Dennis Robertson on Utility and Welfare in the 1950s

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> Economics is the study of mankind in the ordinary business of life, or of the more material part of human welfare. It is a study worth pursuing partly for its intrinsic interest, but mainly because it may help us to form reasoned judgments on matters of public policy and act on them so far as our opportunities offer (Robertson 1957, p. 30).

1. Introduction

In February 1962 Dennis H. Robertson (b. 1890; d. 1963) read a paper on "Cardinal Utility" to the Voltaire Society in Oxford. The unpublished manuscript, kept in the Robertson Papers (Trinity College, Cambridge), conveyed the main points of Robertson's two major pieces on the subject ([1951] 1952 and 1954; they consist of revised versions of lectures delivered in the University of Manchester in December 1950 and in Sheffield University in February 1954, respectively) and added some new material (especially from the methodological perspective). Robertson's central claim was that welfare economics should be based on cardinal utility, and that the ordinalist revolution in the consumer and welfare theories should be rejected. The move to ordinal utility theory since the 1930s had led to the "undue curtailment of the range over which purely economic arguments can be recorded as affording useful guidance to behaviour" (1962a, p. 2). According to Robertson, it was only by sticking to the study of the economic or material aspects of welfare under the assumption of measurable utility, that the economist would regain its ability to approach "Economic Welfare as an Objective of Economic Policy" ([1949] 1952, p. 61).

The present paper investigates Robertson's effort to defend the Cambridge utilitarian tradition against the so-called "new welfare economics", developed in the late 1930s and in the 1940s on the basis of Lionel Robbins's ([1932] 1935) influential criticism of the scientific legitimacy of interpersonal comparisons of utility, and of the Hicks-Allen (1934) ordinalist revolution in consumer theory (see e.g. Kaldor 1939; Bergson 1938; Lange 1942; Samuelson 1947, chapter 8). Although A. C. Pigou (1951; partly reproduced as appendix 11 to the 1952 reprint of *The Economics of Welfare*) made a single attempt, upon invitation from the editor of the *American Economic Review*, to vindicate interpersonal comparisons in the style of Cambridge old welfare economics, it was Robertson's sustained endeavor to rescue Marshallian cardinal utility (a concept largely rejected by Pigou in 1951) that attracted some attention from economists at the time. As acknowledged by Pigou (1952, p. viii), he did not feel competent to discuss "recent difficult discussions about utility and 'the new welfare economics' in their technical aspects, only in the 'plain man' manner" of the 1951 article. Robertson too admitted that "I know that I have not grasped the requisite philosophical and mathematical equipment to get properly on the top of it" (1962a, p. 1), but he managed to make an impact on the literature of the 1950s through a careful discussion of the economic content of the mathematical argument. As Paul Samuelson (1963, p. 518) remarked in his obituary article on Robertson, "he had the rare vice of being a charming writer. He would sneak up on the unwary reader and gain his acquiescence by a siren song. The man could almost make you believe in such absurd things as cardinal utility. What others had to steal by the bludgeon of matrix calculus, he deftly purloined by the stiletto of wit."

Robertson is, of course, better-known nowadays for his seminal contributions to monetary and business cycle theories. Indeed, the literature on "Robertsonian economics" (Presley 1978; see also Fletcher 2000) is silent about his work on microeconomics in general and on the utility debate in

particular, an example followed by entries in dictionaries and encyclopedias. After allocating Robertson's writings into five major categories - trade cycle, industrial structure, monetary economics, microeconomics, macroeconomics commentary and policy - Charles Goodhart (1992, pp. 14-18) pointed out, in a Cambridge lecture commemorative of the centenary of Robertson's birth, that Robertson's "doughty defence of cardinal utility (in a field of ferocious technical complexity) is perhaps his best known" work on microeconomics. Goodhart, however, refrained from commenting on Robertson's participation in the utility debate by quoting a passage from Robertson's favourite book, *Alice in the Wonderland*: "Ahem! said the Mouse, with an important air. Are you ready? This is the driest thing I know. Silence all round."

Why did Robertson decide in the early 1950s to take up such a dry subject? In 1944 he had replaced Pigou as Professor of Political Economy in Cambridge, where he lectured on Economic Principles until his retirement in 1957. The lectures, published in three volumes between 1957 and 1959, included extensive discussion of utility theory along Marshallian lines (Robertson 1957, chapters 5 and 6). Furthermore, he had been invited by the editor of the *Quarterly Journal of Economics* to review the *Survey of Contemporary Economics* (Ellis 1948), which resulted in Robertson's ([1950] 1952, section 4) first detailed incursion into the utility controversy. Economic welfare was the topic of Robertson's ([1949] 1952) presidential address delivered to the Royal Economic Society in June 1949. It should also be noted that, after Keynes's death in 1946, the intense debate about macroeconomic theory that had absorbed much of Robertson's energy was largely over (Robertson continued to contribute to the macroeconomic literature in the 1950s, though mainly on economic policy; see Boianovsky and Presley 2002). Finally, as stressed by Robertson, the discussion concerning utility and economic welfare had implications for economic theory as a whole, not just for microeconomics. "The subject of my report, though arid, is on the face of it of some importance." It was important because it concerned "what sort of a study economics is, and what it is all about" ([1951] 1952, p. 13). Such methodological issues were not very fashionable when Robertson started to read economics at Cambridge in 1910 - "to us it seemed a topic more suitable for discussion by Germans than by Englishmen" (ibid, p. 14) - but in the 1940s and 1950s, when Cambridge welfare economics was under attack, the object and scope of economics attracted Robertson's attention.

2. Economic Welfare and the Scope of Economics

Robertson's 1949 address to the Royal Economic Society was a response to Ralph Hawtrey's claim in his presidential address, delivered three years before, that the scope of economics should be enlarged to embrace all the elements of "good life" through a complete integration of economics with ethics. Hawtrey (1926, pp. 184 and 203-15) had expressed similar views concerning the notion that economics should not only take account of valuations and ethical standards as given data, but that it should pronounce upon the validity of these standards. Hawtrey's (1926) suggestion raised critical reaction from Robbins ([1932] 1935, pp. 146-47), who contended that economics and ethics should be kept separated, since they belong in positive and normative studies respectively. Moreover, Robbins (pp. 139-40) argued that interpersonal comparisons of utility often deployed in welfare economics are based on judgments of value and conventions, and should, therefore, be part of ethics instead of pure economics. Robertson too was critical of Hawtrey's approach, but for reasons quite distinct from Robbins's. Instead of suggesting that welfare propositions should be part of ethical or normative studies, Robertson argued that the restriction of the scope of economics to the material side of welfare should enable economists to investigate the determination of economic welfare and put forward proposals for its promotion.

> What I want to discuss is whether the old view that the economist as such is concerned only with certain parts or aspects - the more material parts or aspects - of human welfare is really out of date ... What I am trying to suggest is that the concept of economic welfare is solid and substantial enough to give the economist plenty to think about, to argue about and, if he can make up his mind, to tender advice about, without feeling constrained to put

his head in a bag, still less a gas-oven, because he does not feel himself to have mastered the whole problem of good and evil (Robertson [1949] 1952, pp. 61-2).

The notion that material welfare is the ultimate subject-matter of economics, advanced by Edwin Cannan (1914, p. 17), had been rejected by Robbins ([1932] 1935, chapter 1), who suggested instead his well-known definition of economics as the study of "human behaviour as a relationship between ends and means which have alternative uses" (p. 16). From that perspective, Robertson's 1949 presidential address represented also a belated reaction to Robbins, not just to Hawtrey. Indeed, in his introductory chapter entitled "What is Economics?" Robertson (1957) would expand on the theme of his 1949 address. The object of the study of economics is "the formation of *judgments* ... on proposals for the promotion of human welfare, proposals some, though by no means all, of which involve political action (1957, p. 17; italics in the original). The scope of economics, following Cannan's definition quoted by Robertson (ibid), is the investigation of "material welfare", conceived as "a flow of enjoyment or satisfaction derived from the good things of life. But not as consisting in all the possible kinds of satisfaction ... We must limit ourselves to the more material and less spiritual parts or aspects of welfare" (p. 18). While the discussion of a man's total welfare is necessarily mixed up with ethics and value judgments, the same is not true of economic or material welfare. In order to dispel the notion that the phrase "economic welfare" is "bulging with ethics and emotiveness" Robertson ([1951] 1952, p. 30) coined the word "ecfare" to replace it.

Economic welfare (or "ecfare") is, therefore, the same as "utility" in Robertson's ([1951] 1952, p. 15) framework. It is what the individual seeks to maximise as a consumer. As pointed out by Ian Little ([1950] 1957, p. 20), in the Cambridge utilitarian tradition the word "utility" described a relation between men and things, a power in objects to cause satisfaction. After the 1940s, "utility" was not used by (most) economists anymore to refer to any power in objects or any real relation, but as a purely abstract concept, a "kind of reflection of satisfaction in logic" (ibid). It is not just (or mainly) a matter of replacing cardinal by ordinal utility systems. Cooter and Rappoport (1984, pp. 515-16) elaborated on Little's insight that, before the ordinalist revolution, utility was interpreted as the power of commodities to satisfy material needs. Comparing utilities across individuals involved, from the perspective of the Cambridge material welfare conception, the comparison of needs, not of subjective desires. Although Cooter and Rappoport refer mostly to Pigou ([1932] 1952) to document their interpretation, the material welfare concept - and its implications for the field of welfare economics - comes out clearer in Robertson's writing in the 1950s.[1]

As pointed out by Cooter and Rappoport (pp. 508-9), the material interpretation of utility provided a comparability convention that was prior to the issue whether individual utility is cardinally measurable or not. The point was first made by Abram Bergson (1966, pp. 65-66) in his criticism of the Cambridge notion that the welfare criterion is given by purely empirical comparison of satisfactions of different individuals. According to Bergson, such an exercise necessarily involves some "commensurating convention" by which the satisfactions of different people are scaled against each other, but the convention itself cannot be proved. He mentioned the convention - called "equal capacity for enjoyment" by Pigou 1951, p. 292, and by Robertson [1951] 1952, p. 38 - that people would enjoy similar satisfactions in similar circumstances, which is consistent with the material interpretation of utility (see also next section).

Robertson (1957, pp. 22-24) commented critically on Robbins's ([1932] 1935) scarcity definition of economics quoted above. According to Robertson, such a definition is "at once too narrow and too wide". On one hand, it excludes from the scope of economics problems associated with the general underemployment of resources, and, on the other hand, it admits the "army commander and the cricket captain", who are both concerned with allocation of scarce means which have alternative uses.[2] More generally, as remarked by Cooter and Rappoport (1984, p. 521), under Robbins's definition, as opposed to the material welfare definition, any scarce good is as appropriate for economic study as another, with no distinction in the hierarchy of needs. Hence, Robbins's approach is more akin to Pareto's concept of "ophelimity" than to Marshall's "utility". Robbins (1953) wrote a long review of *Utility And All That*, where he essentially reaffirmed the main points of his 1932 volume. The review contained a detailed

discussion of the essay that gives Robertson's book its title. Robbins questioned the notion that the use of scarce resources for promoting the less material side of human happiness should not be an object of study for economists, as well as the legitimacy of the distinction between welfare and economic welfare. In particular, he found Robertson's term "ecfare" a "very dubious and elusive entity". Section 4 of the review dealt with the possibility of interpersonal comparisons of utility, which Robbins identified as the essence of Robertson's position. According to Robbins (1953, p. 109; italics in the original), such comparisons "rest ultimately upon assumptions which are essentially *conventional* in character", that is, judgments of value imported from political philosophy. Robertson replied to Robbins's criticism and explained why the distinction between economic welfare and other kinds of welfare should be kept.

> It is because I think the economist, on the basis of judgments which are judgments of fact and not of value, can hope to make useful statements about some, though not all, of the consequences for human happiness of economic changes, *including changes which entail or consist in a change in the distribution of income*. Now Robbins makes it quite clear that he does not believe this. He thinks that about his latter type of change *no* statement can be made which does not involve an appeal to extra-economic considerations such as justice or political workability. I am bound to say that this still seems to me a defeatist view, and one which belittles unduly the *specific* contribution which the economist can hope to make as an (official or unofficial) counselor (Robertson 1954, p. 677; italics in the original).

Since welfare economics, in Robertson's view, is concerned with judgments of fact, it pertains to positive, not normative, economics - a distinction that is not conspicuous in Robertson's approach. In chapter 1 of his *Lectures*, Robertson (1957, pp. 21-30) discussed the relation between economics and three other fields of study, from which the economist takes his data (group I, formed by natural sciences, psychology and law), uses some tools (group II, formed by logic and mathematics), and to which he hands over his results to be dealt with (group III, formed by ethics and politics). The third group is defined as the "study of how people think they ought to behave, both as individuals and as members or officers of organised communities" (p. 29). Some courses of action suggested by the economist to promote economic welfare may be turned down for ethical or political reasons (such as national security, "power", or "justice"), but this should not keep him from his duty to act as a "watchdog for economic welfare" (p. 20).

The relevant dividing line, then, is not the positive/normative dichotomy `a la Robbins, but the distinction between the theoretical economics and the formulation of economic policy based on it on one side, and its practical application on the other. As pointed out by Cambridge economist Maurice Dobb (1969, p. 32), Pigou's ([1932] 1952, part 1, chapter 1) approach to economic welfare makes it clear that the investigation of what will increase or decrease it is a non-normative study of causes and effects as in any other branch in economics. "Any ethical or normative judgment enters in only when it comes to deciding whether or not economic welfare as defined is a desirable goal of policy", which "falls outside the Economics of Welfare as such". This was also Robertson's interpretation. Moreover, the view that the concept of economic welfare provided a purely economic and non-political criterion, shared by Robertson and Pigou, was firmly based on the assumption of measurable utility (see Hutchison 1964, chapter 1, section 4; Bergson 1966, pp. 68-69).

3. Cardinal Utility and the Marshallian Consumer's Surplus

Robertson discussed the old Cambridge cardinalist treatment of the behaviour of the individual consumer in detail in chapter 5 of volume 1 of his *Lectures* and, more briefly, in section 1 of his 1951 essay. Robertson's careful discussion of Marshallian demand theory was not prompted by the view that cardinality was a necessary assumption for the interpretation of consumers's behaviour.

> Now I have never permitted myself to question this conclusion - the conclusion namely ... that in order to explain the ordinary behaviour of consumers in the market, it is not necessary to suppose that utility possesses cardinal, as distinct from merely ordinal,

magnitude. The issue, in my judgment, only becomes acute in later connections (Robertson 1954, p. 666; see also 1957, p. 87).

The "later connection" mentioned by Robertson, as discussed below, is the law of diminishing marginal utility of income, a concept instrumental for interpersonal comparisons of economic welfare and based entirely on cardinal utility. As for demand theory, the use of the idea of measurable utility, although not essential, provided a more persuasive account of "what really happens" than in other explanations of consumers' behaviour (1957, p. 87). In Robertson's (1962a, p. 2) view, the dismissal of cardinal utility and its replacement by ordinalism after the mid 1930s was brought about by two methodological mistakes. First, an "excessive delight in the use of Occam's Razor", which led to a tendency to treat the smallest and least restrictive set of hypothesis which might serve to account for a given state of affairs as though "it were actually the most satisfactory explanation we are able to give of that state of affairs". Secondly, a somewhat "snobbish" tendency to assume that, because other subjects are able to dispense with concepts that are "not fully 'operational', i.e. testable by external observations and measurement", economics must also be in that position. Robertson suggested that "those methodological excesses are crystallised in the reluctance to attribute the quality of full measurability, in some significant sense, to that thing, namely the economic welfare of human beings, which I conceive to be the central object of economic study."

The core assumption of the Marshallian approach, according to Robertson ([1951] 1952, p. 15; 1957, pp. 72-73), is the psychological rule of diminishing marginal utility, firmly based on "introspection and observation" (1962a, p. 3) and interpreted as a corollary of the notion that utility is a quantitative and measurable entity. Along with the requirement (only implicit in Marshall and Robertson) that utility is additively separable - that is, that the marginal utility of each good depends only on the available amount of that good and not on the quantities of the other goods - diminishing marginal utility implies strictly convexity of Edgeworth's indifference curves (see e.g. Mandler 1999, p. 72). The Marshallian consumer is supposed to have the cardinal capacity of knowing the rate at which marginal utility declines, a knowledge that enables him to maximise his economic welfare or utility by distributing his expenditure so that the marginal utility of the goods he purchases is proportional to their prices. The fact that utility is measurable does not mean that marginal utility can be directly measured, but that the price the consumer pays for each good can be taken as an indirect measure of its marginal utility. Robertson clarified that measurement applies to marginal, not to total utility.

He illustrated the argument with an analogy from the absolute scale of temperature (as opposed to ordinary centigrade or Fahrenheit scales): equal movements along the scale register equal absolute changes of temperature, but it is not possible to express the total temperature at one point as a multiple of that total temperature at another, so long as the starting-point of the scale is left unspecified. "In mathematical language, the function connecting utility with consumption becomes determinate up to a linear transformation, leaving indeterminable only the unit in which we choose to measure and the level from which we start" (1962a, p. 4). Moreover, as pointed out by Robertson (1957, pp. 74-75), Alfred Marshall distinguished between goods which are necessary to life - in which case the starting-point for utility must be at some positive point - and the other goods for which it may be reasonable to fix it at the point of zero supply. This implies that total utility (of real income as a whole and of its components) becomes "*intrinsically* measurable in the same sense as additions to utility are measurable" (ibid; italics in the original).[3]

Apart from the law of diminishing marginal utility, another important proposition of Marshallian economics as a whole is the "law of increasing cost", that is, in the absence of any improvement in knowledge or organization, the larger the amount of a thing produced "the greater the real cost involved in making any addition to the production" (1957, p. 34). The phrase "real cost" is used, of course, in the sense of the disutility or dissatisfaction incurred by the supply of effort by the production factors. Robertson put the two laws together in a diagram used to illustrate the "economic problem" faced by the representative agent in his decision about how much to consume and to work. In figure 1 below units of utility are measured along the ordinate and units of effort (or dissatisfaction) along the abscissa. *AB* is the curve of marginal satisfaction derived from additional consumption, and *CD* is the curve of marginal dissatisfaction incurred on additional consumption. As Robertson (ibid) pointed out, the exercise can only

be carried out under the assumption that "satisfaction and its opposite are measurable things" - an assumption, he told his students, "which it would shock some of my colleagues to hear me asking you to make".

[Insert figure 1 around here]

From the Marshallian perspective, the law of diminishing marginal utility applies not just to individual goods but to real income as a whole (Robertson 1957, p. 73). The extension of the law of diminishing marginal utility to the proposition that the marginal utility of real income falls with increases in real income had been criticised by Robbins ([1932] 1935, chapter 6) on the grounds that it is based on the purely conventional assumption that men in similar circumstances are capable of equal satisfactions. But, even if individuals differ in their powers of enjoyment, it can be assumed that these differences are distributed in a random fashion between income-groups, as argued by Robertson (1957, p. 88; see also Pigou 1951, p. 292). Once granted the legitimacy of the law of diminishing marginal utility of real income, one has to take into account the fact that the Marshallian "marginal utility of money" will be diminished either if the consumer's money income increases with given prices, or if the price of the good falls with a given money income. This has implications for the limitations of the technique devised by Marshall to measure utility, "consumer's surplus".

Robertson discussed carefully Marshall's notion of consumer's surplus, since, by providing a measure of the economic welfare of the individual, it represented the very core of Cambridge welfare economics. The main result of the traditional cardinal account of consumer behaviour was the corollary that the consumer can be regarded as enjoying a net surplus of satisfaction, based on the fact that he receives the greater part of his supplies at a price lower than he would be prepared to pay for them. Having claimed that marginal utility and (in certain conditions) total utility derived from the consumption of a good are "intrinsically" measurable, Robertson now investigates whether they are "practically" measurable, in the sense that there is some reliable measuring-rod available which the economist can apply (1957, p. 77). He argues that the consumer's surplus was regarded, on one assumption, as being intrinsically or in principle measurable; and, on a further assumption, as being also operationally measurable in terms of money. Robertson's distinction between measurability in principle and in practice was based on his suggestion that "in economics at least we should not be ashamed to make use of concepts which are not operationally testable" (1962a, p. 9).

The money measure of the surplus derived by a consumer from a particular good ("tea") is the difference between what the individual "*would* pay, if he were subjected to a bit by bit process of blackmail, rather than go without tea altogether, and what he actually *does* pay for his existing purchase of tea" (Robertson [1951] 1952, p. 16; italics in the original; see also 1957, p. 75). In figure 2 below, the curve *DD'* represents a consumer's demand schedule for tea. He buys an amount *OM* per year at a price *MP*, thus spending *HOMP*. The sum which could be extracted from him is *DOMP* (which measures the total utility), and the triangle *DHP* is a measure of the consumer's surplus. As Marshall was aware, this method of measuring utility in money is only accurate on the assumption that the proportion of the consumer's income spent on tea is small, otherwise the marginal utility of money would change and money would fail as a measuring-rod of utility.[4] Robertson (1957, p. 76) considered it a legitimate assumption in most cases, but pointed out that, in Marshall's framework, the fact that the marginal utility of money is not constant implies that such measures of the total utility of particular goods cannot be added up to yield a measure of the total utility of the individual's income. Furthermore, the economist should not try to measure in money the utility of goods of prime necessity to life ([1951] 1952, p. 16). Robertson summed up his examination of Marshall's view of utility in four propositions:

> (1) increments of utility derived from particular goods are both intrinsically measurable, and practically measurable with the measuring rod of money; (2) totals of utility derived from particular goods are intrinsically measurable provided you reckon them from a sensible starting point; (3) totals of utility derived from particular goods are not practically measurable except on a certain restrictive assumption, which, however, can generally be sensibly made; (4) the total of totals, i.e. the total utility of income in general, is not practically measurable at all. This doctrine still seems to me acceptable, and its guarded

nature to have taken in advance most of the sting out of the fuss that has been made about measurable utility (Robertson [1950] 1952, p. 71; see also 1957, p. 77). [5]

The measurement problem becomes more acute once we move from the plane of the individual consumer to the whole market for a particular good, that is, from the consumer's to the consumers' surplus. The problem now is that, due to differences in tastes and powers of enjoyment and (more importantly) in income, the same sum of money represents different amounts of utility. Despite the danger of "adding up things which are really incommensurable", Robertson (1957, p. 78) defended as fair Marshall's assumption that in many cases the markets for two or more goods to be compared are made up of different income classes in about the same proportions. "The upshot is that even when we cannot make it more precise the general notion of consumers' surplus ... is of considerable importance as a guide to public policy" (ibid). Robertson illustrated the argument with a comparison between direct and indirect taxation in figure 2 below. The line *HP* now means that tea can be produced at a constant cost of *OH*. This cost is raised to *OK* by the imposition of a tax *HK*, which reduces the consumer's purchases to *ON* and his surplus to *DKQ*. Hence, on the *ON* quantity of tea he pays a total tax of *KHLQ*, but on the tea *NM* (which he no longer buys) he looses consumer's surplus *QLP* with no corresponding gain to the State. This shows that direct taxation is to be preferred to indirect taxation on the basis of cardinal utility and the consumer's surplus analysis.
[Insert figure 2 around here]

4. Cambridge Welfare Economics

The two main general propositions of Cambridge welfare economics, as formulated by Pigou ([1932] 1952, pp. 82, 89) are: (i) provided the dividend accruing to the poor is not diminished, increases in the size of the aggregate national dividend must involve increase in economic welfare; and (ii) provided it does not lead to a contraction in the size of the national dividend, any increase in the absolute share of real income in the hands of the poor will increase economic welfare. The national dividend, used as an indicator of economic welfare, is maximized only if the marginal social cost of all resources is the same in all alternative uses. This is the topic of chapter 14 of the first volume of Robertson's *Lectures*, entitled "Some defects of economic freedom". It is largely based on Robertson's well-known 1924 article "Those empty boxes", which criticised in detail Pigou's claim - in the first (1920) edition of *The Economics of Welfare* - that under conditions of free competition production in "increasing cost" industries is carried further, and in "decreasing cost" industries less far than the maximisation of economic welfare requires. Moreover, in contrast with Pigou - who replaced Marshall's discrete consumer's surplus analysis by marginal analysis concerned with small changes in output - Robertson remained faithful to Marshall's approach.[6]

According to Robertson ([1951] 1952, p. 17), the "most important use that has been made of the concept of consumer's surplus" is the Marshallian argument that where large internal economies of large-scale production prevail, the increase in consumer's surplus generated by additional production may exceed the increase in money cost, and justify the carrying on of the enterprise in question at a financial loss. This applies especially to the pricing policy of public companies under monopoly conditions, as discussed in the *Lectures* (1957, pp. 166-68). Figure 3 below depicts a monopoly enterprise, where *CC'* is the average cost curve, *CC''* represents marginal cost, *DD'* is the demand curve and *ON* is the ordinary monopoly output. The expansion of output from *OM* (where price just covers average costs) to *ON'* will increase consumer's surplus by *EKQ'P* and cause a financial loss of *CKQ'*. The difference is the triangle *PHQ'*, and the financial loss is covered by taxes.[7]

[Insert figure 3 around here]

Robertson, however, was critical of the tendency in the economic literature to "play this principle for somewhat more than it is worth." In his 1924 article he had discussed a decreasing cost industry with *m* units of fixed resources sunk, and *n* units of running resources employed in conjunction with them to

produce *p* units of output. According to Pigou's analysis, *p* should be such that, in the social interest, its price remunerates that *n*th unit of running resources. Instead, Robertson (1924, pp. 21-22) suggested that this *p*th unit of output is the net product of [that unit + *m/p* units of fixed resources]. These *m* units of fixed resources yield no product unless at least one unit of running resources is applied, which implies that such fixed resources are responsible for a part of any additional output. This means that the whole case for carrying production in decreasing cost beyond the competitive point (at which receipts cover costs) "seems to me to vanish". In particular, Robertson challenged the conclusion that the industry should be subsidized to the extent of the whole burden of the charges of the fixed original plant. He did not repeat that piece of criticism in the *Lectures*, but the idea is implicit in his remark that "the public interest may be better served on balance by a common-sense rule that [a public enterprise] should, over a cycle of years at any rate, at least cover its full costs, than by a rule that it should produce at a loss up to the point at which price equals marginal cost, since this latter rule might be very difficult to combine with practical test of efficiency of management" (1957, pp. 167-68).

Furthermore, Robertson criticised marginal cost pricing on the grounds that, while the gain of consumer's surplus *PHQ'* is a net gain, it is only obtained by changing the distribution of income - through taxation to cover deficits - in favour of the consumers of that particular good and against the other consumers. It is only implicit here that the utility of income is not the same for all individuals. As pointed out in his 1950 book review, arguments based on consumers' surplus are only valid where the distribution of income is not at stake ([1950] 1952, p. 72). In the end, Robertson (1957, p. 168) suggested that in many cases a special form of price discrimination, called multipart pricing or two-part tariff, should be deployed as an alternative to subsidized production. It consists in a fixed uniform admission fee to finance fixed costs plus a variable charge corresponding to marginal costs, combining the benefit principle of taxation with the principle of economy that the price of an additional unit equals the additional cost of producing it.

In his 1924 *Economic Journal* piece Robertson had distinguished between two types of decreasing cost: (i) unexhausted internal economies of scale due to the lumpy and discontinuous process of investment in fixed capital, and (ii) given time, methods of production are capable of improvement. In the first case, only a raising of the demand schedule can generate a reduced cost, in contrast with the other case. Apart from his discussion of the monopoly case summed up above, Robertson (1957, p. 163) also considered the first class of decreasing cost in the context of pure competition, with the well-known Marshallian result that a subsidy would allow an increase of consumers' surplus with no corresponding increase in social cost. He pointed out, however, that the argument only applies if no more than a few industries in the economy are in this position, otherwise - given the supply of productive factors - it would not be possible to expand production in all or most of them. In the case of the second class of decreasing cost industries, the only justification for State intervention is to try to accelerate the improvements in organization from which decreasing cost eventually arises. Robertson (1924, p. 26; 1957, pp. 163-64) stressed, against Pigou, that, under the assumption that economies of large scale of the second group are irreversible, the subsidy should be temporary instead of permanent.

Increasing costs due to diseconomies of large scale production, of the kind imagined by Pigou, are hard to find or even to conceive of (Robertson 1924, pp. 26-27; 1957, p. 164). According to Robertson, the sole and sufficient explanation of the phenomenon of increasing costs is factor-scarcity, due either to higher transfer prices paid by an expanding industry for all its supplies of some factor, or to the fact that the industry has to pay higher transfer prices for part of its supplies of a factor, while other parts of that factor (which have a relatively higher productivity for the purposes of this industry) are able to squeeze producers' surplus.

> But in either case this change in the price of factors has come about as the result of an expression of consumers' preferences in the form of money demand, and there is no prima facie case for going behind it or attempting to set aside its consequences. The increased incomes represented by the increased money costs represent a mere handing over of wealth from consumers to the owners of the scarce factors or bits of factors. There may be reasons to regret this, but they are of a different order from those now under consideration, and point to collaring or taxing these surpluses ... rather than to restriction of the scale of

the industry in which they occur (1957, p. 164; see also 1924, p. 27).

This is a restatement of Robertson's (1924) famous critique that the causes of changes in long-run supply prices are not symmetrical in decreasing and increasing cost industries and, therefore, that there corresponds an asymmetry in their implications for public policy (see also Samuelson 1947, p. 208).

Finally, Robertson (1957, pp. 162-63) discussed briefly the implications of external economies and diseconomies for the maximisation of welfare. He agreed with the traditional Cambridge view that a tax should be imposed on the industry generating a negative externality (such as pollution), so that private and social costs converge and the output in that industry is correspondingly reduced ("Pigou's tax"). The case of external economies - when expenditure of a certain type by an entrepreneur would lower costs of others besides himself but is not carried so far as to maximise welfare because he would not exact the whole benefit himself - is more complex. Robertson (1924, pp. 23-24) argued that Marshall's representative firm is capable of introducing and appropriating internal improvements in organization and technique. He illustrated the argument by imagining an industry with a positive externality to be administered by a National Guild. Since the full advantages of any improvement will be enjoyed by the Guild itself, one could think, under Pigou`s analysis, that such a Guild will produce at a point where price equals marginal cost. But in fact, in order to avoid losses, it will decide its output in such a way that total receipts cover total costs, that is, the long-period competitive outcome. Robertson inferred from that that optimality under pure competition is not strictly incompatible with positive externalities. That is probably the reason why there is no reference to subsidies in Robertson's treatment of positive externalities in the *Lectures*. Instead, Robertson mentioned the connection between positive externalities in general and the theory of public goods, or "communal consumption" as it is called by him (1957, pp. 90-91; 162-63).

The second proposition of Cambridge welfare economics listed at the start of this section, pertaining to income distribution, was often stressed by Robertson. The law of diminishing marginal utility of real income allows economists to make those comparisons between the economic welfare of different persons "which the modern purists forbid us to make, or rather tell us that, if we insist on making them, we are ceasing to act as economists and basing ourselves on ethical considerations" (1957, p. 88). Together with the assumption that differences in powers of enjoyment are distributed in a random fashion between income groups, that law leads to the conclusion that complete equality of distribution generates the maximum positive utility from a given real national income. If economic welfare is the sum of individual utilities, the law of diminishing marginal utility implies that it will be maximised only if the marginal utility of income is the same among all individuals. Under the assumption of equal capacity for enjoyment, the first-order condition for a maximum is fulfilled only if all incomes are the same (see Bergson 1938, p. 324). However, this does not settle the distribution issue, since the potential negative impact of changes in distribution on the size of income - by impairing the incentives to work and save - should be taken into account. In any event, this should not prevent the application of utilitarian calculus to the matter.

As pointed out by Robertson (1957, p. 55), the two propositions of Cambridge welfare economics could conflict, since national real income is an imperfect index of economic welfare. In particular, the quantity of satisfaction yielded by a given flow of goods and services depends on the distribution of the flow as well as its size, which makes it possible that economic welfare might be increased if the distribution of the flow becomes more equal even though its total falls. This is related to the criticism, by members of the "new welfare economics", of Pigou's traditional distinction between the size of the real social income and its distribution, as discussed in the section after the next one.

5. Utility Theory since Pareto

Robertson's case for cardinal utility was based on a careful discussion of what he perceived as flaws of the ordinalist approach. He started his account with an examination of Vilfredo Pareto's claim that lumps of utility can be set out in an *order* of magnitude, but one cannot ask *how much* greater one lump of utility is than another (Robertson [1951] 1952, section 2). However, as pointed out by Robertson, Pareto

and his immediate followers did not consistently adhered to the postulate of ordinal utility, since the notion of marginal utility was still present in the assumption about the signs of the second derivatives of the utility function.[8]

> They continued to use the law of diminishing marginal utility of individual things and certain other allied propositions with regard to related things - complements and substitutes. And if you want to do that you have got to assume not only that the consumer is capable of regarding one situation as preferable to another situation, but that he is capable of regarding *one change in situation* as preferable to another *change in situation*. Now while the first assumption doesn't, it appears that the second assumption really *does* compel you to regard utility as being not merely an ordinable but a measurable entity (Robertson 1957, p. 85).

He illustrated the argument with the picture reproduced in figure 4 below. If the consumer can say that he rates the change *AB* more highly than the change *BC*, it will always be possible to find a point *D*, such that he rates the change *AD* just as highly as the change *DC*. This is equivalent to saying that the interval *AC* is twice the interval *AD* - "we are back in the world of cardinal measurement". Robertson also expressed the argument formally. If the utility function is given by ø(x), in the sense of an index of the total utility enjoyed by a consumer, the assumption that the consumer prefers a larger amount of x to a smaller amount - so that ø'(x) is positive - than any other function F(ø(x)) will do, provided F' is positive, so that F(ø) and ø move in the same direction. Things are different, however, if we assume that the consumer can distinguish between increments of utility: $ø(x_3) - ø(x_2) < ø(x_2) - ø(x_1)$, where x_1, x_2, x_3 are any three successive values of x. Then only such functions of x as exhibit this phenomenon are eligible as indices of utility. It can be shown that any such function f(x) is bound to the original function ø(x) by the relation f(x) = Aø(x) + B, where A and B are constants. "In other words only two things remain arbitrary about the utility function - the scale in which we measure (the size of the 'util') and the point from which we start measuring. But this we knew already!" (1957, p. 86; see also [1951] 1952, p. 18, and section 3 above).
[Insert figure 4 around here]

Robertson's argument was adapted from Oskar Lange's 1934 article on the "Determinateness of the Utility Function", which had made a strong impression on him (see Robertson [1950] 1952, p. 71). Lange established formally that the marginal utility concept is linked to the assumption that utility is measurable. Hence, as pointed out by Robertson (1962a, p. 4), by using the law of diminishing marginal utility Pareto "inadvertently re-admitted cardinal utility by the back door. For use of this law involves recognition of the power not merely of comparing situations but of comparing differences of or changes in situations and labeling such differences or changes with cardinal numbers." The upshot is that either we accept that we can compare increments of utility (and therefore are committed to the cardinal nature of utility) or we decline to accept that (and therefore give up the notion of marginal utility and its diminishingness).[9] According to Robertson's ([1951] 1952, pp. 18-19) account of the development of ordinal utility theory, Hicks and Allen (1934) realized that and replaced marginal utility for the concept of marginal rate of substitution, which is equivalent to the ratio of two marginal utilities in the old cardinalist terminology. Moreover, instead of the law of diminishing marginal utility, Hicks and Allen introduced the notion of diminishing rate of marginal substitution, which essentially states that ordinal indifference curves are convex to the origin. Robertson, however, was far from convinced that Hicks and Allen had provided a rationale for the convexity of indifference curves.

> Now I was never really able to see why such a law [of diminishing rate of marginal substitution] should prevail - why, in geometrical language, the indifference curves portraying the relation between the quantities of each pair of chosen commodities should be convex towards the origin - unless we had prior knowledge that each thing independently was subject to a law of diminishing absolute marginal utility. Such knowledge, it seemed to me, was required to validate the formidable assumption which Hicks [1939, pp. 23-24] admitted to be required by his treatment - the assumption namely

that for every bundle of commodities there is a set of prices and an income level at which the consumer will demand that bundle (Robertson 1962a, pp. 4-5).

Robertson (1954, p. 667) was delighted to find confirmation for his interpretation in K. J. Arrow's (1951, p. 529) criticism that the law of diminishing marginal utility - "although bound up with the untenable notion of measurable utility" - provided a better basis for the convexity of indifference curves than Hicks's attempted justification. Frank Knight (1944), in an article that came out a few years before Robertson's first writings on the topic, had suggested yet another argument in support of the cardinalist justification for the convexity of indifference curves. Despite some imprecision, Knight's valid point (as elaborated by Robertson [1951] 1952, pp. 26-27) was that the law of diminishing marginal utility was instrumental in explaining why increases in income, by diminishing the marginal utility of goods already consumed, expand the variety of goods purchased. Cardinal utility theory fares better than the ordinal approach in accounting for the diversity issue, that is, why the consumer, when his money income increases or other prices fall, decides to add a new commodity to his shopping list instead of buying increased amounts of the old ones.[10]

While the Hicks-Allen revolution brought utility theory one step closer to eliminating all psychological elements, it remained a "definitely psychological theory, 'explaining' the consumer's behaviour in the sense of relating it to the working of his mind" (Robertson [1951] 1952, p. 19). Things started to change, however, with the development of Paul Samuelson's (1938) revealed preference theory, which attempted to derive demand functions directly from the consumer's behaviour, instead of relying on introspection and psychology (Robertson [1951] 1952, pp. 19-21; see also Lewin 1996, pp. 1309-11, for a similar account). One of Samuelson's crucial assumptions is that there is no collection of available goods for which, in some situation in respect of income and prices, he will not reveal a preference over some other collection of goods. That assumption, as pointed out by Robertson (p. 20), played a similar role to diminishing marginal utility and diminishing marginal rate of substitution in other formulations, by ensuring that the whole of income will not be spent on just one good. Robertson doubted the degree of success of revealed preference theory in "eliminating offensive psychological matter" from the theory of consumer. As much as in Hicks-Allen, Samuelson's assumption warranted Robertson's (1962a, p. 6) "suspicion of clandestine cardinalism" in ordinal utility theory. Samuelson's behaviourist approach influenced Hicks's 1956 *Revision of Demand Theory*, which dropped the convexity assumption and claimed that (i) the consumer always acts in accordance with a consistent scale of preferences, and (ii) given his supplies of all other things, he would always prefer to have more money than less (see Robertson 1957, p. 87). This last assumption implies that the marginal utility of money is positive, with no implication as to how it changes, "nor therefore any concealed infection of cardinalism" (1962a, pp. 6-7). Robertson recalled that, because of Hicks (1956), "things were looking black for my last-ditch resistance!" in the late 1950s. However, things changed with the demonstration by Peter Newman (1961) that in the modern consistency theory the convexity assumption is required after all. "Of course he does not admit that there is any smell of cardinality about it - nobody ever does. But that is not the point: I need the experts to tell me whether the beast exists or not; if it does exist, I can bring my own nose to bear" (Robertson 1962a, p. 7; underlined in the original).

Apart from the convexity assumption, Robertson's second line of defense of cardinal utility theory was represented by his criticism of the methodological principle of Occam's Razor. Although the theory of demand could be presented in a purely objective and behaviouristic fashion (as in chapter 4 of volume 1 of the *Lectures*), Robertson did not accept the view that consumer theory should merely describe choices instead of explaining them (see Backhouse 2003). It had become clear by the mid 1950s (see e.g. Graaff 1957, pp. 35-40) that the problem of measurability of utility is relevant when economists are interested in explaining choices. However, the definition of individual welfare in terms of "conjectural choices" lead to the prevailing view that their description was all economists needed. As put by Graaff (pp. 35-36; italics in the original), "to say that 'the utility of [the situation] *A* is greater than the utility of [the situation] *B*' is just a *way of saying* that *A* would be chosen. Whether or not utility is measurable - and whether or not it exists - is irrelevant." Robertson's attitude was different:

The primary business of the economist is to understand the world, not to set it right; and it

still seems to me to accord better with what we know about ourselves and other people to suppose that the consumer goes about equipped with a law of diminishing marginal utility from individual commodities and from real income in general than to suppose that he goes about clad in a ready-made network of innumerable marginal rates of substitution. The fact that the latter hypothesis, the more complicated of the two psychologically, happens to be the more economical logically, affords no guarantee whatever that it is the nearer to the truth." (Robertson 1954, p. 670).

Robertson ([1951] 1952, pp. 27-28; 1954, pp. 670-75) also discussed the implications for the cardinalism vs. ordinalism issue of the then new developments in the theory of choice under uncertainty. In particular, he examined to what extent the Neumann-Morgenstern's (1944) version of cardinal utility theory supported the traditional Cambridge approach to utility measurement. Robertson's argument ([1951] 1952, p. 28) was that Neumann and Morgenstern's attempt to derive an actual measure of utility from the degree of uncertainty faced by individuals "seem to have done as much harm as good to the cause which they have lent their distinguished aid." Under the assumption that agents act as if they were trying to maximise the mathematical expectation of utility, it follows that the theory of choice under uncertainty requires (in contrast with the theory of choice under certainty) that the utilities of which the expectation is thus averaged are measurable things expressed by cardinal numbers (Robertson 1954, p. 671). Although Robertson ([1951] 1952, p. 28) was convinced that actions in the face of uncertainty can only be analysed under the supposition that the individual can form an estimate of the relative difference in desirability between pairs of situations, he did not agree that mathematical expectation was the right way to do it. Robertson rejected the possibility of reaching an indifference point between the certain option and the lottery option. Neumann and Morgenstern are not able to account for the familiar phenomena of fair gambling and insurance, which Marshall (1920, pp. 135, 843) discussed with the help of the law of diminishing marginal utility of income. Marshall's answer, that there is plenty of room for insurance but none for gambling, followed from his moral judgment that the pleasure associated with gambling (which may exceed the loss of expected utility) is of an unwholesome kind. According to Robertson, Neumann and Morgenstern did not advance much beyond Marshall, in the sense that their model is a theory of proper behaviour rather than actual behaviour.

Neither did Robertson (1954, pp. 672-74) accept the claim of Friedman and Savage (1948) to have incorporated gambling by dropping the assumption of diminishing marginal utility of income. If the marginal utility is invariable, there will be no discrepancy between the mathematical expectation of income and the mathematical expectation of utility derived therefrom. Nevertheless, as pointed by Robertson (1954, p. 674), this would not prevent the existence of some people taking pleasure in facing uncertainty and others, displeasure. The upshot is that, "for this reason, i.e., because they ignore the pleasures or pains of uncertainty-bearing per se, I am less excited than, as a member of the cardinal Club, I should wish to be by the additional evidence in favour of cardinalism which has been turned out by the N[eumann] and M[orgenstern] and F[riedman] and S[avage] machines".[11]

6. New Welfare Economics

One of the immediate casualties of the ordinalist revolution was Marshall's consumer's surplus, an idea essential to the Marshall-Robertson version of Cambridge welfare economics. However, Hicks's (1941) article on the "Rehabilitation of the consumer's surplus" brought new life to that old concept. Robertson ([1951] 1952, p. 23; 1957, pp. 82-84) agreed that Hicks had improved on Marshall's treatment in two ways. First, by showing that Marshall's notion - that his money measure was immune from error in any case in which a price movement leaves the total amount spent on that commodity unaltered - is an illusion. Secondly, by making explicit that the measuring rod will wobble in different directions according to whether we fix our thoughts on what the consumer would pay in order to be exempted from a given rise in price or in what he would accept as an adequate compensation for suffering it, the latter

being the greater of the two.

> These refinements however are not very important - what *is* important is the claim that we can scrap the cardinality of utility and yet go on much as before; for on this claim ... has been founded a large body of work, sometimes described as 'new welfare economics', applying the concept of consumer's surplus, often more boldly and baldly than I think Marshall himself would have approved, to various problems of pricing policy, public investment, and the like (Robertson [1951] 1952, p. 23).

However, Robertson (1962a, pp. 10-11; underlined in the original) was not convinced that Hicks's quantification of the consumer's surplus did not involve comparisons of differences of utility and, by that, cardinalism. He quoted a passage from Hicks (1956, p. 86) where reference is made to the "gain" which accrues to the consumer if he succeeds in buying some extra units of a commodity for less than he would have than be prepared to pay. "But what is this gain a gain <u>of</u>, if not of utility? asked Robertson. Moreover, if the measures indicate that in one set of conditions (say when consumption is 100 units) this gain is greater, for a given price-fall, than in another set (say when consumption is 200 units), "are we not, in spite of all disclaimers, comparing the magnitudes of different <u>increments</u> of utility?"

Apart from questions pertaining to the welfare of the individual consumer, the ordinalist revolution had strong implications for the treatment of the welfare of the whole nation or other significant group. The rejection of the twin notions that the utility enjoyed by an individual is a measurable quantity and that interpersonal comparisons of utility can be made had led, immediately after Robbins ([1932] 1935), to the temporary dismissal of welfare economics as a field of economic theory - except in the restricted sense of Pareto's proposition that general welfare is greater in situation A than in situation B only if somebody's welfare is greater at A than in B and nobody's is less (Robertson [1951] 1952, p. 30). However, in due time the notion of interpersonal comparison was replaced by the proposition that it would often be possible for those who are made better off by a change to compensate those who are worse off and still remain better themselves (see Robertson [1950] 1952, p. 70). Kaldor's (1939) "compensation" criterion of an increase in general economic welfare, as further elaborated by Scitovsky and Hicks, quickly became one of the foundations of the "new welfare economics". However, "the plain man's difficulty with it is that it seems to make what *does* happen to general ecfare depend on what *might* happen, but doesn't, and very likely for practical reasons couldn't, in the way of compensation" (Robertson [1951] 1952, p. 31; italics in the original). Even if the Kaldor-Scitovsky criteria were fulfilled, all that has happened is that there has been a *potential* increase in general economic welfare; whether there has been an *actual* increase or not depends on a judgment about whether the new distribution of income is better or worse than the old, a point first made by Little ([1950] 1957, chapter 6).

Robertson paid careful attention to Little's ([1950] 1957, p. 275) criterion, which, although a byproduct of the set of compensation criteria suggested by Kaldor, Scitovsky and Hicks, differs sharply from those of the compensating school. An economic change is desirable, according to Little, if (a) the new distribution is no worse than the old, and (b) the potential losers could not profitably bribe the potential gainers to oppose the change. As clarified by Sen (1963, p. 772), Little's welfare criterion is entirely based on the assumption of transitivity. The economic welfare of the community is given by E, an ordinal function of the ordinal welfares of all individuals. The choice is between two situations Q_1 and Q_2, which represent two alternative combinations of individual welfare corresponding to E_1 and E_2 respectively. Little's condition (a) is expressed by the notion that if redistribution would be improved by moving from Q_1 to Q_2, this means that a point on the utility-possibility curve of Q_1 (which is either southwest or north-east of Q_2) is better than Q_1 (Little [1950] 1957, p. 103). This implies that there is a point H on the utility possibility curve through Q_1 such that, on Paretian grounds, either $E_H > E_1$, or $E_2 < E_H$, and that, on some unspecific grounds, $E_H > E_1$. Condition (b) says that there is no H such that $E_2 < E_H$. Therefore, we may conclude with Sen (1963) that $E_2 > E_H$, and $E_H > E_1$, which, as claimed by Little, is a sufficient criterion for holding that $E_2 > E_1$.

Sen's clarification was a reaction to the debate between Robertson, Meade and Little in the 1962 *Economic Journal* about the latter's welfare criterion (see figure 5 below, where U_a and U_b represent the

ordinal utilities of individuals a and b). The curves illustrate Samuelson's (1947, pp. 243ff) concept of "utility-possibility function", representing the maximum level of well-being any one may enjoy, given the levels enjoyed by the remaining members of the community. The shape, curvature and position of the curve depend upon the particular indexes selected to represent individuals levels of welfare (see Graaff 1957, pp. 59-63). The issue between Meade and Robertson was whether Little's point H fulfills its function, that is, to help us to compare the welfare-flows which will be enjoyed by a and b respectively if we adopt Q_2 policies with what those flows would be under existing Q_1 policies if it were possible to allot those welfare flows between the two individuals in a manner similar to that in which we shall find that they allot themselves if we move to Q_2 (see Robertson 1962b, p. 227). In order to develop his argument, Little ([1950] 1957, p. 104) introduced also point H', such that both H and H' are defined as distributionally similar to Q_2 , and therefore to each other. According to Robertson, the precise extent of the similarity would become clearer if we assumed cardinal instead of ordinal utility. In that case, H' and H can be defined as the points where their respective lines cut the straight line running from the origin through Q_2 (see figure 6 below). Robertson concluded that the intermediary point H is instrumental in helping the policy-maker to make a decision, granted that he has a good knowledge of the Q_2 situation. [Insert figures 5 and 6 around here]

Little's criterion was, therefore, seen by Robertson (1962b, p. 229) as a substantial contribution to the solution of the problem, although he remained "doubtful if it can be defended itself effectively against those who have attacked it on the grounds of its incompatibility with pure ordinalism except by replying boldly 'so much the worse for ordinalism'". Robertson was referring to Arrow's (1951b, p. 928) remark that Little's discussion of the equivalence of two income distributions means that the relative utilities of different individuals are the same in the two situations, which requires cardinal utility. The root of the problem, in Robertson's (1954, pp. 675-77), was the rejection by most of the new welfare economics of the distinction between real income on one side (conceived as a magnitude independent of distribution) and economic welfare on the other. The Pigovian tradition had drawn a distinction between the size and and the distribution of the national income and claimed that welfare depends upon them both (see Robertson [1951] 1952, pp. 35-37), an approach followed by Kaldor (1939). That tradition was challenged by Little, Samuelson and others on the grounds that we can only combine the various goods into a single quantity by weighting them, but we can only get the weights from a welfare function, which means that the weights themselves depend on income distribution (see Graaff 1967, pp. 90-92). The argument, however, as understood by Robertson, was based on ordinal utility.

In his 1962 Oxford address Robertson conceded (to Little, an Oxford economist), along the lines of his 1962 note in the *Economic Journal*, that judgments about the relative levels of economic welfare of individuals A and B can be made without taking a cardinalist view. However, the point was not to decide whether the world should have more economic welfare if it contained another Mr. A then another Mr. B. "We are concerned with such propositions as to whether a given course of action will create more ecfare for Mr. A than for Mr. B, or again whether it will create more ecfare for Mr. A than it destroys for Mr. B." According to Robertson (1962a, p. 12), this could only be accomplished by "forming an opinion about the relation between increments of real income and increments of ecfare in the case of both individuals ... and to form such an opinion requires a cardinal view of utility."

Another branch of the new welfare economic, apart from the compensation school and its refinement by Little, was represented by the "social welfare function" introduced by Bergson (1938, 1948) and further elaborated by Samuelson (1947, chapter 8). Although accepting Robbins's ([1932] 1935) standpoint, Bergson suggested that interpersonal comparisons are not really impossible, but that they cannot be made without judgments of an ethical nature. Moreover, he challenged the Cambridge belief that interpersonal comparisons of welfare require measurable welfare for any one person, as well as the notion that the assumption of cardinal utilities could dispense with the need to make ethical judgments to compare them. Bergson's new idea is expressed in the shape of a social welfare function expressed by the vector $W(u^1, ..., u^v)$, where the u's are the ordinal utility functions of the v men comprising the community. It summarizes a set of ethical judgments regarding the way in which one

individual's welfare is to be put together with another's (see Graaff 1957, pp. 8-10). Bergson (1938) expressed the Cambridge social welfare function as a particular case of his general function, where group welfare is the sum of the cardinal utilities of the members of the community: $W(u^1, ..., u^v) = u^1 + ... + u^v$. Samuelson combined Bergson's welfare function with his own utility-possiblity function to illustrate the solution by the tangency of the two functions. Again, the Cambridge solution would be represented by a tangent point where the marginal utility of income is the same for both individuals.

In his Manchester lecture, Robertson ([1951] 1952, p. 37) interpreted Bergson's function as an outcome of the rejection of the possibility of measurable interpersonal comparisons of utility, and described it as a "vast umbrella" introduced from the outside, "which tells you, among many other things, whether or not to do something which will increase A's ecfare and diminish B's, without any need for you to bother your head whether the increase in A's ecfare is greater or less than the diminution in B's." The concept of a social (not just economic) welfare function becomes relevant, from Robertson's ([1951] 1952, pp. 40-41, [1949] 1952, pp. 63-65) perspective, when one comes to the situation where other factors beyond the purely economic ones - such as "justice", "power" etc - must be taken into account in the final decision about the broad welfare implications of an economic change. He was, however, sceptical of the ability of Bergson's mathematical construction to help solve the problem. In his Oxford lecture, Robertson (1962a, p. 14) made clear that "if anybody, trying to make up his mind in the face of all these considerations, economic and non-economic, finds comfort in the thought of an all-embracing Social (not merely Economic) Welfare Function, whose maximisation would indicate that a perfect solution has been reached, he is welcome to do it - as long as he realises that this is simply a magnificent way of stating the problem, without contributing, so far as I can see, one jot to its solution.". Given the absence of criticisms by Robertson of the internal theoretical consistency of the social welfare function, one tends to believe that he doubted its practical implementation. This is what comes out of the closing paragraph of the 1951 Manchester lecture, where he referred to the maximisation of the social welfare function as indicating "that our decisions have been those which the Archangel Gabriel, or perhaps only those which uncle Joe Stalin, would have made in our place." Robertson felt that Bergson's attempt to find a mathematical expression for social welfare had some points in common with his own emphasis on quantification in welfare economics, but the differences were even more significant.

Robertson's reaction to Bergson's social welfare function was, therefore, distinct from Lange's, who, after claiming in 1934 that although not strictly necessary to demand theory, psychological introspection (and cardinal utility) was necessary for a theory of human welfare, embraced in 1942 ordinalist welfare economics on the grounds that it is not open to the epistemological criticism of lack of operational significance (Lange 1942, p. 215). Robertson, on the other hand, as discussed above, did not believe that economics should dispense with non-operational propositions.

7. Concluding remarks

Robertson's sustained effort in the 1950s and early 1960s to protect Cambridge from the criticism of new welfare economics was based on his view that the replacement of the law of diminishing marginal utility of income - which made possible interpersonal comparison of utility - by compensation criteria and the social welfare function did not represent progress in the field. His defence of cardinal utility was not restricted to welfare economics, but included also demand theory, since ordinal utility could not provide a better account of the consumer's behaviour, especially the crucial assumption that indifference curves are convex towards the origin. This was associated with an emphasis on material welfare as the domain of economics.

Samuelson (1974, p. 1285, n. 23) has suggested that Robertson's writings on utility in the 1950s "received attention primarily from the already converted, and were received with condescending silence by the *avant garde* ordinalists with whom he hoped to debate; in view of the work he put into the matter, this is a pity." This statement may be true of Samuelson's own lack of response to Robertson's arguments about utility, but it is not a fully accurate description of that literature. Economists paid attention to

Robertson's claims, if not because they came from "the wisest and most eminent economist in this country" (Robbins 1953, p. 111). Reactions (most of them critical) came also from Friedman (1955), Armstrong (1955), Kennedy (1954), Baumol (1958), Hicks (1956, chapter 2), Graaff (1957, pp. 35-40), Bergson (1966, pp. 63-70) and others.

Robertson's explorations into pure utility theory had also some impact in Cambridge, as judged by Pigou's (1953) chapter on utility. Although Pigou did not refer to Robertson, the references to the distinction between measurement "in practice" and "in principle" (p. 40) and to the formal demonstration that acceptance of diminishing marginal utility entails acceptance of cardinal utility (p. 43) indicate that he was well aware of Robertson's 1952 *Utility and All That*. Such references cannot be found in Pigou (1951), where he had conceded to the ordinalists that utility is not measurable, but maintained that interpersonal comparisons can be made based on differences in utility - a not perfectly consistent argument, as pointed out by Kauder (1965, p. 199). Furthermore, Pigou's (1953, p. 45, n. 3) interpretation, that Robbins's denomination of interpersonal comparisons as "value judgments" was "merely... a difference of name" (as compared to the Cambridge approach), was hardly precise. Robertson may also have had some influence over Cambridge students at the time, including Amartya Sen, who arrived at Trinity College in 1953. As recalled by Sen, his teachers at Trinity - Dobb, Sraffa and Robertson, whom he "came to know quite well" - were the main influence, together with Joan Robinson, his thesis supervisor.

> And then Robertson was very important. He presented good, critical reasons for being sceptical of behaviourism, including the notion of revealed preference that had by then taken hold of economics. The idea that we can understand human beings in terms only of their behaviour, and then only their non-verbal behaviour, never through conversation ... was very alien to the Marshallian part of the Cambridge tradition, a tradition I came to admire a lot. The natural heir to that tradition in my students days was Dennis Robertson (Sen's interview in Klamer 1989, p. 138).

Sen at first entertained the idea of embarking on a thesis on welfare economics, under the encouragement of Robertson and Dobb. "Dennis Robertson felt that it was a sensible thing to do, but he was clear that utility provided enough of a basis for all welfare economics" (p. 140). Eventually Sen wrote a dissertation on the choice of techniques under J. Robinson, who had no interest in welfare economics at all. However, Sen would be one of the founders in the 1960s and 1970s of the field of social choice, where the informational issues related to interpersonal comparisons of utility and use of non-utility data became central. From that perspective, Sen's (1970, especially chapters 7-9) careful investigation of the possibility that collective choice depends not merely on individual orderings but also on interpersonal comparisons of levels of welfare or of marginal gains and losses of well-being of individuals represented a return to and further development of the issue of utility measurement discussed at Trinity in the 1950s.

Notes
1. Cooter and Rapporport (1984, p. 519) did refer to Robertson ([1951] 1952, p. 14), but only to mention his reference to J. N. Keynes's *Scope and Method of Political Economy*, a book that, as Robertson put it, "to be quite honest I doubt if many of us read it" in his student days at Cambridge.
2. It is somewhat of a puzzle that Cambridge economists did not react in the 1930s to Robbins's criticism. In correspondence with Robbins (held in Trinity College, Cambridge) of 2 June 1932 Robertson acknowledged receiving Robbins's 1932 book, "which I hope to read by the time I see you, but cannot be sure". It is likely, therefore, that Robertson discussed the book with Robbins in a private meeting.
3. As pointed out by Robertson (1962a, p. 9), it was clear to Marshall that the assumption of utility measurability is only valid if we reckon from a sensible starting-point, which must be above zero in the case of a line of expenditure essential to support life. This is related to Bergson's (1966, p. 67) interpretation that even admitting cardinal measurability, it would define the relation of satisfactions to income only in terms of two dimensional constants. If $S(M)$ represents any admissible set of magnitudes for the total satisfactions derived from income M, so too would all other sets given by $AS(M) + B$, where A and B are the dimensional constants. Only A matters in the comparison of increments of satisfactions,

but this must still be settled by convention.

4. According to Robertson (1957, p. 76), Marshall (1920, math. app., note 6) was confusing in the passage where he explained the assumption that the proportion of a man's income spent on tea is small. It is not clear whether Marshall is suggesting that, in the event supposed, the crude measure of consumer's surplus is too big or too small, and whether he is suggesting that it needs correcting by two separate operations or by one only.

5. As stressed by Robertson (1957, p. 72, italics in the original), this is "what I *believe* to be the Marshallian view". Robertson's interpretation that Marshall was largely consistent on the issue of utility measurability contrasted with Pigou's (1951, 1953, chapter 5) criticism of Marshall in that regard.

6. The differences between Marshall's and Pigou's frameworks has led Myint (1948, chapter 10) to suggest that there were two, not just one, Cambridge schools of welfare economics.

7. As pointed out by Robertson, *ON'* is also the monopolist perfect price discrimination solution, which satisfies the marginal conditions but does not generate a deficit.

8. On Pareto's inconsistency see Weber (2001).

9. Robbins (1953, p. 104) rejected Robertson's conclusion that repudiation of cardinal utility involves surrender of the claim that the consumer can compare differences between situations, as contrasted with comparing situations, in respect of their utility. Hicks (1954) essentially agreed with Robertson against Robbins's interpretation of the issue.

10. See also Mandler's (1999, pp. 93-96) discussion of Robertson's argument about convexity. As pointed out by Mandler, the Robertson-Knight point about the introduction of new consumption goods implicitly supposes that the agents consider the utility of goods not yet consumed to be independent of current consumption.

11. Friedman (1955) replied to Robertson's criticism. According to Kauder (1965, p. 216), the rebuttal to Robertson's comment should be that the pleasure and pain of uncertainty is a factor shaping the utility function and not outside it. See also Baumol's (1958) argument that Robertson's criticism does not apply because it is not the purpose of the Neumann-Morgenstern utility index to set up any sort of measure of introspective pleasure intensity, and that the word "cardinal" denotes something different from the usual neoclassical meaning.

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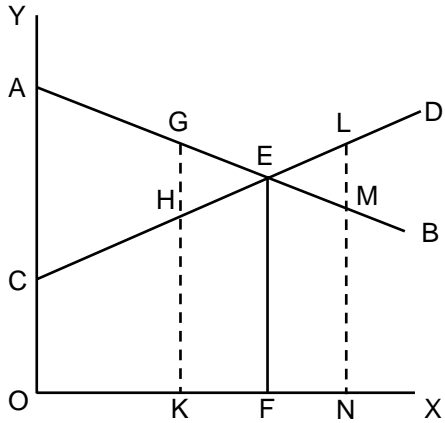Weber, C. 2001. Pareto and the 53 Percent Ordinal Theory of Utility. *History of Political Economy.* 33: 541-76.

Figure 1. The Economic Problem
Source: Robertson, 1957, p.34.
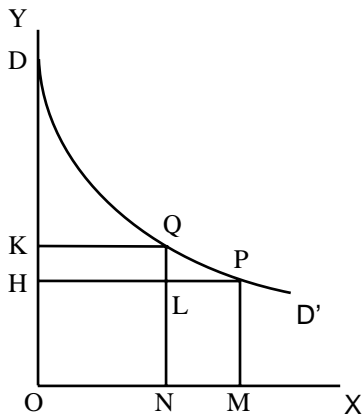
Figure 2. Consumer's Surplus
Source: Robertson, 1957, p.75.
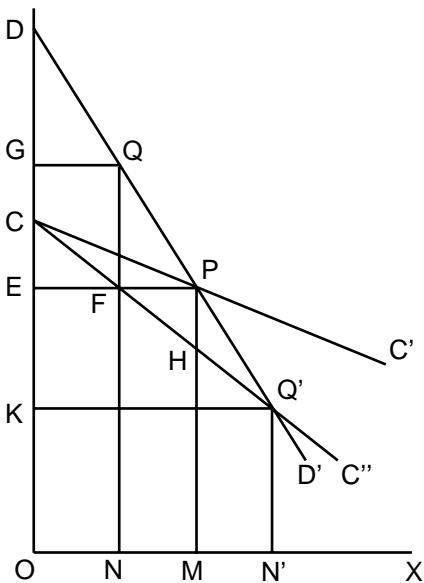
Figure 3. Consumer's Surplus and Monopoly
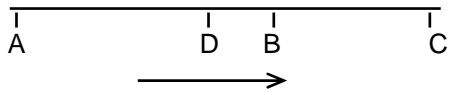Source: Robertson, 1957, p.160.

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Figure 4. Comparison of Changes in Situation
and Measurability of Utility
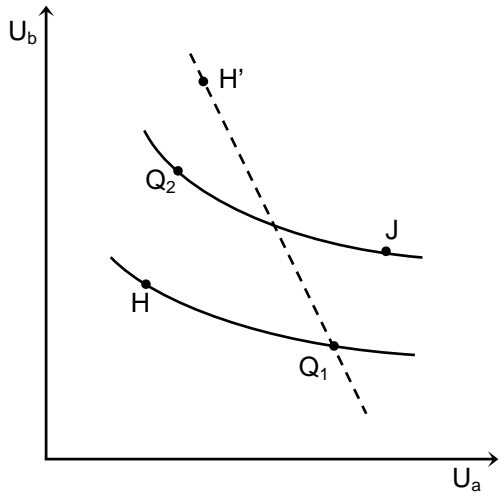Source: Robertson, 1957, p.85.

Figure 5. Little's Welfare Criterion
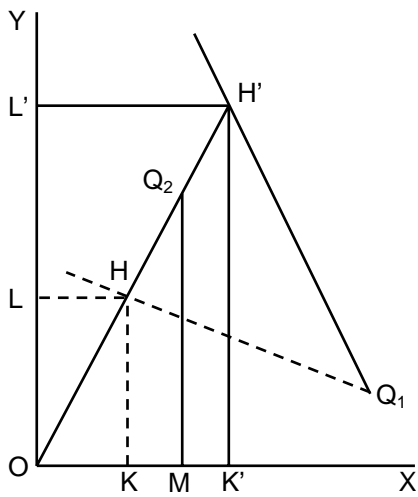Source: Robertson, 1962b, p.226.

Figure 6. Little's Welfare Criterion Under Cardinal Utility
Source: Robertson, 1962b, p.228.