

Factors Determining Income Distribution

Jan Tinbergen

Since the phrase *income distribution* covers a large number of different concepts, it is necessary to define these and to indicate the choice made in this article.

Income for a given recipient may cover lists of items which are not always the same. Apart from popular misunderstandings about which items to include and exclude, statistical sources on incomes use varying definitions, often because of the data available. Tax statistics, which are among the most important sources for income data, sometimes exclude items because tax legislation contains allowances or includes items because of traditional concepts of income. The data from this source have been processed by a number of authors seeking to approximate the economic income concept, and we will assume that this aim more or less has been attained. In other words, we will assume that, in principle, the income figures used in the more sophisticated studies available cover the economic income concept and, more precisely, primary income, which we consider identical to income before tax.

Our interest will not be directed to factor income distribution, that is, the portions of national income accruing to labor, capital, and land. Rather, the total income as distributed among individuals or households is our focal point. A distinction should be made between income recipients as the basic units, households as the

The author is Professor of Development Planning, Economics Faculty, Netherlands School of Economics, Rotterdam.

basic units, or consumers as the basic units. In one household, except for single-person households, there may be more than one income recipient. Since the number of consumers in a household is larger, as a rule, than the number of income recipients, there is a point to distinguishing between incomes per recipient, per household, and per consumer. The latter either may be defined as each person whose consumption is financed by part of the household income, or in terms of consumption units, where female and young consumers are given weights below 1, the weight given to an adult man. For its welfare implications the income distribution among consuming units is the most relevant of these various concepts.

For each of the subjects discussed—recipient, household, or consumer—we may distinguish between primary income, secondary income, or income after tax and income after complete redistribution. The latter concept contains elements allocated to the recipients, below cost, of a number of goods or services, such as low-cost housing or education. Again for its welfare implications the last concept is the most relevant of the three mentioned.

For a numerical picture of the changes in income distribution over time or the differences between various communities, countries, or regions, data on the income after complete redistribution are the most relevant. Only a limited number of studies is available disclosing information on this distribution. Because of the smallness of taxes and other items of redistribution in earlier periods, the estimation for these periods may be simple in some cases and may permit comparisons over time. Before 1900 taxes in the now developed countries were relatively low, and few other schemes of redistribution were in operation, with some exceptions. This enables us to conclude, as we did in some previous studies [7], that in Western countries income distribution has become considerably less unequal than it used to be.

Income Distribution as the Result of a Social Order

In principle it is not possible to discuss the factors determining income distribution in isolation from the complete social order of the geographical unit considered. Income distribution is the outcome, together with other features of the society studied, of the interaction of all relevant variables appearing in the model describing the operation of that society. The use of models does not mean more than some degree of simplification of reality which is necessary to understand the essence of the operation of an economy or, somewhat wider still, a society. Although the judgment of what

is relevant and what is not leaves room for some subjective appraisal, the selection can be made fairly objective by the introduction of quantitative criteria or limits to what can be disregarded by the model used. In the description of a modern Western society the operation of production processes, property rights, tax systems, systems of social security, education, and consumer behavior are all relevant and must be represented in the model. As a consequence, primary and secondary incomes and incomes after complete redistribution all will occur as variables, or rather sets of variables for different occupational groups, in an adequate model, together with production functions, wealth, enrollment for different types of education, and data on tax structures and the structure of public expenditure. This article will not give an example of a complete model of this type; income distribution will be singled out for a closer look at the factors which determine primary income distribution. This is comparable to the discussion of a group of markets when described as part of a model. The variables occurring in such a description must be of at least three types: those exogenous to the model as a whole; those endogenous to the model but exogenous to the portion of the model focused upon; and those endogenous to that portion. Among the first category are the tax system, the educational system, and production functions with their respective variables: tax rates, school fees, if any, and the quantity of production factors available at the time point studied. Among the second category are the quantities of various goods produced and consumed and their prices. Variables of the third category will be described at more length together with the equations connecting them.

The use of a partial model of the kind suggested implies that problems of shifting taxes or social security rates are taken care of in principle but not explicitly. It also implies that we will deal with direct, not indirect, determinants of income distribution. By definition, the indirect factors occur in equations other than those we are going to discuss and so contribute to the explanation of those variables which are exogenous to our portion of the model, although they may be endogenous to the model as a whole. It would be incorrect even to include indirect determinants in our equations. As a simple illustration we may think of the separate description of some commodity market. Among the variables explaining the price of the commodity the wages of the producers may occur. These wages may depend on the general cost of living in the economy, but it would be incorrect to include cost of living in the equation of the supply of the commodity studied.

Demand and Supply as Instruments of Analysis

In a complicated modern society it is inconceivable that every variable be determined by some central authority. It also is inconceivable that traditional standards would determine the picture of income distribution completely. A number of decisions are freely taken by individuals or groups, such as trade unions or large enterprises. This is true even in so-called centrally planned or socialist countries, although both terms are misnomers. It is much more true, of course, in mixed Western, that is, socialist-capitalist societies.

This state of affairs enables us to describe the processes of income determination and, hence, of income distribution by the economic method of demand and supply analysis. This analysis does not exclude the existence of lags, even long lags, but for an explanation of the long-term tendencies of income distribution these lags will be less disturbing than for an analysis of short-term movements, which often are subject to the rigidity of social institutions. Even such institutions and the rules of behavior by which they live can be subsumed under the concepts of demand and supply factors. There need not, therefore, be a contrast, still less a contradiction, between the existence of institutions of a traditional character, such as the caste system in India, and the use of demand and supply analysis of income distribution. There is a considerable freedom to arrange these various concepts either as demand and supply or as institutional factors. Preference for one approach rather than the other simply may be a question of the author's taste; there is a point, however, to letting the choice depend on the relative size of the influence of each of the factors involved. Gunnar Myrdal's [5] and, in a way, Mrs. Irma Adelman's [1] presentation of the determinants of income distribution are not in contrast, therefore, with the presentation chosen here. Our attempt will be to use demand and supply as the primary classification principle of the determinants of income distribution and institutional elements as one of the additional subclassification elements.

The essence of demand-supply analysis in attempting to explain price formation consists of the clear distinction between a demand and a supply equation. The former expresses the quantity of demand as a function of price and of a number of other variables; in the case of a commodity market, demand also is assumed to depend on income, on consumption habits, and on prices of competing goods. The supply equation expresses the quantity supplied as a function of price and a number of other variables, such as cost

of production and capacity to produce. In a demand equation the additional variables (excluding price) sometimes are called demand factors; in a supply equation they are called supply factors. From the demand and the supply equation two other equations may be obtained by the elimination, alternatively, of the quantities or of the price. The former sometimes is called the price equation, the latter the turnover equation. These new equations are based on the assumption of equilibrium between demand and supply. For some markets equilibrium only may be attained after a long period of adaptation; then the price equation and the turnover equation are valid only in the long run. For shorter run purposes more complicated assumptions can be made, introducing stocks of the commodity considered [8].

In the present article we will consider income as a price. Our attempt will be to express income in terms of demand and supply factors, but a further element will be added. We want to consider income distribution, that is, a characteristic of a group of incomes. This also implies that the demand factors and the supply factors will have to be replaced by a distribution characteristic of each of these factors. The simplest way to do so is to represent a distribution by some parameters, such as the average and the standard deviation as a minimum; more parameters can be added if need be, or other parameters can be chosen. Instead of the average, the median, or instead of the standard deviation, the variance, may be used and so on.

The theory we are proposing to apply is general in the sense that it may cover various types of income, especially labor and capital income. In some cases the material available for testing only covers labor incomes. This can be defended by the fact that the overwhelming part of income inequality in today's Western countries stems from labor incomes.

Demand for Production Factors and Production Functions

Demand for production factors will be exerted by the organizers of production, that is, managers of private or public production or administration, educational and other institutions. As a rule the composition of demand will be determined by the available technologies of production in the widest sense. It also may depend on the prices for the various production factors, and in that case we will call it flexible; otherwise it will be called rigid. Technologies of production are represented by production functions, which tell

us how much product can be made with the aid of given quantities of the production factors used. Apart from the quantities, the qualities of the production factors demanded will be important; they also should be elements of the production function. It is only more recently that these quality elements have been taken into account. In the older production functions only the quantities of labor, capital, and land were included as variables.

Generally, demand for the various qualitative factors—in our case of some various types of labor—will be derived from the aims of production, either maximum profit or the volume of production as determined by institutional considerations. In some of the cases studied empirically and to be reported upon below, a given production mix of some main product groups (for example, agricultural, industrial, trade and transportation, and other services) has been taken. The demand for labor of various qualifications (for example, first, second, and third level) has been derived from this production mix through fixed output-input coefficients. In other studies a country's demand and demand structure has been represented by its average income per capita and the distribution of income. Some theoretical preparatory studies [9, 10] have been based on parameters of continuous distributions of demand according to qualities of labor, but empirical studies in most cases could be based better on discrete distributions. In all cases we sometimes will use the phrase "required quality distribution" for the distribution of labor qualities demanded by the organizers of production.

Supply of Production Factors: Utility Functions

In contradistinction we will characterize the supply distribution of the qualities of labor by the phrase "available quality distribution." In our empirical studies so far we have considered the levels of qualification of the citizens of a country or region as given, usually represented by the distribution of the active population over the three main levels of education, although sometimes only over the third and lower levels. In some further studies not yet completed, five educational levels have been distinguished and, in addition, three levels of independence: employees, small-scale managers, and large-scale managers.

The theory of supply in principle has been based on the choice of occupation which supposedly maximizes the utility of each individual. The concept of the utility function, while considered the basis of modern economic theory for at least a century, has remained remarkably vague and has been explored only rarely. This

forced us to give some more concrete content to that concept, as shown in previous publications [9, 10]. In the simplest cases it is assumed that an individual's utility depends on three things: his consumable income (representing all consumption satisfaction lumped together); on some disutilities (or utilities) derived directly (not indirectly through his income) from either his education level or his occupation; and on the disutility derived from some tension or difference between his required and his available qualification.

In the empirical studies to be reported upon the supply distribution is taken to be identical to the distribution of obtained levels of education. In future work an effort will be made to include several more elements or variables indicative of the quality distribution among the population, such as other characteristics used in job evaluation (for required qualities) and in career planning (for obtained or obtainable qualities). There also will be scope for no longer considering as given an individual's level of education, but for deriving it from its innate properties and from the opportunities or environment with which it was confronted.

*Income Distribution Explored with the
Aid of Required and Available Qualities*

From the preceding sketch and from publications already mentioned and others to be mentioned, attempts have been made to "explain" observed income distributions with the aid of regression analysis, using as the "explanatory" variables some of the parameters mentioned, which are meant to represent the distributions of required and available qualities. Two types of analysis have been used: time series and cross section. So far the time series analyses seem to this author to have been rather shaky [11], but further attempts are planned. Cross-section analyses refer, on the one hand, to cross sections among entire countries, developed and a few underdeveloped, based on earned incomes collected by Lydall [4]. On the other hand, they refer to material collected by Barry R. Chiswick [3] on the states of the United States and the provinces of Canada, by Theodore P. Schultz [6] on small regions and a number of municipalities of the Netherlands, by Leland S. Burns and H. E. Frech on a number of the same type of entities [2], as well as some figures on the provinces of the Netherlands [11].

The explanatory variables used depended very much on the availability of data. Qualification was only represented by education. For the single-country studies, using states or provinces, stocks of people with various education levels were available. Moreover,

the single-country observations were more homogeneous and, hence, comparable than those for a number of different countries, as in Lydall's material. In the latter case only enrollment figures for pupils or students were available, implying the assumption of slow change which may not be warranted at all.

The general, although defective, impression obtained from the empirical testing is that the larger part (between one-half and two-thirds) of the variance in incomes observed can be attributed to demand for and supply of education as distributed. The newer material collected by Mrs. Adelman will be subjected to similar analyses, as far as data permit, by my collaborator Wouter van Ginneken. Of the studies already finished, several have been published and the full details can be found there. The use made by me of Chiswick's material differs from his own interpretation, as does the material on Holland used by Burns and Frech. My own preference, in line with the preceding text, is to use as explanatory variables the demand index (weighted average of requirements of third-level educated people by agriculture, manufacturing, trade and transportation, and other services) and two supply parameters (average years of schooling and their standard deviation) in order to explain each state's highest income decile (expressed in terms of its median). I followed the same line in order to explain differences in income distribution between the provinces of the Netherlands [11]. In addition, I tried using another test using the same measure of income distribution, but using as explanatory variables the excesses of supply over demand for each of the three education levels. This was done for the United States only.

How Can Income Inequality Be Reduced?

Among the factors used to explain income distribution, a distinction should be made between factors which can and cannot be influenced by socioeconomic policy. In several analyses by others the influence of, for example, sex and age has been estimated. To date, they are examples of the former category. Levels of education, up to a point, are examples of the latter category. Both through financial and educational measures it is possible to induce more people to take education or to take education of higher levels. Since we know that in the past some types of measures have contributed considerably to less inequality, but that the application of some of these measures already may have reached a saturation level, the question is in what areas we still may expect results of further egalitarian measures.

Our studies having been concentrated mainly on the impact of education; we only can try and answer the question of what can be done in the field of education. As could be expected, the answers vary considerably. Some of the results give hope that in two decades primary income inequality may be reduced to half its present size; other results are far less hopeful. The results of the last example of the analysis made for the United States (using the three excess figures) permits a special interpretation: higher incomes could be depressed and lower incomes enhanced by the deliberate creation of an oversupply of qualified and a shortage of unqualified people. I think the suggestion is worth further exploration.

In order to avoid misunderstanding it should be added that other factors than education still may contain promises for more egalitarian policies. To begin with, there are personal aptitudes not yet sufficiently covered by statistical material; tax and other financial measures also have not been explored. In the longer run, lump-sum taxes on human capabilities may become feasible and may work out in a more egalitarian way. Also, one may think of upper limits set to the income derived from membership on enterprise boards [12].

References

- [1] Irma Adelman and C. Taft Morris, "An Anatomy of Income Distribution Patterns in Developing Nations" (stenciled excerpt of Part III of final report prepared for U.S.A.I.D., 12 February 1971).
- [2] L. S. Burns and H. E. Frech, III, "Human Capital and the Size Distribution of Income in Dutch Cities," *De Economist* 118 (1970): 598.
- [3] B. R. Chiswick, *Interregional Analysis of Income Distribution* (New York: National Bureau of National Research, Inc., 1972).
- [4] H. Lydall, *The Structure of Earnings* (Oxford: Oxford University Press, 1968).
- [5] G. Myrdal, *Asian Drama* (New York: Twentieth Century Fund, 1968).
- [6] T. P. Schultz, "The Distribution of Personal Income: Case Study The Netherlands," unpubl. Ph.D. diss., Massachusetts Institute of Technology, 1965.
- [7] Jan Tinbergen, "Trends in Income Distribution in Some Western Countries," in *Geneva International Papers* (Geneva: Institut des hautes études internationales, forthcoming).
- [8] ———, *Business Cycles in the United Kingdom* (Amsterdam: North Holland Publishing Co., 1956).
- [9] ———, *Selected Papers* (Amsterdam: North Holland Publishing Co., 1959), p. 243 ff.
- [10] ———, "A Positive and a Normative Theory of Income Distribution," *Review of Income and Wealth* 16 (1970): 221.

- [11] ———, “Income Inequality: Past; Present; Outlook,” Series on Comparative Urban and Social Economics (forthcoming).
- [12] ———, “Some Features of the Optimum Regime,” Moskowitz lecture No. 13 (New York: School of Business, New York University, 1972).