The Interpretation of Voting in the Allocation of Economic Resources

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The Quarterly Journal of Economics, Vol. 58, No. 1. (Nov., 1943), pp. 27-48.

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The Quarterly Journal of Economics is currently published by The MIT Press.

THE INTERPRETATION OF VOTING
IN THE ALLOCATION OF ECONOMIC RESOURCES

SUMMARY

Individual goods and social goods compared, 27. — Quantitative measurement of social goods, 28. — Ideal output of social goods, 30. — Individual voting on outputs, 32. — Individual voting on increments to existing outputs, 40. — Alternatives to voting, 42. — Distributing the cost of social goods, 44. — Social goods not equally available to all voters, 47.

Economic goods are of two types: individual goods and social goods. The two types are similar in that each serves the needs of human beings and each is produced only through the use of scarce resources. They differ, however, in the character of their demand. Individual goods are characterized by *divisibility*. They can be divided into small units over which particular persons can be given exclusive possession (e.g. carrots, sewing machines, barber services). Such goods are amenable to individual demand and to free consumer choice. The amount consumed by any individual can be adjusted to his particular tastes. Social goods, on the other hand, are not divisible into units that can be the unique possession of individuals. Rather, they tend to become part of the general environment — available to all persons within that environment (e.g. education, protection against foreign enemies, beautification of the landscape, flood control). Consequently, these goods cannot easily be sold to individual consumers and the quantities available to different individuals cannot be adjusted according to their respective tastes. The amount of the good must be set by a single decision applicable jointly to all persons. Social goods, therefore, are subject to collective or political rather than individual demand.

Economists have, on the whole, been preoccupied with the portion of economic activity relating to the production of individual goods. They have developed an impressive body of theory describing the enterprise economy under various conditions, and have formulated a set of principles for determining the most economical outputs of individual goods. But no comparable body of theory exists for social goods, despite the fact that the production of the latter — even in peacetime — uses up no less than a fifth of all available resources and that the relative importance of social goods is steadily growing. The purpose of the present paper is to show

how certain portions of conventional economic theory may be adapted to problems relating to the production of social goods.

According to accepted theory, a maximum of human satisfactions will be attained, through the use of a given supply of factors, if: (1) production is carried on in response to the free choices of individual consumers (providing the consumers make the "right" choices and income is distributed "correctly"),[1] (2) all units of each good and of each factor are priced uniformly, (3) the output of each constant- or increasing-cost industry is adjusted so that the price of the product is equal to average cost, and the output of each decreasing-cost industry is adjusted so that the price of the product is equal to marginal cost, (4) production is carried on with the least costly known methods, and (5) the price of each factor is set so that the demand for it is equal to the supply.[2]

The first three of these principles are not entirely relevant to the production of social goods, because such goods are not suitable for individual consumer demand. It will be shown, however, that these principles can be modified for use in determining the ideal output of social goods. The argument will proceed in three steps: (1) formulation of the basic principles to guide the production of social goods, (2) practical application of these principles, and (3) examination of problems in the distribution of costs.

QUANTITATIVE MEASUREMENT OF SOCIAL GOODS

In discussing the ideal output of social goods, it is necessary at the outset to establish meaningful units in which quantities of social goods may be measured. This raises certain difficulties, because most of the things ordinarily regarded as social goods are highly complex. Each comprises whole congeries of particular goods which can be provided in many different ways and in

1. By "right" consumer choices I mean simply those choices which make for proportionality between prices and marginal rates of substitution; by "correct" distribution of income, a distribution such that marginal satisfactions from income are equal, in terms of socially accepted valuations, for all persons.

2. See A. C. Pigou, Economics of Welfare, 4th ed., London, 1933; Oskar Lange et al., On the Economic Theory of Socialism, Minneapolis, 1938; Harold Hotelling, "The General Welfare in Relation to Problems of Taxation and of Railway Rates and Utility Rates," Econometrica, July, 1938, pp. 242-269; J. R. Hicks, "The Foundations of Welfare Economics," Economic Journal, December, 1939, pp. 696-712.

different combinations. For example, an increase in the "quantity" of education available in a given community may take the form of additional buildings, changes in curricula, inclusion of a greater number of students, addition of new educational units such as kindergartens or junior colleges, raising of minimum teacher requirements, etc. Thus, quantities of "education" cannot be measured in simple physical units of volume, time, or weight. There are, however, other practicable quantitative measures of education and other such similar complex social goods.

One approach is to treat separately each component element of the complex social good. Thus, instead of dealing with quantities of "education" taken as a whole, attention would be centered on buildings, equipment, number of teachers, training and grade of teachers, hours devoted to particular subjects, number of students participating, hours of instruction per day, days of instruction per year, etc. Reasonably satisfactory quantitative measures could be assigned to each of these components. This solution is essentially similar to that which is ordinarily applied in measuring quantities of individual goods. Here the good is defined, not in terms of complexes such as food, but in terms of particular components such as cane sugar or No. 2 red wheat. Another possible approach is to measure the quantity of complex social goods simply in terms of their money cost. This solution is based on the principle that any decision to change the quantity of a complex social good may be resolved into two distinguishable parts: (1) a decision as to the relative priorities of various particular component services, and (2) a decision as to the amount of the over-all increase or decrease. If the scale of priorities is established so that it is known what particular services are to be added with increasing expenditure and what services are to be dropped with decreasing expenditure, then the quantity of the complex social good can be usefully measured in terms of the amount of money expended.

Each of the two approaches is useful and each is applicable to certain practical situations. Whenever the scale of priorities is not definitely established or agreed upon, the separate treatment of each component in terms of physical units would be preferred. On the other hand, whenever the scale of priorities is clearly established or whenever the determination of the scale is to be referred to

experts or representatives, the second approach of measuring quantities in terms of cost would be preferred.

The following analysis is arranged so that either of the two measures may be employed alternatively. If physical units are used, increasing, constant, or decreasing cost may apply, whereas if cost units are used, only constant cost may apply. It should be emphasized that the quantity of a social good, whatever measure is used, refers to the quantity available in the community as a whole, not necessarily to the amount available to any particular person or consumption unit.

IDEAL OUTPUT OF SOCIAL GOODS

Suppose that the citizens of a given community are faced with the task of deciding how much public education should be made available. It is inevitable that the citizens will differ regarding this question. Some, perhaps, will wish to have no education under any circumstances, some will want no more than the three R's, and others will desire a highly developed system of schools. Assuming a "correct" distribution of income, each person's taste can be expressed by a curve indicating the amount of money he would be willing to give up in order to have successive additional quantities made available in the community. Such a curve would be analogous to an individual demand curve. It would express, for different possible quantities of education, the individual's marginal rate of substitution between education and other goods (money). A series of such curves of individual marginal substitution is shown in Figure 1 for a community which is assumed to contain three persons (MS_a, MS_b, MS_c). The marginal rates of substitution of the three individuals, for each quantity of education, can be added to give the total marginal rate of substitution of the entire population. In this way a "curve of total marginal substitution" (TMS in Figure 1) can be constructed, expressing the amount of money the members of the group collectively would be willing to give up in order to obtain successive units of education. This curve corresponds, as closely as is possible under the conditions, to the familiar curve of total demand.[3]

3. It must be noted that this curve differs from the familiar curve of total demand, which denotes the amount of a good that individuals are willing to buy at each of several prices. The demand curve is obtained by adding the number of units of the good that would be purchased by the various individuals at each possible price (horizontal addition); whereas the curve of total marginal
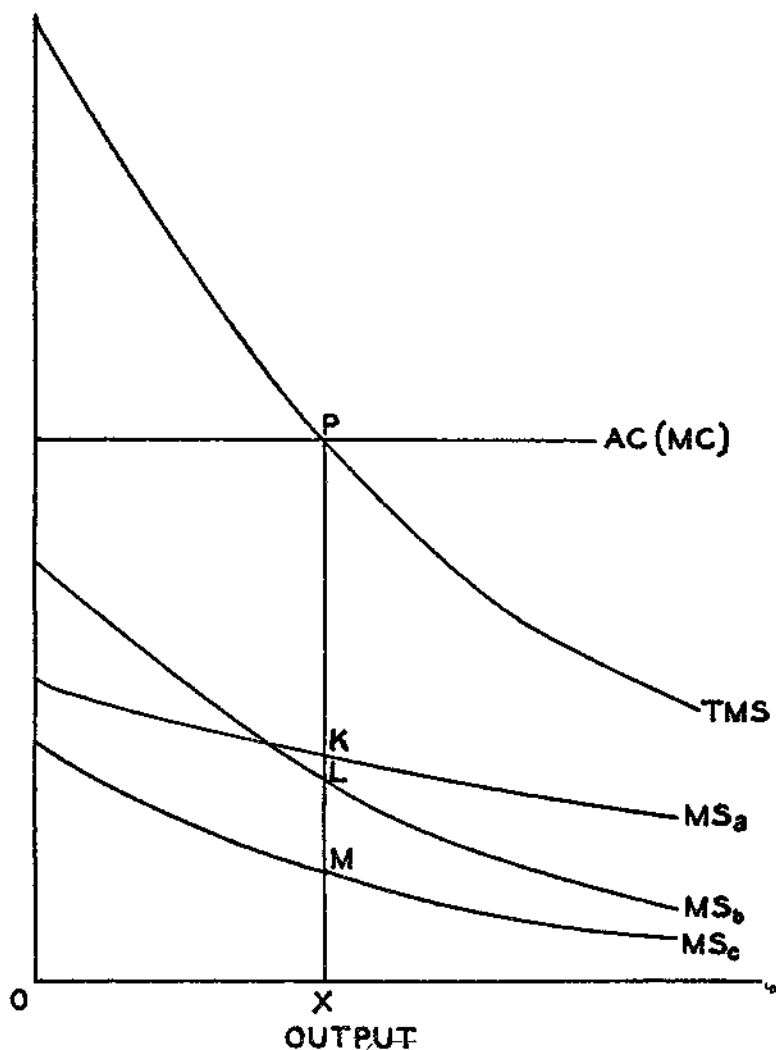
FIGURE 1

One of the cardinal principles in determining the output of an individual good is that price should equal cost, i e. average cost or marginal cost, whichever is lower. This implies that the ideal out-

substitution is obtained by adding the marginal rates of substitution (expressed in money) of the various individuals at each possible quantity of the social good (vertical addition).

put is indicated by the point of intersection between the demand curve and the appropriate cost curve. Through the use of the curve of total marginal substitution, this principle can be adapted to the problem of determining the ideal output of a social good. Thus, to continue with our illustration, the ideal output of education is indicated by the point of intersection between the curve of total marginal substitution and the appropriate cost curve — which one depending upon whether increasing or decreasing cost prevails at relevant outputs. This is shown in Figure 1 (assuming constant cost) by the point of intersection (P) between the curve of total marginal substitution (TMS) and the curve of average cost (AC). OX is the ideal output.[4]

Ideal output can also be indicated in another way, which will prove more useful for subsequent analysis. For this, three new curves are required: (1) a curve expressing the average marginal rate of substitution per person (TMS/N), (2) a curve expressing average cost per person (AC/N), and (3) a curve expressing marginal cost per person (MC/N). These curves are derived by dividing the total marginal rate of substitution, average cost, and marginal cost, respectively, by the number of people (N). Ideal output, originally defined as the output at which the total marginal rate of substitution is equal to average (or marginal) cost, can also be designated as the output at which the average marginal rate of substitution is equal to average cost per person (or marginal cost per person). This follows since, at the output where AC (or MC) equals TMS, AC/N (or MC/N) must equal TMS/N. See Figure 2

INDIVIDUAL VOTING ON OUTPUTS

It has been shown that the optimum output of social goods is indicated by the intersection of the curve of average marginal substitution (TMS/N) and the appropriate curve of cost per person (AC/N or MC/N). If this formulation is to be practically useful, something must be known — directly or by inference — about marginal rates of substitution and costs. It is, of course, no more difficult to obtain information on the cost of producing social goods than to get similar data on individual goods; but to estimate marginal rates of substitution presents serious problems,

4. If there were no point of intersection between the two curves, i.e. if average cost were at all outputs greater than total marginal substitution, the service should not be offered at all.
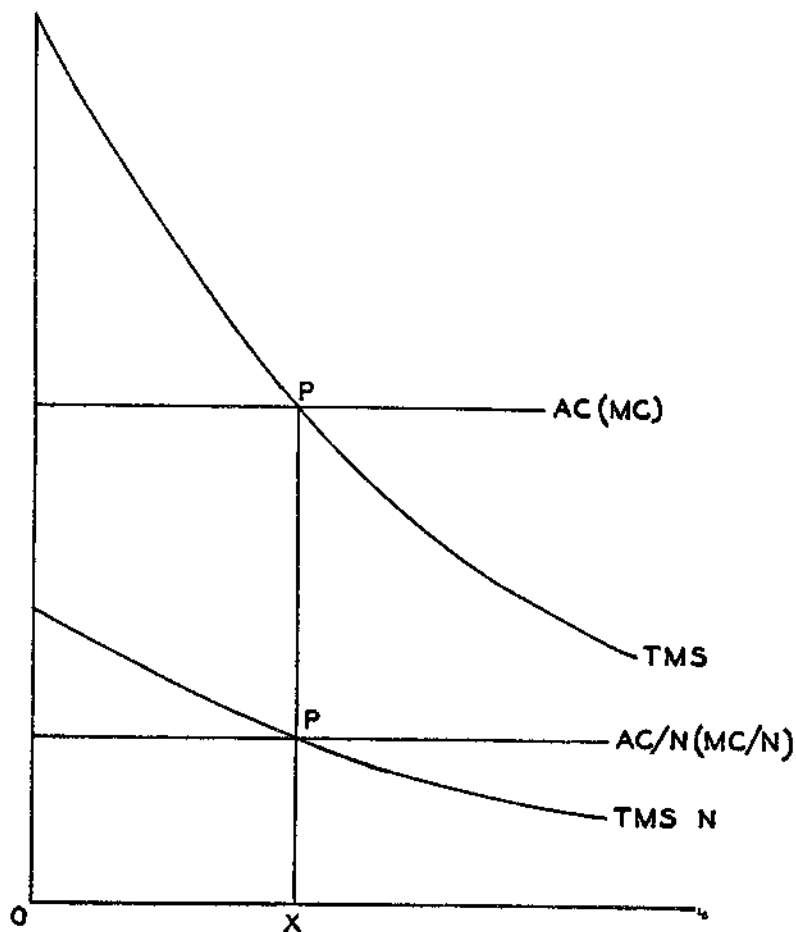
FIGURE 2

since it requires the measurement of the preferences for goods which, by their very nature, cannot be subjected to individual consumer choice.

The closest substitute for consumer choice is *voting*. Consequently, it may be worth while to explore the possible use of voting as a means of measuring or inferring marginal rates of substitution and hence of determining ideal output. Suppose that our community, faced with the problem of determining the precise quantity of education to provide, allows each individual to indicate, by means of voting, the amount of education that he prefers. Each

individual's preference will depend upon two factors: (1) the relative amount of satisfaction *he* expects to derive from different amounts of education — as indicated by his curve of marginal substitution, and (2) the cost *to him* of different amounts of education. The latter will depend partly on the total cost to the community of different amounts and partly on the contemplated distribution of that cost among different individuals. Each individual will, of course, vote for that quantity at which *his* marginal rate of substitution is equal to *his* marginal cost. This would be indicated by the point of intersection between his curve of marginal substitution and his curve of marginal cost.

At this point it is necessary to digress briefly in order to introduce four assumptions:

First, it is assumed that all individuals in the community actually vote and that each expresses a preference which is appropriate to his individual interests.

Second, it is assumed that the cost to the community of providing various possible quantities of education is known. Curves AC, AC/N, MC and MC/N can then be constructed.

Third, it is assumed that the cost of whatever amount of education is to be "produced" will be divided equally among all the citizens. Thus the curve of average cost for each citizen will be equal to AC/N and the curve of marginal cost for each citizen equal to MC/N. The implications of this assumption will be analyzed in a later section on the distribution of the cost of social goods.

Fourth, it is assumed that the several curves of individual marginal substitution are distributed according to the normal law of error. This implies that there is a large number of such curves — one for each person — and that these curves are arranged so that at *each quantity of education* the marginal rates of substitution of the several persons are distributed symmetrically about a mode (see Figure 3). Thus, if a vertical line, cutting the several curves, is erected at any point Z along the horizontal axis, the points of intersection (a, b, c, d, e, f, g) between this line and the several curves of marginal substitution will tend to be distributed along the line according to the normal law of error. Most of the intersections will occur near the mode (d), but some will occur at varying distances above and below the mode. Indeed, a modal curve can be drawn indicating the position of the mode at each
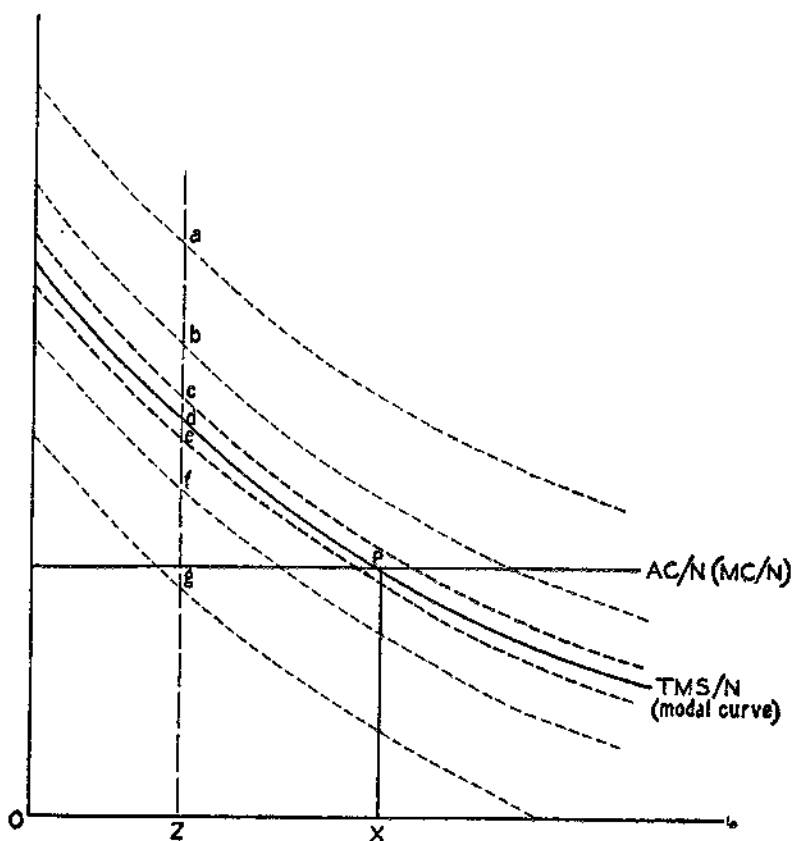
FIGURE 3

quantity of output, and this modal curve will, still assuming a symmetrical distribution of the curves, coincide with the curve of average marginal substitution (TMS/N).[5]

This assumption can conform to the facts of individual preference only if two conditions are met. (a) The tastes or desires of

5 In a symmetrical distribution the mode and the arithmetic mean are identical It is to be noted, however, that the symmetry of a frequency distribution may be disturbed by the fact that zero is the lower limit of the data. In terms of the present problem, zero represents the lowest possible marginal rate of substitution (except in cases where the commodity is so abundant as to be a nuisance). At relatively large outputs, therefore, the marginal rate of substitution of some individuals would be zero, and the modal marginal rate of substitution would be less than the average per capita.

individuals must actually be distributed according to the normal law of error. Whether this condition is realized in practice is not known definitely, but available information suggests that it is not an unreasonable hypothesis. For example, the data in the Consumer Purchases Study of the United States Department of Agriculture indicate that consumer tastes for individual goods are distributed normally. Three series from this study, selected from hundreds of similar series, are shown in Table I. (b) All individ-

TABLE I

PERCENTAGE DISTRIBUTION OF FAMILIES BY EXPENDITURES FOR VARIOUS PURPOSES: WHITE, NON-RELIEF, NATIVE-BORN FAMILIES, 1935–36[1]

Annual Expenditures for Food farm families with three or more children, and with incomes from $1,000 to $1,499 per year, Middle Atlantic and North Central States[2]		Annual Expenditures for Clothing: village families with two young children and with incomes from $1,500 to $1,999, Pennsylvania and Ohio[3]		Total Annual Expenditure for Family Living small city families with incomes from $2,000 to $2,249, North Central States[4]	
Expenditure	Percentage of Families	Expenditure	Percentage of Families	Expenditure	Percentage of Families
$50–$99	4%	Under $50	4%	$750–$999	2%
100–149	16			1,000–1,249	8
150–199	25	$50–$99	15	1,250–1,499	13
200–249	17	100–149	28	1,500–1,749	21
250–299	19	150–199	33	1,750–1,999	29
300–349	9	200–249	16	2,000–2,249	17
350–399	5	250–299	4	2,250–2,499	5
400–449	3			2,500–2,999	4
450 or over	2			3,000–3,499	1
Total	100	Total	100	Total	100

[1] Data based on Consumer Purchases Study made by the United States Department of Agriculture in cooperation with the Work Projects Administration.
[2] U S D A , Miscellaneous Publication, No 405, 1941, p 14
[3] U S D A , Miscellaneous Publication, No 422, 1941, p 17
[4] U S D A , Miscellaneous Publication, No 396, 1940, p 33

uals must be potentially in an equal position to benefit from the social good. This condition is not always realized in practice. For example, childless persons may be less interested in education than families with children. Thus, even though the curves of marginal substitution of either class of persons might be arranged symmetrically, the distribution of the curves for the two classes together might be significantly skewed or multi-modal. However, most social goods are or can be made available on relatively equal terms to all persons, e.g. health services, protection from foreign enemies,

maintenance of law and order, etc. For the moment, therefore, we shall postulate that all individuals are equally able to benefit from the social good under consideration. In this way, we may continue with the assumption that individual marginal substitutions are distributed according to the normal law of error. Later we shall take up the problem of social goods which are not equally available to all.

Under the conditions assumed, if the citizens are allowed to vote on the quantity of education to be provided, each person will vote for the quantity indicated by the intersection between his individual curve of marginal substitution and his curve of marginal cost (MC/N). Since the various individuals will presumably be interested in education to varying degrees, as indicated by the dispersion of the individual curves of marginal substitution, a wide variety of preferences will be indicated. Referring to Figure 3, those whose curves of marginal substitution lie in the lower left part of the diagram will favor a relatively small amount; those whose curves of marginal substitution lie in the upper right will favor a relatively large amount. But, assuming that the curves of marginal substitution are distributed according to the normal law of error, one intermediate amount (OX) will be voted for by more individuals than any other single amount. The individuals voting for this quantity are those whose marginal rates of substitution are modal, and the amount voted for by this modal group may be presumed to indicate the point of intersection (P) between the curve of marginal cost per person (MC/N) and the modal or average curve of marginal substitution (TMS/N). Thus voting makes possible the location of one point (P) on the curve of average marginal substitution (TMS/N), namely, the point at which the curve of individual marginal cost (MC/N) intersects with (TMS/N).[6] See Figure 3.

If education is "produced" under conditions of constant cost, as shown in Figure 3, marginal and average cost will be identical. Hence the modal vote will indicate not only the point of intersection between TMS/N and MC/N but also the point of intersection between TMS/N and AC/N. This latter point, as stated above, occurs at the optimum output. Hence the modal vote pro-

6. In order to designate this point of intersection, it is not necessary that the majority of *all* the voters should prefer this amount. It is only necessary that more persons vote for this amount than for any other.

vides direct information as to the most economical amount of education to provide.

If education is "produced" under decreasing cost, the modal vote will also give the desired information directly. In this case the marginal cost curve (MC/N) lies below the average cost curve (AC/N). However, the most economical output is that at which the marginal rate of substitution and marginal (rather than average) cost are equal. Thus the modal vote directly indicates the most economical output.

If, however, education is produced under conditions of increasing cost, the modal vote cannot directly denote optimum output. It can indicate only the point of intersection between MC/N and TMS/N, not the point of intersection between AC/N and TMS/N which is required. A further elaboration of our technique is therefore necessary.

This case requires a different procedure of taxation. The cost must be raised by means of a tax levied upon each individual in the form of a "price" per unit of the social good, it being understood (1) that the price is to remain constant regardless of output, and (2) that the price is to be uniform for all individuals. From the point of view of any one individual, this "price" represents his marginal cost. His marginal cost curve would appear, therefore, as a horizontal line, the height of which would be determined by the "price." Moreover, since the same "price" would be charged all individuals, the marginal cost curve would be the same for all. This curve is shown in Figure 4 as IMC (individual marginal cost).

Let us now suppose that the "price" of education is set, and that the citizens are asked to vote on the quantity of education they prefer. Each person will, of course, vote for the quantity indicated by the intersection between his curve of marginal substitution and the curve of marginal cost (IMC), and the modal vote will locate the point of intersection (R) between TMS/N and IMC. The optimum output, however, is determined by the intersection of TMS/N and AC/N; the modal vote does not locate this point. From the position of point R relative to curve AC/N, it can be ascertained, however, whether the intersection of TMS/N and AC/N lies to the right or to the left of point R.

If R is above curve AC/N, then the point of intersection lies to the right of R,[7] and output should be increased beyond the

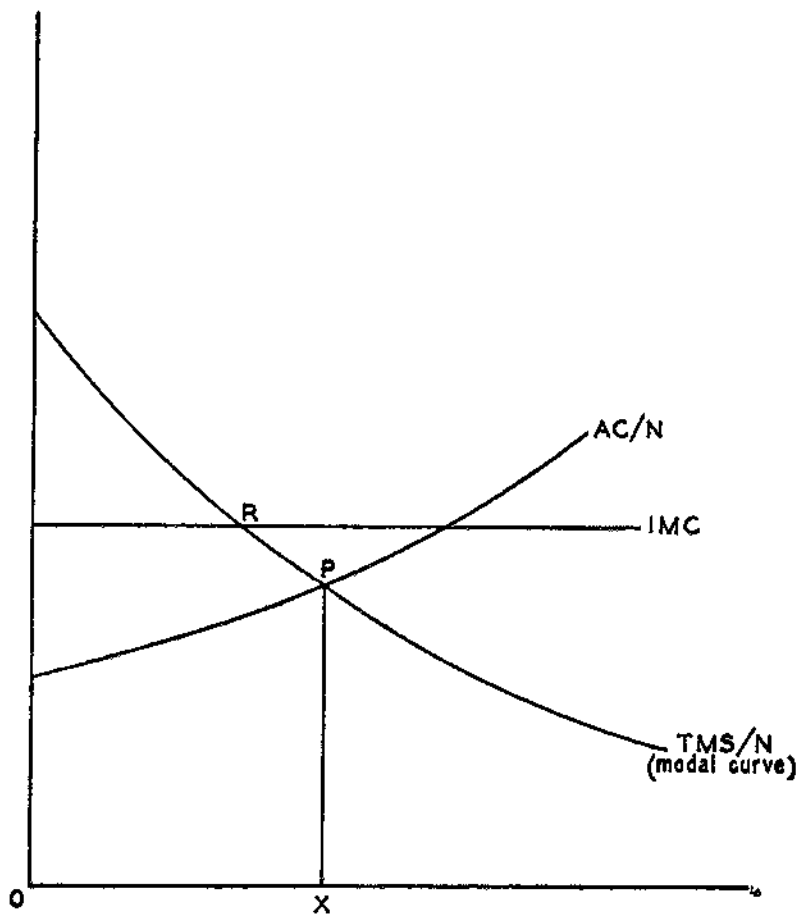7. Assuming that curve TMS/N slopes negatively.

FIGURE 4

amount voted for by the modal group. And if R lies below curve AC/N, the point of intersection is to the left of R and output should be reduced to less than the amount voted for by the modal group. This relationship is to be explained by the fact that if R lies above curve AC/N, the price announced to the voters is so high that (at this price) the modal group prefer less than the optimum amount of the good; and if R is below curve AC/N, the price is so low that the modal group prefer more than the optimum amount. Only when R lies on curve AC/N (i.e., when curves

AC/N, IMC, and TMS/N all intersect at the same time) will the vote of the modal group indicate the optimum output.

The result of the voting depends entirely on the price announced. The question arises, then, whether there is any rule by which the correct price could be ascertained in advance of the voting. The answer is in the negative. However, as a result of successive trials and errors over a period of time the correct price could be closely approached, especially since (1) the direction of the error is known after each trial, and (2) more than one point on the TMS/N curve would be known after several trials.[8] It is conceivable, moreover, that the voters might be asked to indicate their preferences at each of several possible prices, so that the position of TMS/N could be ascertained along several points and the intersection of TMS/N and AC/N could be located immediately.[9]

INDIVIDUAL VOTING ON INCREMENTS TO EXISTING OUTPUTS

Let us now assume that the individuals of a community are permitted to vote, not on how much of the good they prefer, but rather on whether or not they wish a given increment or decrement to the quantity already provided. This situation is illustrated by school elections, common in the United States, in which citizens are asked to vote "yes" or "no" on a proposed bond issue for the purpose of constructing a new school building.

Suppose the community is composed of seven persons whose marginal substitution curves are distributed symmetrically, as shown in Figure 5, and that the cost of education (or any increment in the quantity) is to be divided equally among them. Assume that quantity OX (Figure 5) is actually being provided and that the people are asked to vote on the question whether or not they wish a small increase in the quantity up to OX_2. All those persons whose marginal rates of substitution at quantity

8. This raises a problem similar to that of deducing a demand curve from a time series

9. It is tempting to assume that the average of the amounts voted for by the several individuals represents the optimum output. In fact, it does not. The average amount voted for will be greater or less than the optimum output, depending upon the slope, shape, and position of the individual curves of marginal substitution Similarly, the assumption that the curves of marginal substitution are distributed according to the normal law of error in no way implies that the results of the *voting* will also be distributed in the same way. The distribution of the vote may be skewed in either direction — depending on the shape of the curves — without violating the assumption that the curves are distributed according to the normal law of error.
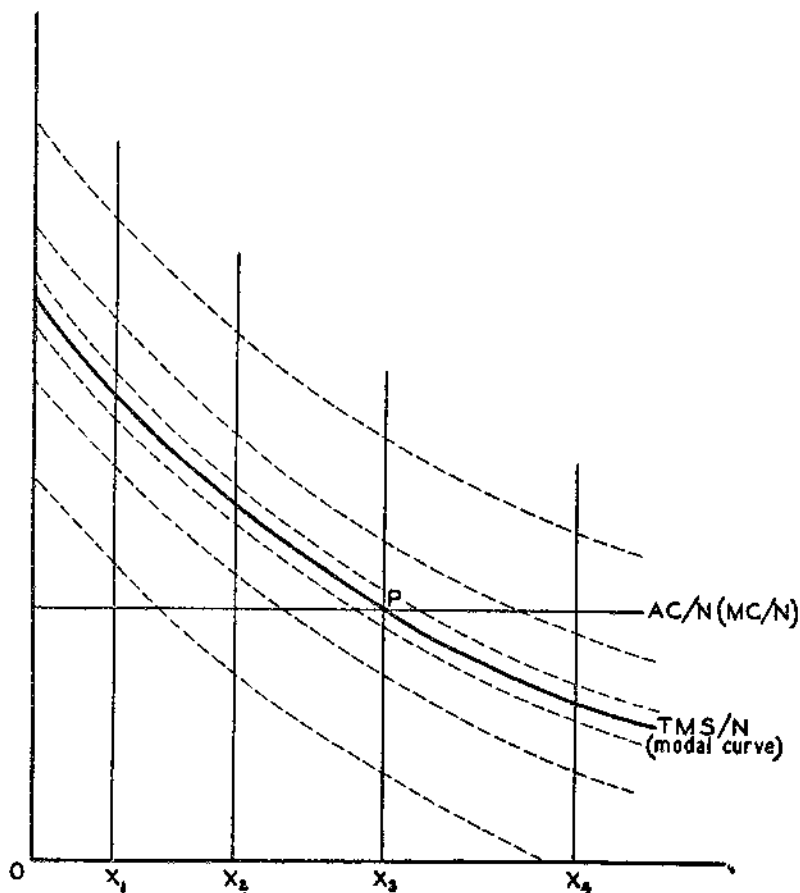
FIGURE 5

OX_2 are greater than the marginal cost (MC/N) at that quantity will vote "yes," and those whose marginal rates of substitution are less than marginal cost will vote "no." In this case, as shown in Figure 5, the vote will be six in favor of the increment and one against. Suppose, then, that the citizens are asked to vote on another increment which will raise the quantity to OX_3, the point at which MC/N and TMS/N are equal. On this question, one-half the citizens will vote "yes" and one-half "no." Finally, suppose the citizens are asked to vote on still another increment which will increase the quantity to OX_4. This time, six persons will vote against and one will be in favor.

From these illustrations it may be seen that as the quantity of education is increased, bit by bit, a majority of the voters will favor each additional increment until a quantity is reached such that the average marginal rate of substitution (TMS/N) is equal to marginal cost (MC/N). At this point the vote is equally divided. Beyond this point, the majority of the voters are opposed to additional increments. Thus it is possible to locate the point of intersection between curves TMS/N and MC/N by finding an increment (or decrement), through trial and error, which is favored by one-half of the voters and opposed by the other half.

This procedure makes possible the direct determination of optimum output for "industries" subject to constant cost and decreasing cost. In these cases, the intersection of TMS/N and MC/N determines the most economical quantity of the social good. This procedure does not, however, directly give the answer for "industries" of increasing cost. For them, it is the point of intersection between curves TMS/N and AC/N (not between TMS/N and MC/N) which must be located. This can be done, but only by a procedure so awkward as to be virtually useless.[1]

On the whole, the procedure of voting on increments does not lend itself well to the determination of optimum output. For constant and decreasing cost "industries" it is somewhat more complicated than the method of asking voters to indicate the quantities they prefer, and for increasing cost "industries" it is hopeless.

ALTERNATIVES TO VOTING

In a society which has outgrown the town-meeting stage, it is seldom practicable to decide on the output of specific social goods by means of popular voting. More commonly, public officials (legislators, elected or appointed administrators, dictators, etc.)

1. Several separate trial and error procedures would be involved. First an arbitrary fixed "price" per unit of education would be set, so that the curve of marginal cost for the individuals (IMC) would be a horizontal line. Then each individual would be asked to vote "yes" or "no" on successive increments or decrements, until the point of intersection between IMC and TMS/N could be determined. It would be located at the increment for which one-half the voters are in favor and one-half opposed. After that, in order to find the intersection of AC/N and TMS/N, it would be necessary to adjust the price and again ask voters to express preferences on increments (or decrements), so that other points on the curve TMS/N could be located. By a wearisome process, it might ultimately be possible to find enough points on curve TMS/N so that the intersection between that curve and AC/N could be located.

are endowed with the power to make such decisions and are expected to act in the "general interest." This means that such officials, if they are to carry out their duties, must have methods of finding out what the people want, i.e. how much of each social good should be produced.

The people can be consulted by letting them vote on particular questions, or perhaps letting them vote for candidates who identify themselves with particular policies. In this case, if the issues are clearly understood, the results of the election can be interpreted as suggested in the preceding sections. In practice, however, the issues are seldom clear-cut. The result of an election can seldom be regarded as an unequivocal indication of public desires. Hence there is a real need for other techniques of gauging public opinion, i.e. finding the points of intersection between the curves of total marginal substitution and average (or marginal) cost. It is for this reason that a number of writers have recently suggested the possibility of using polls, questionnaires, interviews, budget investigations, and other devices involving samples, to study the desires of the individuals who compose the public. Indeed, with the increasing emphasis upon economic planning, it is imperative that these and other techniques for discovering individual tastes and preferences be developed and employed.[2]

If a poll is based on a representative sample of the population, and if the questions are put in the same way as if the entire citizenry were voting, the results can of course be interpreted in exactly the same way. For such a poll to be as reliable as the results of actual voting, however, several conditions would have to be met.[3] First, it would be necessary that the issue had been discussed sufficiently to enable the pollees to become informed. Second, in order to be sure that the individual pollees would use thought and discretion in reaching their decisions, it would be necessary for them to have a sense of responsibility, i.e. to feel that their choices would actually influence policy.

2. See Maurice Dobb, Review of Economic Studies, February, 1935, pp. 137–148; and Barbara Wootton, Lament for Economics, London, 1938, Chapters 5 and 6, especially pp. 289–291.

3. The polling of a "scientifically" selected sample might produce more accurate results than general voting, unless arrangements were made to insure that every person would actually vote. If voting is voluntary, it is possible that the results may represent the preference of a biased sample of the population, including a relatively large proportion of, perhaps, the "politically minded," the well-to-do, or the better educated.

It is conceivable that techniques involving polls and questionnaires would yield information in greater detail than could be obtained through large-scale voting. It might be possible in this way to carry on minute studies of individual preferences, so that actual curves showing marginal rates of substitution, instead of merely a few isolated points on curves, could be obtained.[4]

DISTRIBUTING THE COST OF SOCIAL GOODS

In the discussion of voting it has been consistently assumed that the cost of providing social goods is to be divided equally among all individuals. This assumption requires further examination. If income were distributed "correctly," so that apportionment of the cost of social goods would not be designed for the purpose of redistributing income, the benefit principle would provide the ideal basis for assessing the costs of social goods. Each person would contribute according to the benefit received by him, and the distribution of real income would be unaffected. In applying the benefit principle, each individual would be charged *as if* he were paying a price per unit for the social good, the price being equal to his marginal rate of substitution at the particular amount of the good being produced. Thus, instead of applying a uniform price to all individuals and allowing each to adjust his consumption according to that price, as with individual goods, a uniform amount of the social good would be provided, and the "price" charged individuals would vary according to their marginal rates of substitution. Referring to Figure 1, if quantity OX were being provided, Individual A would pay a "price" equal to XK, and his contribution would be equal to this price multiplied by the number of units of the good provided (OX). The "price" charged Individual A under this arrangement would be such that, if free individual consumer choice were possible, he would choose the particular quantity of the social good that is actually available.[5] In this way his marginal contribution to the cost of the social good would correspond to his marginal rate of substitution, and his real income would remain

4. The work of Professor L. L. Thurstone in deriving the indifference schedules of actual individuals is suggestive. See his article "The Indifference Function," Journal of Social Psychology, 1931, pp. 139–167 The difficulty with this approach is that individuals must be asked what they would do under various hypothetical conditions. There is always the possibility that verbal preferences would differ significantly from actual choices in a real situation.

5. If the social good were financed in this way, all individuals would vote for the same output, namely, the most economical quantity.

unchanged. Any other arrangement would result in his being made worse or better off. Similarly, the "price" charged Individual B would be XL, and the "price" charged Individual C would be XM (Figure 1). Thus the total amount paid by the three individuals would be equal to the total cost of the service.[6]

The application of the benefit principle is difficult, however, because of problems involved in the measurement of benefit. To determine the cost that should be assessed against an individual, if the benefit principle is to apply, requires that something be known about his marginal rates of substitution. At first thought it might be supposed that this information could be obtained from his vote (or other expression of preference). But the individual could not vote intelligently, unless he knew *in advance* the cost to him of various amounts of the social good, and in any case the results of the voting would be unreliable if the individual suspected that his expression of preference would influence the amount of cost to be assessed against him. Moreover, the practical administrative problem of making nice adjustments between individual benefit and cost would be insuperable.

On the whole, the possibility of distributing costs according to benefit is not very promising. It seems clear that some more or less arbitrary alternative method must be adopted. The problem is to find that arbitrary method which will involve the least error and the fewest practical problems. With an initially "correct" distribution of income, an *equal* distribution of cost seems most practicable. This means, of course, that the provision of social goods may involve the redistribution of income. Those individuals who are forced to pay more in taxes than they get back in benefits will find their real incomes diminished, whereas those who pay out less than they receive in return will enjoy an addition to their real incomes. The seriousness of this redistribution is greatly lessened, however, by the fact that many social goods are ordinarily produced simultaneously. Thus the gain to any one individual from the

6. An exception to this solution for the problem of distributing the burden of costs must be made in the case of a social good provided under conditions of decreasing cost. Here economy requires that output be increased to the point where total marginal substitution is equal to marginal cost. At this output, however, if each individual beneficiary were to contribute an amount equal to his marginal rate of substitution times the number of units of the good produced, total revenue would be insufficient to defray total cost. In this case, therefore, it would be necessary to devise an alternative method that would raise sufficient revenue and yet leave the distribution of incomes unaffected.

provision of a particular social good may be counterbalanced by a loss to him resulting from the provision of another social good, and on balance the redistribution of income may be slight.

The great advantage of the equal distribution of cost is that it involves only random errors, whereas any other arbitrary distribution introduces a constant bias in favor of some particular group or class. It also has the advantage that it helps to clarify the desires of the public regarding the distribution of social goods. If costs are not distributed equally, variations in amounts voted for by different individuals would depend quite as much upon differences in individual marginal costs as upon differences in individual marginal rates of substitution, and the modal vote would not necessarily indicate the point of intersection between the curve of marginal (or average) cost per capita and the curve of average marginal substitution. Indeed, if the output of social goods is to be determined by the preferences of individuals, it must be possible to obtain expressions of individual preferences unalloyed by differences in individual marginal costs. In other words, a necessary condition to the use of individual preferences in determining the ideal output of social goods is that the cost of social goods be distributed equally. Since equal distribution of cost is desirable on other grounds, as pointed out, this condition does not necessarily render the technique of voting impracticable or objectionable.

It must also be recognized that the condition of equal distribution of cost does not in any way preclude the use of taxation for purposes of redistributing income. It is required only that redistributive taxes be levied independently of taxes for the purpose of financing the production of social goods. This is, of course, at variance with present practice. Commonly the functions of redistributing income and of providing funds for public services are merged into a single tax system. Under these conditions, any expressions of preference on the part of individual citizens are ambiguous in that they reflect not only marginal rates of substitution but also (different) marginal costs.

Neither does the condition of equal distribution of cost require that incomes be distributed equally. The only assumption is that the distribution of income is "correct" in the sense that it is socially accepted. Thus, if some individuals have more income than others, they may well vote for more of a particular social good than others, with less income — if the cost of the social good is uniformly dis-
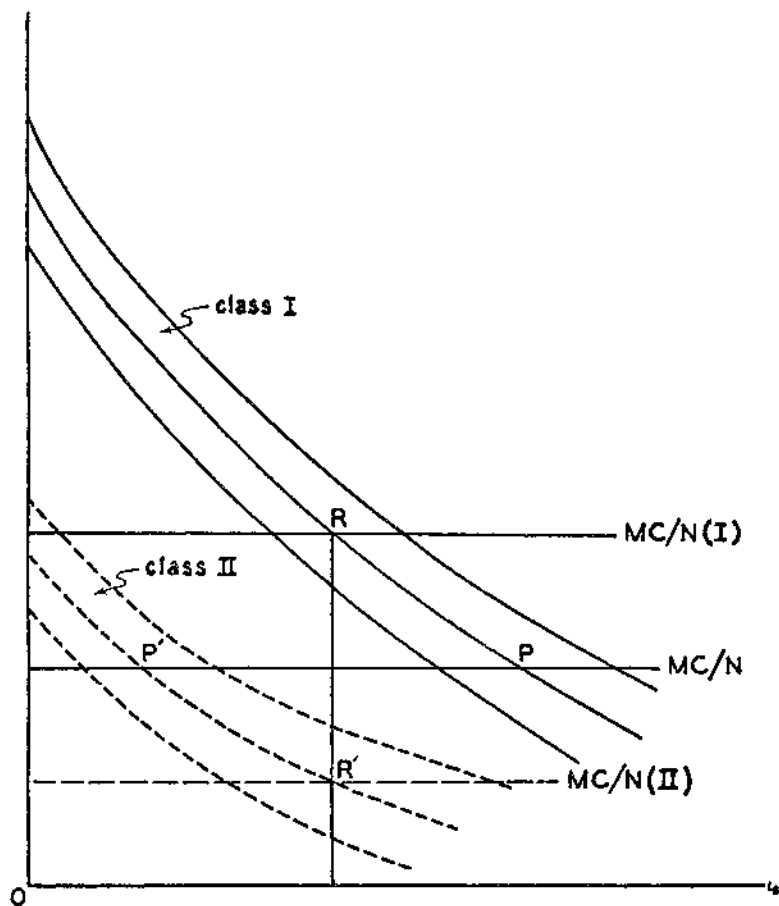
FIGURE 6

tributed. This corresponds exactly to the fact that the individuals with larger incomes buy more individual goods than persons with smaller incomes. The fact that such differences in income are socially sanctioned implies that the preferences of richer persons ought to count for more than that of the poorer persons in determining the allocation of the society's resources.

SOCIAL GOODS NOT EQUALLY AVAILABLE TO ALL VOTERS

Up to this point it has been assumed that any social good voted upon is accessible to all voters upon equal terms, and that

differences in individual preferences are to be accounted for solely by differences in taste. This postulate, however, does not always conform to practical reality. When it does not, recourse to the benefit principle becomes more necessary and at the same time more practicable. It would then be desirable to classify the voters according to the amount of potential benefit that they would be expected to derive from the social good, and to tabulate the voting separately for each class. The intersection of the modal curve of marginal substitution and the curve of marginal cost per person (MC/N) could then be located for each class. For example, in Figure 6, the curves of marginal substitution for a group of citizens (Class I) who are in a position to benefit greatly from a social good are shown in solid lines, and the curves of marginal substitution for those able to benefit to a much smaller degree (Class II) are shown in dotted lines. The modal vote of the first group is indicated by P and of the second group by P^1. In such a situation, application of the benefit principle would require that the cost assessed against citizens of Class I should be increased and that levied against citizens of Class II decreased, until two conditions are satisfied: (1) the modal output voted for by persons of Class I (indicated by point R) is equal to that voted for by persons of Class II (point R^1), and (2) the entire cost of providing the social good is covered. The difficulty with this solution is that if the citizens realize that their voting affects the amount of cost they will be expected to bear, individually or as a class, the results of the voting will tend to be unreliable. Hence the cost to be levied on the several groups must be determined (apparently or in fact) without reference to the voting. Hence other methods of estimating potential benefit — drawing heavily upon common sense — are undoubtedly necessary. Such techniques are illustrated by the methods used in many American cities of distributing special assessments for street improvements. By such methods only very rough adjustments, for obvious and clear-cut differences in potential benefit, can be made.

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WASHINGTON, D. C.

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[Footnotes]

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