NOTICE

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NOTE BY EDITORS

THE article which opens this issue is the first of a series of six Surveys of recent developments of economic theory which it is hoped to publish in the ECONOMIC JOURNAL at six-monthly intervals. This series, like the parallel series which is appearing in the *American Economic Review*, is supported by a grant from the Rockefeller Foundation. The Editors wish to acknowledge the initiative and encouragement of the late Professor Norman Buchanan, then Director for the Social Sciences at the Rockefeller Foundation, in suggesting and developing the plans for these Surveys. The subsequent Surveys will include " Linear Theory and Activity Analysis," by J. R. Hicks; " Interest Theory," by G. L. S. Shackle; " Theories of International Trade Policy," by Sir Donald MacDougall; " Theory of Oligopoly," by C. F. Carter. The scope of the last article in the series has not yet been finally determined.

A SURVEY OF WELFARE ECONOMICS, 1939–59[1]

I. INTRODUCTION

WHILE it continues to fascinate many, welfare economics does not appear at any time to have wholly engaged the labours of any one economist. It is a subject which, apparently, one dabbles in for a while, leaves and, perhaps, returns to later in response to a troubled conscience—which goes some way to explain why, more than other branches of economics, it suffers from an unevenness in its development, a lack of homogeneity in its treatment and, until very recently, a distressing disconnectedness between its parts.[2]

A survey of the literature, therefore, which sought to do no more than elucidate in rough chronological order the ideas of the chief writers, while it might whet the appetite of some, would almost certainly leave the mind of the general reader in a dazed and dissatisfied condition. An alternative

[1] I wish to acknowledge, with gratitude, the services of Dr. S. A. Ozga, who gave freely of his time in discussing a first draft with me. The paper has benefited greatly from his many suggestions and criticisms. I am indebted also to Mr. Klappholz for some useful criticism on my excursion into methodology, and to Mrs. Diana Oldershaw for thoroughness and care in the cheerless task of compiling a bibliography.

[2] Little's *Critique*, in my opinion, has gone far to remedy this particular defect.

procedure, and that adopted here, is the bolder one of occasionally tightening up loose connections and, especially in the later sections, suggesting, if not adopting, a particular perspective. While such a method imparts a more coherent picture than could possibly emerge from a non-committal account of the principal ideas, some degree of personal predilection is obviously unavoidable. It is a matter of prudence that the reader at all times bear this in mind.

On the question of coverage, since welfare economics is here understood as analysis—theoretical welfare economics, as it is sometimes called—and not the application of welfare propositions to economic situations, everything in the larger literature on economic policy has been disregarded. Index numbers, as indicators of welfare changes, are given only footnote treatment, since in all essentials the problems associated with them are the same as those uncovered in the controversy over hypothetical compensation, a matter discussed at some length in Part III. Excluded also is the controversial field of socialist economics except in so far as theoretical innovations are thrown up by the disputants. Again, the accent being on the formal development of welfare economics, the non-static aspects inevitably receive less attention.[1] Thus, until Part V, the framework of our exposition remains a static one. No growth or innovation takes place, no uncertainty exists and individual tastes remain unaltered. In addition, the working population is fixed and is, in some sense, fully employed. Within this framework it is further assumed that individual behaviour is consistent, and—unless otherwise proposed—that the individual is the best judge of his own wants.

To avoid tedious qualification at every stage of the analysis, we shall assume henceforth, unless otherwise indicated, that each individual consumes some of each of the goods and supplies some of each of the factors in the economy; that all goods and factors are sufficiently divisible to warrant the concept of marginal adjustment; that each class of goods or factors is a homogeneous group, any unit in that group being a perfect substitute for any other; and, lastly, that all relevant functions are differentiable and have sufficient curvature to yield tangency solutions.[2] Nothing unexpected or fundamental emerges from the removal of any of these simplifications, with the exception of divisibility. The consequence of removing this simplification is, however, dealt with in Part IV and an occasional footnote. Finally,

[1] A great deal of welfare economics, in the broader meaning of the term, is spoken by the elder-statesman type of economist, and much of it rings wise and true. But while it warns us, rightly, of the limitations of our analysis, it does not contribute directly to the formal development of the subject. Some of these broader considerations, however, are touched upon in the final section.

[2] If the functions are not differentiable we get kinks and corner solutions. If they have insufficient curvature we have corner solutions in the choice of output possibilities, and boundary optima in exchange situations. In such cases, though the optimal solution in terms of outputs is unambiguous, relative prices may be indeterminate within a wide range. Treatment of these things is popular in the literature on linear programming.

in order to purge the text of continual amplification, illustration and comment, which would otherwise impede the flow of the argument, footnotes have been freely resorted to. The general reader is advised to omit them on a first reading.

Since we have affirmed that the subject matter of this survey is theoretical welfare economics, we may begin by hazarding a definition of the term. Theoretical welfare economics is, then, that branch of study which endeavours to formulate propositions by which we may rank, on the scale of better or worse, alternative economic situations open to society. The words " better " and " worse " obviously call for clarification, and to this end we first consider the situation of the individual. His indifference map may be regarded as a picture of his chosen ranking of the conceivable combinations of goods and services. If we say that when he moves to a higher indifference curve (or that when he expands the effective area of his choice [1]) he is better off, or he increases his welfare, we are giving expression to an ethical judgment; namely (*a*) that the individual—and no one else—is the best judge of his own well-being. In the Crusoe economy no more than this is required for welfare economics. But it is required. Without it, we may remark that Crusoe moves to a higher indifference curve, but we are then only describing how Crusoe acts: we are not judging his welfare. We can agree that under the utility hypothesis the individual believes himself to be better off in choosing a goods combination II rather than I. But since it is we, as welfare economists, who are to decide how to rank the alternatives facing him, unless we are agreed to accept his own ranking as final his preference field is irrelevant as an index of his welfare.

Since welfare economics is, however, concerned chiefly with community welfare, we shall require additional ethical judgments. The most widely accepted of these is (*b*) that the welfare of the community depends on the welfares of the individuals comprising it, and on nothing else. The mathematical expression of this statement is, of course, Bergson's social-welfare function in its general form, discussed in Part II. We can make this function a little more specific by attributing to it an ethical property which, it is believed, most people will accept—(*c*) that if at least one person is better off, no one being worse off, the community as a whole is better off.[2]

Turning to the more likely case, in which changes in economic organisation make some people better off and others worse off, several avenues are

[1] An interesting suggestion for a welfare economics in terms of expanded choice rather than indifference curves has been made by Lancaster [142]. Though it transpired that the definitions he adopted were not consistent * (see [183], [64] and [191]), it should not be hard to think of some consistent set of definitions which would enable us to determine changes in welfare by reference only to budget data, like index numbers. However, one cannot envisage any great advantage for welfare economics from this innovation.

* Since the above note was written, Lancaster has submitted a new set of definitions and a general proof in the ECONOMIC JOURNAL, December 1959.

[2] In such cases Graaff [84] would say that the social-welfare function was of the " Paretian type."

open to us: (d_1) we can defer final judgment on the alternative patterns of welfare open to the community until we have completely specified the social-welfare function—that is, until we have ranked all possible combinations of individual welfares—which, in practice, means that we shall defer it indefinitely; [1] (d_2) we can exercise our judgment about resulting welfare distributions whenever we have to rank alternative situations. And, we may go further, and indicate the guiding aim of our policy on distribution, such as to equalise real incomes in some sense. Finally, (d_3) we might try to evade this judgment on welfare distribution by the conservative principle of compensated adjustment. We must suppose, as in (d_1), that any degree of welfare redistribution is feasible, and, on this principle, redistribute in order that no one is left worse off, though some are better off, in effect meeting the criterion (c) above.

There remains the question of methodology, which is touched upon only in the slightest manner in the formal treatment of this subject.[2] The question to be answered is whether welfare propositions, like positive propositions in economics, are capable of being tested. In the latter we postulate a set of propositions, or axioms, A, and test the implications, B. In effect, hypotheses about welfare can be cast into the form, if W then R; by which we mean that if we accept certain assumptions about the nature of the economic universe, and if we accept some particular definition of an improvement in social welfare, then we can draw an inference R—namely, that when certain conditions are met social welfare is increased. This inference, R, a welfare proposition, can, conceptually, at least, be subjected to a test, inasmuch as we can inquire of each person whether or not he is better off, or else compare the ranges of goods available to him in two alternative situations.

Formally, then, propositions in welfare economics may be subjected to tests in the same way as those of positive economics. But there are far greater difficulties involved in testing an implication " fulfilling these conditions will make everyone better off " than in testing, say, the implication " if the price rises he will consume less." Generally, in positive economics any of the implications we seek to observe are simpler than direct tests of the set of axioms from which it is deduced—if these axioms can be tested at all. In

[1] It may be noted in passing that the view that a prior mapping of a boundary encompassing all possible welfare combinations open to the community may proceed without ethical presuppositions reckons without ethical judgments (a) and (b) above.

[2] An exception to this opinion is a recent and highly stimulating paper by G. C. Archibald [6], to which I am extremely indebted. It is difficult, however, to accept his suggestion that welfare economics can be studied without committing ourselves to welfare judgments by the simple expedient of sewing them on to a definition of welfare. This, of course, is possible, but no worthwhile advantage seems to follow from this ruse. The definition, he concedes, if it is to wear, must be " interesting." But an " interesting " definition, in the context of welfare, is surely one that has broad ethical appeal. A definition which embodies no acceptable ethical proposition and yet is interesting to someone, is interesting only as a weird exercise. In order to decide whether a definition of an improvement in social welfare is to be adopted as the base on which to erect welfare propositions, we are impelled to ponder on its ethical implications.

welfare economics, however, if anything it seems the other way about: a test of the implications is more difficult than a direct test of the assumptions. Indeed, so remote is the likelihood of testing welfare implications that one is tempted to relinquish the orthodox methodology and have recourse to an admittedly inferior method—some might say an inadmissible method—of attempting to ascertain the validity of the premisses, *W*. After all, if (*a*) the assumptions about consistency and the shapes of the technological and behaviour functions are correct, and (*b*) if no other considerations are relevant, then good logic ensures that the implication, *R*, follows—that if the rules deduced are met, welfare, as defined, is increased.

Both these are, of course, very big ifs. In regard to (*b*), since our attention may be drawn to additional considerations as the subject progresses, we can never be sure we have not overlooked some factor which bears on the individual's welfare. As for (*a*), some of the assumptions have so far entered into positive theorising that their undeniable usefulness as assumptions has come to be associated with a belief in their validity. We may decide, after all, that people are in fact sufficiently consistent, and that tastes are sufficiently constant for the period in question, to make little difference to the result. As for the others: the nature of the production functions involved, the relationship between income distribution and relative prices, the interdependence of individual welfares, may gradually yield to patient investigation, so that any assumption about these things can be more than mere guesses. But it is a slow business. In the meantime, the practice has been to allow for our ignorance about such functional relations by requiring that our welfare propositions hold for all conceivable properties of such functions—a procedure which is, perhaps, too severe a test of the applicability of welfare propositions, and is, apparently, in large measure responsible for the indiscriminating pessimism now in vogue,[1] a matter which will receive further attention in the final part of this survey.

The above remarks are to be understood as an attempt to explicate the kind of methodology which appears consistent with the writings of the better-known economists, and to elaborate the sense of the frequent statement that welfare propositions rest on both factual and ethical assumptions. Unless both are granted, the first as being " realistic," the second as being " widely acceptable," the welfare propositions deduced from them are of no practical importance.

II. The Optimum Conditions

Looking back over the last two decades at developments in welfare economics, the names that most readily spring to mind are those of Bergson, Kaldor, Hicks, Scitovsky, Samuelson, Little, Arrow and Graaff. The

[1] The word to be underlined here is *indiscriminate*. There may well be grounds for pessimism concerning the scope for applications of welfare economics, but, as is contended in the final section, most of the pessimism generated is for the wrong reasons.

temptation is to plunge at once into a discussion of the welfare criteria proposed by Kaldor, Hicks, Scitovsky and others, and of the social-welfare function introduced by Bergson, and later explored by Arrow and others, for these are the things which excited the most controversy at the time and still pique the curiosity by their elusiveness. For the purpose of exposition, however, this temptation is to be resisted. During the period in which these welfare criteria were being subjected to close scrutiny, treatment of the optimum conditions was one of the staple materials in text-books on welfare economics, and examples of their application continued to pour into the journals. A survey of this more pedestrian activity, which can usefully be regarded as a search for the necessary conditions of a position of maximum social welfare, is logically anterior in that the range of welfare possibilities open to society should be unfolded prior to the engagement of an apparatus of social choice involving ethical judgments. The next few pages, therefore, will be taken up with the examination of the optimum conditions of social welfare, leaving social-welfare functions and welfare criteria (which may be thought of as properties of a social welfare function) to be dealt with in Part III.

The Thirties

Although several noteworthy contributions appeared in the thirties, no common mode of treatment emerged. For one thing, while the welfare import of a Crusoe economy seemed plain enough, the significance for the community as a whole of meeting the so-called optimum conditions was not always clearly understood. For another, there was a variety of ways in which an optimum position might be expressed and discrepancies as to the proper number of conditions necessary to identify it. A comparison in these respects of the various contributions, in order of appearance, would be a fascinating if exhausting game. The intellectual reward, however, would be slight. We therefore omit in the text further reference to the pre-1939 literature on this aspect [1] except for a few paragraphs on Pigou and Bergson,

[1] The somewhat disconnected nature of earlier developments in this field can be illustrated by outlining some of the principal features of three well-known contributions in the thirties; in chronological order, Lerner, Kahn and Hotelling.

In his article on monopoly (A. P. Lerner, " The Concept of Monopoly and the Measurement of Monopoly Power," *Review of Economic Studies*, 1934), Lerner adopts as a definition of optimum a situation in which no individual can improve his welfare without making another worse off. It is met when the rates of substitution between pairs of goods for all individuals are equal to the technical rate of substitution. According to Lerner, this translates into the condition that product price ratios be proportional to marginal displacement costs, which condition is satisfied if price equals marginal cost. Any divergence between price and marginal cost is a measure of loss entailed by monopoly power.

In his later paper on Socialism (" Economic Theory and Socialist Economy," *Review of Economic Studies*, 1934), without saying more about optimum, he introduces the condition that all factors have the same ratio of marginal physical products, failing which a net increase of output is possible. Though Kahn (R. F. Kahn, " Some Notes on Ideal Output," ECONOMIC JOURNAL, 1935) objects to Lerner's calling this condition an objective test on the grounds that it may be fulfilled while at the same time the " wrong " amounts of goods are produced, a re-reading of Lerner reveals that

a brief appraisal of the main features of whose work provides the necessary background to the developments in the period that concerns us.

The standard work of reference in the inter-war period was, of course, Pigou's *Economics of Welfare*.[1] In scope, in erudition, in systematic and lucid exposition, the work is a classic which no interested student can read without pleasure and, indeed, without occasional wonder. Mention of issues which are at the hub of current controversy may be discovered ensconced in the middle of an innocent-looking paragraph or tucked away modestly in some passing footnote. Aware of the obstacles to any generalisation in this field, Pigou moves cautiously. Only welfare which can be brought into relationship with the measuring rod of money falls within his province. For the most part he declines the services of the partial consumers' surplus technique

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its objectivity consists in its being recognisable by a government bureaucrat producing goods in accordance with some arbitrary scale of values. Significantly, Lerner adds that a pricing system eliminates not only this source of waste but also that from producing the " wrong " goods when measured against people's demands, the latter source of waste being the more important.

Since the apparent purpose of Kahn's paper on ideal output was to put a sharper edge on some of the Pigovian tools, he adopted Pigou's welfare objective of maximising the national dividend. To do this without reference to distribution is, according to Kahn, to suppose we are maximising the satisfaction which would obtain if differences in the marginal utility of money to different people did not exist. So as not to become involved in distributional problems he assumes this to be the case, and is able, therefore, to take the price of a commodity, or factor, as denoting its marginal utility, or disutility, respectively, for the community. These latter assumptions, it may be observed in passing, are not those adopted by Pigou in his *Economics of Welfare*.

Kahn's paper is remembered chiefly for its amendment of two corollaries of the Pigovian system. First, whereas Pigou would have expanded industries with external economies and contracted those with external diseconomies in the belief that these effects were the exception rather than the rule, Kahn proposed that, in the event of such effects being common, the rule should be such as to shift resources from industries whose external economies were below the average to those industries where they were above the average. Second, and more of a departure from tradition, in the absence of external effects, the industries to expand are those whose ratios of price to marginal cost are above the average, and the industries to contract are those whose ratios are below the average. Ideal output requires no more than an equal degree of monopoly in all sectors of the economy. Criticism of this latter proposition seems to have ignored his " provisional " assumption that all factors were perfectly inelastic in supply.

Hotelling's famous paper (H. Hotelling, " The General Welfare in Relation to the Problems of Taxation and of Railway and Utility Rates," *Econometrica*, 1938) was one of the first attempts to vindicate the partial welfare approach of consumers' and producers' surplus in the light of a general welfare analysis. His fundamental theorem attempted to demonstrate than any excise tax which replaced an income tax yielding the same revenue placed the individual in a less-preferred position. A bridge, or other public utility, in which price was set above marginal cost (in order that total receipts cover total costs in decreasing-cost projects) was an example of an excise tax on a product or service in contrast to the alternative of raising the requisite revenue by an income tax, leaving price to equal marginal cost in the public utility.

A rather different argument is used later in the paper to uphold the consumers' surplus notion, which anticipates by a few months the Kaldor formula: if, in introducing an investment, some distribution of the burden is possible such that everyone concerned is better off than without it, there is a *prima facie* case for introducing it. This, he admits, leaves aside the question of whether the necessary distribution is practical. Provided, however, the benefits are great and widespread, it should be introduced even if some are actually made worse off. Extreme hardship, however, would warrant compensation.

[1] A. C. Pigou, *The Economics of Welfare*, 4th Edition (London, 1932).

initially favoured by Marshall, preferring a more general approach, and adopts a dual criterion for the detection of improvements in social welfare: an increase in the national dividend without any increase in the supply of factors, and a transfer of wealth from rich to poor. In regard to the first, while there are insuperable difficulties in measuring the national dividend as a total figure, an increase in its value—brought about either by increasing some goods without diminishing others or by transferring factors to activities in which their social value is higher—is deemed an improvement in welfare provided that the share of the poor is not thereby reduced. As for the second, any reorganisation of the economy which increases the share of the poor without injuring the national dividend is to be accepted as a gain in social welfare. Any other consequence of economic reorganisation is ambiguous.

In order that output be truly ideal we must measure in terms of social, and not private, value; hence, his clear distinction between (i) the value of the marginal *private* net product, which is no more than the marginal physical product of the factor, as appropriated by the producer, times the market price of that product, and (ii) the value of the marginal *social* net product, which is the total of the products and services arising from the employment of the additional factor, no matter to whom they may accrue, each product or service being multiplied by the relevant market price. A large part of the book is devoted to pointing up situations in which (i) and (ii) diverge. In the event that (ii) exceeds (i) in any industry, that industry is to be expanded. If the reverse is true, the industry is to be contracted.

The Economics of Welfare is frequently associated with the controversies of the thirties over interpersonal comparisons of utility. But its enduring contribution is to be found in the continued emphasis on the vital distinction between social and private valuations of economic activities, a distinction evoked nowadays more by reference to " external effects " or " external economies and diseconomies of production and consumption."

Though Bergson's seminal paper appeared in 1938,[1] his influence on several of the later writers was marked. In particular, Lange, Samuelson, Arrow and Graaff[2] drew inspiration from his approach and technique. The approach used was the time-honoured one of constructing a more general model under which the contributions of the previous writers could conveniently be grouped. In essence, social welfare was to be thought of as some function of the goods bought, and the factors supplied, by each of the individuals in the community plus, for completeness, any other relevant variables. Without giving it any specific form, this social-welfare function can be maximised subject to the constraints of the production functions. Of the variety of expressions which can be concocted of the first-order conditions

[1] A. Bergson, "A Reformulation of Certain Aspects of Welfare Economics," *Quarterly Journal of Economics*, 1938.

[2] See bibliography, items 144, 222, 14 and 24.

for this maximum, Bergson selects four which lend themselves to the following interpretation:

> (1) The marginal social welfare " per dollar " of each commodity be the same for all individuals.
>
> (2) The marginal social diswelfare " per dollar " of each kind of work be the same for all individuals.
>
> (3) The marginal-value productivity of each type of labour be equal to the wage of that type of labour.
>
> (4) The increment in value from shifting a marginal unit of any non-labour factor from a good X to a good Y be equal to the costs involved in this shift. This condition is more familiar in the special case in which the costs of shifting the factor are nil. The condition then requires that the value of the marginal product be the same in all uses.[1]

Conditions (1) and (2) are but formal corollaries of a maximum welfare position for society: in the jargon, they have no more " operational significance " than the equal marginal utilities per penny at which the " discerning " consumer aims. If by unanimous consent the distribution of the work and of the product are ideal, these two conditions are deemed to be fulfilled: no other test is possible.

Bergson's method had the virtue of recognising that the latter two conditions containing the rules for ideal output were separable from any prepossessions about the distribution of welfare which would be reflected in the first two conditions, an inference which was in contradistinction to the impressions conveyed by certain of the Cambridge writers, that they could be accepted only in conjunction with a particular distribution of welfare, equality.[2]

Development after 1939

Though continually displayed at slightly different angles by the various writers, the optimum conditions after 1939 began to look distinctly shopworn. A chronological reading imparts more of a sense of repetition than of evolution. Our purpose will be served with least tedium if, therefore, we proceed at once to an exposition of the logic of the optimum as it appears to-day, illustrating in footnotes the practice of some of the chief writers.

[1] As may be gathered from a further reading of the text, condition (3) may be viewed as a special case of a more general interpretation of condition (4), extended: (*a*) to cover all factors and not merely nonhuman ones, and to apply to all occupations including leisure, and (*b*) to include, in the differences in welfare referred to, the preferences of resource-owners as between occupations in addition to external economies and diseconomies.

[2] On the other hand, Bergson states that only the Cambridge School (which he associates with Marshall, Edgeworth,* Pigou and Kahn) have a clear-cut social-welfare function. If social welfare is the sum of the individual utilities, diminishing marginal utility implies that the maximum social welfare is consistent only with equality of the marginal utility of money income among all individuals. If all have equal capacity for enjoyment, this first-order condition for a maximum is fulfilled when all incomes are the same. * See note on p. 265 below.

In their various formulations all of the optimum conditions are derivable from what is commonly called a Pareto optimum,[1] defined as a position from which it is not possible, by any reallocation of factors, to make anyone better off without making at least one person worse off (or, more briefly henceforth; to make " everyone " better off[2]). Since, at this level of abstraction, no institutional restrictions are placed on the degree of factor movement, large or small, a true summit position is implied. In general, there are many such summit positions, each characterised by a different distribution of welfare.[3] Only a particular form of the social-welfare function enables us to select among all summit positions that yielding the highest social welfare. The Cambridge concept of ideal output, or ideal allocation of factors, a position from which no reshuffling of factors can add to the social value of the total product, expresses essentially the same idea as a summit or Paretian optimum position.[4] However, its attainment is contingent upon the fulfilment of a single rule, which we shall designate the *allocative rule*, requiring that the value, at the margin, of any class of factor be the same in all occupations in which it is used.

In consequence, as we should expect, the allocative rule is equivalent to any one of the alternative statements of the optimum conditions. Ignoring for the present the distinction between private and social valuation, and assuming for the moment, as does Pigou, that factor supplies are perfectly inelastic, we can decompose the allocative rule into three popular optimum conditions.[5] (1) *The Exchange optimum*, which requires that for each individual, the rate of substitution be the same for all pairs of goods in the economy.[6] It is simple to demonstrate with the aid of the familiar box

[1] See V. Pareto, *Cours d'Economie Politique*, Vol. II (Lausanne, 1897), pp. 90 ff., and also E. Barone, " The Ministry of Production in the Collectivist State," in *Collectivist Economic Planning*, edited by F. A. von Hayek (London, 1935).

[2] When used as an abbreviation of the relevant expression, " everyone " will be placed in quotation marks, otherwise it carries its normal meaning. If the goods were sufficiently divisible, then a situation in which at least one could be better off and no one worse off would also be a situation in which, literally, everyone could be made better off.

[3] To choose as between such positions we must therefore be prepared to make ethical judgments.

[4] Lerner's " Rule " for the Controlled Economy [148, Chapter 16]—six conditions linked by equality signs—amounts to the Pigou condition that the value of the marginal social net product be the same in all uses *plus* those conditions under which, in a decentralised economy, firms will in fact realise the Pigou conditions, assuming a coincidence of private and social net products.

Though tested in the increasing complexity of successive chapters, the Rule emerges triumphant. Even indivisibilities leave it unscathed, provided that the value of the product of the indivisible block of factors be estimated with reference to the area under the relevant demand curve—this area representing approximately the revenue of a perfectly discriminating monopolist.

[5] These three do not give the most compact form of the optimum conditions. As we shall see later, the first could be easily made part of the third. But in this limited form they appear frequently in welfare analysis, and will generally suffice when the results of the analysis in question are negative.

[6] The reader is reminded of our simplification: that all goods be highly divisible; that each individual buys some of all the goods; that all factors enter into each of the goods—unless modified in the text.

diagram [1] that no movement from a tangency position can make both individuals better off. (2) *The Production optimum*, which requires that for each product the rate of substitution between any pair of factors be the same.[2] Once this condition is fulfilled, it is not possible to produce any more of a good without producing less of some other good (for brevity, henceforth; to produce more of " every " good). (3) Building on these two " lower level " optima, each of which is a locus of " efficient points," is the *Top Level optimum*.[3] It requires that the subjective rate of substitution, common to all individuals, be equal to the rate of transformation (or, rate of objective substitution) for all pairs of goods in the economy.[4] Once top-level optimum is achieved, it is not possible to describe a higher level of welfare for " everyone " given the production possibilities of the existing supply of factors.[5]

[1] The lengths of the two axes measure the given quantities of the two goods to be divided between the two individuals, the origins of whose indifference maps lie in opposite corners. The locus of mutual tangencies is commonly referred to as the contract curve, after Edgeworth.

[2] The geometric representation is similar to that of the exchange optimum, except that the amounts of the factors are measured along the two axes, and that in principle the iso-product curves may be numbered. The locus of mutual tangencies is frequently referred to as the locus of efficient points, or, sometimes, as the production contract curve.

[3] Myint [189, Chapter 8] talks of (i) the subjective optimum, (ii) the physical optimum, and (iii) the general optimum of production and exchange, respectively.

[4] The standard diagram here is of the transformation curve, or production possibility curve, between two goods being tangent at some point to a community indifference curve. The data necessary to the transformation curve are taken directly from the locus of efficient points in the iso-product diagram. The concept of the community indifference curve will be discussed later.

[5] To show that these three conditions can be derived from the allocative rule, express the equality of the value of the marginal product in all lines of output as

$$p_x\frac{\partial X}{\partial A} = p_y\frac{\partial Y}{\partial A} = \cdots \qquad (a)$$

$$p_x\frac{\partial X}{\partial B} = p_y\frac{\partial Y}{\partial B} = \cdots \qquad (b)$$

where X and Y are products, A and B are factor units, p_x, p_y, are prices of the products X and Y, $\frac{\partial X}{\partial A}$ is the marginal physical product of factor A in the production of X, and so on.

Then: (1) Exchange optimum follows from there being but a single set of product prices facing each individual. Without this provision, the *value* of the marginal product would be ambiguous. (2) The production optimum follows from dividing (a) by (b) to give $\frac{\partial B}{\partial A}$ in X equal to $\frac{\partial B}{\partial A}$ in Y. (3) Top-level optimum follows if we divide (a) through by p_y and $\frac{\partial X}{\partial A}$, and (b) through by p_y and $\frac{\partial X}{\partial B}$, to obtain

$$\frac{p_x}{p_y} = \begin{bmatrix} \frac{\partial Y}{\partial A} & \frac{\partial Y}{\partial B} \\ \frac{\partial X}{\partial A} = \frac{\partial Y}{\partial X} & \frac{\partial X}{\partial B} = \cdots \end{bmatrix} = \frac{\partial Y}{\partial X}$$

p_x/p_y faces each individual, so that to each the rate of substitution is $\partial Y/\partial X$, and this is equal to the rate of transformation $\partial Y/\partial X$ (on the right-hand side of the equation) between the products, using any of the factors at the margin.

(It may be observed that this last equation reveals, in brackets, that the ratio of the marginal physical products for all pairs of goods is the same for each of the factors—an alternative statement of the production optimum.)

It is commonly alleged that a sufficient condition for the allocative rule, and therefore for the optimum conditions also, is that in all markets the price of the product is equal to its marginal cost. For multiplying each side of the equality by the marginal physical product of any of the factors yields the equality between the value of the marginal product and the factor price. And since—granted factor markets competitive and, provisionally, ignoring non-pecuniary considerations—the price of any class of factor is the same everywhere, so also is the value of the marginal product.

But is this condition *necessary* to the allocative rule? According to Kahn,[1] the rule is not violated if product prices are not equal to their corresponding marginal costs, provided that they are proportional to them. This " proportionality " thesis, however, requires not only a zero elasticity of all factor supplies, explicitly assumed by Kahn, but also that no good be both a final product and an intermediate good.[2]

If we now remove the assumption of a zero elasticity in the supply of factors, a summit position is not consistent with the proportionality thesis. If, for instance, product prices everywhere exceed their corresponding marginal costs by a given proportion, the value of the marginal product of each factor exceeds its supply price by the same proportion, granted the above proviso about intermediate goods. Factor owners may benefit by extending their supplies at prices less than the values of their corresponding marginal products, while consumers may gain from lower prices on additional purchases of the various products. The allocative rule should therefore be interpreted to include non-pecuniary activities, in particular leisure, among the alternative occupations open, without constraint, to the factor owner. Put otherwise, to the set of optimum conditions mentioned above, we must add a lower-level optimum condition requiring that the rate of transformation between factor and product be the same as the subjective rate of substitution between factor and product for every individual. We shall refer to this condition briefly as the factor-product condition.

What about occupational preference? If occupations X and Y pay the same rate but the individual prefers Y, he will place more of his factors there. In the limiting case he places all of his factors in Y. He may do this—though others may not—even though X pays a higher rate than Y, and, therefore, the market value of his marginal factor is higher in X than in Y.

[1] R. F. Kahn, " Some Notes on Ideal Output."

[2] In this connection, Little [161, p. 163] gives the following example. Coal, though a finished good, is priced as an intermediate good at its marginal cost. Electricity is priced as a finished good above its marginal cost. The rate of substitution of these two goods is therefore not equal to their rate of transformation. What this seems to show, however, is that, since the prices of all finished goods are required to be a given proportion of the value added at the margin by any (or, in the long run, all) of the factors, if an intermediate good is used as a finished good, in its latter use the price should be the appropriate proportion of its marginal cost, whereas when sold as an intermediate good its price should be set equal to its marginal cost. Whether it is possible always to maintain two different prices for the one product is a different matter.

But if the individual voluntarily forgoes extra payments in X, it is obviously because the loss in market value he sustains by reason of his choice is, at least, made up by the value that the individual places on his preference for Y (the words *at least* are inserted to allow for the individual who has placed none of his factors in X and whose premium for Y exceeds the current difference in pay between X and Y). The allocative rule should, in consequence, be amended to require that factors be so allocated that, to each individual factor owner, the value of any remaining preference of Y over X is equal, at least, to the additional market value of his marginal factor in X. An alternative statement is that a Pareto optimum has not been achieved if a worker can improve his welfare by moving to a lower-paid occupation. These opportunities for individual betterment are, however, exhausted by the factor-product condition mentioned above. For, given the rates of transformation between factor and product in the two occupations, a worker who prefers occupation Y to X will place more of his factors in Y than one who does not, in the limiting case placing none of his factors in X.

In passing, it may be mentioned that another, more compact, scheme of optimum conditions can be adopted which encompasses the formulations of several well-known writers. Summarised in a single rule that the rate of substitution between each pair of goods—goods to include, now, both products and factors—for every individual be equal to their corresponding rate of transformation, this statement comprehends six conditions: (1) that the rates of substitution be equal for all individuals as between (*a*) pairs of products, (*b*) pairs of factors and (*c*) any product and any factor; and (2) that the common rate of substitution be equal to the technical rate of transformation in each of the pairs (*a*), (*b*) and (*c*).[1] It may be observed, first, that in fact (1) is implied by (2), for if each individual equates his rate

[1] These conditions can be summarised in the following example of an optimum position, where A and B are different factors, and X, Y and Z their marginal physical products in three alternative uses.

	X	Y	Z	.	.
A	1	5	8	.	.
B	2	10	16	.	.
.	.	.	.	.	.

Since each of these figures is a marginal physical product, or rate of transformation of factor into product, if we assume that, through prices, each individual equates his rate of substitution to each of these figures, then we fulfil (*c*) for (2), and therefore also for (1). Reading horizontally, we see that, at the margin, a unit of factor A can be transformed into 1 unit of X, 5 of Y or 8 of Z. This ratio of 1 : 5 : 8 is true also for the second line, and represents the product rate of transformation (using any of the factors at the margin) to which the individuals must equate their rates of substitution, thus fulfilling (*a*) for both (2) and (1). Finally, if we glance down the columns we remark that the rate of technical substitution of A for B is 2 : 1 in each of the products X, Y, Z. If each individual equates his factor rate of substitution to this technical rate of transformation between factors, (*b*) is fulfilled for both (2) and (1). Obviously, in such a table, for any number of rows and columns the ratios, row-wise, are all the same, which give another ratio which holds for all of the columns. A failure at any point in these ratios indicates a failure at some point in the optimum conditions.

of substitution to the rate of transformation a common rate of substitution as between the individuals emerges for each pair of goods. Second, that inter-temporal substitution can be allowed for in (1) and (2) by regarding products and factors at different dates as different goods. Something like the conditions in this form will be found in Hicks [1] and in Chapter 8 of Little's *Critique*.[2]

Having amended our allocative rule to take account of factor-product adjustment and occupational preference or, alternatively, having completed one or other scheme of optimum conditions, we must recognise, first, that perfect competition is neither a necessary nor a sufficient condition for meeting the allocative rule, or the optimum conditions, even under the provisional assumption of coincidence of private and social valuation.[3] It is not necessary, since, without perfect competition, the allocative rule could be employed to guide the controlled economy into equating prices to marginal costs. It is not sufficient [4] simply because a situation in which price equals marginal costs in all lines—a corollary of perfectly discriminating monopoly as well as of perfect competition—does not necessarily entail proper adjustment to the factor-product condition. True, all factors are paid the full value of their marginal product, but—to introduce an inevitable indivisibility at this stage—since universal perfect competition is consistent with fixed hours of work in production,[5] each worker is subjected to a constraint which, in general, prevents his adjusting the supply of his labour to

[1] See bibliography, item 96.

[2] See bibliography, item 161. Dealing with the inter-temporal conditions, Little mentions the condition that the rate of substitution over time between goods be the same for each individual and equal to the rate of transformation over time. This is treated as one condition, not two. For the rest he ignores transformation and substitution as between factors themselves, and as between factors and products; instead he has two conditions requiring a common rate of substitution as between goods and money and as between bonds (or shares) and money.

In a simple riskless economy one would suppose Fisher's concept of the rate of interest which equates the marginal time preference of all individuals with the rate of return over cost would satisfy the inter-temporal requirements of an optimum position. We shall, however, touch on this point again in Part V.

[3] Despite continued allegations to the contrary. For recent examples see Dorfman, Samuelson and Solow [59, p. 410], and Henderson and Quandt [92, p. 211].

[4] In industries subject to decreasing returns to scale, owing to some scarce factor being unpriced and left out of the firm's production functions, marginal cost to the industry exceeds the inclusive average cost to the firms (since, in these circumstances, average costs do not include rent payments to this scarce factor). In perfect competition firms would then expand output to the point where the marginal cost to the industry exceeded the price of the product, the latter being equalled by the average costs of firms (excluding, of course, rent to the unpriced factor). A common example of such a case is deep-sea fishing. If someone appropriated the fishing area and charged a rent, based on the catch, so as to maximise his receipts (given the price of fish), perfect competition would result in an output for which price equalled average costs for the firms (including rent) and marginal cost to the industry.

[5] When we allow for this constraint, or indivisibility in the supply of factors required of the individual, the supply curve of labour to the industry is no longer the horizontal addition of the supply curves of the individual labourers, but a schedule of the number of positive responses to an all-or-nothing offer over a range of such offers.

the going wage-rate. Consequently, his own valuation of his marginal factor may fall short of, or exceed, that of the market.[1]

Furthermore, even if perfect competition did meet the optimum conditions laid down, these conditions themselves are only necessary conditions for a Pareto optimum. Since they are all in fact first-order conditions, they are consistent with a constrained minimum position (*a* in Fig. 1). Second-

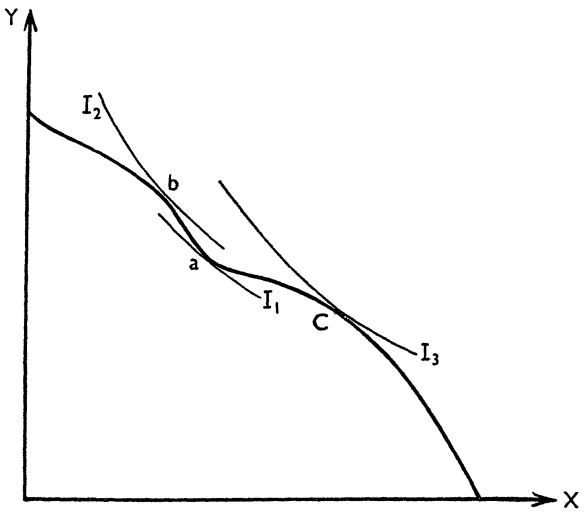

FIG. 1

order conditions are required which, as it happens, are no other than the stability conditions for equilibrium positions.[2] Nevertheless, even if the second-order conditions are fulfilled, or we have good reason to believe that the position in question is one of maximum, since only marginal conditions are involved we are assured only of a local maximum (*b* in Fig. 1), which may not, of course, be the largest maximum. True sufficient conditions, sometimes referred to as total conditions,[3] are needed for a genuine summit position. Such conditions require that for all movements, large or small, from the optimum in question, no other position can be reached at which "everyone" is better off.

[1] Even though his marginal valuation exceed the market price of his labour unit, by accepting the all-or-nothing offer he may still make a surplus, or rent, in the occupation.

[2] See Hicks [96, p. 704]. Reder [207, p. 45] adds that the attainment of stable equilibrium under conditions of perfect competition satisfy the second-order conditions. Which stability conditions are intended are nowhere to be found, but presumably the Marshallian conditions are in mind—that the demand curve for each product cut the corresponding supply curve from above. Actually, the sufficient conditions for a (local) maximum are more complex, resulting as they do from the expansion of $d^2W < 0$, W being the welfare function subject to the production constraints.

[3] See Hicks [96, p. 704]. The total conditions include the possibility of introducing a new good or ceasing to produce an existing good. Apparently no easily observable rules can be enunciated for the total conditions.

Finally, we must remind ourselves that a Pareto Optimum, or an ideal output, is but one of a large number of conceivable summit positions, each distinguishable from the others by a different pattern of welfare distribution.[1] It follows that, although there are particular optimal positions corresponding to any given non-optimal position which make " everyone " in the latter position better off, a movement from this given non-optimal position to *any* optimal position is not necessarily an improvement for " everyone."

We now turn to some of the outstanding applications of the optimum conditions. For the most part, the formal demonstrations involve little more than an inspection of the optimum conditions under alternative economic organisations. A practical difficulty in all the cases considered is that the optimum rules, corrected for differences between social and private valuations, must be met in *all* sectors for any welfare inference to be valid. If this stringent requirement cannot be met for any reason, there are no general rules to fall back upon; in particular, we cannot suppose that more conditions fulfilled are better than less. Again, we have so far ignored the consequence for the optimum conditions of the influence on the individual's welfare of the welfare of others. These two difficulties, along with others, will be treated in Part V. They are mentioned here in order to impress on the reader the rather provisional basis of the familiar welfare propositions which follow.

The case against monopoly in allocative economics [2] rested on its alleged restriction of output. This partial view of things was corrected by Kahn's ideal output [3] characterised by an equi-proportional degree of monopoly in all lines of production. In so far as Lerner, Reder and Little [4] reject this solution on grounds that the factor-product condition is not met, two points appear to have been overlooked. First, if Kahn's explicit assumption of a

[1] This is clearly recognised by Hicks [96, p. 701] and, later, by Reder [207, p. 38] and by Samuelson [222, p. 231–2]. In fact, the general proposition that we cannot identify an ideal allocation of resources unless we commit ourselves to a specific welfare function was argued—though in more informal terms involving utility—as far back as 1936 by Harrod (R. F. Harrod, "Another Fundamental Objection to Laissez-Faire," ECONOMIC JOURNAL, 1936).

On the other hand, Myint [189], who wrote of a " scientific welfare economics," seems to have put the matter too strongly in stating that the optimum conditions enable one to study " the purely mechanical efficiency of the economic system in satisfying individual requirements " without involving " any normative value judgments " [189, p. 118]. This language can easily convey the impression that allocative efficiency is something to the good which may be usefully pursued independently of any agreement on a desirable welfare distribution. But, as will be made explicit in Part III, an output combination that is " efficient " with respect to the existing welfare distribution may be " inefficient," and therefore non-optimal, with respect to another, possibly more desirable, welfare distribution.

[2] I think it would generally be conceded to-day that questions of stability, technical efficiency, innovation, the distribution of wealth and power, capture the interest both of the economists and the public more than do questions concerning the optimum output.

[3] R. F. Kahn, " Some Notes on Ideal Output."

[4] See bibliography, items 148, 207 and 161.

zero elasticity of the supply of all factors is accepted [1] the factor-product condition is, in effect, fulfilled. Second, if the view is taken that Kahn's assumption is too far at variance with the facts to be acceptable, perfect competition fares no better than equi-proportional imperfect competition. For, as we have already pointed out, perfect competition is consistent with fixed hours of work in all occupations which, effectively, precludes opportunities for marginal adjustments by factor-owners.

In the belief that price equal to marginal cost was the correct rule for industry, the Government intervening with taxes and bounties in order to correct for external effects, one slipped easily into the marginal-cost-pricing controversy bedevilled by computational conundrums, problems of administration, monetary and fiscal policy, political power and so forth. Allocative considerations alone, as it happens, have little to contribute.[2] An older element in the controversy goes back to Pigou's *Wealth and Welfare* of 1912, in which the author sought to demonstrate that output under competition was excessive inasmuch as rents which ought to enter into marginal costs were, instead, spread over average costs. The outcome of the discussion which followed this proposition was that—granted the prevalence of optimum conditions in all other sectors, and the coincidence of social and private benefits—the total increment of Ricardian rent and also, for that matter, all transfer rents on intra-marginal factors, should *not* in any case enter marginal costs. Such rents are not real costs but transfer payments, and there is no divergence, on these grounds, between competitive and ideal output.[3] However, we must remind ourselves again that price equal to marginal cost in all sectors is not by itself enough to meet the necessary conditions for an optimum. Further, even if these necessary conditions were met, and sufficient conditions also, there is no warrant for the assumption that such a summit position is, in any acceptable sense, superior to all non-summit positions.

The marginal-cost-pricing rule is yet less satisfactory when, as is generally the case, we envisage setting prices only for one or several industries, while having to acquiesce in a diversity of relationships between price and marginal costs in all other sectors of the economy. Finally, if it were decided, for lack of a better rule, to equate price to marginal cost in any case the particular methods used to cover costs in decreasing-cost industries have no direct

[1] This zero elasticity is to be taken to result from a combination of a zero substitution effect plus a zero wealth effect in the supply of factors.

[2] Few of the contestants in this field of controversy questioned the welfare basis of marginal-cost pricing. For instance, the chief issues raised by Coase [48 and 49], Thirlby [236], Nordin [192] and Vickrey [243], among others, turned upon the practicability and other advantages of alternative methods of covering costs.

Despite its title, I can find nothing in Nancy Ruggles' article [217] that provides a welfare justification for marginal-cost pricing.

[3] An excellent survey of this older controversy is to be found in Ellis and Fellner's 1943 paper [63].

allocative implications. They have welfare effects only inasmuch as they affect the real distribution of income in the economy.[1]

The taxation controversy is much of a piece with the monopoly one. Little,[2] in repudiating Henderson's allegation of an excess burden of indirect taxation,[3] argued that the alleged welfare superiority of direct taxation rested on its non-infringement of the existing ratios of prices to marginal costs. It was further required, however, that factor supplies were invariant, otherwise, whether taxes were direct or indirect, the factor-product condition was not met. In conclusion, since taxes on goods (including leisure) to which the individual is least responsive offend least against the optimum position, Little hazards the general statement, familiar from consumers' surplus analysis, that the least objectionable taxes are those on goods for which the individual's demands are least elastic. If there is a weakness in this analysis it is the restriction to a single individual which avoids the distributional complications.[4] For even a poll tax imposed on an already optimally organised economy is not neutral if its proceeds are redistributed among the community. It shifts the economy to a different optimal position—one in which some people are better off and others are worse off.

With the popularity of the indifference-curve technique, the original Bickerdike case for " incipient " tariffs [5] was revised, first by Kaldor in 1940,[6] then by Scitovsky, by Kahn, Meade, Johnson and Graaff,[7] to mention only the better-known contributors.

The basic idea is that although in a world of perfectly competitive economies free trade results in a world optimum, a country thinking only of its national welfare may increase its welfare, at the expense of other countries, by acting as a monopolist—selling less to foreign countries but on better terms. The simple demonstration that this is possible in the two-good, two-country model proceeds by use of Marshall's offer-curve technique plus the community indifference curves of the tariff country.

[1] In general, if an optimum were to be attained by universal application of the marginal-cost-pricing rule, or on some other formula, one can go no further on a purely allocative basis. For there are no allocative requirements for the pricing of the *intra* marginal units. Of the indefinite number of ways of covering costs (paying for fixed factors in the short period), including direct subsidies to the industry, two-part tariffs, discriminatory charges, all are consistent with the implementation of the allocative rule, though each affects in a different way the distribution of welfare. In this connection see Oort [194], especially the appendix.

[2] See bibliography, item 155.

[3] See bibliography, item 94.

[4] Essentially the same argument was put forward about the same time by Friedman [74]. He justifies his restriction of the analysis to a single individual by asserting his concern with " allocative " and not with " distributive " problems.

In justice to Friedman and Little, it must be allowed that they were explicit about many practical matters which forbade any sweeping policy conclusions.

[5] C. F. Bickerdike, " The Theory of Incipient Taxes," ECONOMIC JOURNAL, 1906.

[6] See bibliography, item 122.

[7] See bibliography, items 228, 119, 172, 115 and 81.

The intersection at F in Fig. 2 of the offer curves [1] of countries A and B reveals the free trade equilibrium, country A importing OX of X in exchange for OY of Y, which is what country B imports in exchange for OX. By imposing a tariff on its imports, country A can reduce the domestic quantities demanded at any given international terms of trade, thereby reducing its effective-offer curve. The optimum tariff is one which generates

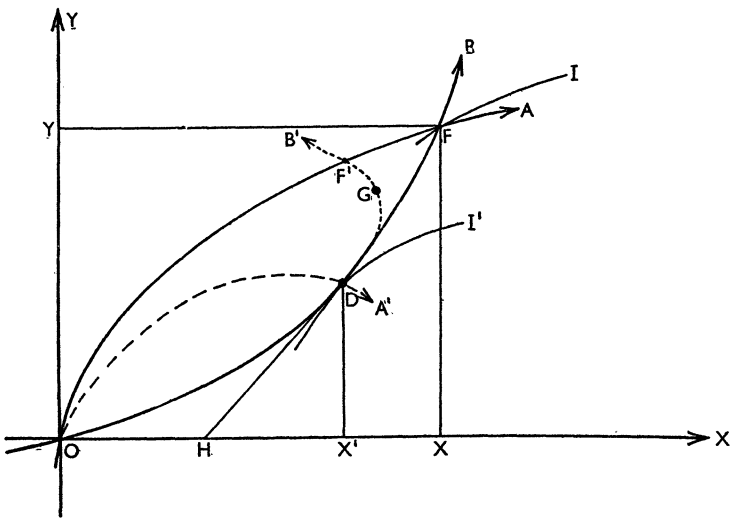

FIG. 2

an effective offer curve, A', intersecting B's unchanged-offer curve at D, at which point A's community indifference curve, I', is tangent to B's offer curve.[2] The measure of gain effected by the optimum tariff is indicated

[1] The offer curve for a country may be derived as follows: construct a terms-of-trade line tangent to the production frontier of a country already optimally organised. If these terms of trade differ from the initial domestic rate of substitution and transformation the new quantities of X and Y *produced* are indicated by the point of tangency of this line with the production-possibility curve; the new quantities of X and Y *consumed* by its point of tangency with the community indifference curve. The length, along this terms-of-trade line, from the production tangency to the consumption tangency represents the exchange of goods; of imports (excess of domestic consumption over domestic production of one of the goods) for exports (excess of domestic production over domestic consumption of the other good).

Swivelling this terms-of-trade line about the production possibility curve continuously alters the lengths representing exchange. When they are measured from a common origin, and radiate into the north-east (and south-west) quadrant, the pencil of such lengths describe that country's offer curve. Unless the two countries have the same terms of trade in their initial no-trade positions, their offer curves must intersect in one or other of the two quadrants.

[2] Community indifference curves are discussed in the next section. I have assumed here a single set of community indifference curves reflecting a "satisfactory" distribution of welfare. The redistributive effects of a tariff are offset by direct transfers of income in order to ensure that no individual is worse off as, with the improved terms of trade occasioned by the tariff, we move to higher community indifference curves.

In Graaff's treatment [84, p. 49], what he calls a "Bergson frontier" takes the place of the

by the movement from the community indifference curve I, in the free-trade position, to I' with the tariff. The tariff is an optimum inasmuch as I' is the highest achievable community indifference curve consistent with B's unchanged offer curve. Thus, it is not possible to move from D and make " everyone " in A better off.

For country A, the slope of B's offer curve represents the rate of transformation through foreign trade of Y, the good exported, for X, the good imported. Seen in this light, the additional condition required is that country A's rate of transformation of Y into X through foreign trade be equal to the domestic transformation of Y into X and also, since we assume perfect competition to prevail in A, to the domestic subjective rate of substitution of Y for X—the slope of the community indifference curve I' at D. If we regard the optimum tariff, t, as equal to the difference between (i) π, the domestic price ratio (equals $X'D/X'H$) and (ii) p, the actual terms of trade (equals $X'D/X'O$) we can deduce that the formula $t = \frac{\pi}{p} - 1$, is equal to $X'O/X'H - 1$. But $X'O/X'H$ measures the elasticity of the foreign offer curve at D. Hence the optimum tariff, $t = E - 1$, where E is the elasticity of the foreign offer curve.

An alternative formulation put forward by Kahn,[1] in terms of the elasticities of the relevant demand and supply schedules, rather than in terms of the offer-curve elasticity, appears to lend itself better to estimation and may be derived directly from the optimum conditions in the above paragraph. Since the rate of transformation through foreign trade must equal the domestic rate of transformation, (a) the marginal cost of importing X divided by the marginal revenue from exporting Y must be equal to (b) the domestic marginal cost of X divided by the domestic marginal cost of Y. If we take the foreign supply curve of A's imports to be upward sloping, the marginal cost to country A of importing X exceeds the foreign price of X by a proportion which varies with the elasticity of that supply curve. The foreign demand curve for A's export, Y, being downward sloping, the receipts from an additional export of Y fall short of its price, again by a proportion which depends on the elasticity of that demand curve.

In the free-trade position, then, where the international price ratio is equal to the domestic price ratio, the (a) ratio, representing the true inter-

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community indifference map. Such a frontier is constructed as the inner limit of all those community indifference curves which for the community have equal welfare value. Any point on this frontier, therefore, indicates the minimum quantities of goods required to attain a given value of social welfare. A criticism of the usual treatment of optimum tariffs, which treatment accepts the optimum tariff position as superior, actually or potentially (*i.e.*, using compensation tests), to the free-trade position, does not apply to Graaff's treatment. The Bergson frontier passing through D does not necessarily have a higher welfare value than that passing through the initial free-trade point, F.

[1] See bibliography, item 119.

national rate of transformation, exceeds the (*b*) ratio; which is to say, that it costs more to transform *Y* into *X* through trade than through domestic production. One therefore proceeds to reduce exports and imports (both by the same value in order to maintain balanced trade) until—with the marginal cost of importing *X* falling, and the marginal revenue from exporting *Y* rising (the respective marginal costs in home production moving in the reverse directions)—the (*a*) ratio is brought into equality with the (*b*) ratio, and the optimum condition is met.

Since, however, the domestic consumers have regard only to (*c*), the ratio of the actual price of imports *X* to the price of exports *Y*, which ratio is always smaller than the (*a*) ratio in the absence of tariffs, the consumers' choice may be " corrected " by increasing the price of imports to the required extent by levying a tariff on imports of *Y*. The tariff which makes these ratios equal is the optimum tariff, and as its height depends upon the shape of the two curves mentioned, it can obviously be calculated with reference to their respective elasticities. Writing η_s for the elasticity of the foreign supply of imports, and η_d for the elasticity of the foreign demand for *A*'s exports, the optimum tariff can be shown to have the form $\frac{1/\eta_s + 1/\eta_d}{1 - 1/\eta_d}$. Graaff has shown that this formula can be easily extended to cover any number of goods entering into a country's foreign trade.[1]

The assumptions of balanced trade maintained, say, through changes in the relative wage-rates of the two countries, of an unchanged level of employment in *A*, of universal competition and an absence of external effects, are exacting enough, to say nothing of the distribution problem. Even if we grant all this, the formulæ, as Graaff points out,[1] do no more than reveal the relationships which are to obtain in the the optimum situation. Guesses at tariff heights using the existing elasticities, if they can be obtained, may be wide of the mark, since the elasticities in question will themselves vary with the height of the tariff.

In conclusion, while there is little doubt that some countries may be in a position to improve their terms of trade with the outside world at some small sacrifice, if any,[2] in imports, the idea of an optimum tariff with its suggestion that there is some calculable set of tariffs which, in the absence of retaliation, is best for a country is all too facile. Quite apart from the stringent conditions and practical difficulties involved, the welfare significance of this optimum tariff is tenuous in the extreme. We already know that in the event that all the optimum conditions are fulfilled (including,

[1] See bibliography, item 84.

[2] If at the free-trade equilibrium *B*'s offer curve were sufficiently inelastic (less than unity), then some tariff imposed by *A* can improve that country's terms of trade while also increasing the volume of its imports. To illustrate, if *B*'s offer curve were *B'* in Fig. 2, intersecting *A* at *F'*, a tariff could reduce *A*'s effective offer curve to intersect *B'* at, say, *G*. Country *A* now imports more and exports less.

here, the foreign-trade optimum condition) in all sectors, the best we can hope for is a Pareto optimum, a necessary condition for a maximum of social welfare. Since there are actually an indefinite number of such summit positions, each corresponding to a different initial pattern of welfare distribution, there are in principle an indefinite number of optimum tariffs. Until we have some rule, evolved from ethical considerations, by which we may choose among the alternative summit positions open to us, there is no warrant for moving to any one of them guided by a set of optimum tariffs calculated on the basis of the existing welfare situation—assuming such calculation practicable. For, as we shall affirm in Part III, there is no acceptable definition of welfare by which an existing non-summit position may be judged inferior to *all* attainable summit positions.

III. The Choice of Welfare Criteria

With the advent of " The New Welfare Economics " in 1939 there began a period of cautious optimism. It was not to last long. Two years later, in an ingenious paper,[1] Scitovsky demonstrated that the apparently felicitous device of hypothetical compensation advanced by Kaldor and promoted by Hicks was quite capable of giving contradictory results. And, though the device was promptly amended to preclude the particular perversity uncovered by Scitovsky, the damage began to spread. Little's fastidious examination of 1949 left the idea of hypothetical compensation, as a criterion of welfare, in a dubious state.[2] It was left to Samuelson to push the logic of Scitovsky's initial discovery to its conclusion: that, in general—if we exclude comparisons between situations in one of which there is more of " every " good—it was not possible to rank alternative economic organisations on the basis of compensation tests.[3] Arrow's sweeping essay on social choice added to the scepticism which gathered force in the fifties,[4] so that when Graaff's thesis appeared in 1957 [5] its elegant nihilism did little more than reflect the prevailing mood.

The controversy over welfare criteria was marked by greater critical insight, in respect both of ethical implications and the applicability of deducible propositions, than the more abstract dissertations on the optimum conditions. Interest in these criteria is, moreover, more easily sustained both because of the more explicitly ethical content and by virtue of a clear evolution of the compensation device which we follow in some detail, an evolution which, as it happens, links up eventually with the concept of a Pareto optimum regarded as a necessary condition for a position of maximum social welfare.

[1] See bibliography, item 227.
[2] See bibliography, item 154.
[3] See bibliography, item 221.
[4] See bibliography, item, 14.
[5] See bibliography, item 84.

Compensation Tests

The formulation of the principle of hypothetical compensation [1] arose out of the controversies of 1938–39 in the ECONOMIC JOURNAL. Harrod,[2] illustrating the traditional acceptance of interpersonal comparisons of utility by reference to the repeal of the corn laws in 1846, had argued that the gain to the community as a whole might be regarded as exceeding the loss to the landlords only if the individuals affected were treated as equal in some sense. While he was prepared to go along with this, Robbins was not.[3] To him this assumption of equal capacities for satisfactions was unwarrantable.

Without challenging Robbins' view of the scientific status of interpersonal comparisons, Kaldor denied their relevance for prescriptive statements.[4] Indeed, according to Kaldor, the classical argument for free trade involved no such arbitrary element, the essence of the argument being that the Government could so compensate the losers as to make " everyone " better off. The compensation test implied by this view was to be understood as an objective test of economic efficiency and, according to Kaldor, prescriptions based on it had a scientific status detached from any value judgment. Thus, whether one should compensate or not, he submitted, was a political question on which the economist could merely pronounce an opinion.[5]

Hicks,[6] who found much to admire in the structure of the traditional welfare economics while deprecating their foundations, eagerly grasped this notion of examining the efficiency of alternative economic organisations without reference to the question of distribution, and particularly without

[1] The terminology varies from time to time, and from one writer to another. The most common terms are compensation test, or compensation criterion; principle of compensation, or of potential or hypothetical compensation (with " overcompensation " frequently substituted for " compensation " in all these terms).

[2] R. F. Harrod, " Scope and Method of Economics," ECONOMIC JOURNAL, September 1938.

[3] L. C. Robbins, " Interpersonal Comparisons of Utility," ECONOMIC JOURNAL, December 1938.

[4] See bibliography, item 123.

[5] Stigler [233] objects to the compensation principle inasmuch as its adoption would apparently sanction compensation of successful thieves for the amounts they would otherwise steal, thereby releasing resources engaged in maintaining law and order. In general, he argues, not only thieves and protected industries but anyone contemplating social mischief would, on this principle, be dissuaded from taking action by adequate compensation. As a principle, therefore, it is repugnant to our moral code.

But in fact the compensation principle asks only whether losers *could* be compensated: it does not require that they *should* be compensated. Consequently, from the successful application of the compensation principle to stealing, or tariff protection, nothing more may be inferred than that their removal would increase " efficiency." Whether, and in what manner, compensation should take place, if it should take place at all, is a question of distribution on which our moral sense has to be consulted. Indeed, the declared aim of the compensation test, as Kaldor stresses, is to separate the question of " efficiency " from that of distribution.

See also a comment on this paper by Samuelson [220].

[6] See bibliography, item 96.

reference to the comparisons of satisfactions as between individuals.[1] Defining an optimum position along Paretian lines,[2] he pointed out that although there was not one but an infinite number of such optima, each differing from the others by a particular distribution of welfare, one could lay down universally valid conditions for such an optimum.[3] If these conditions were not met the position was not one of optimum and, consequently, " everyone " could be made better off in moving to some optimum.

While Hicks followed Kaldor in using the notion of compensation as a wedge between efficiency and distribution, he was more cautious on the question of prescription and toyed with the idea of linking economic reform based on efficiency alone with some measure of actual compensation designed to make it more acceptable from the point of view of distribution, albeit not without reminding us that transfers of wealth might well reduce efficiency.

Scitovsky's paper, two years later,[4] is memorable chiefly for its apparently paradoxical demonstration, that having shown a position II to be more efficient than a position I on the Kaldor–Hicks criterion, the same criterion might well reveal, following the community's adoption of the II position, that I was now more efficient than II.[5] With this in mind, the new criterion suggested by Scitovsky was, as might be expected, that which required the result of the original Kaldor–Hicks test to be consistent with that of the " reversal " of this test—by which is meant the original test applied, now, to a movement from II to I. Only if *both* tests disclosed II to be better than I, or I to be better than II, was the Scitovsky criterion fulfilled. Any other outcome was ambiguous.[6]

[1] This, according to Hicks, was one of the three weak links in Pigou's valuation of the social income. The other two were: (1) the distinction between welfare and economic welfare (though this seems to be less a distinction of principle than of measurability), and (2) the measurement of the real value of the national dividend. However, as Hicks does point out, Pigou's welfare propositions refer to *changes* in the national dividend and, therefore, in no way depend upon his success in measuring the national dividend as a whole.

[2] Implicit in the definition of a Pareto optimum is a Paretian criterion that a position II is superior to I if, in moving to II, " everyone " is actually made better off. But its range of application is likely to be limited. It may be said that Kaldor's achievement consisted in transforming the Paretian criterion from an actual to a potential situation; II, that is, qualifies as the better position if, in the movement from I to II, " everyone " *could* be made better off. In effect, Kaldor followed Pigou's procedure in dividing welfare economics into propositions about the value of the product and those about distribution. Pigou's indicator for an increase in the national dividend, it should be recalled, was in fact just such a compensation test (*The Economics of Welfare*, 4th edition, pp. 50–5).

[3] Hicks' marginal conditions required that the rate of substitution between any two goods (including factors) were the same for each individual and each producing unit. His stability conditions ensured that the position was one of maximum, and not of minimum. His total conditions (which in fact comprehended the stability conditions) would ensure the impossibility of improvement by introducing, or abandoning, any product or factor.

[4] See bibliography, item 227.

[5] It should be borne in mind, however, that positions I and II being compared were not, in the Scitovsky treatment, full optimum positions. In his main demonstrations they were two bundles of goods, each divided between a two-person community such that the exchange optimum prevailed in the division of each bundle.

[6] Scitovsky put it slightly differently. He considered two possibilities, (1) a II position in which redistribution of the II product made " everyone " better off than he was in I, and (2) a

To apprehend the nature of the Scitovsky paradox,[1] and some of the finer points emerging from the further development of welfare criteria by Samuelson and others, familiarity with two popular constructs in welfare economics, the community indifference map and the utility possibility curve, is of great expository value. The former is elaborated below and then employed to shed light on Scitovsky's initial and somewhat esoteric demonstration. The latter construct will be explained later, prior to a consideration of Samuelson's distinguished paper of 1950.

A direct analogy with the individual indifference curve suggests that the community indifference curve be a locus of combinations, or " bundles," of goods as between which the community is, in some sense to be defined, indifferent. It has been found useful to define this indifference in such manner that for any point on the curve (representing a bundle of goods which may be chosen by the community) it is not possible to make " everyone " in the community better off. The exchange optimum, therefore, obtains at every point along the community indifference curve. In consequence, at every such point the rate of substitution between goods is the same for each of the individuals in the community.

Let us illustrate the geometric construction of a community indifference map for a community of two individuals, A and B, whose respective indifference maps are indicated in Fig. 3.[2] Since we may form a community indifference curve from any pair of the individual curves, let us start by choosing a_1 and b_2. The community indifference curve to be constructed therefrom is to have the property that, at all points along it: (i) the individuals A and B maintain their respective levels of welfare, a_1 and b_2, and (ii), as mentioned, the rate of substitution be the same for each individual for any division of the bundle of goods held in common.

If, therefore, we place the origin of B's map diagonally opposite to that

I position in which redistribution of the I product made " everyone " better off than he was in II. If (1) were possible and (2) impossible, then we could say that II was the more efficient position. Conversely, if (1) were impossible but (2) were possible, then I was the more efficient alternative. Whereas if both were possible we could say nothing. Other possibilities, such as II better than I by the original test and equal to I by the reversal test, were ignored.

[1] Scitovsky's attitude is less vulnerable than might appear from a reading of later criticisms. If he appeared to accept compensation tests as tests of efficiency he did so: (*a*) because the more acceptable Paretian criterion was likely to be satisfied very rarely, and (*b*) because in any case the " principle of compensated adjustment "—the fulfilment of the Kaldor–Hicks test plus actual compensation in order to make " everyone " actually better off, which gives the effect of implementing the Paretian criterion—obviously favoured the *status quo*. Nevertheless, he was not willing to prescribe policy solely on the basis of these tests, and without reference to social justice.

Furthermore, he anticipated Samuelson in defining II to be more efficient than I if for every distribution of welfare each person in II could be made as well or better off than he was in I, a criterion which would be fulfilled if there was an increase in at least one good without there being a reduction in any good. Notwithstanding this generalisation, he held that only two distributions really mattered—a position later taken up by Little in his more down-to-earth approach—that before the change and that after.

[2] This follows my treatment in 1952 [177]. Graaff has a similar geometric treatment. Scitovsky [228] and Baumol [24] also go into the construction of this curve in some detail.

of A's origin and, keeping B's axes parallel to those of A, move B's map until b_2 just touches a_1 at, say, c' in Fig. 4, then the point Ob (the origin of B's map) taken with reference to A's origin, Oa, represents a point on the required community indifference map. Another such point would be Ob', B's map having been moved downward to the right and adjusted so that, once again,

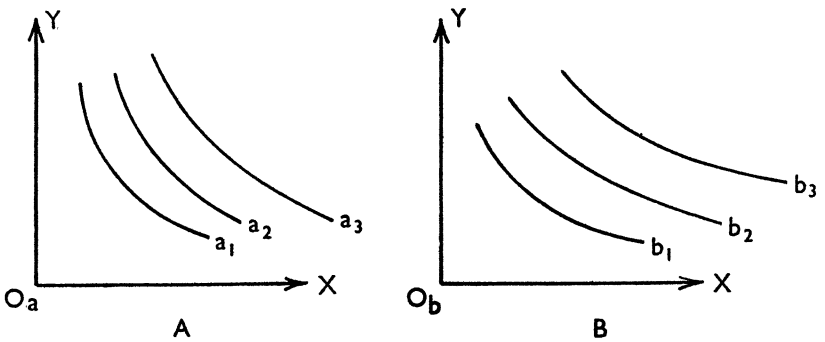

FIG. 3

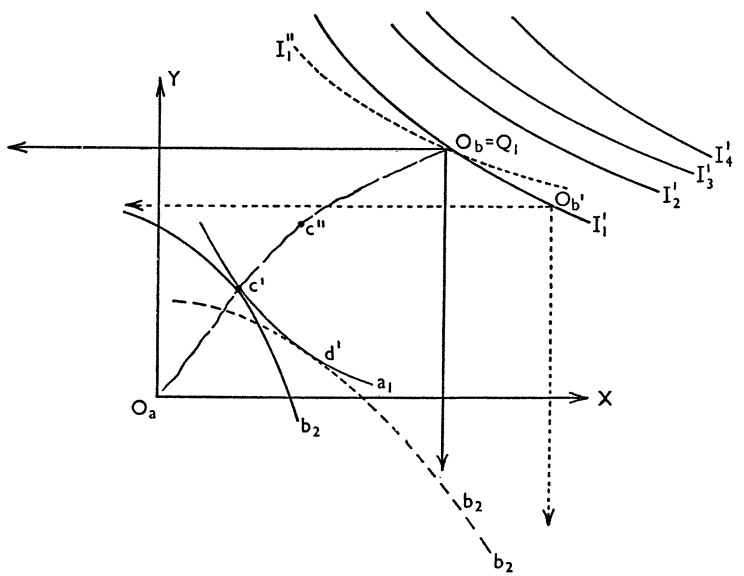

FIG. 4

b_2 just touches a_1, this time at d'. Clearly, by moving B's map continuously downward to the right, and then upward to the left, b_2 at all times being placed tangential to a_1, B's origin describes the community indifference curve I_1', having the desired properties (i) and (ii).

Two further observations are necessary before proceeding. First, given any point in the X–Y quadrant, say Q_1, as represented by Ob in Fig. 4, the particular community indifference curve we have constructed, I_1'—representing the sum of the individual welfares a_1 and a_2—is not the only

community indifference curve which may pass through Q_1 having property (ii). For we could divide this bundle Q_1 between A and B in an indefinite number of ways, taking care always that, whatever the distribution chosen, the rate of substitution be the same for both individuals. Under this restriction, therefore, redistribution is confined to movements along the contract curve of Q_1. If, for instance, we move along the Q_1 contract curve from c' to c'', the latter point being the mutual tangency of a_2 and b_1, a new community indifference curve I_1'' can be generated from these individual curves in the way described. I_1'' and I_1' cannot, of course, be compared on the Paretian criterion—that " everyone " is better off on one of these community indifference curves compared with his being on the other—since in moving from I_1' to I_1'' individual B is worse off while A is better off. Indeed, we can derive a whole pencil of such non-comparable community indifference curves passing through Q_1, each corresponding to a different division, along the contract curve, of the Q_1 bundle. It is, clearly, a consequence of property (ii) that each of these community indifference curves passes through Q_1 at a slope parallel to the mutual tangency (on the contract curve) of the individual indifference curves from which it is generated.

Second, if we use the Paretian criterion to rank the community indifference curves its consistent application presents us with a map of non-intersecting community indifference curves.[1] For instance, having I_1' as representing individual welfares a_1 and b_2, we could proceed to construct I_2' from, say, a_2 and b_2, I_3' from a_3 and b_3, I_4' from a_3 and b_7 and so on—" everyone " being better off in each successively higher community indifference curve. Such curves we may call *comparable*. They form part of a consistent community indifference map. Obviously, quite a number of other consistent maps may be constructed on this principle, beginning with, say, I_1', though, in general, it will not be possible to move from a curve of one of these maps to that of another.

Fig. 5 illustrates the Scitovsky case with two alternative bundles of goods, Q_1 and Q_2. The existing division of Q_1 between A and B is given by c' on the contract curve OQ_1, with I_1' representing the community indifference curve proper to that distribution. On the other hand, the existing distribution of Q_2 is indicated by c'' on the contract curve OQ_2, with the community indifference curve I_2'' corresponding to c''. If, now, I_1' and I_2'' were directly comparable we could move direct from one to the other and fulfil the Paretian criterion of an improvement in the community's welfare. They are not comparable, however, and we therefore have recourse to the Kaldor–Hicks criterion, which devises comparability through

[1] It does not follow, however, that successively higher non-intersecting community indifference curves fulfil the Paretian criterion. Individual indifference maps which were identical and homogeneous would yield a unique set of non-intersecting community indifference curves. Irrespective of the manner in which the individual curves were combined, only one curve would pertain to a given bundle of goods.

hypothetical compensation. Through Q_2 we proceed to construct a community indifference curve I_2' that is comparable with I_1'. Apparently, then, there is some division of the Q_2 bundle—that from which I_2' has been generated—which does make " everyone " better off than he is with the Q_1 bundle. If we act on this criterion and arrive safely at Q_2, however, we discover that Q_1 beckons us with exactly the same happy prospect. For we may construct I_1'' through Q_1 comparable with and, as it happens, above I_2''.

The apparent paradox is easily explained. With the distribution c' of the Q_1 bundle, the common rate of substitution is, say, $2Y = X$. With X twice as valuable as Y for the community, the bundle Q_2, which differs from Q_1 in having, let us say, one more of X and one less of Y,[1] must be reckoned

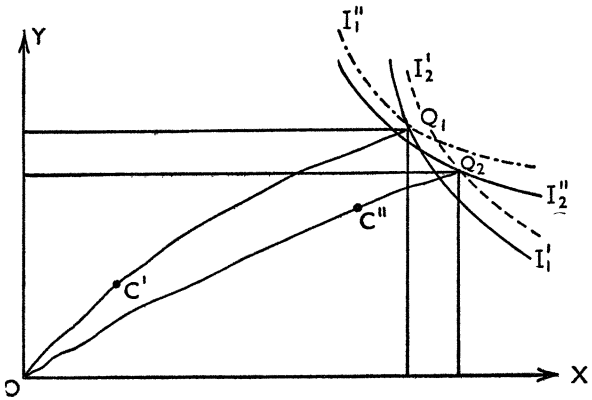

FIG. 5

by the community as the more valuable of the two. Having moved to Q_2, however, the new distribution of that bundle is that indicated by c'', a distribution which happens to be associated with a common rate of substitution $Y = 2X$. But on these relative valuations, Q_1 is, for the community, clearly the more valuable of the two bundles. This inter-relationship between relative valuation and distribution is the source of elusiveness and paradox which runs through so much of the initial controversies on welfare criteria and index numbers.

Little's Criterion

In respect of welfare criteria, Little's " Foundations " paper of 1949,[2] developing more systematically the ideas put forward in Scitovsky's 1942 " Note," [3] represents the most critical opposition to the original Kaldor

[1] So small a difference between the two bundles is adopted to suggest that we may effectively ignore those changes in the community's rate of substitution that result only from a movement along the community indifference curve.

[2] See bibliography, item 154.

[3] See bibliography, item 227.

dichotomy between efficiency and distribution. He is no less critical of the purism of Robbins, since the impossibility of scientific inter-personal comparisons of welfare is not relevant to propositions about group welfare—though not for the reasons put forward by Kaldor, that they might be circumvented by the device of hypothetical compensation. It is not relevant simply because one no longer believes that propositions about group welfare require the adding together of the (cardinal) utilities of the various individuals.[1]

Value judgments, affirms Little, in particular those about distribution, cannot be avoided in welfare economics. We should, however, make them explicit and, if we wish to carry the reader with us, endeavour to make them widely acceptable. To say that a policy which meets the Kaldor–Hicks criterion increases the " efficiency " of society is, in effect, to recommend it. Whereas if the value judgments implicit in the criterion are bared, it is unlikely to find favour with many people. Compensation is, after all, only hypothetical: it is consistent with making the poor yet poorer. Hence, to announce, as did Kaldor, Hicks and others at that time, that an objective method of detecting increases in " wealth " or " efficiency " had been discovered, is to mislead opinion by the use of persuasive words. Nothing had been discovered. Kaldor had merely coined a *definition* of efficiency, one whose ethical implications, as it happens, are hardly acceptable.

Turning to the more positive part of his analysis, Little explicitly favours the piece-meal approach to what he calls utopianism, or the all-or-nothing approach of Bergson, Samuelson and others. The value premisses on which his criterion will rest are: (i) that the individual is deemed to be better off in a chosen position than he is in any other position, and (ii) that a movement to a situation in which " everyone " is better off is a good thing. The criterion he lays down, reminiscent of Pigou's dual criterion, is that, in so far as welfare is affected only by the economic variables under consideration, the change to a new situation ought to be made: (*a*) if the new distribution is no worse than the old, and (*b*) if it is impossible to make " everyone " as well off in the original position as he would be after the change.

Three things are worth noticing: first, that Little does not commit himself to the extent that Pigou does in the matter of distribution, though one is left with the impression that, like Pigou, he would consider a general reduction of inequality, *cet. par.*, a good thing. Second, that part (*b*) of the criterion amounts to the fulfilment of the Kaldor–Hicks reversal test for a movement from I to II which Scitovsky had proposed to ensure consistency after the original Kaldor–Hicks test was met. Little refers to this reversal

[1] Indeed, inter-personal comparisons of themselves are not value judgments but judgments of fact resting upon observation and introspection. A " desirable " distribution of real income is, on the other hand, obviously a value judgment. Thus, while we may agree on what constitutes an ideal distribution of real income, differences in our judgments of the facts may preclude agreement on the specific distribution of money, or goods, in the community.

test as the " Scitovsky criterion." [1] Third, an implication in the first edition of the *Critique* [2] that comparisons of *relative* welfare distributions could be made. Such comparisons would require, as Arrow remarked in the review of that edition,[3] both the possibility of inter-personal comparisons and the measurement of cardinal utility.[4]

The particular method employed by Little in judging whether a movement from the initial situation I to an alternative situation II is an improvement for the community is to pose three questions: (i) Is the Kaldor–Hicks criterion satisfied? (ii) Is the " Scitovsky criterion " satisfied? (iii) Has II a better distribution than I? Since the answer to each of these three questions is either a yes or a no, eight different combinations of answers to (i), (ii) and (iii) are possible. In his second edition, in order to meet criticisms of his earlier edition of the *Critique*, particularly those of Arrow and Baldwin,[5] Little considers the eight possible combinations first under assumption A: that purely distributional changes are not possible.[6]

We may usefully classify his results as follows: of four combinations (out of the eight possible) (i) and (ii) are both satisfied in two of these combinations, and are both *not* satisfied in the other two combinations, while the answer yes to question (iii) occurs only once, in one of the former pair of combinations. For that combination then, in which (i), (ii) and (iii) are satisfied, a movement from I to II is prescribed. Of the remaining four combinations, the answers to (i) and (ii) are opposites in all cases. In two of these cases, however, the answer to (iii) is yes, and therefore, as it transpires, a movement to II is prescribed in either case.

The sanction for a movement to II in the latter two cases may require a word of explanation. Suppose that the Kaldor–Hicks test shows II to be better than I (though the " Scitovsky criterion " gives the opposite result), it follows that a movement from I to II′—II′ being the hypothetical distribution of the II bundle which renders it comparable with that of the I bundle—would make " everyone " better off. We now make a further imaginary journey from II′ to II, II being the initial distribution of the II bundle. From (iii) being answered in the affirmative, we know that II is better than, or at least no worse than, the II′ distribution of that bundle.

[1] From now on, quotation marks will distinguish it from Scitovsky's declared criterion which required the fulfilment of the Kaldor–Hicks test, for a movement from I to II, *plus* the non-fulfilment of the reversal test.

[2] See bibliography, item 160.

[3] See bibliography, item 11.

[4] A comparison could be made, however, by use of the notion of comparability of distributions. If II′ represents a distribution of the II bundle which is comparable with the existing distribution of the I bundle, and if the initial distribution attaching to the II bundle is better than this II′ distribution, then the II distribution may be said to be better than the I distribution. It is along such lines that Little proceeds in his second edition.

[5] See bibliography, items 11 and 19.

[6] In his first edition Little made the arbitrary assumption that a redistribution of welfare was possible before the change to the new position, but not after, with results that were criticised by Arrow [11] and Baldwin [19].

The total welfare effect may then be regarded as a compound of two improvements: a movement from I to II′ which makes " everyone " better off, followed by a movement to II—which is to a better distribution of that bundle, or at least to one that is not worse.[1] We explain the other case in a similar fashion, though beginning the other way round. A distributional change from I to I″—I″ being that hypothetical distribution of the I bundle which is directly comparable with that attaching to the II bundle—is, by (iii), an improvement if anything. While, since the " Scitovsky criterion " is met, a movement from I″ to II makes " everyone " better off.[2] To conclude under assumption A, if the Kaldor–Hicks criterion, or the " Scitovsky criterion," or both, are met, and, in addition, the redistribution involved is, at least, not worse, then a movement from I to II is recommended.

[1] In Fig. i let Q_1 and Q_2 be the two bundles, and I and II their corresponding community indifference curves. II′ is a community indifference curve passing through Q_2 which is comparable

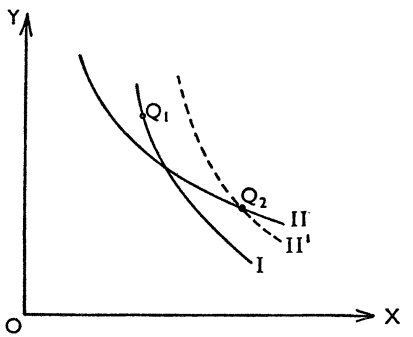

FIG. i

with I. Hence the Kaldor–Hicks criterion is satisfied. If the community moves to Q_2 but maintained the II′ distribution " everyone " would be better off. A further improvement takes place in adopting the II distribution of Q_2.

[2] In Fig. ii the initial improvement arises from I″, which is a better distribution of the bundle

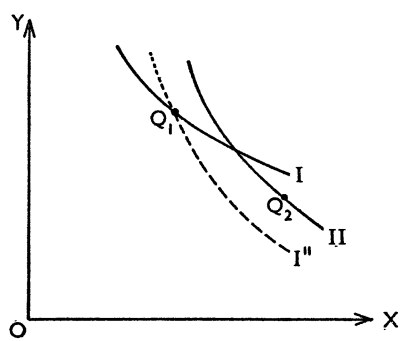

FIG. ii

Q_1, and one comparable with the II distribution of Q_2. A movement from I″ to II now makes " everyone " better off.

Following this exercise, Little considers these possible combinations under assumption B, that all distributional changes are possible. This means that " intermediate " positions such as II′ and I″ are not merely hypothetical but directly attainable as, of course, is any other distribution. The trouble about such an assumption, as Arrow pointed out,[1] is that in the event of its adoption the logical procedure would be to move towards the attainment of an ideal distribution of welfare with any bundle of goods. Indeed, if all restrictions on direct redistributions were removed the only test open to us would be the straightforward Paretian criterion: we should

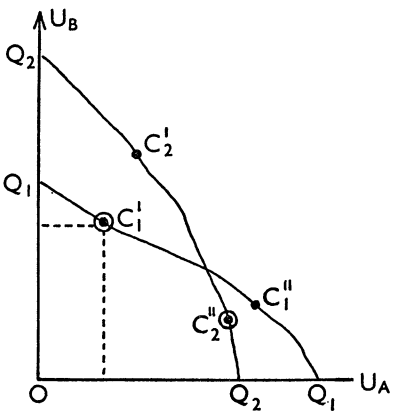

FIG. 6

ask, is " everyone " better off with the ideal distribution of a new bundle II compared with the existing and comparable distribution of the bundle I.

Samuelson's Criterion

Further pursuit of welfare criteria is possible along a rather different route, one which begins with further consistency tests and leads inexorably to a concept of Bergsonian dimensions in which all the welfare potentialities inhering in the resources of an economy are displayed prior to eliciting some acceptable social-welfare function to select for us the ideal pattern of welfare. Our progress towards this concept will be facilitated by the employment of Samuelson's utility-possibility curve to which we now give brief attention.

In construction it resembles the production-possibility curve except that, along each of the axes, the welfare, or ordinal utility, of one of the individuals is measured on any arbitrary scale.[2] The boundary of all combinations of the individual utilities which are possible with a given bundle of goods forms the utility-possibility curve. If two individuals, *A* and *B*, share a

[1] See bibliography, item 11.

[2] With ordinal, and non-comparable utility, the scale used on each axis is arbitrary in everything except order.

bundle Q_1, such a curve may be mapped from data summarised along the contract curve of Q_1, since each point on the contract curve—and, for that matter, a corresponding point on the utility-possibility curve—may be viewed as providing the maximum utility to B consistent with a given utility to A.

The initial division of the Q_1 bundle, in Fig. 6, is represented as the point c_1' on the utility-possibility curve Q_1Q_1. Since B's utility cannot increase without that of A diminishing, the boundary Q_1Q_1 is downward sloping to the right. Q_2Q_2 is the utility-possibility curve corresponding to the Q_2 contract curve, with c_2'' indicating the individual utilities corresponding to the existing division of that bundle. In order to compare the alternative bundles Q_1 and Q_2 using the Kaldor–Hicks criterion, we move along the Q_2Q_2 utility curve from c_2'', the existing distribution—increasing B's welfare at the expense of A's—to c_2', a point north-east of, and therefore comparable with, c_1' on the Q_1Q_1 curve. Having thus satisfied the Kaldor–Hicks test, we now try the reversal test, which will be based on the c_2'' distribution of the Q_2 bundle. From c_1' we move along Q_1Q_1 to c_1'', a point to the north-east of, and therefore comparable with c_2'', in this way making both individuals better off with the Q_1 bundle.[1] Since Q_2 is superior to Q_1 by the original test and Q_1 superior to Q_2 by the reversal test, the criterion proposed by Scitovsky is not fulfilled. If the decision to move from one position to the other depended solely on these compensation tests we should have no warrant to change the initial position.

But suppose the Scitovsky criterion were met? Quite apart from the ethical objections voiced by Little and others to using compensation tests as a sufficient criterion of an improvement in economic organisation, we apparently run into logical difficulties if we persist in its application. For, as Gorman [2] has pointed out, the Scitovsky criterion may lead us round in circles if adopted as a welfare criterion. To use his illustration, c_1, c_2, c_3 and c_4 indicate the welfare distributions pertaining to four bundles of goods, Q_1, Q_2, Q_3 and Q_4 respectively, whose utility possibility curves are shown in Fig. 7. Bundle Q_2 is easily shown superior to Q_1 by the Kaldor–Hicks test, while Q_1 cannot be shown superior to Q_2 by the reversal test. Hence, by the Scitovsky criterion, Q_2 is better than Q_1. By the same criterion, Q_3 is shown superior to Q_2, and, again, Q_4 is shown to be superior to Q_3. Transitivity requires that Q_4 be superior to Q_1. But it is manifest from the figure that, by the Scitovsky criterion, Q_1 is superior to Q_4.[3] Clearly, the Scitovsky criterion—and, therefore, the Kaldor–Hicks criterion also—is not transitive,

[1] Though, admittedly, it summarises the Scitovsky paradox with greater facility than the community indifference curve technique, the latter provides greater insight inasmuch as it points up the dependence of relative valuation on distribution.

[2] See bibliography, item 79.

[3] We could demonstrate this intransitivity just as well if, along the axes, we measured goods instead of utility, and treated the curves as community indifference curves, the points c_1, c_2, c_3 and c_4 being alternative bundles of goods.

and could not be used alone [1] as a guide to policy without risk of contradiction.

Even for a straight choice between two alternatives we may be dissatisfied with the Scitovsky criterion. Though a movement from Q_1 (with

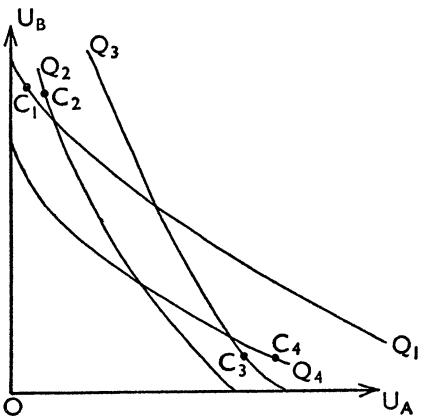

FIG. 7

the attached c_1' distribution) to Q_2 (with the attached c_2'' distribution) meets the Scitovsky criterion in Fig. 8, we cannot allow that Q_2 is *potentially* superior to Q_1 when it is superior for only two alternative distributions of

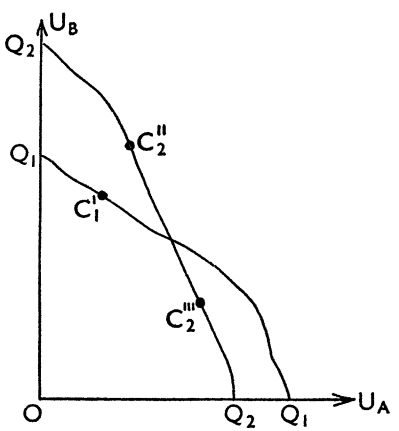

FIG. 8

welfare; at least, not unless, in the nature of the problem, these two distributions are the only ones admissible. If, for example, we had to consider

[1] While Little's adoption of the " Scitovsky criterion " may appear vulnerable on these grounds, we must remember that his criterion also demands an acceptable distribution of welfare prior to any change being recommended. The Gorman demonstration of intransitivity does apparently depend on marked differences in the distribution of some of the bundles. Provided, then, that the acceptable range of welfare distributions was narrow, the fulfilment of Little's criterion would preclude, on distributive grounds, such contradiction.

distributions comparable with c_2''', which would show Q_1 superior to Q_2, we could no longer assert that Q_2 was potentially superior to Q_1. Indeed, if, as Samuelson suggests,[1] we put aside for the present the question of distribution in the belief that, at a later stage, we may have the choice of any ("feasible") distribution, a much more stringent criterion is required to designate a potentially superior bundle; namely, Q_2 is potentially superior to Q_1 only if for every conceivable distribution Q_2 is superior to Q_1—if, that is, the Q_2Q_2 utility-possibility curve is at all points outside that of Q_1Q_1. A sufficient (though not a necessary) condition for Q_2 to be potentially superior to Q_1 and, to fulfil, therefore, Samuelson's criterion of an increase in "potential real income," is that Q_2 have more of "every" good than Q_1.[2]

[1] See bibliography, item 221.

[2] In view of Samuelson's welfare discussion in his 1950 paper being closely bound up with his examination of index numbers as indicators of a potential increase in the community's real income, a few words on the close relationship between index numbers and compensation tests may be of interest.

For the consistent individual,

$$\Sigma p_2q_2 \geqslant \Sigma p_2q_1 \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (a)$$

implies

$$\Sigma p_1q_1 < \Sigma p_1q_2 \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (b)$$

From (a) we can infer that the q_2 bundle is preferred to the q_1 bundle, for in the II situation—that in which the p_2 prices are available—he spends on the q_2 bundle as much, or more, than the cost of the q_1 bundle. (This, indeed, is the interpretation of the (a) notation.) Thus, he could have had the q_1 bundle at the prices ruling in II, but chose instead to spend as much, or more, on the q_2 bundle—clear evidence of his preference for the q_2 bundle. Now, if instead of (a) we had the situation

$$\Sigma p_1q_1 \geqslant \Sigma p_1q_2 \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (c)$$

similar reasoning would point to a preference for the q_1 bundle. Since he cannot prefer both q_2 and q_1, (c) is not consistent with (a). If (a) is established, we must cross out the greater-than-or-equal-to sign of (c), which, therefore, renders it (b). The sense of (a) and (b) in terms of indifference curves can be seen by the reader in Fig. iii without the need for comment.

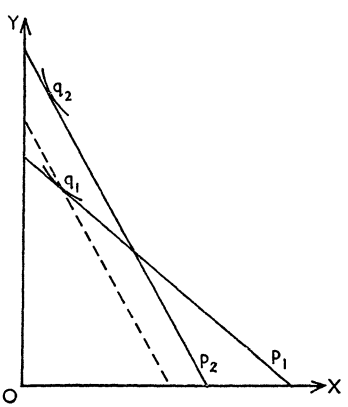

FIG. iii

In the case of the community, however, the simultaneous observation of (a) and (c) does not necessarily indicate inconsistency. In view of the intimate relationship between welfare distribution and relative prices, non-comparable indifference curves attaching to the bundles q_1 and q_2

For some central range of the bundles on the production-possibility curve, all the corresponding utility-possibility curves will overlap. The outer envelope of these overlapping curves, which we may refer to as the utility frontier,[1] is indicated by *FF* in Fig. 9. Regarded as the boundary of all utility combinations possible with the given resources of the economy, *FF* summarises the data which in principle can be made available without any ethical presuppositions other than: (*a*) that the individual is the sole judge of his own welfare, and (*b*) that the welfare of the community depends only upon the welfares of the individuals who comprise it. And only at a later stage, when choosing as between alternative combinations of individual welfares, are the ethics of distribution involved. The search for a satisfactory test of a potential welfare improvement using only compensation tests has—in its comprehension of all conceivable welfare distributions—joined with the concept of all existing production possibilities to issue in a construct, the utility frontier of society which, though it contains no ethical presuppositions other than an acceptance of individual choice, provides the basic data of welfare possibilities necessary for a comprehensive social choice determined by any method.

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may intersect as shown in Fig. iv. With the p_2 prices, q_2 has the higher value for the community, and (*a*) obtains. This situation corresponds to the fulfilment (for a movement from q_1 to q_2) of the Scitovsky reversal test—q_2 being preferred to q_1 when the comparison is based on the I_2 distribution of welfare. On the other hand, with the p_1 prices, q_1 has the higher valuation, and the index

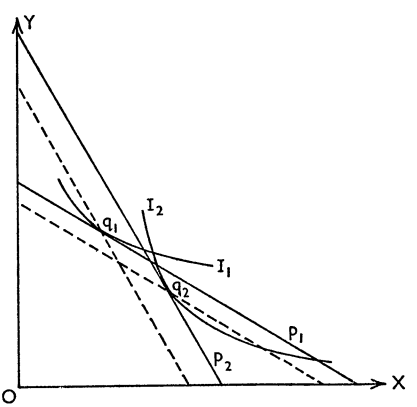

FIG. iv

numbers give us (*c*). This situation corresponds to the non-fulfilment of the Kaldor–Hicks test, inasmuch as q_2 is not preferred to q_1, when the comparison between bundles is based on the I_1 welfare distribution.

Indeed, if we think now in terms of the Samuelson criterion, which requires that we compare q_2 and q_1 for all conceivable distributions of welfare, and, therefore, for an implied range of corresponding price ratios, q_2 is potentially superior to q_1 only if, for all such price ratios, q_2 costs as much or more than q_1. Again, a sufficient condition for this to occur is that the q_2 bundle contain more of " every " good than q_1

[1] Samuelson [221] refers to it as the *situation* utility-possibility curve in order to distinguish it from the *point* utility curve of a bundle of goods.

It may be supposed that all welfare distributions on and within the boundary of Fig. 9 can be reached by government policies or, if we wish to appear realists, we can follow Samuelson and include only " feasible " welfare combinations in the picture. The set of W curves in the figure emerges from some acceptable social-welfare function, each such curve being a locus of welfare combinations as between which society is indifferent.[1] If

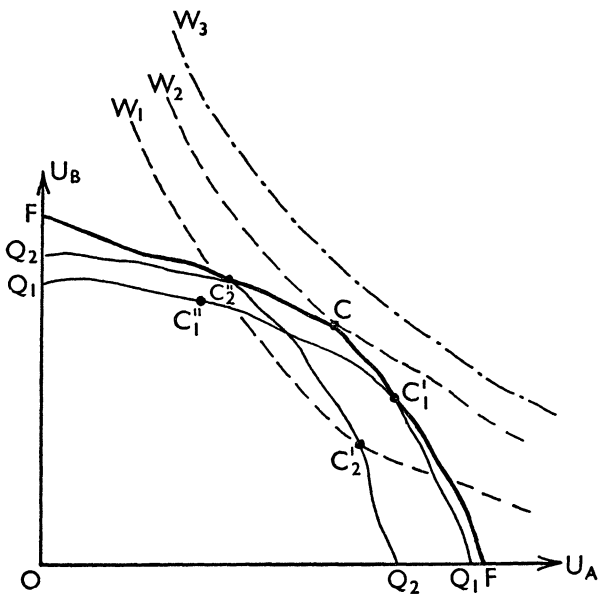

FIG. 9

the social-welfare function is " of the Paretian type," to use Graaff's terminology, the W's are ranked north-east from the origin; which is to say, if " everyone " is better off, then society is deemed to be better off—an ethical judgment that seems to have met with little opposition. C in Fig. 9 is clearly the maximum social welfare for the particular Paretian type of social-welfare function chosen: of all the welfare combinations open to society that at C has, in the opinions formalised by the welfare function, the highest social value.

Disregarding, provisionally, the social-welfare function, let us briefly explore the properties of the utility frontier. The point c_1', as the tangency between Q_1Q_1 and the frontier FF, informs us that there is no distribution of any other bundle that can yield a situation in which " everyone " is better off than he is at c_1'. Since on this description c_1' is recognised as a Pareto optimum, all the necessary conditions—the exchange, production and top-level optima—are all fulfilled. Indeed, since the utility frontier is made up

[1] The reader is reminded that we have yet to determine whether a social-welfare function for society can emerge from the separate aspirations of the individuals comprising it.

of tangency points such as c_1', this frontier constitutes a locus of Paretian optima.

A welfare combination c_1'' on the utility-possibility curve Q_1Q_1 is obviously not a Pareto optimum, being a point below the frontier *FF*. Exchange optimum obtains and we must assume—if *FF* is a genuine frontier —that production optimum also obtains. Top-level optimum, however, does not obtain, since a movement from c_1'' to, say, c_2'' involves a change of bundle which in effect makes " everyone " better off, thereby fulfilling the Paretian criterion. But such a movement does not fulfil the Samuelson criterion. For if we consider all comparable distributions of Q_1 and Q_2, for some of them, Q_2Q_2 will be above Q_1Q_1, while for others the reverse is true. Once it is appreciated that whether or not any efficiently produced bundle has top-level optimal properties—that rates of substitution in consumption and in production are equal—depends entirely on its distribution,

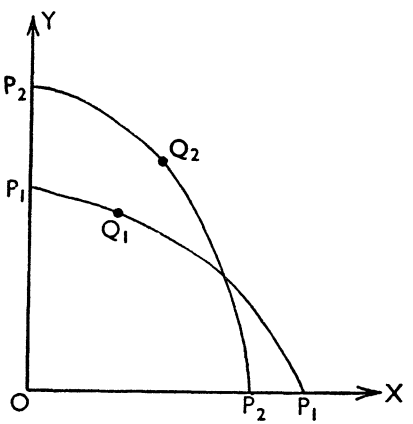

FIG. 10

any belief in the potential superiority of a Pareto optimum disappears. Any Pareto optimum will, of course, be actually superior to some particular range of comparable non-optimal positions. But since the optimal characteristic of a bundle depends solely on the distribution attaching to it, divested of that distribution it fares no better than the other efficiently produced bundles. No bundle, then, is superior to any one of the other efficiently produced bundles for *all* welfare distributions, and therefore no bundle can fulfil the Samuelson criterion.[1]

If Q_1 and Q_2, in Fig. 10, are regarded as bundles of goods on alternative

[1] A similar treatment using community indifference curves can be found in [180], where it is shown that as optimal and non-optimal positions are characterised, at top level, by the relationship between prices and their marginal costs, comparisons between such positions cannot even be made. Only when such a range of bundles (on the production-possibility curve) are divested of their optimal or non-optimal characteristics can comparisons between them be made and, in the absence of a particular welfare distribution, no bundle can be demonstrated superior to any other.

production-possibility curves P_1P_1 and P_2P_2 respectively [1] we run into trouble according to Samuelson. For though the utility-possibility curve generated from bundle Q_2 lies everywhere above that generated from bundle Q_1, obviously the utility frontier of the production-possibility curve P_2P_2 will not lie everywhere above that of P_1P_1. If, now, the community experiences a shift from Q_1 on P_1P_1 to Q_2 on P_2P_2, producing more of all goods in the new position, the inference that a potential increase of real income has taken place would be false. This afterthought, however, is not very convincing.[2]

The Social-welfare Function

We have already indicated that, in a manner analogous with the imposition of an individual's ordinal welfare function—in two dimensions, his indifference map—upon his budget constraint, to yield a maximum position, we can impose a Paretian-type social-welfare function upon the boundary of welfare possibilities to reveal the summit position for society. Actually, the original Bergson welfare function was designed to rank not the combinations of individual welfares but, more directly, the combinations of all those variables on which the individual welfares depended, in particular the goods consumed and the services rendered by each of the individuals in society. And, formally, this is how Arrow deals with it.[3] He was the first to make the attempt. Although the social-welfare function had received continual mention since Bergson's 1938 formulation, no instruction in the drafting of this grandiose design had been hazarded. Rather it had been invoked in the grand manner of Samuelson as a *deus ex machina* to crown the formal elegance of his " general equilibrium " welfare. Indeed, one could hardly hope to do more with so stupendous a concept—except, perhaps, to question whether such a thing could, in principle, be constructed so as to manifest the aspirations of a free society. This, in fact, was the task that Arrow set himself.

We are to imagine that each individual has his own precise notion of a

[1] The meaning to be attached to a choice between alternative production frontiers is far from obvious. Other than international trade, which presents the community with alternative *consumption* possibilities, one expects, with the passage of time, that the entire production frontier move outward. The choice of accumulating at a faster rate, then, translates into the choice of having the entire frontier move outward at a faster rate.

Even if, owing to the exhaustion of irreplaceable resources, some parts of the frontier shrink, the event is, surely, irreversible.

[2] The sense of the word " potential " in this context is elusive. In the original Kaldor–Hicks criterion the statement that Q_2 is potentially superior to Q_1 would mean that a *redistribution* of the product Q_2 would make " everyone " better off. Pending the actual redistribution, that is, the superiority of Q_2 remains potential. But what of the assertion that a production-possibility curve P_2P_2 is potentially superior to P_1P_1, since, for any point on P_1P_1, there will be some point on P_2P_2 with more of " every " good? For not only is hypothetical distribution involved in this case but also hypothetical movements along the production-possibility curves. But if one can envisage movements from bundle to bundle along the curves, why not also between the curves? If such movements are admitted, however, as it seems they should, the comparison between the two production-possibility curves crumbles. Only the outer production frontier has meaning.

[3] See bibliography, item 14.

suitable welfare function for society or, to use Arrow's terminology, that each individual has a particular " ordering," or ranking, of all the conceivable "social states"—each "social state" referring to a distinct combination of all the relevant variables in the economy that enter into the individual's welfare.[1] Suppose there are m distinct social states conceivable, and suppose that there are altogether n different ways of ordering these m social states,[2] the question to be answered is: regardless of which of these n different ways happens to be chosen by each of the individuals, will it be possible, always, by means of some rules that are ethically acceptable to a free society, to construct therefrom a corresponding social ordering of the m social states?

In order to be ethically acceptable, Arrow proposes that the social ordering to be derived from the individual orderings meet certain " reasonable " conditions: (i) it must be positively associated with the individual orderings; [3] (ii) if some social state be removed, as no longer relevant, society's ranking of the remaining social states must not be changed; (iii) the social ordering must not be imposed, either by custom or dictatorship.

After dismissing the rank-order method of voting,[4] and after a preliminary skirmish with the compensation principle,[5] Arrow opens a full-scale attack with his " Possibility Theorem " designed to demonstrate the impossibility of meeting these conditions.

Though the problem has been posed on an astronomical scale, the proof is compact enough, involving, in the first instance, only two individuals and three alternative social states, x, y, z. Since among Arrow's axioms is the requirement that for every conceivable set of individual orderings there must correspond a distinct ordering for society, in the event that individual I prefers x to y and individual II y to x, we are obliged to infer that society is " indifferent " as between y and x. To state otherwise, for instance, that society prefers x to y, leads to logical implications which reveal individual I to be a dictator inasmuch as society's orderings will always coincide with his.

If, now, to take an awkward possibility, individual I has the ordering x, y, z, and II has the ordering z, x, y, we are required to infer, as just stated,

[1] Although it is allowed that the welfare of each individual may depend on those of others, inasmuch as the goods received and services rendered by every individual enter into the social states to be ranked, the formal treatment at no point draws on this complication.

[2] If we admit only " strong " ordering—no provision for indifference being made—m alternative social states can be ranked in m factorial different ways. The introduction of " weak " ordering —indifference being allowed—multiplies this number.

[3] This condition would exclude inter-personal comparisons of utility.

[4] See bibliography, item 14, p. 27.

[5] Since Arrow's rejection of the compensation principle on the grounds of inconsistency [14, pp. 34–45] stems from his adoption of a footnote suggestion by Scitovsky [228, pp. 94–5] that two bundles of goods whose community indifference curves intersect be regarded as " equally good," his demonstration is, perhaps, otiose. If anything, the principle of compensation cannot qualify for a social-welfare function meeting Arrow's conditions simply because of Arrow's axiom that for *all* alternative social states a social ordering must be derived, whereas it is generally acknowledged—notwithstanding Scitovsky's (unguarded?) proposal—that cases arise for which the compensation test gives an ambiguous answer, an answer which precludes judgment and prescription.

that society is indifferent as between y and z. In addition, for both individuals, and therefore for society also, x is preferred to y. From which it follows—using Arrow's transitivity axiom—that, for society, x is preferred to z. But, since I prefers x to z, and II prefers z to x, we are bound to conclude, also, that society is indifferent as between x and z, which contradicts the conclusion of the previous sentence.[1]

Arrow concludes that, in general, a rule for passing from individual orderings to a social ordering consistent with his " reasonable " conditions cannot be found. Consistency would require an imposed or a dictated social-welfare function.

While the formal lay-out of Arrow's argument was impressive, it would not be unfair to suggest that the conclusion was hardly surprising. One does not have to venture beyond a vision of two stubborn men on an island with mutually opposite ideas about the proper division of labour, and the fruits thereof, to run into an impasse of this sort. Notwithstanding this opinion, Arrow's thesis caused some stir in academic circles. Several papers were published, productive more of symbols than of substance, urging modifications of Arrow's conditions in the attempt to keep the social-welfare function from expiring.[2] But even if Arrow had proved that, in principle, a completely satisfactory transition from any set of individual orderings to an ordering for society was always possible, the route to the (continually changing) position of maximum social welfare would have been too arduous for the most accomplished econometrician to plot, to say nothing of prompting humanity to undertake the journey.

Summing up, there are three main ways of regarding compensation tests:

(1) As sufficient conditions for prescribing a change to a new position by defining such tests as tests of " efficiency." It is doubtful if anyone holds this view today—or ever did without some qualification. If, however, it were adopted, and one aimed at a test which was to detach itself from any particular distribution, contradiction could be avoided only by espousing the Samuelson criterion. In view of the virtually infinite number of welfare distributions, such a criterion is not a practical proposition. But for the one situation in which the criterion is always satisfied—that in which one of the bundles has more of " every " good than the other—no such test is necessary.

(2) Once proposed, the Samuelson criterion—requiring that the

[1] What this contradiction seems to reveal is that the " social indifference " arbitrarily—though in view of Arrow's axioms, necessarily—attributed to an opposition of values between individuals is not transitive, as we might well suspect.

[2] Hildreth [106] argues that if one individual barely prefers x to y while another desperately prefers y to x, the social choice should rank y above x. J. C. Wheldon [246] also considers bringing in inter-personal comparisons of welfare, as do Kemp and Asimakopulos [129], who further propose a " constitution " which entails measurable utility. Inada [113] proposes a less-severe set of conditions which lead also to the Arrow result.

Other contributions, such as those of Little [162], Rothenberg [213] and Buchanan [44], are of a more philosophical nature.

utility-possibility curve of one bundle be at all points outside that of the other—lent itself to the idea of an envelope of such curves, or a utility frontier encompassing all welfare possibilities latent in the resources at the disposal of the community. Each of the welfare combinations on the frontier corresponds to a position of Pareto optimum, but without some expressed partiality for one distribution of welfare over all others there is no acceptable case in welfare economics for prescribing a movement from a non-optimal position to any optimal position.[1] On the other hand, the formation of a " satisfactory " social-welfare function in order to determine a unique position of maximum social welfare is not only utopian, it is in principle impossible.

(3) Returning to earth again, we may accept compensation tests but only as necessary conditions for policy prescription. For instance, in Little's piecemeal approach, if the Kaldor–Hicks and/or the " Scitovsky criterion " are fulfilled, then a movement to the new position is recommended provided, however, that redistribution is acceptable.

IV. Consumers' Surplus

One can readily sympathise with the high hopes originally entertained by Marshall for his doctrine of consumers' surplus as an instrument of social betterment. His definition of the individual consumer's surplus—the amount a man is willing to pay rather than go without the thing, over the amount he has to pay—had so immediate an appeal to subjective experience that, despite severe criticism of the doctrine and Marshall's own eventual loss of faith in it, the prospect of its extension as a practical tool of welfare analysis has tempted the ingenuity of several eminent economists, among whom the best known is Professor J. R. Hicks. In his *Value and Capital* consumer's surplus appeared as a by-product of his ordinal treatment of the theory of consumer's behaviour. In this more acceptable ordinal form it was further refined and developed in a series of papers appearing in *The Review of Economic Studies* in the early forties.[2] The substance of these papers, along with some further reflections, may be found in his recent *Revision of Demand Theory*.

Myint, in his 1948 book,[3] champions the consumers' surplus technique as against the marginalism of Pigou. The marginal conditions, he contends, permit only of small adjustments within the neighbourhood of the existing pattern of output. In contrast, consumers' surplus enables us to meet the Hicksian total conditions which encompass all ranges of output and, indeed, enables us to determine whether or not any particular good should be abandoned or a new one introduced. Again, it is frequently pointed out

[1] It may be stressed, however, that if society is not already at an optimum position there is scope for making " everyone " better off.

[2] See bibliography, items 100–103.

[3] See bibliography, item 189.

that the marginal conditions are inappropriate for goods that are insufficiently divisible to enable the consumer to equate the value of the good to him with its market price. In such cases the value of the " marginal " unit —which may be the only unit purchased—might greatly exceed the price. So much at least may be said in favour of the technique of consumers' surplus. What of the criticisms? Before we consider them, however, and Hicks' attempts to meet them, let us glance briefly at the various definitions proposed.

In the course of defining consumer's surplus in terms of money income in *Value and Capital*, Hicks suggested that the notion was akin to a compensated variation in income. The definition used in this connection was, soon after, shown by Henderson to differ from the original Marshallian definition,[1] the difference turning on the quantity of the good purchased. Marshall's definition corresponded to the sum of money that the consumer was prepared to pay for the privilege of being able to buy at the existing price *the amount that he was already buying at that price.* On the other hand, Hicks' definition concerned the sum he was prepared to pay for the privilege of being able to buy the good at the existing price *in whatsoever quantities he wished.*[2] Inasmuch, then, as Marshall's definition involved a quantitative constraint, absent in the Hicks definition, the maximum sum of money that the consumer would be prepared to pay would be smaller under the former definition than under the latter.

In the same paper Henderson pointed to a further ambiguity: the

[1] See bibliography, item 93.

[2] Using Henderson's diagram on which Fig. v is based, the Marshallian consumer's surplus

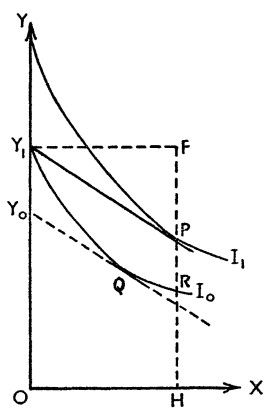

FIG. v

is equal to *PR*. For if he were obliged to spend *FR* in buying *OH* of *X* he would be just as well off as if *X* were not available, whereas in fact he has to spend only *FP*. Hicks' compensating variation, however, is Y_1Y_0. For if the consumer is made to pay this much in order to retain the price *P* he will just reach *Q* on the indifference curve I_0, his initial welfare position in the absence of a price for *X*.

Note, that since the issue in these earlier illustrations was whether to introduce *X* at a given price or not to introduce *X* at all, an all-or-nothing offer confronted the consumer.

compensating variation measure proposed by Hicks would differ according to whether the consumer had to *pay* for the opportunity to buy the new good X, or whether he was to *be paid* for abandoning the purchase of X. The same distinction clearly held if the choice was that between buying X at a lower price or at a higher price.

In reply, Hicks [1] carefully traced a relationship between four definitions of consumer's surplus and the Marshallian measure—the area under the individual's demand curve. The scheme required some new terminology in order to effect a double distinction: (*a*) that between the compensating variation (CV), for either a fall or rise in price, which compensation when paid or received is such as to leave the consumer in his *initial* welfare position, on the one hand, and, on the other, the equivalent variation (EV), again for a rise or fall in price, which involves compensation, paid or received, such as to leave him in the *subsequent* welfare position following the change of price,[2] and (*b*) that between the *price* compensating variation (CV_p), or *price* equivalent variation (EV_p), on the one hand, which covers those cases for which the individual is free to choose the quantity of the good in question, and, on the other hand, the *quantity* compensating variation (CV_q), or the *quantity* equivalent variation (EV_q), to cover those cases in which—like the original Marshall definition—the consumer is restricted to the quantity purchased in the absence of compensation.[3]

[1] See bibliography, item 102.

[2] It follows, as Hicks points out, that (1) the CV of a *fall* in price from p_1 to p_2 (the maximum payment by the individual in order to have the new, lower, price p_2, which payment leaves him at his *initial* welfare) is exactly equal to (2) the EV of a *rise* in price from p_2 to p_1 (the maximum payment by the individual in order to retain the old, lower price p_2, which payment leaves him at a new, lower level of welfare, which is equal to the initial welfare in (1)).

[3] These four definitions are identified in Fig. vi, in which, for brevity, we consider consumer's

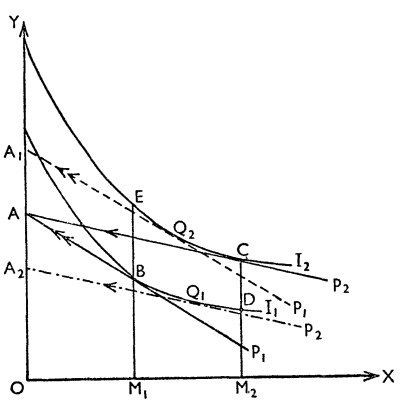

FIG. vi

surpluses only for a fall in price from p_1 to p_2, the income of the individual—equal to all other goods at fixed prices—being measured as OA.

The CV_p is measured as AA_2, this being the maximum income the consumer will pay for the

There is no analytical difficulty in extending these four definitions to simultaneous changes in the prices of many goods.[1] Indeed, they can be extended to cover not only all goods bought on the market but also all factors sold by the individual to the market, thereby involving rent in the same fourfold distinction.[2] In the absence of income effects, all these measures coincide, though in any case the differences between them are thought not to be important for practical measurement.

We are now faced with the rather more difficult task of making the transition from the individual to the community. Hicks attempts this by abandoning Marshall's assumptions about constant market shares and so forth, arising from his cardinal view of utility, as implausible and unnecessary. Without bothering our heads over inter-personal comparisons, if the area between the demand curve and the price is taken as a good approximation of the sum of the individual consumers' surpluses, however defined,[3] and if the area between the supply curve and the price [4] is taken to be a good approximation of the sum of the relevant producers' surpluses, however defined, we may add these areas algebraically as sums of money. If both areas are positive, or if the positive consumers' surplus exceeds the negative producers' surplus (in the case of decreasing average cost), the compensation principle provides a rationale for undertaking the investment in the good in question—or for retaining it if it is already in production. At least it does this if all the gains and losses to the community from the production of this good are summarised in this partial picture given by the market demand and supply curve. In general, this will not be the case. Problems arise when we trace out the effects in the rest of the economy, and it is to such problems that Hicks addresses himself in his *Rehabilitation* paper of 1943.[5]

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privilege of buying X at the lower price p_2. For with only OA_2 of his income left, he can move along A_2p_2 and just touch I_1, his initial level of welfare, at Q_1.

The EV_p is measured by AA_1, this being the minimum sum which the consumer will accept to relinquish the opportunity of buying at the lower price p_2. With this compensation and the old price he can move along A_1p_1 and at Q_2 just touch I_2, the welfare level he would reach if he did not relinquish p_2.

The CV_q is measured by CD. It is the maximum the consumer will pay for the privilege of buying at p_2 if, along with this privilege, he is constrained to buy OM_2 of X, the quantity which he would buy at p_2 in the absence of any compensating payments. Thus, if he buys OM_2 at p_2, he gets to C. He pays CD and gets to D, which is on I_1, his initial level of welfare.

The EV_q is measured by EB. It is the minimum the consumer will accept to return to the higher price p_1, if he is at the same time constrained to purchase OM_1, the quantity of X which in fact he would consume at p_1 in the absence of compensation receipts. Thus, consuming OM_1 at p_1 places him at B. The receipt of BE takes him to E, which is on I_2, the higher level of welfare he could have reached with p_2 in the absence of any quantity constraint.

It has been argued [179] that in all plausible circumstances we should consider using only CV_p and EV_p.

[1] Hicks, in his generalisation of consumer's surplus [101], expresses them in terms of Paasche or Laspeyres variations plus income and/or substitution effects.

[2] See bibliography, item 182.

[3] For most purposes, the CV_p definition is appropriate.

[4] Where the supply curve is above the price the producers' surplus is taken to be negative.

[5] See bibliography, item 100.

If over the whole economy competition was perfect, and there was a complete absence of external economies and diseconomies, no apparent difficulty arises. The prices of the factors attracted to the new project reflect their values at the margin in all other uses. If, however, prices exceed their corresponding marginal costs in other industries the values of the factors which move into the new project exceed their prices and, therefore, their cost to the new project. Since the opportunity cost of these factors to society exceeds their cost to the new project, some correction is called for and may be administered by raising the apparent marginal cost of the product under consideration by the appropriate percentage prior to measuring the net surplus. If this corrected net surplus, or social surplus, is positive the good should be introduced, and in the amount which makes the corrected marginal cost equal to price, notwithstanding that the commercial criterion, that of a positive producers' surplus, is not met.[1]

This treatment does not, however, face up to the chief difficulties. Even within its own limited terms of reference, it does not answer the rather obvious question of what to do when some of the factors to be used in the new good X come from industries whose prices exceed their marginal costs in varying degrees, while others come from industries whose prices fall below their marginal costs, again in varying degrees. In principle, of course, there

[1] The question of whether we are not double counting by adding together consumers' and producers' surpluses deserves some attention if only because of Marshall's warning in appendix K of the *Principles*. Obviously the issue turns on the meaning of producers' surplus. In the *Principles* it is used as a synonym for rents (not profits), which have been defined recently [182] in a manner symmetrical in all respects with consumer's surplus—as the *CV* or *EV* to the individual arising from changes in the prices of the factors that he sells to the market.

In an n-dimensional figure containing both goods' axes and factors' axes, we can regard the individual as both a consumer of goods, measuring the welfare effect of a change in the prices of goods along the goods' axes, and as a supplier of factors, measuring the welfare effect of a change in the prices of factors along the factors' axes. In principle, however, the welfare of all such price changes may be measured along any one, or any several, of the axes. After all, the net effect of any group of price changes is to place the individual on a higher, or lower, indifference surface, the difference between which and the initial indifference surface, being measurable along any one (or several) of the axes, as a *CV* or *EV*.

On a partial view, however, and thinking in terms of individual demand curves, we could add together the consumer's surplus arising from a decline in a group of product prices in the manner suggested by Hicks [99]—the *cet. par.* on successive goods, to include the lowered prices of goods whose consumer's surplus has already been measured. Alternatively, this same decline in a group of product prices could be regarded as giving rise to an increase in rent, or producer's surplus, for the individual, inasmuch as a fall in the price of any product he consumes is *pro tanto* a rise in his real income, or welfare. Now, the addition of an improvement in welfare of this sort, first as a consumer's surplus and then again in the guise of a producer's surplus, is obviously wrong. But this does not mean that there may not be some practical convenience in dividing a given gain of welfare into two parts: a part arising from changes in product prices and a part arising from changes in factor prices. An individual whose factors are attracted into the production of X and who, in addition, is enabled to purchase X at a lower price does in fact gain from both these circumstances. Therefore the total gain which places him on a higher indifference surface and which is, as suggested above, measurable in principle on any one of the axes, is, on this partial approach, split into a measure of the gain from the lower product prices plus a measure of the gain from the higher factor prices, which two measures add together to yield a measure of the total gain in welfare.

is little difficulty: we can value each factor to be used at the value it contributes elsewhere. But we have to abandon any simple practical rule, such as raising or lowering the cost curve of the industry in question.

Many of the chief difficulties in taking account of the repercussions in the rest of the economy are mentioned by Little,[1] whose main conclusions may be summarised as follows: the case for which Hicks' treatment is valid is that for which the introduction of a new good, X, affects only to a negligible extent each of the outputs of all other goods in the economy. However, cases in which other goods, say Y and Z, are closely related to X in consumption are more common. Suppose, for example, that Y and Z are close substitutes for X, and that everywhere price is equal to marginal cost. Now if both Y and Z are produced under constant costs there is little trouble. The area under the demand curve for X is then a measure of the consumers' surplus which meets the *cet. par.* requirement that all other prices be constant, and, in so far as the introduction of X causes consumers to switch from Y and Z to buying X, they are—for all intra-marginal units—made better off, the area between the demand curve for X and its price being a measure of their gain.[2] Since the assumption of constant costs ensures that no losses of producers' surplus take place in Y and Z, there is no need to correct the producers' surplus in X. Obviously, however, if price exceeded marginal cost in Y and Z the supply curve of X would have to be raised for reasons given above.

In the event, however, that Y and Z are not constant-cost industries difficulties begin to mount. Suppose they are increasing-cost industries, the consequent consumers' surplus in X measured in the usual way will be an underestimate. For in so far as the shift of output from industries Y and Z reduces their prices, when X is introduced, consumers are better off than if, as in the previous case, their prices remain constant. Yet the consequence of a decline in the prices of Y and Z is to reduce this shift of demand from Y and Z to good X, thereby, of course, reducing the area of consumers' surplus in X, notwithstanding the additional benefits accruing to consumers in this case as compared with the previous case. On the other hand, against any gain of producers' surplus in X must be set losses of producers' surplus in Y and Z. However, producers' surpluses are difficult things to measure, involving as they do the rents of all factors whose prices or occupations are changed as a result of introducing X. Profits, which are more closely identified with the area between the price and the supply curve, afford little clue to the magnitudes involved. Even in the special case above, we must be prepared for a rise in the prices of some factors, a fall in the prices of

[1] See bibliography, item 161, Chapter 10.

[2] True, in so far as demand has shifted from Y and Z to X, the areas under the demand curves for Y and Z have shrunk. But this can be legitimately ignored, for no consumer can be worse off when Y and Z are available at the same price as before, and X is now cheaper (or newly available). In other words, the *cet. par.* being met in the measurement of the consumer's surplus in X, no further correction need be allowed for.

others, both groups of factors being found in many industries besides those of X, Y and Z.

Though we have said nothing yet of divergences between private and social valuation, they require the same sort of correction as discrepancies in the ratios of prices to marginal costs. There is, however, still the familiar and inescapable difficulty arising out of the interdependence of valuation and distribution: in making the transition from the individual to the community, that is, we cannot escape the complication uncovered in Part III. Here, as there, only the Samuelson criterion can serve us without fear of contradiction for all criteria in which distributive considerations are to be set aside.

In order to separate this source of complication from that arising from closely related goods with increasing costs, let us suppose again that all goods other than X are produced under constant costs. The area enclosed between the demand curve for X and the price is a rough approximation to the sum of the individual consumers' CV_p given the existing distribution of welfare, prior to the introduction of X. The area between the supply curve and the price is yet a cruder approximation to the sum of the factor-owners' CV_p at the given welfare distribution. The algebraic sum of all individuals CV_p, regarded as consumers and as suppliers of factors, is therefore approximately represented by the area enclosed between the demand curve and the corrected supply curve.[1] Crude as this area is as an index of net gain in welfare arising from the introduction of X when all other goods are produced at constant costs, we are required by the Samuelson criterion to measure this social surplus for all conceivable welfare distributions. If for any welfare distribution this area of surplus is negative, there is no warrant, on grounds of " efficiency "—on the Samuelson criterion alone—for introducing X. On Little's approach, however, provided that we approve of the distribution which accompanies the production of X, we should introduce X if the social surplus is large enough to assure us that the sum of the CV_p must be positive. If it is positive, the Kaldor–Hicks criterion is met: with the old distribution (prior to the introduction of X) " everyone " can be made better off by producing X.

In sum, then, as a method of capturing data on which to exercise the compensation tests, consumers' and producers' surpluses suffer not only from the distributional complications common to comparisons based on such tests but also from difficulties in their measurement, largely owing to their essentially partial character. In view of this, one can sympathise with

[1] It is sometimes proposed that the sum of the CV's should exceed the sum of the EV's. But on Hicks' definition, if a price moves in favour of an individual the maximum he is prepared to pay for that price is the CV, while if the price moves against him the CV becomes the minimum he must receive in order not to be worse off than before. The gainers can therefore compensate the losers if the sum of all their CV's is positive.

The sense of this definition is further illustrated in the special case of an individual whose gain as a consumer exactly offsets his loss as a supplier of factors, his net CV being nil.

Little's comment that consumers' surplus is but a theoretical toy,[1] though it is putting the case a little too strongly. After all, what other practical procedures are open to us in a comparison of two situations?

V. Some Recent Obstacles

In order not to clutter up the main features in the developments over the last twenty years, we have set aside for separate treatment in this section a number of considerations, all of which appear, on the surface of things, to reduce the applicability of welfare economics.

Second Best Optima

The recent paper by Lipsey and Lancaster [2] was the culmination of a diversity of contributions [3] which sought ways of approaching a next best solution whenever some particular institutional or policy constraint prevented the realisation of all the conditions necessary for a true summit position. A common conclusion, albeit a negative one, was implicit in all these writings; namely, that if one or more of the optimum conditions could not, in the circumstances, be met in one or more of the sectors of the economy, one did not make the best of a bad job by proceeding blithely to fulfil the remaining conditions. To illustrate with a familiar problem; the determination of the output of a particular industry when it is known that in all other industries price exceeds marginal cost. Rather than equate marginal cost to price in this particular industry, we should choose an output for which price here, as elsewhere, exceeds marginal cost.[4] The new rule in this case is, of course, simple and obvious. If, however, some of the other industries were perfectly competitive, some monopolistic and others subsidised there may not be a satisfactory second-best solution at all, and, if there is, the rules to be adopted may be far from simple.

A theorem embodying this negative conclusion is proved elegantly by the simple mathematics of maximising a function of n variables subject to the usual constraints—such as the production function—*plus* an "artificial" constraint in the form of an *inequality* of one of the conventional marginal conditions. The first-order conditions resulting from this operation are not identifiable as the usual marginal conditions for an optimum but are relatively complex expressions. Indeed, without knowledge of the specific forms of the welfare and production functions we should, in general, be unable to translate such expression even in qualitative terms—we should be

[1] See bibliography, item 161, p. 180.

[2] See bibliography, item 141.

[3] Some examples of the application of second best theory may be found in Jacob Viner's *The Customs Union Issue* (1950); S. A. Ozga, "An Essay in the Theory of Tariffs," *Journal of Political Economy*, 1955; J. E. Meade, *The Theory of Customs Unions* (1955), also [172], [51] and [155].

[4] See R. F. Kahn, "Some Notes on Ideal Output," and the discussion in Part II. It is assumed, in this example, that the supply curves of all factors are of zero elasticity.

quite unable to say, for instance, that in regard to, say, a good Y the price should be greater, equal or less than its marginal cost.[1]

Though no logical difficulties arise in placing this theorem within the body of welfare analysis, it does seem, at first blush, to reduce drastically the applicability of such analysis. For it is too much to hope that welfare economists will be operating in an environment subject to no policy or institutional restraints. And it requires only that in one sector the conventional optimum conditions be abandoned as impracticable for the conventional optimum conditions to be irrelevant in the remaining sectors.

Interdependent Utilities

Though recognition of the effect on the individual's welfare of the possessions of others is not new in the literature, Duesenberry was the first to invest the idea with some formal analysis and to deduce therefrom some implications for welfare economics.[2] He attacks the problem by supposing a community of three people, each of whose welfare depends not only on his own income but also on those of the other two.[3] This interdependence, in effect, imposes additional constraints, so that the first-order condition of a maximum position for each individual is more complex than the usual one. Whereas with independent utilities the individual equates his (subjective) rate of substitution between product and factor to the marginal physical product, there are now, with interdependence, additional terms in the condition so as to take account of the welfare effect upon others of the addition to his welfare. Thus, translating into value terms, if the value of the marginal product were equal to one pound the supply of the additional factors provided is not justified if it merely compensated the individual for the sacrifice involved. The one pound must, in addition, compensate others who are—let us assume—adversely affected by his one pound of additional income. Indeed, it must be enough to cover the effects of all subsequent adjustments to his own and to their incomes. If, of course, instead, the effects on others are beneficial, inasmuch as they rejoice in each other's good fortune, symmetrical reasoning shows that—since each individual in his own adjustment ignores the benefits he confers on others—the application of the conventional factor-product rule results in an output below the true optimum. In such situations no specific rules can be laid down without specific knowledge of the nature of the interdependence.

[1] Though the theory was not generalised to cover a community, the conclusion is applicable to the community. Thus, following the recognition of one or more policy constraints, pursuit of the remaining optimum conditions will not direct us to a point on the second-best utility frontier —a position, that is, in which, accepting the constraints, it is impossible to make "everyone" better off. To reach this second-best frontier, the familiar marginal equalities must give way to other more complex ones.

[2] See bibliography, item 60.

[3] Duesenberry simplifies further by assuming only one good and only one factor. But the results he reaches are sufficiently general for the purpose in hand.

An interesting idea emerges from this analysis. Imagine, says Duesenberry, that, on balance, each income group is adversely affected by the income groups above but not by those below it, then a progressive income tax [1] would be a corrective in the right direction. Ideally, of course, the tax should suffice to cover all the initial and subsequent claims necessary to placate everybody in the lower-income groups, and the stronger is this envy of others,[2] the heavier must be the tax. In this connection the term " excessive " [3] is used to indicate a circumstance in which any net increase of output—for instance, more of " every " good without additional effort—will not advance the welfare of the community no matter how it is distributed. Indeed, any increase of output makes the community worse off, since, no matter how the additional goods are distributed, the additional envy generated cannot be adequately compensated out of these extra goods.[4]

However, if the community were in so unfortunate a position, symmetrical reasoning would surely point to the possibility of improvement through a reduction of output. Empirical confirmation of the existence of excess envy does not therefore constitute a valid objection to the application of welfare analysis,[5] though the more complex conditions of substitution between factor and product are likely to involve guesswork rather than measurement, to

[1] No reason is given why the tax should be progressive as distinct, say, from a proportional income tax.

[2] Envy of the possessions of others is frequently referred to, or classified under, " external diseconomies of consumption." But such terminology seems more appropriate to the tangible and, in principle, measurable effects on other people's enjoyment and convenience of the use by others of consumer goods. Such by-products as air pollution, noise, mutual hindrance and litter are obvious examples.

[3] See bibliography, item 84, p. 51.

[4] One might imagine that the existence of " altruistic " interdependence (enjoying others' good fortune) adds to the community's welfare while " egoistical " interdependence (resenting others' good fortune) reduces it, but this is not so. If I am made happy by the thought of those with higher incomes, or advancing incomes, I must be saddened reflecting on those with lower incomes, or declining incomes. If, on the other hand, I suffer mortification contemplating higher incomes, or advancing incomes, I shall feel triumphant in my own progress relative to that of others. How much and in what way a person's welfare is affected by either sort of interdependence obviously depends on his age, his nature, his environment, his movement and position along the income scale, etc., there being no *a priori* reason to suppose that on balance his welfare is increased or reduced by either sort of interdependence. I owe appreciation of this point to Sir Roy Harrod.

Nevertheless, the argument that the application of the conventional factor-product condition results in too small an output in the case of altruistic interdependence and too large an output in the case of egoistical interpendence still holds. For the individual properly takes all his own feelings into account when adjusting the supply of his factors to their prices, but does not take into account the pleasures or pains experienced by others in the community whose welfares are affected by the size of his income.

[5] Though no formal development is undertaken here, it may be noted in passing that differences in the degree of envy experienced do not disturb this conclusion. We can easily see this by contemplating a situation prior to which the community's mutual envy is not such as to warrant any check on output. Thus we may imagine output to increase along with improvements in technology, this being permitted provided the additional product suffices to reward any additional factors involved and to placate additional envy generated. The additional envy may issue chiefly from one or a group of persons. Increased output is warranted, however, only so long as this additional envy, no matter how distributed, can be more than compensated out of the increase. Symmetrical reasoning applies to differences in degree of altruistic interdependence.

say nothing of the political difficulty of a decision to reduce total output in order to restore a position of optimum.

What of the other marginal conditions of optimum? The general belief seems to be that a true optimum would require their modification also. But if excessive envy has been ruled out on the previous argument as evidence only of a failure of the true factor-product conditions, a failure which results in an output larger than optimum, the belief seems mistaken. Consider a movement from a position where initially there was a discrepancy of the factor rates of substitution as between one good and another to a position in which the factor rates of substitution were the same for the two goods. Since additional goods are made available without additional effort, there is some distribution of the additional goods which will—despite the existence of some (not " excessive ") envy—make " everyone " better off. Top-level optimum remains unmodified for the same sort of reason: if the relevant community indifference curve cuts the transformation curve there must exist a range of output possibilities for which " everyone " can be made better off. Finally, the exchange optimum, requiring the rate of substitution between all pairs of goods be the same for each individual, survives for similar reasons.[1]

Dynamics

No body of formal dynamic welfare analysis comparable with that of static welfare analysis exists. Reder made a modest attempt to erect some stylised structure in the shape of an extension of the optimum conditions to risk-bearing and the like,[2] but the concepts, even in principle, were scarcely

[1] By considering the effect on an individual's welfare of the consumption by another of particular goods, Henderson and Quandt [92] have concluded otherwise. They use two arguments: (1) In a model containing two individuals, each of whose utility function depends upon his own consumption and that of the other, the utility of one of them is maximised subject to a given utility of the other. The resulting expression differs from the familiar one (deriving from independent utilities) by having the ratio of the marginal utilities (to be equated to the price ratio) modified to take account of the losses or gains in the utility accruing as a consequence of the other's possession of the two goods. The interpretation placed on this mathematical expression by the authors is that the equality of rates of substitution is no longer the optimal condition. All that emerges, however, is that in the presence of interdependence the old formula no longer holds. It does not mean that the *ratio* of the modified marginal utilities are not, in equilibrium, equal.

(2) A graphical illustration in which, with an individual's indifference map drawn on the assumption of independence, the introduction of considerations resting on interdependence moves the individual from his initial (independent) optimum. This obviously will not do. In the two-good, two-person case, in which every combination chosen by one determines the combination of goods left to the other, each individual ranks every point in the box diagram according to the balance of advantage experienced—taking into account his response to the other's possessions—thereby generating a consistent ranking of his indifference curves. An optimum position under these conditions has the usual optimal property. In general, then, regardless of what goes into the individual utility functions, if rates of substitution between any two individuals differ, mutually advantageous exchange—provided the utility functions remain unchanged—is possible.

In any event, the community need not be very large before the individual will discount his influence on the consumption of others completely, accept the given prices and seek a maximum position within his means, thereby equating his rates of substitution to those of the market.

[2] See bibliography, item 207.

measurable, and the ideas have not caught on. The fashion remains to court disillusion at the static level in a formal manner, and pessimism informally at the dynamic level.

On the question of capital accumulation, extension of the optimum conditions to inter-temporal substitution had led to a proposed rule [1] that the quantity of money be adjusted so as to determine a rate of interest at which full-employment-saving and investment are equal. This rule is rejected by Graaff, among others, chiefly for two reasons.

First, the larger the existing holdings of bonds, the larger must be the supply of money in order to secure the full-employment rate of interest, a rate which therefore varies according to the volume of bonds in the economy. Indeed, if this is an objection, one might go further on the assumption of a wealth-saving relationship, popularly known as the " Pigou effect." For as Metzler has shown,[2] with such a relationship the rate of interest appears largely as a monetary phenomenon determinable by the Government's control of the quantity of money. In response to changes in the quantity of money, changes in the price level shift the full-employment saving schedule into equilibrium at the policy-chosen interest rate and investment level.

Second, the rate of saving depends not only on the current bond prices but also on expected future bond prices and, in addition, on variations in the general level of prices expected over time. But these prices, in turn, are influenced by the present and future saving of people, about which the individual saver and investor can have no clear information. Nor can the entrepreneur correctly estimate the productivity of his investment unless the investment plans of others, present and future, are known to him.

Now this second set of objections, though they may have particular relevance to capital accumulation, are surely general to all optimum rules. Unless direct information is available about everybody's present and future activities, or unless we can predict their effects on future prices, individuals are liable to make decisions they will regret and, in so far as they do make mistakes, incur " wastage " on the allocative criteria discussed. Sooner or later, there will appear " too much " investment in X, " too little " in Y and so on. Obviously these are the inescapable consequences of uncertainty. But having determined the other optimum conditions explicitly in the absence of uncertainty and, for that matter, in the absence of innovation, changes in taste, etc., we should be able to do no less for the conditions determining the rate of accumulation. Having done this satisfactorily, we may then consider the effects of uncertainty not only on the optimum conditions for capital accumulation but also, in general, on all the optimum conditions.

Keeping the analysis within a static framework, then, equality of the rate

[1] See bibliography, item 16.

[2] Lloyd Metzler, " Wealth, Saving and the Rate of Interest," *Journal of Political Economy*, 1951

of return over cost with the marginal rate of time preference appears to be a required condition for the optimum rate of investment—always ignoring indivisibilities and divergences between social and private benefit, which may, of course, be of special importance in dealing with investment goods. For if this equality does not obtain, say the rate of return exceeds marginal time preference, there is scope for making some people, as borrowers and lenders, better off without making others worse off—provided, always, we abide, as we do in static welfare analysis, by people's immediate judgment of their own good. And though, as in the first objection, variations in the volume of bonds and money will influence the rate of interest and, therefore, the rate of accumulation, thus giving rise to the problem of additional conditions (connected, perhaps, with the distribution of welfare), this rule will still be necessary inasmuch as its non-fulfilment leaves room for some net improvement in the community's welfare.

If, on the other hand, we do decide to place the whole subject in a dynamic context; to consider, that is, the distribution of welfare over time in conditions of uncertainty and, indeed, in conditions of changing productive organisation and social institutions, the inadequacy of the necessary conditions for an optimum position is apparent. It is with some such context in mind that Graaff abandons the conventional optimum conditions of capital accumulation and takes up the idea of a collective approach to this question. The things to be decided upon, all of which involve value judgments, are the choice of a time horizon beyond which we have no interest, the time distribution of welfare on our side of the horizon, and the amount, if any, of " terminal " capital equipment we bequeath to posterity beyond the horizon. These are not very firm materials to work with and, ere long, scepticism sets in and the whole lot is, in effect, emptied into the social-welfare function, there to meet a fate already prepared by Arrow.

The treatment of uncertainty *per se* is hardly more satisfactory. While there is a general case for spending on research and information services in order to improve expectations and guide business decisions up to the magic point at which the value of additional output attributable to such expenditure is just equal to such expenditure, the application of such an " optimum " rule is mainly guesswork. Again, some writers, such as Graaff, see proper to point out to us that, after all, uncertainty adds zest to life. One is already in danger of trailing off into banalities.

Treatment of the desirability of full employment, on the one hand, and stability, on the other; of government spending versus private spending; of standardisation versus variety; of speed of adjustment as against comfort and security,[1] are subject in greater measure to the same pitfall, since on such broad issues the relatively simple goal of pushing outward the welfare

[1] A rapidly adjusting economy imposes psychological strains on men and women which cannot easily be fitted into the welfare calculus. In this connection consult an informal and lively essay by Honor Croome in *Lloyds Bank Review*, 1959.

frontier or of comparing situations on the basis of compensation tests, give way to vaguer ideas of what is proper, and yet vaguer criteria, if any, for their implementation.

VI. A Summing Up

Many of the modern writers on welfare economics take a poor view of its prospects. Little warns us, more than once, against the impressions of rigour and refinement in an analysis which ought to be employed only as a rough guide to policy, though " good common sense " would do as well. Graaff is less compromising. On a close examination, he asserts, every proposition in welfare economics is found wanting. It is more profitable and more honest to bend our energies to the development of positive economics in order to serve the public by providing policy-makers with all the knowledge necessary to choose between alternative programmes. On the other hand, Reder ends his book on a rather indulgent note, one from a theme made familiar to us by Galbraith's *Affluent Society*. We are a wealthy country, he urges, speaking of the United States, we can afford waste. Is it really worth while scrimping at the margin in order to squeeze the most out of our resources? If the implication that welfare economics—which to Reder, but not to others, treats of scrimping at the margin—already enables us to squeeze the most out of our resources is granted, Reder's attitude might be justified, at least for the United States. But the strength of the recent attacks on welfare economics stem, rather obviously, from the belief in its being totally inadequate. If this be the case, there is no point to the judgment that the propositions of welfare economics are superfluous in view of the existing economic milieu. Therefore before passing judgment on the value for our economy of the study of welfare economics, let us briefly review some of the main objections to this study and consider how they might be met.

Though one can understand the general impatience with a subject which promises so much and, apparently, yields so little, Graaff's conclusions are too cavalier by far. Sweeping generalisation is to be regarded askance, no less when it is purely negative. True, few welfare propositions can be predicated which are not, almost in the same breath, qualified out of existence. But this fact is, to a large extent, a consequence flowing from our ignorance of the world we live in. In recognition of it, we busy ourselves ferreting out of welfare analysis all those tacit assumptions that appear to say something about the economic universe.[1] But this purging of tacit empiricism has gone too far. Any generalisation but the most trivial is sure to collapse when all bounds to technical and behaviour possibilities are removed—when allowance is made for any and every imaginable situation. Under so exacting a procedure, it is not at all surprising that unambiguous prescription is hard to come by. What the subject badly needs is a strong

[1] A parallel procedure in positive economics, as objectionable as it is common, is the " repudiation " of economic theorems simply because one can think up a less restrictive set of axioms.

infusion of empiricism to end its unchecked wanderings in the empyrean and to bring it down to earth feet first. Even the establishment of probabilities, or likelihoods, may enable us to escape the otherwise inevitable " perverse " cases thrown up, for example, by the inter-relationship of welfare distribution and relative valuation.

The import of these remarks may be illustrated by reference to some of the difficulties already encountered, assuming, provisionally, that private and social valuations coincide.

The general second-best theorem certainly takes the edge off the marginal-cost rule in all existing types of economies, but, maybe, not more than that. If we grouped commodities into broad categories, on the basis of close substitution, a small departure from an ideal output (in terms of these broad categories) could not, perhaps, be sustained long without a movement in prices so marked as to attract factors to some industries and repel them from others. If there were evidence for this belief then: (1) the existing degree of commercial rivalry might suffice to keep us close to the community's utility frontier, and (2) the precise rule for a nationalised industry may not be important with this scheme in mind. If, for instance, there are no substitutes for the product of a nationalised industry, then regardless of whether the price is set equal to average cost, to marginal cost or to something in between, the output demanded may be much the same. If, on the other hand, the nationalised industry produces a good, say electricity, for which other fuels are close substitutes, although the choice of the marginal-cost or average-cost rule may make an appreciable difference in the sale of electricity, the amounts demanded of all fuels taken together, measured in effective units, in some sense, may alter by very little. We should still be close to the utility frontier. Indeed, if we could rely upon existing enterprise, public and private, to keep us fairly close to an ideal output, we might abandon our concern with " utopian " welfare economics and pay more heed to the piecemeal approach. The compensation tests would then be serviceable in decisions to undertake entirely new projects. And though Little has spoken of consumers' surplus as a toy, it is hard to see how gains and losses on any scale can be computed without something of this sort. However, we are allowing that output in the rest of the economy is only roughly ideal. For this and other reasons given in Part IV, the area between the curves is only an approximation to the sum of the *CV*'s in the community. Only a slight gain in the practicable measure of the social surplus would not then be convincing evidence of the desirability of the investment in question.[1] Setting some minimal size of gain would have the added advantage of eliminating the

[1] Sir Roy Harrod, in correspondence with me, points out that to reject all projects unless a sizeable gain can be expected from their introduction would be a very damping maxim, and if adopted would deprive us of the fruits of progress. If, from our experience of things, a small change can be recognised as connected with a whole series of small changes whose sum results in a large change, then we should base our decisions, not on the data of each small change in isolation, but on the expected result of this large change.

possibility of contradictory answers which may arise when compensation tests are based on different distributions of welfare—though, on looking into the matter, we may have grounds for believing that, for all feasible distributions of welfare, the community indifference map, and hence, the corresponding outputs, vary but little.[1]

Turning to interdependent utilities, it must be admitted that if factor payments do not suffice both to compensate the factor-supplier for his additional sacrifice and to allay the heightened envy of others, existing output is too large. There is a temptation, in contemplating this circumstance, to lose patience with human cussedness [2] and to insist that if both the Smith family and the Jones family receive a 10% increase in their " real " income they *are* better off, even if they both sulk at the other's good luck. But while this may be salutary morals, if welfare is what people experience, there is no escape for us in honest indignation. We may be wise to invest more resources in social psychology in the hope of making people more " rational," but in the meantime we have to concede that an all-round increase of worldly goods may not make people any better off and, indeed, may make them feel worse off.

Nonetheless, we must remind ourselves that the kinds and degrees of welfare interdependence are yet in the realm of conjecture. Common observation, and intuition, suggest that it is a stronger factor at higher living standards than at lower ones. In the poorer countries, where the bulk of the populations still struggle for bare subsistence, it may be negligible.

In recognising that no promising foundations for a dynamic economics have been laid, we must not overlook the difficulties intrinsic to that level of analysis. Though relative prices, outputs and patterns of income distribution may be used, in certain circumstances, as indicators of changes in social welfare, for many of the dynamic factors that enter into welfare—time-paths of response, uncertainty, stability—no equally objective and measurable data exist, a deficiency which, in addition, makes agreement on norms more difficult. While this is a pity, it is not a fatal frustration. If we were more confident of our welfare economics at the static level of analysis it is not likely that we should be much inhibited by the recognition of unsolved dynamic problems. For whatever provision we make for uncertainty, patterns of response, capital accumulation, etc., practical criteria for improving the allocation of existing resources, and for choosing between alternative investment possibilities, could still be profitably applied.

[1] In the extreme case that the community indifference map remained unchanged for all distributions of welfare, allocative efficiency could be effectively separated from distributional considerations. In that event, " efficiency " tests, based on the compensation principle, could never contradict. Such a case, however, does not strengthen any prescription based on " efficiency " tests by themselves. (A sufficient condition for this extreme case to obtain exists when the consumption functions of all individuals are homogeneous and identical.)

Constant costs in the production of all goods do, of course, ensure unchanged relative prices, but do not ensure an unchanged combination of outputs, in response to redistributions of welfare.

[2] See bibliography, item 209.

Finally, though confidence may grow or decline as a result of empirical research, one thing should not be overlooked: the apparent trend towards economic egalitarianism apparently facilitates the application of welfare economics. For one thing, the stronger is this trend, the less we need worry about changes in the distribution of welfare causing contradictions in compensation tests. Indeed, in so far as equality is promoted by a highly progressive tax structure, the latter may be regarded as a sort of built-in compensatory device.[1] In the limiting case of completely equalising taxes, gainers automatically compensate losers, thereby fulfilling the uncontradictable Paretian criterion while continuously maintaining an ethically unobjectionable distribution of income.

Again, as Duesenberry has pointed out, in a world in which the gains of higher-income groups are resented by the lower-income groups,[2] an income tax goes some way towards correcting the conventional factor-product optimum condition by reducing the disposable marginal earnings of the factor below their value on the market. Indeed, not only does an income tax correct for social envy, this envy itself is reduced in so far as it is provoked by disposable rather than gross incomes. The more sensitive is the community in this respect, the steeper the progression of the tax necessary to correct the conventional conditions. In extreme cases only complete equality of disposable incomes solves the problem of interdependent welfares. In the nature of things, so extreme an institution is more likely to be encountered in an opulent society than in an indigent one.

Conclusions

It has already been suggested that explorations into the characteristics of the economic universe may show us a way round conceivable obstacles which have all too readily been adopted as logical impasses; that, provided we group commodities broadly, the allocative efficiency of Western economies—in the sense of being close to the utility frontier of society—may merit a high rating; and that a continuation of the trend towards income equalisation reduces the need for correcting the conventional optimum for interdependent welfares while, at the same time, facilitating the application of criteria involving compensation tests. Yet, if all this is accepted it does not follow that the prospects of a rehabilitation of welfare economics are good. For one thing, there are several important issues—such as the choice between variety and dearness, on the one hand, and standardisation and cheapness,

[1] Even though the resultant pattern of consumption varied widely as between one welfare distribution and another, in so far as a progressive income tax narrows the range of possible welfare distributions, it reduces the likelihood of contradiction using the various compensation tests. In the limiting case of complete equalisation no contradiction can arise—whenever "everyone" could be made better off, everyone in effect is made better off.

[2] There is no reason to believe, however, that a rise in the incomes of others of our group, or of the income groups beneath us, should be any less discomforting than an increase in the incomes of the groups above us. All increases of income, other than our own, amount to a loss of income status relative to some others.

on the other, or the proper division between private and public sectors of the economy—which the welfare economist can do little more than discuss in very general terms. For another, the notion of discrepancies between private and social benefit which, at first glance, appears a promising field for the application of welfare economics—and a salutary reminder of the limited capacity of the invisible hand—when pursued in earnest reveals grave difficulties. Certainly, the more serious objections to using index numbers, or consumers' surpluses, in the measurement of changes in social welfare do not reside in the tangle of interdependences which has chiefly engaged the interest of recent writers. (If we do not believe that, over time measured in decades, the great majority of families in the Western world have higher real incomes in the index sense, we can always suppose a tax structure that effectively maintains income equality, in which case a rise in the appropriate index indicates a rise in the real value of goods and services of each family.) So long as we restrict ourselves to measuring in terms of private valuations, such a rise in the index may tell us little of welfare, or happiness, as experienced by individuals. Advances in the techniques of production, and in the utilisation of material possessions, have repercussions on people's welfare far beyond the initial anticipations of satisfactions.[1] Of course, such repercussions may be regarded as manifestations of a divergence between social and private valuations, but they are not thereby rendered amenable to measurement.[2] Taken together, however, they can be of decisive importance.

While accepting, therefore, " an expansion of the area of choice " as synonymous with an increase of welfare for the individual, and as an unexceptionable norm of policy, it requires an alarming degree of complacency to believe that a rising standard of living as commonly understood is the certain instrument of an expanding horizon of opportunities. Obviously the growth of material prosperity, and its dispersion among the populace, entails—by definition, we might say—more goods, and new kinds of goods, among the mass of the people. But it is scarcely less obvious to-day that the

[1] The growth of private motoring provides a topical example. Each individual's enjoyment of his car varies inversely with the number of cars on the road. So long as cars increase faster than roads can be built the advantages—both for travel and ostentation—diminish. If we remind ourselves of the continual exasperation with which each motorist regards his fellow motorists, not to mention pedestrians, the inconvenience to the latter, the pollution of the air, the incessant noise, the problems of town planning, the growth of ribbon building and consequent spoiling of the countryside, the tying down of large numbers of police, the pressure on magistrates, to say nothing of the toll in killed and injured or the long-run effects on the national character, one may legitimately conclude that the yearly output of motor cars is too large by far, whatever the distribution of welfare.

[2] The cost of certain external effects, such as the smoke nuisance of factories, can be measured, roughly, by sample surveys. For an example, see Pigou, *The Economics of Welfare* (4th edition, p. 185, n.). But where the discomfort endured leaves no material evidence it may be as difficult for the person afflicted to estimate the appropriate money compensation as it is for others to accept his estimate. In those cases, which are by far the most important, where the introduction of new types of goods (and their conditions of production) change for better or worse a whole way of life for the community, there is no hope of estimating the cost of the " external effects."

concomitant subtopiaisation of society involves a continual erosion of opportunities, at least for a sensitive minority.[1]

To sum up, if welfare economics is to be repudiated as a serious branch of study it is not for the logical difficulties which inevitably appear when generality of treatment is taken to encompass all imaginable relationships. These difficulties, and others, we have suggested, may be far from insuperable. It is rather that a study of welfare which confines itself to the measurement of quantities of goods and their distribution is not only seriously limited, it is—at least in those countries where the mass of people have advanced far beyond subsistence standards—positively misleading. For the things on which happiness ultimately depends, friendship, faith, the perception of beauty and so on, are outside its range: only the most obstinate pursuit of formalism would endeavour to bring them into relation with the measuring rod of money, and then to no practical effect. Thus, the triumphant achievements of modern technology, ever-swifter travel, round-the-clock synthetic entertainment, the annual cornucopia of slick and glossy gadgets, which rest perforce on the cult of efficiency, the single-minded pursuit of advancement, the craving for material success, may be exacting a fearful toll in terms of human happiness. But the formal elegance of welfare economics will never reveal it.

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Abbreviations

A.E.A.	American Economic Association
O.E.P.	*Oxford Economic Papers*
E.J.	*Economic Journal*
J.P.E.	*Journal of Political Economy*
Q.J.E.	*Quarterly Journal of Economics*
S.E.J.	*Southern Economic Journal*
S.A.J.E.	*South African Journal of Economics*
C.J.E. & Pol. Science	*Canadian Journal of Economics and Political Science*
A.E.R.	*American Economic Review*
R.E.S.	*Review of Economic Studies*

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[1] For instance, foreign travel, once suggestive of the lure and enchantment of far-away places, has become a highly organised mass exercise with small opportunity of avoiding motorised traffic, crowds of camera-happy tourists and cynical tourist-hardened populations. For a particularly painful example of these things, read a report on "The Last Days of Andorra?" in *The Economist*, August 22, 1959.

Again, for those who enjoy a beach humming with portable radios, or the lakes teeming with motor boats, the world may be improving. But not for those whose tastes run to quieter things.

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Note to footnote 2 on p. 205.—FRANCIS YSIDRO EDGEWORTH, the first editor of the ECONOMIC JOURNAL, was not, of course, a Cambridge Economist. At seventeen he entered Trinity College, Dublin, and then went on to Magdalene Hall, and Balliol, Oxford. Later he became Tooke Professor of Political Economy at Kings College, London, after which he was Drummond Professor of Political Economy at Oxford. Sir Roy Harrod, in correspondence with me, has made it plain from his fairly intimate acquaintance with the man, that Edgeworth's approach and style of thought were very much in contrast with those of the Cambridge School. He was catholic in his views, extremely widely read, and had a high regard for certain continental writers, such as Auspitz, and Lieben and Pierson. Though he shared in some of the views of the Cambridge School he laid a special stress on the *inequality* of capacities for enjoyment and, therefore, on the desirability of an unequal distribution of income.