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1. The currently accepted scenario for theorizing about social choice-making emanates from Arrow's famous work (1963). The concept of a social state plays a crucial role in this scenario. We shall be arguing that this concept as the basis of the theory of social choice is inconsistent with any acceptable notion of individual liberty. In the alternative scenario that we shall propose, the set of all possible human actions is conceived to be partitioned into two disjoint classes, over one of which there is no need to seek a social ordering in a political democracy. In this class are included individuals' activities like production, consumption, recreation and so on, regarding which society lays down some rules and regulations with which individual actions must comply. These rules and regulations - along with some other collective activities - compose the other class: in a political democracy there is a need for a social ordering only over this class.

The use of the word scenario is deliberate: our focus will be on what is an appropriate conceptualization of the process of social decision-making - appropriate from the standpoints of its internal logic, realism and usefulness.

2. In the scenario which emanates from Arrow, the aim is to find a social choice rule which for each set of individual orderings for alternative social states (one ordering for each individual), states a corresponding social ordering of alternative social states. Arrow imposed four conditions of correspondence on this rule.[2] They are: (1) Unrestricted Domain: The domain of the social choice rule includes all logically possible combinations of individual orderings. (2) Pareto Principle: If every individual prefers x to y, then society prefers x to y. (3) Independence of Irrelevant Alternatives: For any pair of alternatives, social choice depends only on the individual choices concerning that pair. (4) Non-dictatorship:

There is no individual whose preference is always adopted by the society for any pair of alternatives. Arrow's general possibility theorem is that there is no social choice rule (which would give a transitive and connected ordering of the alternatives) satisfying these four conditions.

The alternatives of choice in this model can be interpreted to be any kind of alternatives - e.g. candidates in an election, or proposals in front of a committee. However, in the scenario which has come to be accepted in the theory of social choice (and the theory of economic policy generally), these alternatives are interpreted to be social states. Arrow has the following to say about this:

> "In the present study the objects of choice are social states. The most precise definition of a social state would be a complete description of the amount of each type of commodity in the hands of each individual, the amount of labout to be supplied by each individual, the amount of each productive resource invested in each type of productive activity, and the amounts of various types of collective activity, such as municipal services, diplomacy and its continuation by other means, and the erection of statues to famous men". (Arrow, 1963, p.17)

Other writers have defined a social state similarly. Sen defines it as "a complete description of society including every individual's position in it"(1970,p.152); and Pattanaik says, "I shall ... interpret the elements of S [i.e., the set of all alternatives] as alternative social states, a social state being a complete specification of the conditions prevailing in the society through time" (1971, p.4).

3. We shall refer to the conception in these definitions as an integral, non-factorable social state which must be viewed by an individual in all its entirety. With such social states as the alternatives of choice, we have a scenario where each item of all individuals' life styles is to be

determined through social decision-making process. However, the general belief among economists is quite the opposite. In particular, it is generally thought that Arrow's scheme provides for the following ethical attitude:

> "... there might be matters on which our explicit views take the form: people should do what they want with regard to that matter. It is in these cases where our ethical view wants to be in certain matters, it is good that men should freely exercise their choice, or at least their choices should count, that Arrow's argument is relevant ..." (Bliss, 1969, p.911)

Consider three social states, {x, y, z}; in x, a coloured person (C) lives in a house next door to a white person (W); in y, C lives in the same house but pays W some 'compensation' per month to buy his approval for living next door to him; in z, C lives away from the white man in question. Let us assume that C prefers x to y to z, but that W prefers z to y to x. Let us also suppose that if C lives next door to W, he does not cause any physical nuisance of any kind. It would then seem that according to any reasonably democratic set of value judgements, C should be allowed to live where he likes. Provided certain universal (universal in the sense that they are the same for all individuals in a society irrespective of their race, or wealth, etc.) rules and regulations - e.g. about town planning matters - are complied with, in a political democracy each individual is allowed to be the arbiter in the matter of where he will live. Similarly, subject to similar rules and regulations, each individual is allowed to be the arbiter regarding the choice of occupation, personal appearance, ways of enjoying sex, research, innovation, production, consumption, and so on. Though nearly each action an individual takes is circumscribed by some social rules and regulations, no political democracy seeks to determine all individual actions. Hence there is never any need in such a society to seek a social ordering over vectors of all or even most indiv-

idual actions (each such vector being an integral social state). Individual liberty in any meaningful sense is inconsistent with a scenario which requires a collective choice from among a set of integral social states.

It is not surprising that with such integral social states as the alternatives of choice, Arrow's conditions[3] have been found to be incompatible with what Sen[1970a] describes as the condition of minimal liberalism, namely that "there are two individuals such that for each of them there is at least one pair of alternatives [of integral social states] over which he is decisive, that is, there is a pair of x, y such that if he prefers x (respectively y) to y (respectively x), then society should prefer x (respectively y) to y (respectively x)" (p.154). The proof proceeds thus. Let x, y, z, and w be all distinct social states. Let individual 1 prefer x to y, and individual 2 prefer z to w. Let everyone in the community including 1 and 2 prefer w to x and y to z. Now by the condition of minimal liberalism, society should prefer x to y and z to w, while by the Pareto principle society must prefer w to x, and y to z. Hence there is no best alternative social state in this set {x, y, z, w}, and a social decision function does not exist for any set which includes these four alternatives.[4]

This apparent dilemma has led some economists to believe that there is a contradiction between liberalism and the Paretian principle (i.e., that if everyone prefers x to y then the society should prefer x to y), and they have, therefore, abandoned their faith in the Paretian principle in order to save their liberalism.[5] But the contradiction that Sen demonstrates is wholly due to the fact that the alternatives of choice are defined as integral social states. If each alternative <u>is</u> "a complete description of society including every individual's position in it", then the condition of minimal liberalism is ill-formulated, because to make an individual decisive over even one pair of integral social states, is to make him decisive

about every other individual's all conceivable activities in those two social states - including the way they sleep, the colour they paint their walls, and the books they read. But, surely, if there is to be any individual liberty, then the elements of the set of all possible human actions must be partitioned into two disjoint classes - in one of which are elements regarding which individuals are free to do what they like provided certain rules of conduct are obeyed, and regarding which there is no need to seek a social ordering; and in the other of which are elements describing those rules of conduct and other collective activities (like foreign policy and defence expenditure, etc.): it is only regarding this latter class of elements that there is ever any need for a social decision-making ordering in a political democracy. What kind of equivalence relation enables us to do this partitioning, and where it may come from, are matters which unfold in the ensuing sections.

5. In a more recent publication (1967) than his book, Arrow has argued against the kind of factoring of the set of individual actions (or decisions) that we have described above. He says:

> "I certainly do not wish to deny that such factoring takes place, but I do wish to emphasize that the partition of a social action into individual components and the corresponding assignment of individual responsibility is not a datum. Rather, the particular factoring in any given context is itself the result of a social policy and therefore already the outcome of earlier and logically more primitive social values" (Arrow, 1967, p.125)

There can be no doubt that the demarcation between individual and social actions - or, rather, what (and how many) are to be the social rules and other such things governing individuals' actions - cannot be imagined to fall from heaven. How these things emerge, rather how they should emerge, needs to be discussed and evaluated. But Arrow goes on to say something

which seems to imply that his particular scenario with its particular conditions of correspondence and with the alternatives of choice interpreted as integral social states (or integral social actions), needs to be also applied to that stage of social decision-making where the partitioning of the set of all possible human actions is decided upon.

> "To conclude, then, we must in a general theory take as our unit a social action, that is, an action involving a large proportion or the entire domain of society. At the most basic axiomatic level, individual actions play little role. The need for a system of public values then becomes evident; actions being collective or interpersonal in nature, so must the choice among them. A public or social value system is essentially a logical necessity" (Arrow, 1967, p.123).

But this line of argument can be applied to any scenario for a theory of social choice. Let us describe the decision to use Arrow's scenario (with its particular four conditions of correspondence and the interpretation of alternatives as integral social states) as the result of applying the nth. order social decision function. But this implies that there must have been an n-1 th. order social decision function, the application of which resulted in the choice of those four conditions and the Arrowian definition of /alternatives/ the of social choice. This n-1 th. order social decision function must logically also be preceded by an n-2 th. order social decision function, and so on. Indeed, there is an infinite regression here.

6. Hence it is inevitable that in any scenario of social choice, this infinite regression will be cut short somewhere or other and somehow or other. Rawls (1972) cuts it short with his concept of the original situation and the associated assumptions and value judgements. Arrow cuts it short with the imposition of the four "reasonable" conditions and the definition of an alternative of choice as an integral social state or a social action "involving a large proportion or the entire domain of society" (1967, p.121).

But it remains fundamentally relevant to examine how realistic (and therefore how useful), and how reasonable (and therefore how morally attractive) is any proposed scenario of cutting short this infinite regression. And this takes us back to the point we made above that the trouble with Arrow's scenario is that with the alternatives of choice defined as entire, integral social states, there is no freedom left for an individual to do what he likes regarding at least some matters. Moreover, even if the social state vector were defined to consist only of what Arrow has described as the "non-trivial" (1967) / , p.121) actions of the individual, then in anything other than a highly efficient command economy (perhaps even in such an economy), it is unrealistic to assume that the society (or, rather, the government) could possibly totally determine all the "non-trivial" individual actions. What jobs people take up; what, how, and how much they produce; what, and how they consume; what use they make of their leisure time - these and many other "non-trivial" actions (along with certain social policy rules, regulations and decisions) determine what the actual components of a social state vector will be in any period. A theory which expects each individual to have an ordering over such vectors, and then for a social ordering over such vectors to emerge, is so unrealistic that it cannot have any implications which are of practical use. Individuals do not (and cannot?) possess such orderings , and societies do not (and <u>should</u> not) seek a social ordering defined over such vectors.

7. Given that the infinite regression referred to above must be cut short at some stage, in the alternative scenario for the theory of social choice that we propose, we assume that individuals have already come to agree on something like Rawls's (1972) first principle of justice: every individual is to be as free to pursue his life style and life design as is consistent with similar freedom for all. In this list of liberties we would include - apart from the various political freedoms and such things as freedoms of

conscience and thought - the freedom to produce and consume, take part in mutually agreed exchange of goods and services, and to give and take gifts, etc. However, the requirement of "compatibility" of such freedoms for one individual with similar freedoms for others, is to be interpreted broadly. Ensuring "compatibility" requires not only civil and criminal laws and a police force, but also perhaps progressive taxation, anti-trust laws, nationalization of some industries and so on. The word perhaps is deliberately emphasized, because though it is already agreed in the society that there is a set of almost infinitely many elements of individual actions about which individuals are to be free, nevertheless what the rules governing these actions are, and what particular activities would be performed collectively - i.e. by the agency of the organized society, viz. the government - remain to be decided. One might say that we visualize individuals as born free, but voluntarily enacting some social rules and setting the government some tasks. We shall term all such things as social policy variables. Their values are not necessarily chosen to remain fixed for all time. Once, in any given period, these things have been decided upon, they are parameters of the social environment for any individual in his individual capacity. Therefore, depending on the context, we shall refer to them as social policy variables or parameters.

Let us denote the set of all possible human actions by $\overline{X}$. The original agreement referred to in the preceding section then partitions this set into two disjoint classes:

$$\overline{X} = \{\{X_1, X_2, \ldots X_m\} \ , \ \{Y_1^g \ , Y_2^g \ , \ \ldots \ , \ Y_m^g \}\};$$

$$g = 1, 2, \ldots s$$

where X_i and Y_j^g's are vectors. X_i are the social policy variables. The

components of a vector of a social policy variable are the various possible values of that variable. There are s individuals. Y_j^g is the vector of various individual activities of g th. individual, about which he is free to do what he likes - provided any rules specified by any of the X_i are complied with. For any person, the set of possible activities in any given period is extremely large; one might say it is almost infinite. As Samuelson has said, "... actually what is called 'freedom' is really a vector of almost infinite components rather than a one-dimensional thing that can be given a simple ordering"(1967 p.1414). We assume that in our society there is no desire to centrally determine each Y_j^g, and therefore no desire to search for a social ordering over the components of Y_j^g's; the society is only interested in influencing and circumscribing the Y_j^g's through the X_i.

Of course, the society in its organised form, i.e. the government, also buys and sells things in the market. It buys the services of judges, civil servants and policemen, etc.; and it may sell electricity, coal or tobacco. But the behaviour of society in this role is controlled by the same parameters of social policy as is the behaviour of a private individual who hires labour or buys or sells a product. So this raises no special problem. But whether the society (or rather the government) will hire any judges and policemen, etc., and whether it will own coal-mining or tobacco manufacture are themselves social policy variables on which a social ordering needs to emerge from the individuals' orderings regarding these variables of social policy. It may be that the state ownership of coal mining can be considered in isolation from all other social policy variables. But if that is not so, and it is commonly felt that this question cannot be considered in isolation from the question, say, of regional distribution of employment, then these two questions together form a composite social policy variable for which a social ordering is to emerge from the individuals'

orderings. We shall be returning to this question of composite social policy variables.

8. Before describing our scenario further we must consider a possible objection to it - which, as it happens, has been raised by Arrow (1967). Having argued that "we must in a general theory take as our unit a social action, that is, an action involving a large proportion or the entire domain of society", he goes on to say:

> "The point is obvious enough in the context that we tend to regard as specifically political. The individuals in a country cannot have separate foreign policies or separate legal systems". (Arrow, 1967, p.123).

And obviously nor do individuals have separate tax policies (or tax rates), or separate motorways, or separate policies regarding old age pensions, etc. But the scenario we are proposing does not assume that a separate legal system or a separate fiscal system is provided to each individual. The same legal system is created for all. The same fiscal measures apply to all individuals within certain groups[6] (e.g. old-age pensioners, those earning a certain amount, those buying whiskey, and so on); as the circumstances of a particular individual change, then at least in a political democracy fiscal (or other) measures are <u>not</u> changed to suit or discommode that particular individual. Legal system provides the same basic rights and obligations for all, but how much <u>direct</u> use an individual makes of the legal system (e.g. by filing law suits, etc.) is left for the individual to decide. No direct price has to be paid for the use of motorways, but for the use of the services of judges, etc., in the law courts, there is a court fee to pay.

Indeed the social policy parameters, i.e., the legal and fiscal

systems, and other social rules and regulations governing the individuals, are in the nature of public goods. They are simultaneously provided for all individuals composing the whole society or a well-defined special group; indeed a basic value judgement in a political democracy (which may be assumed to have been settled in the original agreement) is that social policy parameters must be the same for all individuals. Thus, on ethical grounds the X_i none of factorable; some of them may also be non-factorable on technological grounds. However, though a social policy parameter is non-factorable in this sense, from our foregoing discussion it is clear that the same cannot be said about the set of all possible human actions.

9. Each individual, g, is assumed to have an ordering over each social policy variable X_i. Each individual, g, also has an ordering over Y_j^g. Some individual r may or may not have orderings for Y_j's which are the vectors of other individuals' activities; in other words, an individual may or may not have preferences about other individuals' activities like consumption, production and recreation, etc. In any case, any individual's ordering over any X_i is assumed to take account of the fact that the value of any X_i that society chooses will have consequences for both his Y_j and other individuals' Y_j's. Hence in framing his preferences over the X_i's, an individual is assumed to take account also of his preferences over his own Y_j, and also his preferences over the others' Y_j's if he has any. The society is interested in a social decision function for only each of the X_i's, and not any of the Y_j^g's. Regarding the Y_j^g's individuals can do what they like so long as any rules and regulations implied by any of the X_i's are adhered to.

10. Recall that Y_1^g, Y_2^g, ... Y_n^g are the vectors of individual actions or decisions about production, consumption, recreation and so on. Each individual g has qualified autonomy regarding these: the qualification being

that these actions are conditioned by the social policy parameters X_1, X_2, ... X_m. For example, tax laws must be complied with as an individual goes about his consumption and production activities. Activities Y_j^g's are voluntary activities. They include mutually agreed exchange of factor services and goods. They may also include voluntary charity, and other altruistic actions (like contributing to relief funds, etc.). We do not have to assume that the actions chosen in the sector Y_j^g by the individuals are motivated only by selfish ends. This sector does not exactly coincide with the price system, though most of the actions in this sector take place in the price system. Again though most of the workings of the price system belong to the Y_j^g sector, it is affected by the X_i because some of the social policy parameters define the rules under which voluntary exchange can take place, and because some of them involve the government in buying and selling in the market. It is also worth pointing out that the freedom to trade, exchange, buy and sell things is assumed to be one of the freedoms reserved for the individuals in the original agreement. Qualifications on this freedom (e.g. not to trade in dangerous drugs and such like) and the rules and regulations governing this freedom are themselves a social policy variable. But the society as a whole is not assumed to be interested in each and every possible good that particular individuals will buy or sell; only some particular goods, and the conditions under which exchange will take place, are of interest to the society. Hence the social ordering is only concerned with these few (?) particular goods, and with the rules governing exchange; not with all individual choices in the market.

11. The society is also interested in distributive justice. Some individuals - e.g. the old, sick, disabled, feeble and retarded - may have very little or nothing to sell; hence they can buy very little or nothing if left to their own devices. Even regarding the distribution among the able-bodied, society may want to alter the distribution that would emerge

from the voluntary actions in the Y_j^g sector. But what is it the distribution of that the society might like to alter? The social preferences in this matter can hardly be directly in terms of the distribution of this good and that; for then the governments would collect redistributive taxation in specified goods, and, similarly, give redistributive transfers in specified goods. This almost never happens. Redistributive social policies in a political democracy are concerned with the distribution of purchasing power - coupled with almost a total freedom to individuals about how they will use that purchasing power. It is undoubtedly true that changes in the prices of goods and services alter the distribution of purchasing power; and that, therefore, such changes need to be taken into account from time to time in the social decisions regarding the relevant X. What sort of changes in prices are to be taken into account, and to what extent, are obviously value judgements. Hence it is not only the redistributive fiscal and other measures, but also cost of living indices, which are based on value judgements.

12. Let us write R_i to represent the social decision function (or rule) regarding an X_i, and R_i^g to represent any individual's ordering over an X_i. Each R_i is a function of the individuals' orderings R_i^g. Thus we have

$$R_i = F_i(R_i^1, R_i^2, \ldots, R_i^s) \; ; \; i = 1, 2, \ldots m$$

We must recognise that it may not be possible for individuals to form orderings over some social policy variables in isolation from some of the other social policy variables. For example, it may be difficult to form judgement about direct taxation without taking into account indirect taxation (and direct and indirect subsidies - though these can be expressed as negative taxes), and government expenditure on various items. To the

extent that this is true of some group of social policy variables, they are to be bunched together as one (composite) policy variable - over which individual orderings are to be sought and then aggregated into a social ordering. When a policy variable is composite, it is likely, if not inevitable, that an individual would judge it in the light of multiple criteria.

Someone may want to argue that all possible policy variables are so intimately interconnected that the process of grouping them does not stop till we have grouped them all into just one composite social policy variable - quite like an integral social state. But such a viewpoint is unrealistic, because it implies that unless the individuals (or their representatives) in a society can agree on, say, fiscal policy they cannot agree on, say, the basic political rights of the individual, or the foreign policy. Though there is some grouping among social policies, they obviously form more than just one group. It is also worth remembering that most of the X_i have components which are different possible rules affecting individual behaviour. Therefore, inter-relationships among some of the alternatives of choice are likely to be less strong than they would be if individuals had been conceived to be forming orderings over individual commodity allocations.

13. We must now ask what conditions of correspondence are to be imposed on each of the R_i, which are the separate social decision functions for each of the X_i. Let us first note that the principle of equal liberties for each individual compatible with similar liberties for all is not one of the social policy variables represented by X_i. We assume that this principle has already been argeed by all in a hypothetical original situation of the kind Rawls (1972) described. It is that principle which ordains us to partition the set of human actions into two classes; one consisting of X_i, and the other of Y_j^g's; each individual has similar equal liberty about the

latter, circumscribed by the former.

It is quite possible that a different set of conditions of correspondence would seem ethically attractive for the different F_i, depending on the social policy variable in question. If the social ordering to be aggregated is about a law concerning mercy killing, then it is possible that the conditions of correspondence which seem attractive in this case may not seem so attractive if the social ordering is over the set of different fiscal policies.

Regarding some of the F_i, we may want to impose Arrow's four conditions. In that case, his "possibility theorem" applies. However, its implications are not so serious in our scenario as in the one currently used. In our scenario, the theorem would imply that if we do accept his four conditions in connection with the search for a particular social decision function R_k, then we must accept the possibility of intransitive social rankings over the set of different values of the k th. social policy variable. Though this is serious, it is much less so than the prospect of intransitive social rankings of entire, integral social states.

14. A number of writers have argued that there may be a hierarchical structure of individual wants.(7) We may assume that this provides each individual with a hierarchy of criteria by which he orders the alternative values of each X_i. A hierarchy of criteria is likely to include the specification of the minimum level that a higher criterion should satisfy before the next one is applied. Now it is possible that such lexicographical orderings of criteria of different individuals by which they assess different possible values of a particular X_k, have a great deal in common; it may well be that the minimum requirements regarding some of the higher criteria, and their order of priority, would coincide for all indiv-

iduals. To the extent that this is so, it would help the social choice of a particular value of some X_k - a value that all individuals agree satisfies a certain number of hierarchically arranged higher criteria. There may be some different value of X_k that some individuals would prefer on some further lower criteria, and, similarly, some other individuals may prefer some other value of X_k on the further lower criteria of their own; but failing agreement on these further, lower criteria, for the moment a compromise value of X_k is chosen.

The approach we have just described resembles Kornai's (1971) approach in terms of what he calls bounds on acceptance. Of the set of all possible different values of a social policy variable X_k, individual (or a sub-group of individuals) p find a subset X_k^p as the minimum acceptable in the light of the criteria they use. This acceptable subset of X_k which satisfies the minimum essential requirements of the sub-group p helps to identify the bounds on acceptance on this sub-group. Similarly, another sub-group of individuals, q, may find another subset, X_k^q of X_k as the minimum acceptable. The intersection of these subsets X_k^p , X_k^q , etc., constitutes the set of decision alternatives acceptable to the society as a whole; it is the set of acceptable compromises. It may well be that in the first round of discussions and arguments, this compromise set is found to be empty; but since, as he rightly argues "decision process takes place over time" (1971 p.97), mutual discussion and persuasion are likely to lead to some of the bounds on acceptance being modified, so that an acceptable compromise decision on the value of X_k to be chosen emerges.

Whether individuals do have a hierarchy of criteria (with specified minimum requirements for each), what these criteria are, to what extent they are similar among indviduals - all these and similar other questions would be useful topics for socio-psychological research. If it turned out

that this model is not realistic, then though that would be unfortunate, it would not by any means be crucial to the alternative scenario for the theory of social choice suggested in sections 7 to 12. In any case, much more detailed speculation is necessary than is provided here in sections 12 and 14 about the different kinds of X_i, and what would seem to be ethically attractive conditions of correspondence for the associated social decision rules as functions of individual orderings, but this must await another occasion.

15. We have been concerned in this paper with the question of what is an appropriate scenario for the theory of social choice. We started by questioning the realism and usefulness of interpreting the alternatives of social choice as integral social states or social actions. We showed that such a conceptualization is inconsistent with the value judgement that each individual should have the right to choose for himself at least some non-trivial actions.

We have proposed an alternative scenario. In it individuals are conceived of as having come to a prior agreement according to which the set of all possible human actions is partitioned into two subsets: regarding the elements of one of these individuals are free to choose what they like provided they comply with certain social rules and regulations of which the other subset consists. The need for a social ordering arises only in connection with this latter subset. The social rules and regulations, or what may be called social policy variables, are not necessarily fixed for all time. We have argued that an assumption of some kind or other of a prior agreement among individuals is inevitable in any scenario because any nth. order social decision-making process must presuppose an n-1th. order social decision-making process (which supplied the rules and conditions for the nth. order process), and that each scenario has its explicit or implicit way of cutting short this infinite regression. Finally, we argued that it may

be possible for individuals to form orderings of the different values of some social policy variables independently of the other such variables.

The advantages of our proposed scenario are that it conforms with the basic liberal democratic value judgement that individuals should be given as much freedom as is consistent with similar freedom for others; and that by assuming some further possible partitioning of the restricted area of social decision-making it helps to explain the commonly observed phenomenon that even if individuals in a political democracy cannot agree on a consistent ordering of the different values of some social policy variable, they nevertheless often come to agreed and consistent decisions on some other social policy variables. However, our scenario does not imply that there will never be any conflict of individual preferences regarding social matters; but it puts such conflicts in their proper perspective.

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Footnotes

(1) I would like to acknowledge that in formulating my ideas about the appropriate scenario for the theory of social choice, I found much stimulus from the two profound papers by Little (1952) and Samuelson (1967).

(2) In the second edition of Arrow's book (1963), the five conditions have been replaced by the four which we shall be mentioning. There are several equivalent versions of these conditions; for a helpful comparative survey, see Pattanaik (1971, Appendix to Ch. 3).

(3) In fact, Sen (1970a) develops this particular paradox without imposing the condition of independence of irrelevant alternatives.

(4) Sen (1970b) has explored the consequences for Arrow's general possibility theorem if the requirement that the social decision function give a connected ranking is dropped. In the article (1970a) dealing with the liberals' dilemma, the social decision function is not necessarily required to give a connected ranking of all the social states under discussion.

(5) See Peacock and Rowley (1972).

(6) This requires some further comment. The special groups would be such as those of the old, disabled, those living in depressed regions, and so on. They obviously do not cover all individuals in the society. But the criteria on which the members of these groups are chosen are equally applicable to all individuals.

(7) For one of the original explorations in this field, see Georgescu-Roegen (1954), and for further development of these ideas, see Chipman (1960). A brief account is available in Rothernberg (1961).

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