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Part II

Inequality of Income: Causes and Measurement

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In preparing this paper the author was ably assisted by Miss Alma Schuhmacher.

MOST CONTEMPORARY WRITERS on income size distribution are concerned with measuring the degree of inequality. It is the contention of this paper that the line of absolute equality (or any similar absolute measure) cannot serve as a base for an operational measure of income inequality; no 'natural' income distribution or unambiguous or generally acceptable 'normative' distribution has been developed that could take its place; and the problem really is to identify, isolate, and then measure the various factors that determine relative income positions, not to 'measure' inequality.

A PERFECT EQUALITY OR INEQUALITY AS A FRAME OF REFERENCE

The problem of measuring the degree of inequality of a given distribution is usually approached in a formalistic way. The existing inequality is measured against a manifestly unrealistic standard of either perfect equality or perfect inequality. Likewise, measurements of *changes* in the degree of inequality over a period, or comparisons of the degree of inequality between populations, are usually in terms of measures based on mathematical definitions of absolute equality or inequality. Indeed, without such a rigid frame of reference, temporal changes in income distribution or comparisons of income distributions are difficult to interpret; in this connection, it may be sufficient to refer to the voluminous literature on the meaning of changes in the slope of the Pareto curve.

Lorenz assumes perfect equality and Gini perfect inequality as the frame of reference.[1] Similarly, in *Changes in Income Distribution during the Great Depression* (NBER, 1946) Horst Mendershausen stated: "measures of income inequality are expected to show how far distribution of income deviates from *perfect equality*, i.e., a state of affairs where all incomes are of the same size" (my italics).

One great drawback of both the Lorenz curve and Gini's concentration ratio (the two measures are closely related) is their relative insensitivity to small changes in the income distribution. Several other statistical char-

[1] Gini's concentration ratio. M. J. Bowman's variant of Gini's curve, like the Lorenz curve, uses the line of perfect equality as a standard of reference: 'A Graphical Analysis of Personal Income Distribution in the United States', *American Economic Review*, September 1945.

acteristics suggested to measure income inequality are more sensitive to small changes in the income distribution, but these also use a minimum degree of inequality defined in mathematical terms as a frame of reference. Thus Mendershausen and Staehle have developed a more sensitive measure of income inequality which is based on a somewhat less absolute definition of perfect inequality – a situation where half of the population has no income, the entire income being distributed among the other half.[2]

Gini himself had suggested earlier a generalization of the concentration ratio in which the denominator would be a measure of less than absolute inequality. As is well known, Gini's ratio of concentration is defined as the ratio of (a) the area between the Lorenz curve and the diagonal and (b) the area of the triangle – the area of concentration obtainable under conditions of absolute inequality (one income recipient getting the entire income, the rest of the population nothing). Thus, the greater the inequality, the larger the ratio of concentration, and conversely, the greater the equality, the smaller the ratio of concentration. By setting a limit to maximum inequality (which graphically is equivalent to reducing the area of the triangle by which the maximum inequality is measured), Gini reduced the denominator of the concentration ratio.[3] The generalized ratio of con-

[2] Horst Mendershausen, 'On the Measurement of the Degree of Inequality of Income Distributions', Cowles Commission, *Report of Fifth Annual Research Conference*, University of Chicago, 1939, pp. 63ff, and Hans Staehle, 'Short-Period Variations in the Distribution of Incomes', *Review of Economic Statistics*, August 1937.

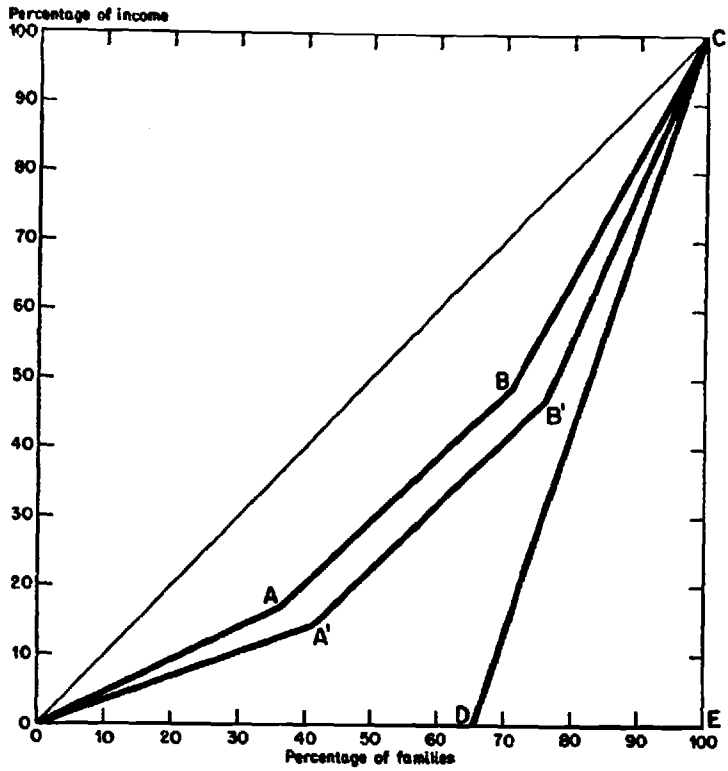
[3] The limitation of inequality is in terms of the minimum number of individuals among whom total income may be distributed in an extreme case. "Suppose that the amount T to be distributed among n units, could not be concentrated in less than k units. If on segment OD, proportionate to the total number of units n, one takes, beginning from EC, the segment ED proportionate to k, the concentration ratio will be given by the relationship of the area of concentration to the area of the triangle OCD. In the case where no limit on the degree of concentration is placed, k is equal to one." (See Chart 1.) Translated from Corrado Gini, 'Intorno alle curve di concentrazione', *Metron*, IX, 1932, No. 3-4; see also his 'Sul massimo degli indici di variabilita assoluta', *ibid.*, VIII, 1930, No. 3.

For a concise summary of Gini's work in this field and for a bibliography of the important contributions of Italian statisticians, see Corrado Gini, 'On the Measure of Concentration with Special Reference to Income and Wealth', *Colorado College Publication 208* (Abstracts of Papers presented at the Second Cowles Commission Research Conference), Colorado Springs, 1936. Many of Gini's early papers on the theory of concentration and the theory of variability have been reprinted, with some enlargements, in *Memorie di Metodologia Statistica* (1939). See also Hugh Dalton, 'The Measurement of the Inequality of Incomes', *Economic Journal*, 30, 1920, 348-61 (reprinted in the 1935 edition of Dalton's volume quoted below) for a discussion of Gini's work and of other Italian literature on income distribution; see also Gini's letter to the editor, *ibid.*, 31, 1921, 124.

For a review of some important early work on measuring inequality of income

Chart 1

Areas of Gini's Concentration Ratio



centration is therefore larger than under the original definition and more sensitive to small changes. An identical movement of the Lorenz curve toward the diagonal results in a proportionally larger reduction of the generalized than of the original ratio of concentration (since an identical change in the numerator is related to a smaller denominator). This can be seen from Chart 1 where OABC and OA'B'C represent respectively two areas under the Lorenz curve to be compared and where the area OABCB'A' is a measure of the degree to which income in the second distribution is less equal than in the first. Suppose that the area of maximum concentration is reduced from OEC to ODC. It can easily be seen that

$$\frac{\text{OABCB'A'}}{\text{ODC}} > \frac{\text{OABCB'A'}}{\text{OEC}}.$$

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size distribution, see Ladislaus von Bortkiewicz, 'Die Disparitätsmasse der Einkommensstatistik', *Bulletin de l'Institut International de Statistique*, vol. XXV, No. 3, 1931.

Gini's generalized ratio of concentration is, however, based on certain *a priori* assumptions, such as that aggregate income is distributed at least between k units or that the income of no unit can exceed a maximum X. The concentration ratio is a helpful analytical tool in the field of vital statistics (where it has generously been applied by Gini and his school) where on *a priori* grounds upper limits may be assumed for a number of characteristics such as birth, marriage, and death rates, but in the field of income distribution an approach via maximum possible inequality seems to hold little promise.

B Natural and Normative Income Distributions

At least two alternatives may be suggested for the traditional approach of using perfect equality or perfect inequality as a standard of comparison. One would be to set a standard of the *socially desirable minimum degree of inequality* and to measure empirical income distributions with reference to it. This was suggested as early as 1917 by Allyn A. Young:

"The degree of departure from absolute equality, however measured or stated, must itself be referred, if not explicitly, then in some vague way, to a standard of normal or justifiable concentration. A dead level of uniformity is neither practicable nor desirable as an ideal of distributive justice."[4]

A standard of a socially desirable or justifiable degree of inequality may, for instance, be derived from principles of welfare economics; however, many other approaches can yield definite 'ideal' income distributions reflecting given sets of economic, political, or ethical principles. This normative approach implies investigating the determinants of inequality and rationalizing the size distribution of income in modern society – an issue that classical and neo-classical economic theory has been singularly reluctant to face. As Dalton pointed out before World War I,

". . . most 'theories of distribution' were almost wholly concerned with distribution as between 'factors of production'. Distribution as between persons, a problem of more direct and obvious interest, was either left out of the textbooks altogether, or treated so briefly, as to suggest that it raised no question, which could not be answered either by generalizations about the factors of production, or by plodding statistical investigations, which professors of economic theory were content to leave to lesser men."[5]

[4] 'Do the Statistics of the Concentration of Wealth in the United States Mean What They Are Commonly Assumed to Mean?', *Quarterly Publication of the American Statistical Association*, XV, March 1917, 478.

[5] *Some Aspects of the Inequality of Incomes in Modern Communities* (London, 1920), Preface.

Until the publication in 1911 of Taussig's *Principles of Economics*

". . . no systematic treatise on economic principles contained any attempt to answer, comprehensively and directly, the question: What are the causes of inequality of individual income?"[6]

The problem was recognized, however, in Irving Fisher's *Elementary Principles of Economics*[7] and Pigou's *Wealth and Welfare* which were published the next year. Subsequent writings on the subject have ranged from the apologetic justification of income inequality in our society to discussion of principles of welfare economics with socialistic implications.

Little seems to have changed with respect to the 'theory of income distribution among persons' since Dalton wrote his pioneering study thirty years ago. The volume on *Readings in the Theory of Income Distribution* sponsored by the American Economic Association (Blakiston, 1946) deals almost exclusively with the respective rewards of production factors, not with the distribution of personal incomes. Although it is recognized that "the nature of the personal income distribution pattern – the distribution of aggregate income as between groups earning incomes of different sizes – also gives rise to problems of great significance" (p. xi), the only article on income size distribution (a revision of Miss Bowman's article referred to above) deals with the problem of measurement, not with causes.

The Conference on Income and Wealth, to my knowledge, has so far not included study of the underlying causes of income inequality among its principal subjects of inquiry.[8] In *Studies in Income and Wealth, Volume Five*, Simon Kuznets, in discussing 'The Why and How of Income Distribution', favors 'synthetic' distributions, where income is regarded as a determinant of other variables such as consumption, over 'analytic' income distributions, where income appears as a function of various determinants.

[6] P. 239. This question was raised, however, several years earlier in the well known article by Edwin Cannan, 'Division of Income', *Quarterly Journal of Economics*, 1905; see also H. J. Davenport, *Value and Distribution* (Chicago, 1908), notably Ch. XXVI.

[7] "No other problem in economics has so great a human interest as this, and yet scarcely any other problem has received so little scientific study," p. 465.

[8] The question of the social and economic determinants of income size distribution was raised, however, by Morris A. Copeland in a paper presented at the Conference on the Evolution of Social Institutions in America held as part of the Princeton University Bicentennial and published, in slightly modified form, in the *American Economic Review*, March 1947. His analysis runs in terms of sources of income and stresses the incentive character of wages and unincorporated business profits and the mutually supporting relationship between inequality of income and of investment ownership.

But even by referring to determinants of income distribution Kuznets clearly had in mind such factors as sources of income, number of income recipients by family, etc., not the basic causes of income inequality among individuals.

Rationalization of the causes of income inequality does not necessarily imply either justification of the *status quo* or advocacy of change. But, as a matter of fact, many theories, offered to explain what in the earlier literature was called the income pyramid and what we now call income distribution, tended to show that inequality reflected immutable laws of nature rather than institutional arrangements of a man-made economic order. Such theories tended to imply, or stated explicitly, that if present inequalities were removed by the intervention of man, they would be rapidly re-established by the action of the laws of nature.[9]

The most elaborate attempt to relate distribution of personal incomes to factors outside the economic system (in terms of inequality of talents) runs back to Sir Francis Galton: *Hereditary Genius* (London, 1869); its real ancestor is Darwin. The first economist to offer a full-fledged theory of inequality of income distribution along these lines was apparently Otto Ammon.[10] His discussion – a mixture of biological, anthropological, sociological, and economic analysis, supported by fragmentary statistical data on the distribution of income for several German states – runs in terms of a joint probability distribution of four traits supposedly fundamental for success in the framework of our economic system and of their transmission by heredity. Ammon introduces, however, the altruistic motive which usually hinders individuals endowed with the highest degrees

[9] The development of the wage structure and trends in income distribution in Soviet Russia may be cited to support this view, otherwise easily classified as apologetic for the capitalist system. See, in particular, Abram Bergson, *The Structure of Soviet Wages, A Study in Socialist Economics* (Harvard University Press, 1946).

[10] *Die Gesellschaftsordnung und ihre natürlichen Grundlagen* (Jena: Fisher, 1895). The relevant chapters have been published in English under the title 'Some Social Applications of the Doctrine of Probability', *Journal of Political Economy*, March 1899, pp. 204-39. Dalton does not refer to Ammon.

Similar theories were expounded around the turn of the century by several Italian and French writers. For an early criticism of theories relating income distribution to the distribution of ability, see Achille Loria, *The Economic Synthesis, A study of the Laws of Income* (London, 1914; a somewhat abridged English edition of the original Italian published in 1908), pp. 221 ff. and Ch. VI. For a brief summary of Loria's criticism, see 'The Psycho-Physical Elite and the Economic Elite' in: *Problems of Eugenic*, Papers communicated to the First International Eugenic Congress (London, 1912), pp. 179-83.

of the four traits essential for success in climbing to the top of the pyramid. Thus the higher incomes correspond only "roughly and in large categories with the higher gifts, the lower incomes with the lower abilities". Furthermore, "The correspondence holds, of course, only between the numbers of persons in a given income class and in the correlative ability class. The data at hand do not touch the question of a correspondence between ability and remuneration in detail." (p. 229).

In this country Henry L. Moore was the first to put forward, in an inquiry into "the law and cause of distribution of general wages among the members of the labor group", the hypothesis that "industrial ability – general sagacity and energy – is distributed according to the normal or Gaussian law".[11] To account for the skewness of the empirical distribution of wages Moore assumed that within each competing group of workers each worker receives the minimum wage of the least efficient plus a supplement proportionate to the excess of his efficiency over that of the least efficient laborer in the same group.

Carl Snyder applied the probability approach to all incomes rather than to the distribution of wages only, arguing that "achievement of a high sort is always a combination of several fundamental faculties" and that complex abilities are obviously more unequally distributed than fundamental characteristics. "The distribution of many simple characteristics of human capacity follows what is known as the normal probability curve.... But when differences of attainment are considered, they do not follow this pattern of the normal probability curve. In some instances perhaps. But in many instances, the curve is sharply skewed."[12] Obviously, to say that the distribution of 'achievement' deviates from the normal curve and is asymmetrical is not to suggest any specific pattern of income distribution that could be used as a standard to which empirical distributions could be related. Even if the distribution of 'gifts' (other authors prefer 'talents' or 'ability') were known, measurable, and stable, the question of the functional relation between gifts and income would arise, since a linear relation between the two variables is not a necessary condition.

Following Snyder, Harold T. Davis has suggested "a general distribution function for the representation of incomes" in which "the distribution of incomes would ... be considered as a special case of [Pareto's] more general law which applies to the measurement of psychic abilities as contrasted with biometric measures or other measures essentially Gaussian in their

[11] *Laws of Wages, An Essay in Statistical Economics* (Macmillan, 1911), Ch. IV, 'Wages and Ability'.

[12] *Capitalism the Creator* (Macmillan, 1940), pp. 253-4.

form".[13] Professor Davis has considerably developed the mathematical formulation of what he calls the "law of the distribution of special abilities", finding empirical support for it in a diverse, though limited, body of evidence, including data on the ability of members of the Indiana University faculty to play billiards and to write mathematical papers, and data showing the distribution of the salary income of the executive staff of a leading corporation. One still might miss the convincing link between the (unknown) distribution of special abilities and the existing distribution of income. Nor does Professor Davis elucidate how cyclical as well as long run changes in income distribution might be related to changes in the distribution of special abilities.[14]

Few, if any, contemporary economists would follow Galton's footsteps in trying to provide an exclusively biological basis for rationalizing the inequality of incomes. We are likely to recognize a large variety of institutional elements in any prevailing income distribution, and most of us probably will recognize, following Taussig, at least two causes of inequality, "inborn differences in gifts, and the maintenance of acquired advantages through environment and through the inheritance of property".[15] Income derived from inherited property destroys the simple scheme of a natural (normal) distribution of income developed by Ammon. Without going into the details of Ammon's argument, we may conclude that any attempt to obtain a reference pattern for an empirical income distribution by relating income to one single set of characteristics, such as inborn gifts, holds little promise.[16]

[13] 'The Significance of the Curve of Income', Cowles Commission for Research in Economics, *Report of Fourth Annual Research Conference on Economics and Statistics* (Colorado Springs, 1938), p. 20. Professor Davis' formula includes a constant representing "the income necessary to sustain life" (subsequently called the "wolf point").

Maurice Fréchet ('Nouvaux Essais d'Explication de la Repartition des Revenues', *Revue de l'Institut International de Statistique*, vol. 13, 1945) has advanced a more general alternative to the theory of direct determination of income by specific biological or sociological factors. His hypothesis is that each characteristic merely determines a corresponding probability distribution of incomes.

[14] Professor Davis offers, however, challenging thoughts on the causal relation that may exist between deviations in the income distribution from the 'normal' Pareto slope of 1.5 and the Spanish Civil War and also the ease with which the Maginot line was overrun; see his *Analysis of Economic Time Series* (Bloomington, 1941), Ch. 9, 'The Nature of Wealth and Income'.

[15] *Op. cit.*, II, 246.

[16] Compare the conclusion reached by A. D. Roy who analyzed twelve samples of hourly outputs of workers in British factories. Dr. Roy concluded that "the tendency for linear measurements in nature and Intelligence Quotients to be distributed normally forms an inadequate platform from which to attack the present (or the past) inequality of incomes" (*Economic Journal*, Sept. 1950).

In contrast to natural distributions, which may have apologetic implications, normative distributions are usually associated with advocacy of the equality of incomes. While equality of income as an ethical principle or a social goal can be traced far back, its justification on grounds of economic theory dates from the development of welfare economics.

Equal distribution of income has been advocated by several theorists of welfare economics, including Abba P. Lerner.[17] His argument is couched in terms of maximizing the probable value of total satisfactions, since it is impossible to discover which of any two individuals has a higher marginal utility of income or to measure the absolute amount of utility or the difference between utilities. The argument in favor of absolute equality being based solely on the inability to measure satisfaction and not on the claim that the satisfaction derived from each marginal dollar (whatever the initial level of income) is the same for all consumers, the point is readily granted by Lerner that, if willingness to work harder and longer hours is indicative of greater capacity to enjoy income, an *unequal* division would be the optimum. A further – and in my view significant – departure from the principle of absolute equality is accepted for the sake "of providing such incentives as would increase the total of income available to be divided".[18] One does not need to dwell upon other explicit or implicit relaxations from Lerner's equalitarian principle of optimum income distribution to conclude that even in a society in which income was distributed according to Lerner's principles the distribution would be depicted by a curve deviating from Lorenz' diagonal.

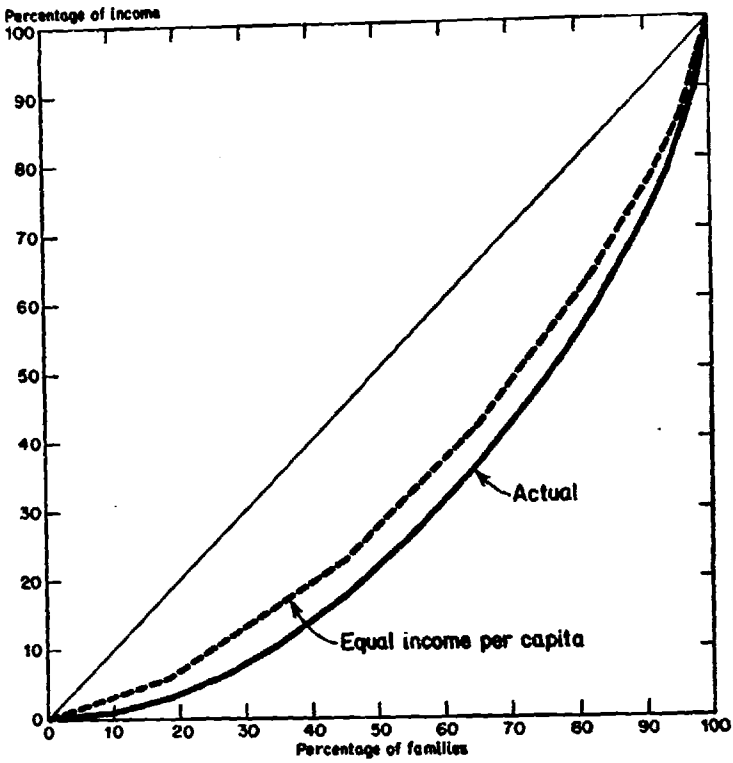
Moreover, since the argument for the equal distribution of income is derived by comparing the satisfaction of income recipients *qua* consumers, it has validity, strictly speaking, only in a society where all income recipients have the same number of dependents, i.e., non-income-receiving consumers. Its extension to family groups of unequal composition would involve recognition of the principle that income should be distributed in direct proportion to the number of consumers in the family group, possibly making due allowance for the reduced needs of children and of old people. Thus an optimum distribution of income would be achieved through equality among all consumers, not among those gainfully engaged.[19] An

[17] "If it is desired to maximize the total satisfaction in a society, the rational procedure is to divide income on an equalitarian basis." *Economics of Control* (Macmillan, 1944), p. 32.

[18] *Ibid.*, pp. 35, 36; also p. 40.

[19] This might be achieved directly or indirectly by first distributing income equally among the gainfully engaged population, then redistributing it, e.g., through family benefits (financed by direct taxation) related to a measure of the capacity to consume, based on family composition.

Chart 2
Family Income in the United States, Assuming Equality of Income per Capita and Actual Size Distribution in 1949



Includes 1 person families.
Sources: Department of Commerce, Bureau of the Census, *Current Population Reports, Consumer Income*, Series P-60, No. 7, Table 3, p. 21; *Statistical Abstract of the U. S. 1950*. p. 25.

optimum Lorenz curve for the United States for any recent year, embodying the principle of equal incomes for all consumers, would deviate considerably from the diagonal. As a matter of fact, the area between such a curve for 1949 and the diagonal was four-fifths of the area of the Lorenz curve describing the actual distribution of incomes of families (including 1-person families) in that year (see Chart 2).

C Toward Analytical Income Distributions[20]

Measuring an empirical size distribution of income against a norm set by a

[20] In revising this section the author had the benefit of constructive comments from Solomon Fabricant, Selma F. Goldsmith, and Frank A. Hanna.

natural or normative income distribution connotes a deviation from and an expected movement toward such a norm. We know from experience that income size distributions change; in the socio-economic setting of the modern world our expectation is that, in the long run, this change is in the direction of more equality. For several reasons, however, even if the theoretical requirements of perfect equality were met, empirical size distributions would fall short of the sort of statistical equality symbolized by the diagonal on the Lorenz chart. We therefore do not know how to reduce 'movement toward equality' to an operational measure. Even without the vexing complications of intersecting Lorenz curves we are at a loss to measure the real magnitude of the change from one year to another as long as the ultimate attainable goal is not the diagonal but a curve between it and the empirical distribution.

One alternative to measuring the inequality of income against the standard of perfect equality, advanced by the writer some time ago,[21] involves the construction of a hypothetical reference curve tentatively called a 'curve of economic equitability'. It was suggested that, when analyzing changes in a size distribution of income, allowance be made for labor force turnover, for family supplementary income recipients, lower income levels of the inactive (retired) population, and for some other factors likely to be present even in a society where incomes were distributed according to some equalitarian principle. The 'area under the Lorenz diagonal' would thus be reduced by the area between the diagonal and the hypothetical curve. Changes in income distribution reflected in changes in the residual area would be proportionately larger than changes in the entire area between the diagonal and the Lorenz curve.

This procedure has the obvious drawback that the hypothetical curve rests on specific assumptions as to the degree of inequality due to factors common to the two (or more) empirical distributions to be compared. While it is possible to establish certain relationships between average (or

[21] In discussing Mr. Pechman's 'Distribution of Income Before and After Federal Income Tax, 1941 and 1947', *Studies in Income and Wealth, Volume Thirteen*. Robert T. Schutz, in a paper presenting an ingenious development of the Lorenz curve analysis ('On the Measurement of Income Inequality', *American Economic Review*, March 1951), advances a similar idea: "It should be remarked that comparison with the line of equality (slope of Lorenz curve equals one) is not necessarily the standard we may wish to use. It might be possible, for example, to work out a 'desirable' income distribution on the basis of age differentials and differences in prices in different communities, and plot this instead of the line of equality as a standard against which the current distribution might easily be compared by means of the coefficient and the chart of tangents [the measures derived by Schutz from the Lorenz curve]." (pp. 120-1).

median) income and degree of urbanization, age of family head, number of supplementary earners in the family, sex of the family head, etc., the effect of each single factor on the income size distribution is difficult to isolate and to measure; some of these factors are interrelated and mere summation would exaggerate their influence.

Even when it is possible to construct a hypothetical reference curve, its analytical use is subject to two serious limitations:

a) The areas under the Lorenz curves are not additive. The area enclosed by the reference curve does not represent the portion of the total inequality depicted by the Lorenz curve that is attributable to specific factors used in constructing such a reference curve. Since the reference curve is not a demarcation line between two components of inequality the two distributions cannot be compared graphically by using the respective areas between the Lorenz and the reference curve.

b) The coincidence of an empirical and of a hypothetical distribution does not necessarily mean that the degree of equality represented by the former is identical with that embodied in the latter, as can be seen by comparing three families of unequal composition. Since the Lorenz curve is based on a ranked cumulative distribution of income and numbers, the actual and the reference curve are identical, yet the actual distribution is in drastic con-

Family	Actual Family Income	Persons in Family	Hypothetical Family Income Assuming Equal Income of $50 Per Capita
A	$150	1	$50
B	100	2	100
C	50	3	150

trast to the criterion of equal per capita income. The inequality in the actual distribution can be shown by preparing a distribution of the *difference* between the actual and the 'norm' income of *each* family, rather than by comparing the whole distribution of actual income with the whole reference distribution.

Thus, all that can be claimed for the reference curve is its usefulness as an expository device, not as a yardstick. The main problem in dealing with income size distributions is, however, to isolate the chief causes of this inequality, not to find the best way of portraying or measuring a given degree of inequality. Ascertaining the determinants of income size distributions raises many complex problems. We have been attempting to analyze the underlying determinants of income size distributions by dividing large aggregates into components and by studying and comparing more homogeneous universes. Color, sex, community type, geographic area, family size and composition, and the number of supplemental earners are some

of the main factors various students have used to differentiate income data. In some cases it was possible to show that differences between distributions reflect combination with different weights of component sub-universes with identical size distributions; by applying identical weights, these differences disappear (see Part III). One use of the standardization of weights is indeed to permit identification of the factors that do *not* account for differences in income size distribution, thus narrowing the area of search for relevant determinants.

The factors determining size distributions of personal incomes may be grouped under six main headings:

a) The basic economic and social determinants of income inequality Taussig identified as "inborn differences in gifts, and the maintenance of acquired advantages through environment and the inheritance of property".

b) Effects of cyclical changes in economic activity.

c) Effects of public policies that change the existing income distribution.

d) Demographic factors such as the age and sex composition of the population and labor force turnover.

e) Socio-geographic factors such as degree of urbanization and geographic location.

f) The time unit to which the income distribution relates.

Clearly, the last three groups of factors are not independent of the general economic and social framework. The ages at which individuals ordinarily enter the labor force and retire are subject to long run changes and to cyclical influences. So are labor force turnover, participation of women in the labor force, the number of supplementary wage earners, locational income differentials, etc. Nonetheless, in studying income size distributions, one might want, in many cases, to account as much as possible for the effect of the last three groups of factors in order to isolate changes caused by the basic economic and social determinants and by cyclical influences.

It is one thing to show that the level of income is related to a certain factor and quite another to show that part of the existing inequality of distribution is due to this factor alone. For example, income is clearly related to age.[22] This can be shown conclusively for this country from sources such as the Census sample surveys of money income, the Federal Reserve Board surveys of consumer finances, or (for covered wage earners only) the Social Security Board statistics. But what exactly was the relative importance of age of family heads as a determinant of the size distribution

[22] In the mature age groups the number of experienced workers is larger. Also, property income is likely to be correlated with age since on *a priori* grounds one may assume that asset holdings increase with age, at least up to retirement.

of income among families in the United States in 1951? Or, what part of the shift toward equality in family income size distributions between 1935-36 and 1951 was due to changes in the average age of family heads or in their age distribution?

Factors such as age or the degree of urbanization affect the entire income range, not only its lower end. Other factors, such as broken families or part period workers,[23] are likely to affect mainly the lower end. Some of the difficulties encountered in interpreting income size distribution arise precisely from the presence of relatively large groups of part period workers (including those who enter the labor force incidentally or intermittently), retired people, and broken families.

Workers who are in the labor force only intermittently usually find employment in low paying occupations; they are likely to account for a large portion of the lower end of an income distribution. The economic and social significance of part period workers is different from that of part time workers. Obviously $500 earned by a young man during the balance of the year on his first full time job after the spring high school graduation belong in a different category from the same amount representing the annual income of a family head who was a member of the labor force during the entire year but who was able to obtain part time employment only.

Such fragmentary data as are available strongly suggest that labor force turnover, while directly affecting labor income only, is probably a major factor making for inequality in the distribution of labor income among persons and affecting the total income distribution of families or of similar income units. No data are available on the number of individuals who enter and who leave the United States labor force during a given year. In a stationary labor force new entrants during the year may be expected to balance permanent withdrawals, and the sum of the two might be about 5 percent of the total labor force. In a growing labor force annual net additions increase the number of part period workers. Moreover, some seasonal needs of industries depending on weather (such as agriculture, construction, and some related industries) or having distinct shopping seasons are ordinarily met by employing individuals not permanently in the labor force.

[23] We use 'part period' to denote persons who do not belong to the population studied during the entire period to which the size distribution relates. 'Part time' workers as used in this paper refer only to workers in the labor force during the entire period covered who did not hold full time jobs. Thus high school students who enter the labor force after graduation are 'part period' workers while workers who worked fewer than the standard (or a conventional minimum) number of hours are 'part time' workers. Obviously, part period workers may also be part time workers. As a matter of fact they frequently are.

Empirical data on labor force turnover, showing changes in the work status of the entire labor force between monthly survey dates, are available since mid-1948 only. It is estimated, for instance, that in 1949, on the whole a year of relatively high employment, on the average 2.8 million persons (nearly 5 percent of its average size) entered the labor force *each month* and nearly as many left it.[24] These figures include, however, a considerable number of duplications as many individuals withdrew from the labor force (and reentered it) two or more times during the year.

The Bureau of the Census estimates that 67.5 million persons worked during some period of the same year for pay or profit, although for the entire year the average was only 56.8 million (excluding from both figures unpaid family workers). Thus, the number of persons working *sometime* during 1949 was 18.8 percent larger than *average* gainful employment; the ratio of part period workers to those holding jobs throughout the year must have been, of course, higher. It might have been 20 percent or more. It is therefore likely that a significant proportion of units in the lowest brackets in the distributions of annual wage and salary income represents two groups of intermittent workers with relatively low earning power – women, many of whom are ordinarily housewives, and youngsters of high school age.[25]

The effect of part period earners on the size distribution of incomes depends on the unit of enumeration and on the time unit to which the distribution relates.

a) Obviously, the shape of any given income size distribution depends on the unit of enumeration.[26] When income distributions *among individuals* in

[24] Bureau of the Census, *Current Population Reports, Labor Force*, Series P-50, No. 19, 'Annual Report on the Labor Force, 1949', Tables 16-17.

[25] Teen-age persons alone accounted for nearly three-tenths of aggregate additions to and for more than a fourth of reductions in the labor force in 1949, while half was accounted for by women (20 years or older) although this group comprises only a fourth of the civilian labor force. Similar relationships prevailed in 1950 and the second half of 1948, when the current labor force turnover series was started, and in the second half of the conversion year 1945, when similar estimates were made.

[26] Even if incomes were distributed according to some equalitarian principle, an empirical distribution of income would be equal only if the criterion of equality was applied to the unit on which the size distribution is based. Indeed, the criterion of equality may be applied in several ways. Income might be distributed equally among all persons gainfully engaged – per capita or in relation to actual working time – or equally among all consumers, or among all families, or according to some other principle. In each case a distribution that would be equal from the viewpoint of one criterion would be unequal in terms of another. Thus, equal distribution among all persons gainfully engaged would result in an unequal distribution of family income, and vice versa.

the labor force are considered, part period income recipients are likely to make the size distribution less equal.[27] Two of the three main groups of part period workers – intermittent and new workers – are likely to belong to the lower paying occupations, and even among those leaving the labor force permanently the majority are likely to have earnings below the mean of full period workers.

In distributions of *family income* most part period workers are likely to appear as supplementary workers. We may safely assume that more often than not low earnings of the family head cause additional members of the family to enter the labor force (as either part or full period workers), so that family incomes including part period workers are likely to be more equally distributed than those of full period workers alone. In the case of part period units representing families formed or dissolved during the period, however, the argument is the same as for distributions among individuals.

b) The effect of labor force turnover increases with the length of the period to which the income distribution refers.[28] Some new units enter the labor force during the period to which a given size distribution relates and others leave it. Similarly, when a distribution among families (or any other income or expenditure unit involving pooling of income) is considered, some supplementary earners are likely to become separate units during the survey period, while some previously independent units merge. The longer the period to which the income distribution relates the larger the proportion of units whose status has changed, a fact likely to have a definite influence on the income size distribution.

If, for instance, in a given year, 5.2 percent of earners (other than intermittent workers) enter the labor force, only 0.1 percent enter it during an average week. Thus an income size distribution for a full year would include 52 times as many part period earners as the one relating to one average week only. The same would be true for individuals withdrawing from the labor force during the year.

The size distribution of family income is also affected by the formation

[27] If all persons above a certain age, not only income recipients, are considered, the effect would be the opposite, as part period employment would reduce the number of zero earners.

[28] While lengthening the period increases the effect of labor force turnover on the distribution of income among persons, it also tends to attenuate the influence of cyclical fluctuations in income and employment, especially when income is averaged over several years.

and dissolution of income (family) units.[29] On the other hand, persons withdrawing from the labor force, temporarily or permanently, may continue to receive property income, so that the effect of labor force turnover is likely to be more important on the size distribution of labor income alone than on the distribution of total income, including property income.[30]

Several solutions of the problem of measuring the influence of part period income recipients may be envisaged:[31]

a) The income size distribution may be confined to full period income recipients.

b) Earnings of part period income recipients may be converted into full period equivalents.

c) The base period of the income distribution may be shortened in order to minimize the number (and the relative importance) of part period earners.

None of these solutions is fully satisfactory, but one or another may be useful to solve specific problems. Since part period earners belong to the empirical distribution, their elimination, either directly or through the device of converting their income to a full period basis, will remove a significant element, making the distribution more equal, the more so the larger their proportion in the total population.

The third alternative, to minimize the number of part period units by shortening the period, may be well suited to certain cases, in particular

[29] In considering the various factors explaining the existence of a relatively high number of units with low incomes, the *Materials on the Problem of Low-Income Families*, assembled by the Staff of the Subcommittee on Low-Income Families of the Joint Committee on the Economic Report (81st Cong., 1st Sess.) discussed briefly the effect of broken families, but not of families formed or dissolved during the course of the year.

[30] Part period units are even more important when analyzing the distribution of income from specific sources, since the proportion of persons receiving income from a *given* source during part of the period only is likely to be larger than the proportion receiving income from *any* source during part of the period only. When analyzing the size distribution of income from a specific source, proper account should be taken of individuals who received income from this source during part of the survey period only. The Census survey of consumer income for 1948 shows, e.g., that 38.5 percent of persons receiving self-employment income drew less than $1,000 from this source (including 2.9 percent who reported losses), as compared with 27.1 percent who received wage and salary income of this size in 1948. It may well be that the considerably higher percentage of low income self-employed includes a significantly higher proportion of part period units in this category, reflecting, among other factors, the high mortality rate of small business.

[31] The problem of changes in family status during the report period may be approached in a similar way.

those involving size distributions of wage and salary income alone. If wage and salary income for one week is chosen as a basis, the size distribution will still contain a certain number of individuals whose labor force status has changed during the week, but all those entering or leaving the labor force before or after this given week will be eliminated.[32] Since customarily new workers report on Monday while most separations occur on Friday, part period earners in a weekly distribution would be relatively few.

Shortening the survey period may raise relatively few questions in the case of labor income, the flow of which is relatively continuous unless interrupted by unemployment or sickness, but for other types of income it involves various degrees of arbitrariness and artificiality. Entrepreneurial income, for instance, is more likely than labor income to be subject to seasonal influences, especially in agriculture. Dividend payments are rather frequently raised to their final annual level by special dividends or by larger final quarter dividends.

Any technique that involves minimization of the effect of part period earners is necessarily a *pis aller* and subject to the criticism of removing a portion of the problem by judicious statistical treatment of the empirical data. Part period units are an integral portion of the universe. The main determinants of an income size distribution are, however, not necessarily the same for part period as for full period units. Instead of removing or minimizing the effect of part period income recipients on the size distribution, it is therefore preferable to ascertain to what extent changes in the income size distribution for the total population are due to a changing proportion of part period earners as distinguished from factors determining the distribution of income among full period earners. For meaningful analysis, the total distribution should be divided into several distributions for comparable income-receiving categories, such as full time, part period, part time, and unemployed workers, so that changes in the total distribution may be explained in relation to changes in its components.

Basically, of course, the treatment of part period workers depends on the purpose of the income size distribution. The distribution of earnings of full period workers approximates the combined effect of the reward for

[32] Going a step further, it will be possible in most cases to convert wage and salary income to a per hour basis and to obtain a size distribution of labor income per hour of employment. Such a distribution will, of course, differ from the one obtained for all members of the labor force with wage and salary income during a given year. While in the first case labor income is related to labor input, in the second it is related to the number of individuals belonging to the labor force, even temporarily, at any time during the given year – a measure likely to be more relevant, e.g., in studies of consumption patterns.

personal ability and of the various environmental factors. The distribution of earnings of part period workers reflects, in addition, the preference of certain segments of the labor force for less than full time employment, the availability of part period job opportunities, and changes in the size and composition of the labor force during the year. Particularly in studies where economic behavior is related to income level it might be advisable (as is frequently done in studies of consumer expenditures) to segregate or to eliminate part period units. Part period units not only usually have lower annual incomes: their consumption (or expenditure or saving) patterns are likely to be more comparable to units with annual incomes corresponding to their incomes on a full period basis. Moreover, the entrance or exit of part period units from the universe may involve expenditures not typical of full period units. New members of the labor force may have extraordinary or nonrecurring expenses for work clothes and tools or moving expenses. Similarly, newly formed or broken families are likely to have extraordinary expenditures for marriage, moving, medical, legal, burial, and similar services.

On the other hand, in some cases it is desirable to show the distribution of earned income among all members of the labor force, including zero earners. Such a distribution reflects not only changes in the internal distribution of awards among those able to get full or part time jobs but also the varying proportion of unemployment.

Similar problems arise when dealing with income distributions among family (or other consumption) units rather than among persons. As already suggested, the effect of changes in the status of units during the survey period on family income size distributions could be dealt with in a way similar to the proposed treatment of part period income recipients. In other cases it might be desirable to focus attention on changes in the size distribution of the income of the active population by isolating the inactive population, or at least retired units that receive transfer income only.

Hazel Kyrk has directed attention to the importance for the lower end of the income size distributions of families with income derived from social security benefits and assistance.[33] She estimates from reports of the Social Security Administration that in 1947 and 1948, of the 17 percent of recipient units reported by the Bureau of the Census as having money incomes under $1,000, about a fourth derived their income entirely from old age assistance, old age and survivors benefits, or aid to dependent

[33] 'The Income Distribution as a Measure of Economic Welfare', *American Economic Review*, May 1950, pp. 342-55.

children. She points out that the social security program has provided with separate transfer income individuals who otherwise could not have existed as independent economic units. Thus, in recent years, the broader and larger transfer payments made to an increasing number of elderly persons and others incapable of earning a living (aided possibly by rent controls) has augmented not only the number of units separately domiciled but more particularly those at the lower end of the income distribution. Paradoxically, the very process that has contributed to raising the economic level of old and incapacitated people and of families relieved of responsibility for these dependents at the same time has been reflected statistically as an increase in the inequality of the income size distribution.

The number of families headed by retired individuals or of retired persons living alone is likely to continue to increase because of the rapid spreading of private pension and retirement systems as well as of the gradual maturing of the old age and survivors insurance program. Any future shifts in the income distribution of the active population in the direction of more equality are, therefore, likely to be obscured statistically by the offsetting effect of additional numbers of retired units receiving transfer income. We have here clearly a case where it is desirable, in studying empirical income size distributions, to isolate changes reflecting the impact of public policy.

Changes in the family status of the population are only one of the problems arising in connection with interpreting size distributions for recipient units other than individual income receivers. Less attention has been paid in recent literature to the relation between family structure and size and income distribution than to the relation between family size and consumption.[34] Yet study of the former relation should cast considerable light on the inequality of income.

Income of families is generally higher than that of single individuals. Frequently, families have more than one income recipient. The Bureau of the Census estimates that in 1948 more than a third (15.6 of 38.5 million) of families of two or more persons had two or more *earners*. The number of families having two or more *income recipients* may have been considerably higher, since many families with one paid worker may have one or several recipients of other types of income.[35] Also, the 2.1 million families having no earners are likely to include some farm families with more than one recipient of income other than labor income.

[34] See William Vickrey, 'Resource Distribution Patterns and the Classification of Families', *Studies in Income and Wealth, Volume Ten.*

[35] *Current Population Reports*, Consumer Income, Series P-60, No. 6.

The effect of supplementary family earners on an income size distribution is still largely unexplored. The Census estimates clearly indicate that inequality of income size distributions decreases as the number of supplementary family earners increases.[36] Some unpublished tabulations of the Bureau of the Census for 1946 seem, however, to indicate that this greater equality was due to differences in the earnings distribution of family heads (having no, one, or two or more supplementary earners) themselves, rather than to differences in the income distribution of supplementary earners. Still, significant inverse correlation may be assumed between the number of supplementary part period family earners and the income of the family head. This probably does not hold true for full period supplementary earners (typically, grown children or distant relatives living with the family). More data for more years and involving larger samples with cross-classification of incomes of principal and supplementary earners must be obtained before definitive conclusions can be drawn concerning the separate effects of part and full period supplementary wage earners on the size distribution of family income.

Obviously, here again we are likely to meet the same problem as with individuals who continue as independent units instead of joining families headed by their younger relatives. To the extent that some supplementary workers are part time or intermittent workers desiring full time employment, an improvement in the labor market situation is likely to cause a decrease in the number of multi-earner families and an accompanying increase of one earner families, including one person families, many of whom will be part period units.

One is thus led to believe more and more that global analysis in terms of size distributions for the entire population is at best the first step toward comprehending changes in income structure. Over-all distributions are the composite result of separate and frequently contradictory developments toward which we should increasingly direct inquiry.

[36] See, e.g., *ibid.*, Table 7. In Bulletin 7 of the same series, the Bureau of the Census commented: "There was a progressive increase in the proportion of families with more than one earner up to the highest income level, at which point this proportion decreased markedly. These figures provide an important clue in explaining the diminution of inequality in the distribution of income in the United States since the depression. It is very likely that because of the greater employment opportunities which exist today, many families which were formerly at low income levels were able to rise to higher income levels as a result of the employment of other family members in addition to the head."