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# CHANGES IN

# *Income Distribution*

# DURING THE GREAT DEPRESSION

HORST MENDERSHAUSEN

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Appreciation is also due those who in 1934 sponsored and produced the Financial Survey of Urban Housing, thereby providing a body of income data the current study has been the most recent to use. It is appropriate to recall here the high tribute accorded the staff of the Central Statistical Board for its aid in that basic inquiry; to Morris Copeland for his appreciation of the significance of income data; and to Theodore Veenstra for pioneer studies. This study is also the beneficiary of the Bureaus of the Census and Foreign and Domestic Commerce which ventured the experiment of collecting data on personal incomes. David L. Wickens directed the Financial Survey and later at the National Bureau developed the income distributions here analyzed.

HORST MENDERSHAUSEN

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## I

This volume contributes significantly to our knowledge of the changes in income distribution. Is there a tendency for incomes to become more, or less equally distributed as time goes on? In particular, are short term fluctuations in general prosperity—booms and depressions—accompanied by a change in the relative income shares of various population groups; and if so, in what direction? These questions call for thorough empirical study.

The ethical implications of such questions are clear; since Karl Marx or the biblical prophets we have felt uneasy about the concomitance of growing wealth and growing concentration of income. There are also economic implications, as changes in income distribution may mitigate or accentuate changes in prosperity itself. Under given conditions of technology and tastes a certain level of employment corresponds to each level of total demand for consumer and investment goods. And since profitable investments cannot be made in the absence of demand for final goods, employment cannot remain on a high level when consumers' demand persists on a low. The aggregate demand of consumers depends in turn not only on their total income but also on the share of those who out of an added income of a given amount, save little compared with the share of those who save much. The nonsavers are the poor rather than the well-to-do. Hence, changes in income distribution can affect employment and the severity of employment fluctuations. The presumable effect of income redistributions on economic stability has not been studied conclusively, even in theory. In a few passing remarks, Mr. Mendershausen shows that the theory would have to take into account how each individual's current savings are affected not only by his current but also by his past and his expected future income. The empirical study of fluctuations of individual income is all the more necessary. Figures on aggregate national income hide vital details of shifts in internal structure.

These details have their importance for the study of single commodity markets no less than for the study of total consumption and employment. The *nouveaux riches* and the *anciens riches* of the same current income level do not use their money in similar ways; no more than do the *nouveaux pauvres* and the *anciens pauvres*. Prediction of demand for a given commodity or group of commodities and a given level of total national income will have to be based, however roughly, not only on some assumed distribution of incomes

between the poor and the well-to-do, but also on the distribution between the old and new poor, old and new well-to-do.

Such details are provided—perhaps for the first time in the history of published income statistics—in the data at Mr. Mendershausen's disposal: of the Financial Survey of Urban Housing conducted under D. L. Wickens' direction and now appearing in Appendix B of this volume.

## II

Essentially, the Financial Survey data show, for each of the 33 cities sampled, a *joint* distribution of sampled families by their incomes in 1929 *and* 1933. Thus the question is answered: what proportion of the persons sampled who received $2,000-3,000 (say) in the boom year 1929 received in the depression year 1933 an income of $1,000-1,500? $1,500-2,000? or maintained the former income of $2,000-3,000? or even exceeded it? Just as the actuary makes conclusions from the survival rates of the people of various ages insured with his company, the economist draws from Mr. Wickens' sample important general, albeit tentative information (the limitations of the sample are ably pointed out in this volume). The economist asks: what was the probability, in 1929, that an American family with a given income and living in a given city, would go down or up by a given amount on the income scale by 1933? Still more generally and tentatively, he will ask: What is the probability that an American family with a given boom-year income will have, in the next depression the same or some other given income, if the national income is expected to fall by a given amount?

This is the type of question Wickens' joint-distribution tables help to answer: They are a sample (or rather 33 samples, one for each city) consisting of observations on two variables—incomes of each family in 1929 and in 1933. In Chapter 3 Mr. Mendershausen has availed himself, to some extent, of these opportunities. By including Appendix B, the Conference on Research in Income and Wealth enabled other economists to make other uses of these unique data; it also hopes that more data of the same kind but for other periods or areas will be forthcoming.

To draw inferences from this material, we have to set up alternative hypotheses (or 'models') of the relation between a family's earlier (boom-year) and later (depression-year) income. One such hypothesis is that the depression income was, apart from an additive random component, a linear function of the boom-year income.

This would correspond to Mr. Mendershausen's Table 36 where linear regressions were calculated: an hypothesis which in view of the very strong skewness of the distribution may not be the best. Other hypotheses might be worth trying.[1] While Mr. Mendershausen's linear regression coefficients clearly point to a definite hypothesis, the same cannot be said of certain other measures he has calculated, such as the degree of change in position with respect to the median, or with respect to some arbitrarily chosen boundaries separating the poor from the well-to-do. Further work will be required to find the most appropriate tools for an adequate description of the processes of income redistribution. A few illustrative remarks follow in the next Section. They are very general: the study of redistribution processes is a new field.

## III

The study of these processes may ultimately throw light on a problem that has tantalized economists for generations: the causes of a given shape of income distribution in a society. The income distribution observed at any time is the cumulative result of preceding redistributions, just as the proportion of tall and small trees in a forest is explained by the laws of their growth.

If, for example, the participation of each family, in dollars per head, in the gains or losses of national income was due entirely to (say, 'normally distributed') luck, bestowing its smile equally on the poor and the rich, the shape of the income distribution would tend to be 'normal' too. Since a run of bad luck would be as frequent as of good luck, and would affect everyone regardless of his previous income, paupers would be as rare as millionaires. But if, to take another hypothesis, not the dollar but the *percentage* change in income were equal for all families, again apart from (normally distributed) chance deviations of this *percentage*, the distribution of the *logarithms* of incomes would tend to be normal. The incomes would be distributed in a skew way, with more persons below than above the mean income. Material of the type presented in Appendix B gives at least a glimpse of what these elementary redistributions are when prosperity is followed by depression. As to income

[1] Logarithmic regressions were used, in a similar problem, by Ruth O'Brien, Meyer A. Girschick, and Eleanor Hunt in 'Body Measurements of American Boys and Girls for Garment and Pattern Construction; A Comprehensive Report of Measuring Procedures and Statistical Analysis of Data on 147,000 American Children' (U.S. Department of Agriculture, Bureau of Home Economics, Textiles and Clothing Division, July 1941).

redistributions on the upturn, this volume contains fewer hints; income data for expansions were not available in the form of *joint* frequency distributions.

It is seen that, because of innumerable individual circumstances, any hypothesis concerning movements within an income distribution (of which two particularly simple examples were just given) is a 'stochastic' law of change: describing the rate of growth of an individual income over its previous level as well as accounting for the random (or 'luck') elements in the change.[2]

Using the first example, suppose further that population (say, $N$ families) and total income, and hence the mean income remain constant. Let every family start with the *same* income and suppose that each subsequent year one-half of the families, chosen each year by lot, have their incomes raised, the other half have their incomes cut, by one dollar a year. After the first year, the standard deviation of incomes will therefore be $\$\sqrt{\frac{\frac{N}{2}.1 + \frac{N}{2}.1}{N}} = \$\sqrt{1}.$ After the second year, one-quarter of the families will have \$2 more than the average, another quarter will have \$2 less than the average, while one-half will have just the average income; the standard deviation will be $\$\sqrt{\frac{\frac{N}{4}.4 + \frac{N}{4}.4}{N}} = \$\sqrt{2}.$ After three years, one-eighth of the families will have had three successive lucky years, one-eighth will have had three successive unlucky years, while three-eighths of the families will have won, and three-eighths of the families will have lost, one dollar each. The standard deviation will be $\$\sqrt{\frac{\frac{N}{8}.9 + \frac{3N}{8}.1 + \frac{3N}{8}.1 + \frac{N}{8}.9}{N}} = \$\sqrt{3};$ and so on. Under this hypothesis, the 'inequality' would turn out 10% higher in 1933 than in 1929 if the starting year was 1910: since $1933-1910 = 23$, $1929-1910 = 19$, and $\sqrt{23} : \sqrt{19} = 1.1$. Thus, the hypothesis would

[2] Compare my note on 'Income Inequality and Demand Studies', *Econometrica,* April 1943. On stochastic (or random) differential equations in other fields of economics see Harold Hotelling, 'Differential Equations Subject to Error and Population Estimates'; *Journal of the American Statistical Association,* Sept. 1927; J. Neymann, Lectures and Conferences on Mathematical Statistics (Washington, D. C., 1937). More recently: T. Haavelmo, 'Probability Approach in Econometrics', *Econometrica,* Supplement, 1944, also issued as Cowles Commission Paper, New Series No. 4.

not be incompatible with Table 6 of this volume! The observed rise in 'dispersion' would have been due merely to the passage of time, not to the fall in general prosperity. The used measure of dispersion is thus not sufficient to describe the effect of depression on the distribution of incomes.

Still other results would have been obtained if the income increases and cuts assigned by yearly lot were not always $1 but varied —and, hence, dispersion of good and bad luck varied—from year to year. One has thus to be careful (and this seems also to be hinted at by the author in Chapter 3) not to regard changes in general prosperity as the sole cause of income redistribution but include in the explanatory hypothesis also some assumptions about the distribution of good and bad luck. Information of the sort given in Appendix B helps one to embark upon such analysis. It is, in essence, not different from any other statistical inference of distribution laws from observed samples.

Given the *joint* distribution of incomes for two years, it is always possible to derive the (so-called *marginal*) distribution for each year separately (see App. B, the rows and columns headed 'Total number'); but not *vice versa*. If we study the distributions for each year separately, neglecting the identity of each family observed in the two years, information is wasted.[3] By studying the joint distribution one might find parameters describing the redistribution process, as well as parameters describing the distribution of each year in a more appropriate way than by purely conventional measures of 'dispersion'. For example, if a reliable linear relation was found to exist between the logarithms of incomes of a family in the two years, the most natural description of the distribution or of its 'dispersion' in any given year would *not* be in terms of the coefficient of variation of incomes.[4]

## IV

Mr. Mendershausen has done well to try to go beyond the purely quantitative distinction between incomes, and to establish patterns of change for separate qualitative types of income. His distinction between the unemployed and employed receivers of low incomes is particularly important. He also distinguishes between tenants and

[3] Another case of wasting information by aggregating material is to use as variables the per capita incomes of entire *cities* in the two years, although the joint distribution by family incomes in the two years is known for each city separately.

[4] Cf. L. Gibrat, *Inegalités Economiques* (Paris, 1931).

house owners, and between skilled and unskilled workers. Another distinction, between high incomes from profits and from other sources, is equally important but has not yielded definite results. In fact, modern business cycles theory is dominated by the distinction between profits on the one hand and all other incomes (so-called costs or rewards of production factors), on the other. An hypothesis advanced by Keynes has occasionally been tested for various historical periods (Earl J. Hamilton has applied it to the gold inflation of the 16th-17th centuries): wages lag behind prices, hence entrepreneurial profits and losses are accentuated by booms and depressions; and, being "the mainspring of entrepreneurial action", profits, in turn, aggravate booms, losses aggravate depressions. The hypothesis might seem to be contradicted by Mendershausen's thesis that the distribution of income becomes less equal in depressions. Yet, the contradiction is only apparent since profits are not the sole income of the rich. To test the hypothesis conclusively, other material would be needed. As the author points out, corporate dividends are a hybrid between profits and interest. Salaries of corporation officers also contain an element of profit. The segregation of the statistical data on incomes of the elements strictly comparable to those used in the theoretical analysis of business cycles is, therefore, not easy. But the attempt must not be abandoned.

Both the materials and the tools of economic research are still too crude to justify definitive conclusions. Any empirical economic study can be judged, at best, as a trial experiment, a promise. This study is such a trial experiment, and a promising one.

JACOB MARSCHAK