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THE INCOME DISTRIBUTION AS A PURE PUBLIC GOOD *

LESTER C. THUROW

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Although the social welfare function — in other words, some value judgment — must ultimately be invoked to determine society's optimum distribution of income, there is a subsidiary problem. Is every initial distribution of income a Pareto optimum, or is some redistribution necessary to achieve a Pareto optimum? There are several reasons for supposing that arbitrary initial distributions of income are not Pareto optimal. Individuals are not just interested in their own incomes. The incomes of other individuals may appear in their own utility functions. To maximize their own utility they may find it necessary to redistribute their income to some other person.[1] Individuals may also receive utility from the process of giving gifts (charity). To maximize their own utility, they may find it necessary to give income to other persons.

There is a third reason, however, why income redistribution may be necessary to achieve a Pareto optimum. The distribution of income itself may be an argument in an individual's utility function. This may come about because there are externalities associated with the distribution of income. Preventing crime and creating social or political stability may depend on preserving a narrow distribution of income or a distribution of income that does not have a lower tail. Alternatively, individuals may simply want to live in societies with particular distributions of income and economic power. There may be no externalities; the individual is simply exercising an aesthetic taste for equality or inequality similar in nature to a taste for paintings.

* The author would like to thank Paul Samuelson and the Harvard-MIT public finance seminar for comments on earlier versions of this paper. The author is responsible for the remaining errors.

1. If the individual is only interested in the income of particular individuals, the income redistribution becomes a merit want that can be handled in the manner of Musgrave and Samuelson in their Biarritz conference of the International Economic Association. (Richard A. Musgrave, "Provision for Social Goods," presented to the Biarritz conference of the I.E.A., Sept. 1966, mimeo, and Paul A. Samuelson, "Pure Theory of Public Expenditure and Taxation," presented to the Biarritz conference of the I.E.A., Sept. 1966, mimeo.)

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Deriving utility from the income of others and from the distribution of income shade into one another. If the income of every other individual in society appears in a man's utility function, he is implicitly choosing an income distribution when he maximizes his own utility function, but there is a subtle difference. First, do his benefits flow from the distribution of income or from the incomes that each individual achieves independent of what happens to everyone else? Many of the benefits connected with social and political stability presumably flow from the distribution of income and economic power rather than from individual incomes. Second, does the individual have preferences about the incomes of particular individuals or about the distribution of incomes without regard to the incomes of particular individuals? Both preferences may exist in real utility functions. The individual may desire particular incomes for particular individuals who are closely associated with him and desire a particular income distribution for society as a whole. Alternatively, the individual may have no preferences concerning particular individuals' incomes, but only be interested in the income distribution in his own neighborhood, not that of society. He may seek to alter the income distribution in his own neighborhood or move into a neighborhood with a compatible income distribution.[2]

Deriving utility from the process of giving gifts, from the incomes of other individuals, and from the income distribution itself can all lead to substantial income transfers in order to achieve a Pareto optimal income distribution from an initial distribution of income. This paper, however, will concentrate on the income redistribution that occurs because the distribution of income itself appears in individual utility functions.

When the income distribution appears in individual utility functions, income transfers take on a different characteristic than when they are generated by either of the other two motives. *The income distribution is a pure public good.* Each individual in society faces the same income distribution. No one can be deprived of the benefits flowing from any particular income distribution. My consumption of whatever benefits occur is not rival with your consumption. In short, the income distribution meets all of the tests of a pure public good.[3] Exclusion is impossible; consumption is non-

2. See C. M. Tiebout, "A Pure Theory of Local Expenditures," *Journal of Political Economy*, LXIV (Oct. 1956), 416–24, and A. Williams, "The Optimal Provision of Public Goods in a System of Local Government," *Journal of Political Economy*, LXXIV (Feb. 1966), 18–33.

3. Paul A. Samuelson, "The Pure Theory of Public Expenditures," *Review of Economics and Statistics*, XXXVI (Nov. 1954), 387–89.

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rival; each individual must consume the same quantity. The same problems also occur. Each individual has a vested interest in disguising his preferences concerning his desired income distribution to avoid paying his optimal share of the necessary transfer payments.[4]

I. The Optimum Income Distribution from a Voluntary Theory of Exchange

Assume for the sake of illustration that there is some measure, X, that perfectly and uniquely describes every possible income distribution.[5] Each individual has a utility function with X as one of its arguments. Given any individual's utility function, it is possible to trace out the utility levels associated with each distribution of income. The utility curve may have both positive and negative portions. Some distributions may raise his utility; some may lower it.

At the same time the individual possesses some initial income. Being a utility maximizer, he wishes to distribute his income across all goods (public and private) to maximize his own utility. On the assumption for the moment that there is one public good (the income distribution) and one private good, the individual will be willing to make transfer payments as long as the marginal utility of the benefits flowing from changes in the income distribution exceed the marginal utility of the benefits flowing from changes in private goods.

Given an individual's initial private income, there are a variety of private incomes and income distributions that would hold the individual on the same indifference curve that would be given by his initial private income alone. The difference between his private initial income and these private incomes determines the transfer payments (positive or negative) that the individual would be willing to make to live in a society with any particular distribution of income. If the initial income distribution added $200 to an individual's welfare, he would, if necessary, be willing to contribute up to this amount to preserve the initial income distribution. Alternatively, if some other distribution added $400 to his welfare, he would be willing to contribute up to $400 if society would actually move to

4. Deriving utility from the incomes of others and from giving gifts is not a public good. Individuals can consume different amounts; exclusion is possible; consumption is rival.

5. I am being deliberately vague about the proper measure of the distribution of income to avoid becoming entangled in arguments about the merits and demerits of different measures.

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the new income distribution. These payments are the maximum amount that the individual would be willing to pay to achieve or preserve any particular income distribution or the minimum amount that he would have to receive to be willing to accept some income distribution. As such they constitute his benefit curve (see B_1, B_2, and B_3 in Figure I). For some distributions he is willing to make payments; for others, he must be paid to accept them. What he is willing to contribute toward achieving any movement in the distri-

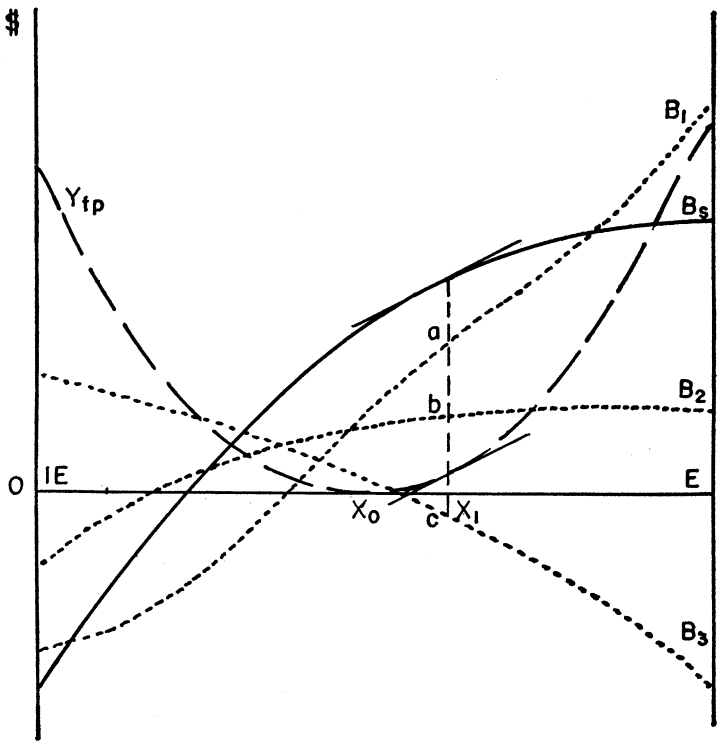

FIGURE I

Where
E = complete equality — equal incomes for each individual
IE = complete inequality — all income to one individual
B_1, B_2, B_3 = benefit curves for individuals 1, 2, and 3
B_s = net social benefit curve (vertical addition of B_1, B_2, and B_3)
Y_{tp} = minimum transfer payments necessary to achieve any income distribution given the initial income distribution
X_0 = initial income distribution
X_1 = Pareto optimum income distribution.

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bution of income is determined by the slope (marginal benefit) of his benefit curve at that point.

Since the income distribution is a public good, the individual benefit curves must be added vertically, rather than horizontally, to obtain society's net benefit curve (B_s).[6] Depending upon individual preferences, the net social benefit curve could take many shapes; in Figure I, however, society is willing to pay for equality but at a diminishing rate. Although society is willing to pay for more equality, Figure I is drawn with two individuals, B_1 and B_2, who benefit from a movement toward equality, and one individual, B_3, who suffers losses when society moves from its initial distribution of income toward more equality. Consequently, compensatory payments to this individual are part of the costs of shifting the income distribution. These compensatory payments are embodied in society's net benefit curve (B_s) since all three benefit curves (with positive and negative slopes) have been vertically added together.

In addition to the net social benefit curve, there is a market constraint curve (Y_{tp}) that reflects the total minimum amount of money (transfer payments) that is necessary to achieve some particular income distribution after the necessary compensatory payments have been made to those who must be paid to accept a particular income distribution. Compensatory payments are not included in the Y_{tp} curve, but they influence its slope since the distribution of compensatory payments affects the amount of transfer payments that are necessary to reach any particular distribution of income. Consequently, the location and shape of the market constraint curve depend upon the initial income distribution and the set of individual utility functions. If the initial income distribution is at point X_0, the market constraint curve is zero at point X_0 (no money need be transferred to achieve the initial income distribution) and rises to either the right or left of X_0 (transfer payments must occur to make the income distribution either more or less equal).

The Pareto optimum income distribution, X_1, is given at the point where tangents to the net social benefit curve and the market constraint curve are parallel unless there happens to be a corner solution at one of the boundaries. At the optimum income distribution the marginal costs (transfer payments) of moving toward more equality are just equal to the net marginal social benefits of moving toward more equality.

6. For a discussion of the theory of public expenditures, see Richard A. Musgrave, *The Theory of Public Finance* (New York: McGraw Hill, 1959), Ch. 4.

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Each individual's contribution (taxes or compensatory payments) for income redistribution is determined by his own marginal benefits from redistribution, the slope of his benefit curve at the optimum distribution (i.e., the slopes of the curves at points *a*, *b*, and *c*). The positive tax payments of individuals B_1 and B_2 are just large enough to make the necessary compensatory payments to B_3 and the necessary transfer payments to move the income distribution from X_0 to X_1. Thus, for example, individual B_1 might make a tax payment of \$500, individual B_2 might make a tax payment of \$250, and individual B_3 might receive a compensatory payment of \$150. The remaining \$600 would be used to move the distribution of income from X_0 to X_1.

Transfer payments are simply made in such a way as to minimize the total cost (transfer payments) necessary to shift the income distribution from X_0 to X_1. The cost minimization distribution of transfer payments would depend upon the initial income distribution, the distribution of compensatory payments, and the optimum income distribution; but a movement toward equality would obviously mean giving the transfer payments to those with relatively low incomes.

The transfer payments themselves could go to any one of the three individuals. Since the total amount of money that an individual would be willing to contribute for redistribution depends upon both his initial income and his utility function, there is no reason to assume that those with large benefits from a movement toward equality are relatively poor. Thus, the minimum cost method of moving from X_0 to X_1 might involve transfer payments of \$400 to B_2 and \$200 to B_3. In this case, B_3 is a man with a relatively low income, even after receiving a compensatory payment of \$150, who does not believe in equality.

Although the point X_1 is an improvement upon the initial income distribution, recontracting may be necessary to obtain a Pareto optimum. The individuals given extra income in the first redistribution may wish to spend some of it on additional income redistribution. Thus, there may be further rounds of redistribution that could make someone better off and no one worse off. Recontracting, however, can also lead to the Scitovsky compensation situation where there is no stable point of equilibrium.[7]

The system can also run into a very peculiar type of dynamic

7. Tibor Scitovsky, "A Reconsideration of the Theory of Tariffs," *The Review of Economic Studies*, IX (Summer 1942), 89–110, and "A Note on Welfare Propositions in Economics," *Review of Economic Studies*, IX (Summer 1942), 77–88.

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instability. Assume that society in general and those who are relatively poor (i.e., those who would be given transfer payments in any movement toward equality) are willing to pay for more equality, given the initial income distribution. Thus, some of the money for transfer payments will come from those who are going to receive transfer payments. After receiving transfer payments, however, the relatively poor may be willing to contribute even more toward equality since they now have more income that can be directed toward this end. Yet when they give the government more money for transfer payments, the money comes right back to themselves. Thus, they desire more equality and are willing to pay for it, but cannot achieve it. A limit is placed upon the movement toward equality by the preferences of those whose tax contributions for redistribution exceed the transfer payments that they receive.

II. A Complication

If the existence of income redistribution leads individuals to alter their work-leisure choices, income redistribution may have an impact on the initial market distribution of income. There is no a priori method to determine how different income distributions might affect the work-leisure choice and the initial market income distribution. With income and substitution effects individuals may work more or less. The method of redistribution will also have an impact. Redistribution through wage subsidies may lead to a different result than redistribution through transfer payments.

If redistribution causes individuals to work less, real costs as well as transfer payments are involved. Total income has fallen. Consequently the market constraint curve now includes real reductions in income as well as transfer payments.[8] If individuals have different (lower) initial incomes, this will also lead to changes in their personal benefit curves. Given preferences as they have been drawn in Figure I, both effects will lead society to purchase a less equal distribution of income than they would have purchased if income redistribution did not affect work-leisure choices.

III. The Mathematics

Mathematically the income distribution is easily put into the context of Samuelson's formulation of the theory of public ex-

8. If taxes affect work incentives differently at different levels, income redistribution could change the shape of the cost curve as well as its level.

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penditures.[9] For simplicity, assume that there is only one public good, the income distribution (measured by X). Since private goods can be purchased in the market, each individual has a utility function with his income and the income distribution as its arguments (see equation (1)). Individuals maximize their utility functions subject to three constraints (see equations (2)–(4)). Each individual starts with some initial income ($Y_0{}^i$). All individuals must consume a common income distribution (X). Different income distributions can be purchased subject to a market constraint function that indicates the minimum amount of income that must be given up to obtain any particular income distribution. The market constraint function (transformation function) depends upon the initial distribution of income, the distribution of utility functions, and the particular income distribution under consideration.

(1) $\quad u^i = u^i(Y^i, X)$

(2) $\quad Y = Y_0{}^i \quad (i=1, \ldots, s)$

(3) $\quad X = X^i \quad (i=1, \ldots, s)$

(4)[1] $\quad Y_{tp} = F \ (Y_0{}^i, \ldots, Y_0{}^s; u^i, \ldots, u^s; X)$

where u^i = utility of the ith individual $(i=1, \ldots, s)$; Y^i = income of the ith individual; $X = X(Y^i, \ldots, Y^s)$ = measure of the income distribution; Y_{tp} = necessary transfer payments.

Since the income distribution is a public good, equilibrium is reached at the point where the sum of the marginal rates of substitution between income and the income distribution for each individual is equal to the marginal rate of transformation between transfer payments and the income distribution (see equation (5)). When equation (5) is fulfilled, a Pareto optimal income distribution has been reached: [2]

$$(5) \qquad \sum_{i=1}^{s} \frac{\dfrac{\partial u^i}{\partial Y^i}}{\dfrac{\partial u^i}{\partial X}} = \frac{\partial Y_{tp}}{\partial X}.$$

In addition to dropping the social welfare function, this formulation differs from Samuelson's original exposition of the theory of

9. Paul A. Samuelson, "The Pure Theory of Public Expenditures," *Review of Economics and Statistics*, XXXVI (Nov. 1954), 387–89.

1. Alternatively,
$Y_{tp} = \min \sum Y^t{}_{tp}$ subject to $X = X(Y_0{}^t + Y^t{}_{tp}, \ldots, Y_0{}^s + Y^s{}_{tp})$.

2. The equivalent condition in Samuelson's formulation springs from an individualistic social welfare function. The partial derivatives of social welfare with respect to changes in the utility of each individual must be equal. This, of course, goes beyond Pareto optimums to social optimums.

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public goods in that individuals are allowed to have negative marginal utilities. Samuelson assumes that each individual has a positive marginal utility for all goods. The assumption of positive marginal utilities is not a necessary assumption; it merely eliminates the problem of compensatory payments. The current debates over defense expenditures indicate that other public goods may also have negative marginal utilities for some individuals.

The analysis is only slightly complicated if the income distribution is allowed to affect the initial distribution of income. Equation (6) replaces equation (2), and this leads to a modification in the market constraint function (see equation (7)). The equilibrium conditions are correspondingly modified, but the form remains the same.

$$Y^i = Y_0^i(X) \tag{6}$$

$$Y_{tp} = F[Y_0^i(X), \ldots, Y_0^s(X); w^i, \ldots, w^s; X]. \tag{7}$$

IV. Conclusions

In the limited sense outlined above, economic theory can tell us as much about the optimum distribution of income as it can about the optimum quantity of any other public good. The voluntary exchange approach can be used to find both the Pareto optimal income distribution and the optimum individual tax payments for income redistribution. It is possible to imagine attempts to measure individual preferences concerning the distribution of income, but these would run into the familiar revealed preference problems common to all public goods.

The pure public good approach has the advantage of focusing attention on individual preferences concerning the income distribution and the public good nature of the income distribution. The latter characteristic raises severe problems concerning the possible decentralization of government tax and expenditure decisions. Local government actions affect the distribution of income, yet everyone must live in a society with one distribution of income. Thus, to achieve its desired distribution of income, society must control the distribution of taxes and expenditures levied at the local level.

To the extent that individuals are interested in the income distribution because of externalities rather than simple tastes for equality or inequality, the public good approach focuses attention on the need for research in an area that is between economics and sociology. What are the empirical effects of the income distribution on crime, social stability, political stability, or any other characteristic

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of society? Perhaps the impact is significant; perhaps it is insignificant. We just do not know.

To some extent the voluntary exchange approach may also explain the process that the political majority must go through before it can impose its social welfare function on the rest of society.

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