THE POSSIBILITY OF SOCIAL CHOICE

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by

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"A camel," it has been said, "is a horse designed by a committee." This might sound like a telling example of the terrible deficiencies of committee decisions, but it is really much too mild an indictment. A camel may not have the speed of a horse, but it is a very useful and harmonious animal – well coordinated to travel long distances without food and water. A committee that tries to reflect the diverse wishes of its different members in designing a horse could very easily end up with something far less congruous: perhaps a centaur of Greek mythology, half a horse and half something else – a mercurial creation combining savagery with confusion.

The difficulty that a small committee experiences may be only greater when it comes to decisions of a sizable society, reflecting the choices "of the people, by the people, for the people." That, broadly speaking, is the subject of "social choice," and it includes within its capacious frame various problems with the common feature of relating social judgments and group decisions to the views and interests of the individuals who make up the society or the group. If there is a central question that can be seen as the motivating issue that inspires social choice theory, it is this: how can it be possible to arrive at cogent aggregative judgments about the society (for example, about "social welfare," or "the public interest," or "aggregate poverty"), given the diversity of preferences, concerns, and predicaments of the different individuals *within* the society? How can we find any rational basis for making such aggregative judgements as "the society prefers this to that," or "the society should choose this over that," or "this is socially right"? Is reasonable social choice at all possible, especially since, as Horace noted a long time ago, there may be "as many preferences as there are people"?

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I. SOCIAL CHOICE THEORY

In this lecture, I shall try to discuss some challenges and foundational problems faced by social choice theory as a discipline.[1] The immediate occasion for this lecture is, of course, an award, and I am aware that I am expected to discuss, in one form or another, my own work associated with this event (however immodest that attempt might otherwise have been). This I will try to do, but it is, I believe, also a plausible occasion to address some general questions about social choice as a discipline – its content, relevance, and reach – and I intend to seize this opportunity. The Royal Swedish Academy of Sciences referred to "welfare economics" as the general field of my work for which the award was given, and separated out three particular areas: social choice, distribution, and poverty. While I have indeed been occupied, in various ways, with these different subjects, it is social choice theory, pioneeringly formulated in its modern form by Arrow (1951),[2] that provides a general approach to the evaluation of, and choice over, alternative social possibilities (including inter alia the assessment of social welfare, inequality, and poverty). This I take to be reason enough for primarily concentrating on social choice theory in this Nobel lecture.

Social choice theory is a very broad discipline, covering a variety of distinct questions, and it may be useful to mention a few of the problems as illustrations of its subject matter (on many of which I have been privileged to work). When would *majority rule* yield unambiguous and consistent decisions? How can we judge how well a *society as a whole* is doing in the light of the disparate interests of its different members? How do we measure *aggregate poverty* in view of the varying predicaments and miseries of the diverse people that make up the society? How can we accommodate *rights and liberties* of persons while giving adequate recognition to their preferences? How do we appraise social valuations of public goods such as the *natural environment, or epidemiological security*? Also, some investigations, while not directly a part of social choice theory, have been helped by the understanding generated by the study of group decisions (such as the causation and prevention of *famines and hunger*, or the forms and consequences of *gender inequality*, or the demands of *individual freedom* seen as a "social commitment"). The reach and relevance of social choice theory can be very extensive indeed.

II. ORIGINS OF SOCIAL CHOICE THEORY AND CONSTRUCTIVE PESSIMISM

How did the subject of social choice theory originate? The challenges of social decisions involving divergent interests and concerns have been explored

[1] This is, obviously, not a survey of social choice theory and there is no attempt here to scan the relevant literature. Overviews can be found in Alan M. Feldman (1980), Prasanta K. Pattanaik and Maurice Salles (1983), Kotaro Suzumura (1983), Peter J. Hammond (1985), Jon Elster and Aanund Hylland (1986), Sen (1986a), David Starrett (1988), Dennis C. Mueller (1989), and more extensively in Kenneth J. Arrow *et al.* (1997).

[2] See also Arrow (1950, 1951, 1963).

for a long time. For example, Aristotle in ancient Greece and Kautilya in ancient India, both of whom lived in the fourth century B.C., explored various constructive possibilities in social choice in their books respectively entitled *Politics and Economics.*[3]

However, social choice theory as a systematic discipline first came into its own around the time of the French Revolution. The subject was pioneered by French mathematicians in the late eighteenth century, such as J. C. Borda (1781) and Marquis de Condorcet (1785), who addressed these problems in rather mathematical terms and who initiated the formal discipline of social choice in terms of voting and related procedures. The intellectual climate of the period was much influenced by European Enlightenment, with its interest in reasoned construction of social order. Indeed, some of the early social choice theorists, most notably Condorcet, were also among the intellectual leaders of the French Revolution.

The French Revolution, however, did not usher in a peaceful social order in France. Despite its momentous achievements in changing the political agenda across the whole world, in France itself it not only produced much strife and bloodshed, it also led to what is often called, not inaccurately, a "reign of terror." Indeed, many of the theorists of social coordination, who had contributed to the ideas behind the Revolution, perished in the flames of the discord that the Revolution itself unleashed (this included Condorcet who took his own life when it became quite likely that others would do it for him). Problems of social choice, which were being addressed at the level of theory and analysis, did not wait, in this case, for a peacefully intellectual resolution.

The motivation that moved the early social choice theorists included the avoidance of both instability and arbitrariness in arrangements for social choice. The ambitions of their work focused on the development of a framework for rational and democratic decisions for a group, paying adequate attention to the preferences and interests of all its members. However, even the theoretical investigations typically yielded rather pessimistic results. They noted, for example, that majority rule can be thoroughly inconsistent, with A defeating B by a majority, B defeating C also by a majority, and C in turn defeating A, by a majority as well.[4]

A good deal of exploratory work (often, again, with pessimistic results) continued in Europe through the nineteenth century. Indeed, some very creative people worked in this area and wrestled with the difficulties of social

[3] "Arthashastra," the Sanskrit word (the title of Kautilya's book), is best translated literally as "Economics," even though he devoted much space to investigating the demands of statecraft in a conflictual society. English translations of Aristotle's *Politics* and Kautilya's *Arthashastra* can be found respectively in E. Barker (1958) and L. N. Rangarajan (1987). On the interesting medieval European writings on these issues see, for example, Ian McLean (1990).

[4] See Condorcet (1785). There are many commentaries on these analyses, including Arrow (1951), Duncan Black (1958), William V. Gehrlein (1983), H. Peyton Young (1988), and McLean (1990). On the potential ubiquity of inconsistency in majority voting, see Richard D. McKelvey (1979) and Norman J. Schofield (1983).

choice, including Lewis Carroll, the author of *Alice in Wonderland* (under his real name, C. L. Dodgson, 1874, 1884).

When the subject of social choice was revived in the twentieth century by Arrow (1951), he too was very concerned with the difficulties of group decisions and the inconsistencies to which they may lead. While Arrow put the discipline of social choice in a structured – and axiomatic – framework (thereby leading to the birth of social choice theory in its modern form), he deepened the preexisting gloom by establishing an astonishing – and apparently pessimistic – result of ubiquitous reach.

Arrow's (1950, 1951, 1963) "impossibility theorem" (formally, the "General Possibility Theorem") is a result of breathtaking elegance and power, which showed that even some very mild conditions of reasonableness could not be simultaneously satisfied by any social choice procedure, within a very wide family. Only a dictatorship would avoid inconsistencies, but that of course would involve: (1) in politics, an extreme sacrifice of participatory decisions; and (2) in welfare economics, a gross inability to be sensitive to the heterogeneous interests of a diverse population. Two centuries after the flowering of the ambitions of social rationality, in Enlightenment thinking and in the writings of the theorists of the French Revolution, the subject seemed to be inescapably doomed. Social appraisals, welfare economic calculations, and evaluative statistics would have to be, it seemed, inevitably arbitrary or unremediably despotic.

Arrow's "impossibility theorem" aroused immediate and intense interest (and generated a massive literature in response, including many other impossibility results).[5] It also led to the diagnosis of a deep vulnerability in the subject that overshadowed Arrow's immensely important *constructive* program of developing a systematic social choice theory that could actually work.

III. WELFARE ECONOMICS AND OBITUARY NOTICES

Social choice difficulties apply to welfare economics with a vengeance. By the mid-1960s, William Baumol (1965) judiciously remarked that "statements about the significance of welfare economics" had started having "an ill-concealed resemblance to obituary notices" (p. 2). This was certainly the right reading of the prevailing views. But, as Baumol himself noted, we have to

[5] By varying the axiomatic structure, related impossibility results can also be obtained. Examples can be found in Arrow (1950, 1951, 1952, 1963), Julian H. Blau (1957, 1972, 1979), Bengt Hansson (1969a, b, 1976), Tapas Majumdar (1969, 1973), Sen (1969, 1970a, 1986b, 1993a, 1995a), Pattanaik (1971, 1973, 1978), Andreu Mas-Collel and Hugo Sonnenschein (1972), Thomas Schwartz (1972, 1986), Peter C. Fishburn (1973, 1974), Allan F. Gibbard (1973), Donald J. Brown (1974, 1975), Ken Binmore (1975, 1994), Salles (1975), Mark A. Satterthwaite (1975), Robert Wilson (1975), Rajat Deb (1976, 1977), Suzumura (1976a, b, 1983), Blau and Deb (1977), Jerry S. Kelly (1978, 1987), Douglas H. Blair and Robert A. Pollak (1979, 1982), Jean-Jacques Laffont (1979), Bhaskar Dutta (1980), Graciela Chichilnisky (1982a, b), David M. Grether and Charles R. Plott (1982), Chichilnisky and Geoffrey Heal (1983), Herve Moulin (1983), Pattanaik and Salles (1983), David Kelsey (1984a, b), Bezalel Peleg (1984), Hammond (1985, 1997), Mark A. Aizerman and Fuad T. Aleskerov (1986), Schofield (1996), and Aleskerov (1997), among many other contributions.

assess how sound these views were. We have, especially, to ask whether the pessimism associated with Arrovian structures in social choice theory must be seen to be devastating for welfare economics as a discipline.

As it happens, traditional welfare economics, which had been developed by utilitarian economists (such as Francis T. Edgeworth, 1881; Alfred Marshall, 1890; Arthur C. Pigou, 1920), had taken a very different track from the vote-oriented social choice theory. It took inspiration not from Borda (1781) or Condorcet (1785), but from their contemporary, Jeremy Bentham (1789). Bentham had pioneered the use of utilitarian calculus to obtain judgments about the social interest by aggregating the personal interests of the different individuals in the form of their respective utilities.

Bentham's concern – and that of utilitarianism in general – was with the *total utility* of a community. This was irrespective of the distribution of that total, and in this there is an informational limitation of considerable ethical and political importance. For example, a person who is unlucky enough to have a uniformly lower capability to generate enjoyment and utility out of income (say, because of a handicap) would also be given, in the utilitarian ideal world, a *lower* share of a given total. This is a consequence of the single-minded pursuit of maximizing the sum-total of utilities (on the peculiar consequences of this unifocal priority, see Sen, 1970a, 1973a; John Rawls, 1971; Claude d'Aspremont and Louis Gevers, 1977). However, the utilitarian interest in taking comparative note of the gains and losses of different people is not in itself a negligible concern. And this concern makes utilitarian welfare economics deeply interested in using a class of information – in the form of comparison of utility gains and losses of different persons – with which Condorcet and Borda had not been directly involved.

Utilitarianism has been very influential in shaping welfare economics, which was dominated for a long time by an almost unquestioning adherence to utilitarian calculus. But by the 1930s utilitarian welfare economics came under severe fire. It would have been quite natural to question (as Rawls [1971] would masterfully do in formulating his theory of justice) the utilitarian neglect of distributional issues and its concentration only on utility sum-totals in a distribution-blind way. But that was not the direction in which the antiutilitarian critiques went in the 1930s and in the decades that followed. Rather, economists came to be persuaded by arguments presented by Lionel Robbins and others (deeply influenced by "logical positivist" philosophy) that interpersonal comparisons of utility had no scientific basis: "Every mind is inscrutable to every other mind and no common denominator of feelings is possible" (Robbins, 1938 p. 636). Thus, the epistemic foundations of utilitarian welfare economics were seen as incurably defective.

There followed attempts to do welfare economics on the basis of the different persons' respective orderings of social states, without any interpersonal comparisons of utility gains and losses (nor, of course, any comparison of the total utilities of different persons, which are neglected by utilitarians as well). While utilitarianism and utilitarian welfare economics are quite indifferent to the *distribution* of utilities between different persons (concentrating, as they

do, only on the *sum-total* of utilities), the new regime without any interpersonal comparisons in any form, further reduced the informational base on which social choice could draw. The already-limited informational base of Benthamite calculus was made to shrink even further to that of Borda and Condorcet, since the use of different persons' utility rankings without any interpersonal comparison is analytically quite similar to the use of voting information in making social choice.

Faced with this informational restriction, utilitarian welfare economics gave way, from the 1940s onwards, to a so-called "new welfare economics," which used only one basic criterion of social improvement, viz, the "Pareto comparison." This criterion only asserts that an alternative situation would be definitely better if the change would increase the utility of everyone.[6] A good deal of subsequent welfare economics restricts attention to "Pareto efficiency" only (that is, only to making sure that no further Pareto improvements are possible). This criterion takes no interest whatever in *distributional* issues, which cannot be addressed without considering conflicts of interest and of preferences.

Some *further* criterion is clearly needed for making social welfare judgments with a greater reach, and this was insightfully explored by Abram Bergson (1938) and Paul A. Samuelson (1947). This demand led directly to Arrow's (1950, 1951) pioneering formulation of social choice theory, relating social preference (or decisions) to the set of individual preferences, and this relation is called a "social welfare function." Arrow (1951, 1963) went on to consider a set of very mild-looking conditions, including: (1) Pareto efficiency, (2) nondictatorship, (3) independence (demanding that social choice over any set of alternatives must depend on preferences *only* over those alternatives), and (4) unrestricted domain (requiring that social preference must be a complete ordering, with full transitivity, and that this must work for every conceivable set of individual preferences).

Arrow's impossibility theorem demonstrated that it is impossible to satisfy these conditions simultaneously.[7] In order to avoid this impossibility result, different ways of modifying Arrow's requirements were tried out in the literature that followed, but other difficulties continued to emerge.[8] The force and

[6] Or, at least, if it enhanced the utility of at least one person and did not harm the interest of anyone.

[7] There is also the structural assumption that there are at least two distinct individuals (but not infinitely many) and at least three distinct social states (not perhaps the most unrealistic of assumptions that economists have ever made). The axioms referred to here are those in the later version of Arrow's theorem: Arrow (1963). Since the presentation here is informal and permits some technical ambiguities, those concerned with exactness are referred to the formal statements in Arrow (1963), or in Sen (1970a) or Fishburn (1973) or Kelly (1978). Regarding proof, there are various versions, including, of course, Arrow (1963). In Sen (1995a) a very short – and elementary – proof is given. See also Sen (1970a, 1979b), Blau (1972), Robert Wilson (1975), Kelly (1978), Salvador Barbera (1980, 1983), Binmore (1994), and John Geanakopolous (1996), among other variants.

[8] For critical accounts of the literature, see Kelly (1978), Feldman (1980), Pattanaik and Salles (1983), Suzumura (1983), Hammond (1985), Walter P. Heller *et al.* (1986), Sen (1986a, 1986 b), Mueller (1989), and Arrow *et al.* (1997).

widespread presence of impossibility results generated a consolidated sense of pessimism, and this became a dominant theme in welfare economics and social choice theory in general. Is this reading justified?

IV. COMPLEMENTARITY OF FORMAL METHODS AND INFORMAL REASONING

Before I proceed further on substantive matters, it may be useful to comment briefly on the nature of the reasoning used in answering this and related questions. Social choice theory is a subject in which formal and mathematical techniques have been very extensively used. Those who are suspicious of formal (and in particular, of mathematical) modes of reasoning are often skeptical of the usefulness of discussing real- world problems in this way. Their suspicion is understandable, but it is ultimately misplaced. The exercise of trying to get an integrated picture from diverse preferences or interests of different people does involve many complex problems in which one could be seriously misled in the absence of formal scrutiny. Indeed, Arrow's (1950, 1951, 1963) impossibility theorem – in many ways the "locus classicus" in this field – can hardly be anticipated on the basis of common sense or informal reasoning. This applies also to extensions of this result, for example to the demonstration that an exactly similar impossibility to Arrow's holds even without any imposed demand of internal consistency of social choice (see Sen, 1993a Theorem 3). In the process of discussing some substantive issues in social choice theory, I shall have the opportunity to consider various results which too are not easily anticipated without formal reasoning. Informal insights, important as they are, cannot replace the formal investigations that are needed to examine the congruity and cogency of combinations of values and of apparently plausible demands.

This is not to deny that the task of widespread public communication is crucial for the use of social choice theory. It is centrally important for social choice theory to relate formal analysis to informal and transparent examination. I have to confess that in my own case, this combination has, in fact, been something of an obsession, and some of the formal ideas I have been most concerned with (such as an adequate framework for informational broadening, the use of partial comparability and of partial orderings, and the weakening of consistency conditions demanded of binary relations and of choice functions) call simultaneously for formal investigation and for informal explication and accessible scrutiny.[9] Our deeply felt, real-world concerns have to be substantively integrated with the analytical use of formal and mathematical reasoning.

[9] In fact, in my main monograph in social choice theory – *Collective Choice and Social Welfare* (Sen, 1970a), chapters with formal analysis (the "starred" chapters) alternate with chapters confined to informal discussion (the "unstarred" chapters).

V. PROXIMITY OF POSSIBILITY AND IMPOSSIBILITY

The general relationship between possibility and impossibility results also deserves some attention, in order to understand the nature and role of impossibility theorems. When a set of axioms regarding social choice can all be simultaneously satisfied, there may be several possible procedures that work, among which we have to choose. In order to choose between the different possibilities through the use of discriminating axioms, we have to introduce *further* axioms, until only one possible procedure remains. This is something of an exercise in brinkmanship. We have to go on cutting down alternative possibilities, moving – implicitly – *towards* an impossibility, but then stop just before all possibilities are eliminated, to wit, when one and only one option remains.

Thus, it should be clear that a full axiomatic determination of a particular method of making social choice must inescapably lie next door to an impossibility – indeed just short of it. If it lies far from an impossibility (with various positive possibilities), then it cannot give us an axiomatic derivation of any specific method of social choice. It is, therefore, to be expected that constructive paths in social choice theory, derived from axiomatic reasoning, would tend to be paved on one side by impossibility results (opposite to the side of multiple possibilities). No conclusion about the fragility of social choice theory (or its subject matter) emerges from this proximity.

In fact, the literature that has followed Arrow's work has shown classes of impossibility theorems and of positive possibility results, all of which lie quite close to each other.[10] The real issue is not, therefore, the ubiquity of impossibility (it will always lie close to the axiomatic derivation of any specific social choice rule), but the reach and reasonableness of the axioms to be used. We have to get on with the basic task of obtaining workable rules that satisfy reasonable requirements.

VI. MAJORITY DECISIONS AND COHERENCE

In the discussion so far, I have made no attempt to confine attention to particular configurations of individual preferences, ignoring others. Formally, this is required by Arrow's condition of "unrestricted domain," which insists that the social choice procedure must work for every conceivable cluster of

[10] See Hansson (1968, 1969a, 1969b, 1976), Sen (1969, 1970a, 1977a, 993a), Schwartz (1970, 1972, 1986), Pattanaik (1971, 1973), Alan P. Kirman and Dieter Sondermann (1972), Mas-Colell and Sonnenschein (1972), Wilson (1972, 1975), Fishburn (1973, 1974), Plott (1973, 1976), Brown (1974, 1975), John A. Ferejohn and Grether (1974), Binmore (1975, 1994), Salles (1975), Blair *et al.* (1976), Georges A. Bordes (1976, 1979), Donald E. Campbell (1976), Deb (1976, 1977), Parks (1976a, b), Suzumura (1976a, b, 1983), Blau and Deb (1977), Kelly (1978), Peleg (1978, 1984), Blair and Pollak (1979, 1982), Blau (1979), Bernard Monjardet (1979, 1983), Barbera (1980, 1983), Chichilnisky (1982a, b), Chichilnisky and Heal (1983), Moulin (1983), Kelsey (1984, 1985), Vincenzo Denicolo (1985), Yasumi Matsumoto (1985), Aizerman and Aleskerov (1986), Taradas Bandyopadhyay (1986), Isaac Levi (1986), and Campbell and Kelly (1997), among many other contributions.

individual preferences. It must, however, be obvious that, for any decision procedure, some preference profiles will yield inconsistencies and incoherence of social decisions while other profiles will not produce these results.

Arrow (1951) himself had initiated, along with Black (1948, 1958), the search for adequate restrictions that would guarantee consistent majority decisions. The necessary and sufficient conditions for consistent majority decisions can indeed be identified (see Sen and Pattanaik, 1969).[11] While much less restrictive than the earlier conditions that had been identified, they are still quite demanding; indeed it is shown that they would be easily violated in many actual situations.

The formal results on necessary or sufficiency conditions of majority decisions can only give as much hope – or generate as much disappointment – about voting-based social choice as the extent of social cohesion and confrontation (in the actual patterns of individual preferences) would allow. Choice problems for the society come in many shapes and sizes, and there may be less comfort in these results for some types of social choice problems than for others. When distributional issues dominate and when people seek to maximize their own "shares" without concern for others (as, for example, in a "cake division" problem, with each preferring any division that increases her own share, no matter what happens to the others), then majority rule will tend to be thoroughly inconsistent. But when there is a matter of national outrage (for example, in response to the inability of a democratic government to prevent a famine), the electorate may be reasonably univocal and thoroughly consistent.[12] Also, when people cluster in parties, with complex agendas and dialogues, involving give and take as well as some general attitudes to values like equity or justice, the ubiquitous inconsistencies can yield ground to more congruous decisions.[13]

[11] See also Ken-ichi Inada (1969, 1970), who has been a major contributor to this literature. See also William S. Vickrey (1960), Benjamin Ward (1965), Sen (1966, 1969), Sen and Pattanaik (1969), and Pattanaik (1971). Other types of restrictions have also been considered to yield consistent majority decisions; see Michael B. Nicholson (1965), Plott (1967), Gordon Tullock (1967), Inada (1970), Pattanaik (1971), Otto A. Davis *et al.* (1972), Fishburn (1973), Kelly (1974a, b, 1978), Pattanaik and Sengupta (1974), Eric S. Maskin (1976a, b, 1995), Jean-Michel Grandmont (1978), Peleg (1978, 1984), Wulf Gaertner (1979), Dutta (1980), Chichilnisky and Heal (1983), and Suzumura (1983), among other contributions. Domain restrictions for a wider class of voting rules have been investigated by Pattanaik (1970), Maskin (1976a, b, 1995), and Ehud Kalai and E. Muller (1977). The vast literature has been definitively surveyed by Gaertner (1998).

[12] This is one reason why no famine has ever occurred in an independent and democratic country (not run by alienated rulers, or by a dictator, or by a one-party state). See Sen (1984), Dreze and Sen (1989), Frances D'Souza (1990), Human Rights Watch (1992), and Red Cross and Red Crescent Societies (1994).

[13] On different aspects of this general political issue, see Arrow (1951), James M. Buchanan (1954a, b), Buchanan and Tullock (1962), Sen (1970a, 1973c, 1974, 1977d, 1984), Suzumura (1983), Hammond (1985), Pattanaik and Salles (1985), Andrew Caplin and Barry Nalebuff (1988, 1991), Young (1988), and Guinier (1991), among other writings, and also the "Symposium" on voting procedures in the *Journal of Economic Perspectives* (Winter 1995), with contributions by Jonathan Levin and Nalebuff (1995), Douglas W. Rae (1995), Nicolaus Tideman (1995), Robert J. Weber (1995), Michel Le Breton and John Weymark (1996), and Suzumura (1999), among others.

So far as welfare economics is concerned, majority rule and voting procedures are particularly prone to inconsistency, given the centrality of distributional issues in welfare-economic problems. However, one of the basic questions to ask is whether voting rules (to which social choice procedures are effectively restricted in the Arrovian framework) provide a reasonable approach to social choice in the field of welfare economics. Are we in the right territory in trying to make social welfare judgments through variants of voting systems?

VII. INFORMATIONAL BROADENING AND WELFARE ECONOMICS

Voting-based procedures are entirely natural for some kinds of social choice problems, such as elections, referendums, or committee decisions.[14] They are, however, altogether unsuitable for many other problems of social choice.[15] When, for example, we want to get some kind of an aggregative index of social welfare, we cannot rely on such procedures for at least two distinct reasons.

First, voting requires active participation, and if someone decides not to exercise her voting right, her preference would find no direct representation in social decisions. (Indeed, because of lower participation, the interests of substantial groups – for example of African Americans in the United States – find inadequate representation in national politics.) In contrast, in making reasonable social welfare judgments, the interests of the less assertive cannot be simply ignored.

Second, even with the active involvement of every one in voting exercises, we cannot but be short of important information needed for welfare-economic evaluation (on this see Sen, 1970a, 1973a). Through voting, each person can rank different alternatives. But there is no direct way of getting interpersonal comparisons of different persons' well-being from voting data. We must go beyond the class of voting rules (explored by Borda and Condorcet as well as Arrow) to be able to address distributional issues.

Arrow had ruled out the use of interpersonal comparisons since he had followed the general consensus that had emerged in the 1940's that (as Arrow

[14] There are, however, some serious problems arising from a possible lack of correspondence between votes and actual preferences, which could differ because of strategic voting aimed at manipulation of voting results. On this see the remarkable impossibility theorem of Gibbard (1973) and Satterthwaite (1975). There is an extensive literature on manipulation and on the challenges of implementation, on which see also Pattanaik (1973, 1978), Steven J. Brams (1975), Ted Groves and John Ledyard (1977), Barbera and Sonnenschein (1978), Dutta and Pattanaik (1978), Peleg (1978, 1984), Schmeidler and Sonnenschein (1978), Dasgupta *et al.* (1979), Green and Laffont (1979), Laffont (1979), Dutta (1980, 1997), Pattanaik and Sengupta (1980), Sengupta (1980a, b), Laffont and Maskin (1982), Moulin (1983, 1995), and Leo Hurwicz *et al.* (1985), among other contributions. There is also a nonstrategic impossibility in establishing an exact one-to-one correspondence between: (1) preferring, (2) dispreferring, and (3) being indifferent, on the one hand, and (1*) voting for, (2*) voting against, and (3*) abstaining, on the other hand, no matter whether voting is costly, or enjoyable, or neither (see Sen, 1964).

[15] On this, see Sen (1970a, 1977a).

put it) "interpersonal comparison of utilities has no meaning" (Arrow, 1951 p. 9). The totality of the axiom combination used by Arrow had the effect of confining social choice procedures to rules that are, broadly speaking, of the voting type.[16] His impossibility result relates, therefore, to this class of rules.

To lay the foundations of a constructive social choice theory, if we want to reject the historical consensus against the use of interpersonal comparisons in social choice, we have to address two important – and difficult – questions. First, can we systematically incorporate and use something as complex as interpersonal comparisons involving many persons? Will this be a territory of disciplined analysis, rather than a riot of confusing (and possibly confused) ideas? Second, how can the analytical results be integrated with practical use? On what kind of information can we sensibly base interpersonal comparisons? Will the relevant information be actually available, to be used?

The first is primarily a question of analytical system building, and the second that of epistemology as well as practical reason. The latter issue requires a reexamination of the informational basis of interpersonal comparisons, and I would presently argue that it calls for an inescapably qualified response. But the first question can be addressed more definitively through constructive analysis. Without going into technicalities of the literature that has emerged, I would like to report that interpersonal comparisons of various types can be fully axiomatized and exactly incorporated in social choice procedures (through the use of "invariance conditions" in a generalized framework, formally constructed as "social welfare functionals," on which see Sen, 1970a, 1977c).[17] Indeed, interpersonal comparisons need not even be confined to "all-or-none" dichotomies. We may be able to make interpersonal comparisons to some extent, but not in every comparison, nor of every type, nor with tremendous exactness (see Sen, 1970a, c).

We may, for example, have no great difficulty in accepting that Emperor Nero's utility gain from the burning of Rome was smaller than the sum-total

[16] It should be explained that restricting social choice procedures to voting rules is not an *assumption* that is invoked by Arrow (1951, 1963); it is a part of the impossibility theorem established by him. It is an analytical consequence of the set of apparently reasonable axioms postulated for reasoned social choice. Interpersonal comparison of utilities is, of course, explicitly excluded, but the proof of Arrow's theorem shows that a set of other assumptions with considerable plausibility, taken together, logically entail other features of voting rules as well (a remarkable analytical result on its own). The derived features include, in particular, the demanding requirement that no effective note be taken of the *nature* of the social states: only of the votes that are respectively cast in favor of – and against – them (a property that is often called "neutrality" – a somewhat flattering name for what is after all only an informational restriction). While the eschewal of interpersonal comparisons of utilities eliminates the possibility of taking note of inequality of utilities (and of differences in gains and losses of utilities), the entailed component of "neutrality" prevents attention being indirectly paid to distributional issues through taking explicit note of the nature of the respective social states (for example, of the income inequalities in the different states). The role of induced informational constraints in generating impossibility results is discussed in Sen (1977c, 1979b).

[17] See also Patrick Suppes (1966), Hammond (1976, 1977, 1985), Stephen Strasnick (1976), Arrow (1977), d'Aspremont and Gevers (1977), Maskin (1978, 1979), Gevers (1979), Kevin W. S. Roberts (1980a, b), Suzumura (1983, 1997), Charles Blackorby *et al.* (1984), d'Aspremont (1985), and d'Aspremont and Philippe Mongin (1998), among other contributions.

of the utility loss of all the other Romans who suffered from the fire. But this does not require us to feel confident that we can put everyone's utilities in an exact one-to-one correspondence with each other. There may, thus, be room for demanding "partial comparability" – denying both the extremes: full comparability and no comparability at all. The different extents of partial comparability can be given mathematically exact forms (precisely articulating the exact extent of inexactness).[18] It can also be shown that there may be no general need for terribly refined interpersonal comparisons for arriving at definite social decisions. Quite often, rather limited levels of partial comparability will be adequate for making social decisions.[19] Thus the empirical exercise need not be as ambitious as it is sometimes feared.

Before proceeding to the informational basis of interpersonal comparisons, let me ask a big analytical question: how much of a change in the possibility of social choice is brought about by systematic use of interpersonal comparisons? Do Arrow's impossibility, and related results, go away with the use of interpersonal comparisons in social welfare judgments? The answer briefly is, yes. The additional informational availability allows sufficient discrimination to escape impossibilities of this type.

There is an interesting contrast here. It can be shown that admitting cardinality of utilities *without* interpersonal comparisons does not change Arrow's impossibility theorem at all, which can be readily extended to cardinal measurability of utilities (see Theorem 8*2 in Sen, 1970a). In contrast even ordinal interpersonal comparisons is adequate to break the exact impossibility. We knew of course that with some types of interpersonal comparisons demanded in a full form (including cardinal interpersonal comparability), we can use the classical utilitarian approach.[20] But it turns out that even weaker forms of comparability would still permit making consistent social welfare judgments, satisfying all of Arrow's requirements, in addition to being sensitive to distributional concerns (even though the possible rules will be confined to a relatively small class).[21]

The distributional issue is, in fact, intimately connected with the need to go beyond voting rules as the basis of social welfare judgments. As was discussed earlier, utilitarianism too is in an important sense distribution indifferent: its program is to maximize the *sum-total* of utilities, no matter how unequally that total may be distributed (the extensive implications of this distributional in-

[18] See Sen (1970a, c), Blackorby (1975), Ben J. Fine (1975a), Kaushik Basu (1980), T. Bezembinder and P. van Acker (1980), and Levi (1986). The study of inexactness can also be extended to "fuzzy" characterizations.

[19] See also Anthony B. Atkinson (1970), Sen (1970a, c, 1973a), Dasgupta *et al.* (1973), and Michael Rothschild and Joseph E. Stiglitz (1973).

[20] On this, see particularly John C. Harsanyi's (1955) classic paper, which stood against the pessimistic literature that followed Arrow's (1951) impossibility theorem. See also James A. Mirrlees (1982).

[21] See Sen (1970a, 1977c), Rawls (1971), Edmund S. Phelps (1973), Hammond (1976), Strasnick (1976), Arrow (1977), d'Aspremont and Gevers (1977), Gevers (1979), Roberts (1980a, b), Suzumura (1983, 1997), Blackorby *et al.* (1984), and d'Aspremont (1985), among other contributions.

difference are discussed in Sen, 1973a). But the use of interpersonal comparisons can take other forms as well, allowing public decisions to be sensitive to *inequalities* in well-being and opportunities.

The broad approach of social welfare functionals opens up the possibility of using many different types of social welfare rules, which differ in the treatment of equity as well as efficiency, and also in their informational requirements.[22] Further, with the removal of the artificial barrier that had prohibited interpersonal comparisons, many other fields of normative measurement have also been investigated with the axiomatic approach of social welfare analysis. My own efforts in such fields as the evaluation and measurement of *inequality* (Sen, 1973a, 1992a, 1997b), *poverty* (Sen, 1976b, 1983b, 1985a, 1992a), *distribution-adjusted national income* (Sen, 1973b, 1976a, 1979a), and *environmental evaluation* (Sen, 1995a), have drawn solidly on the broadened informational framework of recent social choice theory.[23]

VIII. INFORMATIONAL BASIS OF INTERPERSONAL COMPARISONS

While the analytical issues in incorporating interpersonal comparisons have been, on the whole, well sorted out, there still remains the important practical matter of finding an adequate approach to the empirical discipline of making interpersonal comparisons and then using them in practice. The foremost question to be addressed is this: interpersonal comparison of *what?*

The formal structures of social welfare functions are not, in any sense, specific to utility comparisons only, and they can incorporate other types of interpersonal comparisons as well. The principal issue is the choice of some accounting of individual advantage, which need not take the form of comparisons of mental states of happiness, and could instead focus on some other way of looking at individual well-being or freedom or substantive opportunities (seen in the perspective of a corresponding evaluative discipline).

The rejection of interpersonal comparisons of utilities in welfare economic and in social choice theory that followed positivist criticism (such as that of Robbins, 1938) was firmly based on interpreting them entirely as comparisons of mental states. As it happens, even with such mental state comparisons, the case for unqualified rejection is hard to sustain.[24] Indeed, as has been for-

[22] On this and related issues, see Sen (1970a, 1977c), Hammond (1976), d'Aspremont and Gevers (1977), Robert Deschamps and Gevers (1978), Maskin (1978, 1979), Gevers (1979), Roberts (1980a), Siddiqur R. Osmani (1982), Blackorby *et al.* (1984), d'Aspremont (1985), T. Coulhon and Mongin (1989), Nick Baigent (1994), and d'Aspremont and Mongin (1998), among many other contributions. See also Harsanyi (1955) and Suppes (1966) for pioneering analyses of the uses of interpersonal comparisons. Elster and John Roemer (1991) have provided fine critical accounts of the vast literature on this subject.

[23] My work on inequality (beginning with Sen, 1973a) has been particularly influenced by the pioneering contributions of Atkinson (1970, 1983, 1989). The literature on this subject has grown very fast in recent years; for a critical scrutiny as well as references to the contemporary literature, see James Foster and Sen (1997).

cefully argued by the philosopher Donald Davidson (1986), it is difficult to see how people can understand anything much about other people's minds and feelings, without making some comparisons with their own minds and feelings. Such comparisons may not be extremely precise, but then again, we know from analytical investigations that very precise interpersonal comparisons may not be needed to make systematic use of interpersonal comparisons in social choice (on this and related issues, see Sen, 1970a, c, 1997b; Blackorby, 1975).

So the picture is not so pessimistic even in the old home ground of mental state comparisons. But, more importantly, interpersonal comparisons of personal welfare, or of individual advantage, need not be based only on comparisons of mental states. In fact, there may be good ethical grounds for not concentrating too much on mental-state comparisons – whether of pleasures or of desires. Utilities may sometimes be very malleable in response to persistent deprivation. A hopeless destitute with much poverty, or a downtrodden laborer living under exploitative economic arrangements, or a subjugated housewife in a society with entrenched gender inequality, or a tyrannized citizen under brutal authoritarianism, may come to terms with her deprivation. She may take whatever pleasure she can from small achievements, and adjust her desires to take note of feasibility (thereby helping the fulfilment of her adjusted desires). But her success in such adjustment would not make her deprivation go away. The metric of pleasure or desire may sometimes be quite inadequate in reflecting the extent of a person's substantive deprivation.[25]

There may indeed be a case for taking incomes, or commodity bundles, or resources more generally, to be of direct interest in judging a person's advantage, and this may be so for various reasons – not merely for the mental states they may help to generate.[26] In fact, the Difference Principle in Rawls's (1971) theory of "justice as fairness" is based on judging individual advantage in

[24] If interpersonal comparisons are taken to be entirely a matter of opinions or of value judgments, then the question can also be raised as to how the divergent opinions or valuations of different persons may be combined together (this looks like a social choice exercise on its own). Roberts (1995) has extensively investigated this particular formulation, taking interpersonal comparison to be an exercise of aggregation of opinions. If, however, interpersonal comparisons are taken to have a firmer factual basis (e.g., some people being objectively more miserable than others), then the use of interpersonal comparisons will call for a different set of axiomatic demands – more appropriate for epistemology than for ethics. For contrasting perspectives on interpersonal comparisons of well-being, see Ian Little (1957), Sen (1970a, 1985b), Tibor Scitovsky (1976), Donald Davidson (1986), and Gibbard (1986); see also empirical studies of observed misery (for example, Dreze and Sen, 1989, 1990, 1995, 1997; Erik Schokkaert and Luc Van Ootegem, 1990; Robert M. Solow, 1995).

[25] This issue and its far-reaching ethical and economic implications are discussed in Sen (1980, 1985a, 1985 b). See also Basu *et al.* (1995).

[26] The welfare relevance of real income comparisons can be dissociated from their mental-state correlates; see Sen (1979a). See also the related literature on "fairness," seen in terms of non-envy; for example, Duncan Foley (1967), Serge-Christophe Kolm (1969), Elisha A. Pazner and David Schmeidler (1974), Hal R. Varian (1974, 1975), Lars-Gunnar Svensson (1977, 1980), Ronald Dworkin (1981), Suzumura (1983), Young (1985), Campbell (1992), and Moulin and William Thomson (1997). Direct social judgments on interpersonal distributions over commodities have been analyzed by Franklin M. Fisher (1956).

terms of a person's command over what Rawls calls "primary goods," which are general-purpose resources that are useful for anyone to have no matter what her exact objectives are.

This procedure can be improved upon by taking note not only of the ownership of primary goods and resources, but also of interpersonal differences in converting them into the capability to live well. Indeed, I have tried to argue in favor of judging individual advantage in terms of the respective capabilities, which the person has, to live the way he or she has reason to value.[27] This approach focuses on the substantive freedoms that people have, rather than only on the particular outcomes with which they end up. For responsible adults, the concentration on freedom rather than only achievement has some merit, and it can provide a general framework for analyzing individual advantage and deprivation in a contemporary society. The extent of interpersonal comparisons may only be partial – often based on the intersection of different points of view.[28] But the use of such partial comparability can make a major difference to the informational basis of reasoned social judgments.

However, given the nature of the subject and the practical difficulties of informational availability and evaluation, it would be overambitious to be severely exclusive in sticking only to one informational approach, rejecting all others. In the recent literature in applied welfare economics, various ways of making sensible interpersonal comparisons of well-being have emerged. Some have been based on studying expenditure patterns, and using this to surmise about comparative well-being of different persons (see Pollak and Terence J. Wales, 1979; Dale W. Jorgenson *et al.*, 1980; Jorgenson, 1990; Daniel T. Slesnick, 1998), while others have combined this with other informational inputs (see Angus S. Deaton and John Muellbauer, 1980; Atkinson and Francois Bourguignon, 1982, 1987; Fisher, 1987, 1990; Pollak, 1991; Deaton, 1995).[29] Others have tried to use questionnaires and have looked for regularities in people's answers to questions about relative well-being (see, for example, Arie Kapteyn and Bernard M. S. van Praag, 1976).

There have also been illuminating works in observing important features of living conditions and in drawing conclusions on quality of life and compa-

[27] See Sen (1980, 1985a, b, 1992a), Dreze and Sen (1989, 1995), and Martha Nussbaum and Sen (1993). See also Roemer (1982, 1996), Basu (1987), Nussbaum (1988), Richard J. Arneson (1989), Atkinson (1989, 1995), G. A. Cohen (1989, 1990), F. Bourguignon and G. Fields (1990), Keith Griffin and John Knight (1990), David Crocker (1992), Sudhir Anand and Martin Ravallion (1993), Arrow (1995), Meghnad Desai (1995), and Pattanaik (1997), among other contributions. There have also been several important symposia on the capability perspective, such as *Giornale degli Economisti e Annali di Economia* (1994) and *Notizie di Politeia* (1996, Special Volume), including contributions by Alessandro Balestrino (1994, 1996), Giovanni Andrea Cornia (1994), Elena Granaglia (1994, 1996), Enrica Chiappero Martinetti (1994, 1996), Sebastiano Bavetta (1996), Ian Carter (1996), Leonardo Casini and Iacopo Bernetti (1996), and Shahrashoub Razavi (1996); see also Sen (1994, 1996b) with my responses to these contributions.

[28] On this, see Sen (1970a, c, 1985b, 1992a, 1999a, 1999 b).

[29] See also Slesnick (1998).

rative living standards on that basis; indeed there is a well-established tradition of Scandinavian studies in this area (see, for example, Allardt *et al.* [1981] and Robert Erikson and Rune Åberg [1987]). The literature on "basic needs" and their fulfilment has also provided an empirical approach to understanding comparative deprivations.[30] Further, under the intellectual leadership of Mahbub ul Haq (1995), the United Nations Development Programme (UNDP) has made systematic use of a particular type of informational broadening to make comparisons based on observed features of living conditions (reported in UNDP, *Human Development Reports*).[31]

It is easy enough to pick holes in each of these methodologies and to criticize the related metrics of interpersonal comparisons. But there can be little doubt about the welfare-economic interest in the far-reaching uses of empirical information that have emerged from these works. They have substantially broadened our understanding of individual advantages and their empirical correlates. Each of these methodologies clearly has some limitations as well as virtues, and our evaluation of their relative merits may well diverge, depending on our respective priorities. I have had the occasion to argue elsewhere (and briefly also in this lecture, earlier on) in favor of partial comparabilities based on evaluation of capabilities,[32] but beyond that specific issue (on which others may well take a different view), I want to emphasize here the more general point that the possibilities of practical welfare economics and social choice have been immensely widened through these innovative, empirical works.

In fact, despite their differences, they fit in general into the overall pattern of informational widening to which recent analytical work in social choice theory has forcefully pointed. The analytical systems explored in the recent literature on welfare economics and social choice are broader than those in the Arrovian model (and correspondingly less uptight, and less "impossible," on which see Sen, 1970a, 1977c).[33] They are also analytically general enough to allow different empirical interpretations and to permit alternative informational bases for social choice. The diverse empirical methodologies, considered here, can all be seen in this broader analytical perspective. The movements in "high theory" have been, in this sense, closely linked to the advances in "practical economics." It is the sustained exploration of constructive pos-

[30] A good introduction to the basic needs approach can be found in Paul Streeten *et al.* (1981). See also Irma Adelman (1975), Dharam Ghai *et al.* (1977), James P. Grant (1978), Morris D. Morris (1979), Chichilnisky (1980), Nanak Kakwani (1981, 1984), Paul Streeten (1984), Frances Stewart (1985), Robert Goodin (1988), and Alan Hamlin and Phillip Pettit (1989), among other contributions. Focusing on the fulfillment of "minimum needs" can be traced to Pigou (1920).

[31] See for example United Nations Development Programme (1990) and the subsequent yearly *Human Development Reports*. See also Sen (1973b, 1985a), Adelman (1975), Grant (1978), Morris (1979), Streeten *et al.* (1981), Desai (1995), and Anand and Sen (1997) on related issues.

[32] See particularly Sen (1992a).

[33] The literature on "implementation" has also grown in the direction of practical application; for analyses of some of the different issues involved, see Laffont (1979), Maskin (1985), Moulin (1995), Suzumura (1995), Dutta (1997), and Maskin and Tomas Sjöström (1999).

sibilities – at the analytical as well as practical levels – that has helped to dispel some of the gloom that was associated earlier with social choice and welfare economics.

IX. POVERTY AND FAMINE

The variety of information on which social welfare analysis can draw can be well illustrated by the study of poverty. Poverty is typically seen in terms of the lowness of incomes, and it has been traditionally measured simply by counting the number of people below the poverty-line income; this is sometimes called the head-count measure. A scrutiny of this approach yields two different types of questions. First, is poverty adequately seen as low income? Second, even if poverty is seen as low income, is the aggregate poverty of a society best characterized by the index of the head-count measure?

I take up these questions in turn. Do we get enough of a diagnosis of individual poverty by comparing the individual's income with a socially given poverty-line income? What about the person with an income well above the poverty line, who suffers from an expensive illness (requiring, say, kidney dialysis)? Is deprivation not ultimately a lack of opportunity to lead a minimally acceptable life, which can be influenced by a number of considerations, including of course personal income, but also physical and environmental characteristics, and other variables (such as the availability and costs of medical and other facilities)? The motivation behind such an exercise relates closely to seeing poverty as a serious deprivation of certain basic capabilities. This alternative approach leads to a rather different diagnosis of poverty from the ones that a purely income-based analysis can yield.[34]

This is not to deny that lowness of income can be very important in many contexts, since the opportunities a person enjoys in a market economy can be severely constrained by her level of real income. However, various contingencies can lead to variations in the "conversion" of income into the capability to live a minimally acceptable life, and if that is what we are concerned with, there may be good reason to look beyond income poverty. There are at least four different sources of variation: (1) personal heterogeneities (for example, proneness to illness), (2) environmental diversities (for example, living in a storm-prone or flood-prone area), (3) variations in social climate (for example, the prevalence of crime or epidemiological vectors), and (4) differences in relative deprivation connected with customary patterns of consumption in particular societies (for example, being relatively impoverished in a rich

[34] See Sen (1980, 1983 b, 1985a, 1992a, 1993b, 1999a), Kakwani (1984), Nussbaum (1988), Dreze and Sen (1989, 1995), Griffin and Knight (1990), Iftekhar Hossain (1990), Schokkaert and Van Ootegem (1990), Nussbaum and Sen (1993), Anand and Sen (1997), and Foster and Sen (1997), among other contributions.

society, which can lead to deprivation of the absolute capability to take part in the life of the community).[35]

There is, thus, an important need to go beyond income information in poverty analysis, in particular to see poverty as capability deprivation. However (as was discussed earlier), the choice of the informational base for poverty analysis cannot really be dissociated from pragmatic considerations, particularly informational availability. It is unlikely that the perspective of poverty as income deprivation can be dispensed with in the empirical literature on poverty, even when the limitations of that perspective are entirely clear. Indeed, in many contexts the rough-and-ready way of using income information may provide the most immediate approach to the study of severe deprivation.[36]

For example, the causation of famines is often best seen in terms of a radical decline in the real incomes of a section of the population, leading to starvation and death (on this see Sen, 1976d, 1981).[37] The dynamics of income earning and of purchasing power may indeed be the most important component of a famine investigation. This approach, in which the study of causal influences on the determination of the respective incomes of different groups plays a central part, contrasts with an exclusive focus on agricultural production and food supply, which is often found in the literature on this subject.

The shift in informational focus from food supply to entitlements (involving incomes as well as supply, and the resulting relative prices) can make a radical difference, since famines can occur even without any major decline – possibly without any decline at all – of food production or supply.[38] If, for example, the incomes of rural wage laborers, or of service providers, or of craftsmen collapse through unemployment, or through a fall of real wages, or through a decline in the demand for the relevant services or craft products, the affected groups may have to starve, even if the overall food supply in the economy is undiminished. Starvation occurs when some people cannot establish entitlement over an adequate amount of food, through purchase or

[35] On this see Sen (1992a) and Foster and Sen (1997). The last concern – that a relative deprivation of income can lead to an absolute deprivation of a basic capability – was first discussed by Adam Smith (1776). Adam Smith's claim that "necessary goods" (and correspondingly minimum incomes needed to avoid basic deprivation) must be defined differently for different societies also suggests a general approach of using a parametrically variable "poverty-line" income. Such variations can be used to reflect the disparate conditions of different persons (including, for example, proneness to illness). On these issues, see Deaton and Muellbauer (1980, 1986), Jorgenson (1990), Pollak (1991), Deaton (1995), and Slesnick (1998), among other contributions. Under certain conditions, the definition of poverty as having an income below the parametrically determined "poverty line" will be congruent with the characterization of poverty as capability deprivation (if the parametric variations are firmly linked to the income needed to avoid specified levels of capability deprivation).

[36] These issues are insightfully scrutinized by Philippe Van Parijs (1995).

[37] See also Mohiuddin Alamgir (1980), Ravallion (1987), Dreze and Sen (1989, 1990), Jeffrey L. Coles and Hammond (1995), Desai (1995), Osmani (1995), and Peter Svedberg (1999), on related matters.

[38] As empirical studies of famines bring out, some actual famines have occurred with little or no decline in food production (such as the Bengal famine of 1943, the Ethiopian famine of 1973, or the Bangladesh famine of 1974), whereas others have been influenced substantially by declines in food production (on this see Sen, 1981).

through food production, and the overall supply of food is only one influence among many in the determination of the entitlements of the respective groups of people in the economy. Thus, an income-sensitive entitlement approach can provide a better explanation of famines than can be obtained through an exclusively production-oriented view. It can also yield a more effective approach to the remedying of starvation and hunger (on this see particularly Dreze and Sen, 1989).

The nature of the problem tends to identify the particular "space" on which the analysis has to concentrate. It remains true that in explaining the exact patterns of famine deaths and sufferings, we can get additional understanding by supplementing the income-based analysis with information on the conversion of incomes into nourishment, which will depend on various other influences such as metabolic rates, proneness to illness, body size, etc.[39] These issues are undoubtedly important for investigating the incidence of nutritional failures, morbidities, and mortalities. However, in a general analysis of the occurrence and causation of famines, affecting large groups, these additional matters may be of secondary importance. While I shall not enter further into the famine literature here, I would like to emphasize that the informational demands of famine analysis give an important place to income deprivation which have more immediacy and ready usability than the more subtle – and ultimately more informed – distinctions based on capability comparisons (on this see Sen [1981] and Dreze and Sen [1989]).

I turn now to the second question. The most common and most traditional measure of poverty had tended to concentrate on head counting. But it must also make a difference as to *how far* below the poverty line the poor individually are, and furthermore, how the deprivation is *shared and distributed* among the poor. The social data on the respective deprivations of the individuals who constitute the poor in a society need to be aggregated together to arrive at informative and usable measures of aggregate poverty. This is a social choice problem, and axioms can indeed be proposed that attempt to capture our distributional concerns in this constructive exercise (on this see Sen, 1976b).[40]

Several distribution-sensitive poverty measures have been derived axiomatically in the recent social choice literature, and various alternative proposals have been analyzed. While I shall, here, not go into a comparative assessment of these measures (nor into axiomatic requirements that can be

[39] An important further issue is the distribution of food *within* the family, which may be influenced by several factors other than family income. Issues of gender inequality and the treatment of children and of old people can be important in this context. Entitlement analysis can be extended in these directions by going beyond the family income into the conventions and rules of intrafamily division. On these issues, see Sen (1983a, b, 1984, 1990), Vaughan (1987), Dreze and Sen (1989), Barbara Harriss (1990), Bina Agarwal (1994), Nancy Folbre (1995), Kanbur (1995), and Nussbaum and Jonathan Glover (1995), among other contributions.

[40] The so-called "Sen measure of poverty" can, in fact, be improved by an important but simple variation illuminatingly proposed by Anthony F. Shorrocks (1995). I have to confess favoring the "Sen-Shorrocks measure" over the original "Sen index."

used to discriminate between them), elsewhere I have tried to address this issue, jointly with James Foster (Foster and Sen, 1997).[41] However, I would like to emphasize the fact that we face here an embarrassment of riches (the opposite of an impasse or an impossibility), once the informational basis of social judgments has been appropriately broadened. To axiomatize exactly a particular poverty measure, we shall have to indulge in the "brinkmanship" of which I spoke earlier (Section V), by adding other axiomatic demands until we are just short of an impossibility, with only one surviving poverty measure.

X. COMPARATIVE DEPRIVATION AND GENDER INEQUALITY

At one level, poverty cannot be dissociated from the misery caused by it, and in this sense, the classical perspective of utility also can be invoked in this analysis. However, the malleability of mental attitudes, on which I commented earlier, may tend to hide and muffle the extent of deprivation in many cases. The indigent peasant who manages to build some cheer in his life should not be taken as nonpoor on grounds of his mental accomplishment.

This adaptability can be particularly important in dealing with gender inequality and deprivation of women in traditionally unequal societies. This is partly because perceptions have a decisive part to play in the cohesion of family life, and the culture of family living tends to put a premium on making allies out of the ill treated. Women may – often enough – work much harder than men (thanks to the rigours of household chores), and also receive less attention in health care and nutrition, and yet the perception that there is an incorrigible inequality here may well be missing in a society in which asymmetric norms are quietly dominant.[42] This type of inequality and deprivation may not, under these circumstances, adequately surface in the scale of the mental metric of dissatisfaction and discontent.

The socially cultivated sense of contentment and serenity may even affect the perception of morbidity and illness. When, many years ago, I was working on a famine-related study of post-famine Bengal in 1944, I was quite struck by the remarkable fact that the widows surveyed had hardly reported any incidence of being in "indifferent health," whereas *widowers*, complained massively about just that (Sen, 1985a Appendix B). Similarly, it emerges in interstate comparisons in India that the states that are worst provided in education

[41] James Foster is a major contributor to the poverty literature; see, for example, Foster (1984), Foster *et al.* (1984), and Foster and Shorrocks (1988). For discussions of some major issues in the choice of an aggregative measure of poverty, see also Anand (1977, 1983), Blackorby and Donaldson (1978, 1980), Kanbur (1984), Atkinson (1987, 1989), Christian Seidl (1988), Satya R. Chakravarty (1990), Camilo Dagum and Michele Zenga (1990), Ravallion (1994), Frank A. Cowell (1995), and Shorrocks (1995), among many others (there is an extensive bibliography of this large literature in Foster and Sen, 1997). One of the important issues to be addressed is the need for – and limitations of – "decomposability" (and the weaker requirement of "subgroup consistency," on which see also Shorrocks, 1984). Foster (1984) gives arguments in favor of decomposability (as did Anand, 1977, 1983), whereas Sen (1973a, 1977c) presents arguments against it. There is a serious attempt in Foster and Sen (1997) to assess both the pros and the cons of decomposability and subgroup consistency.

[42] On this see Sen (1984, 1990, 1993c), and the literature cited there.

and health-care facilities typically report the *lowest* levels of perceived morbidity, whereas states with good health care and school education indicate *higher* self-perception of illness (with the highest morbidity reports coming from the best provided states, such as Kerala).[43] Mental reactions, the mainstay of classical utility, can be a very defective basis for the analysis of deprivation.

Thus, in understanding poverty and inequality, there is a strong case for looking at real deprivation and not merely at mental reactions to that deprivation. There have been many recent investigations of gender inequality and women's deprivation in terms of undernutrition, clinically diagnosed morbidity, observed illiteracy, and even unexpectedly high mortality (compared with physiologically justified expectations).[44] Such interpersonal comparisons can easily be a significant basis of studies of poverty and of inequality between the sexes. They can be accommodated within a broad framework of welfare economics and social choice (enhanced by the removal of informational constraints that would rule out the use of these types of data).

XI. THE LIBERAL PARADOX

This lecture has included discussion of why and how impossibility results in social choice can be overcome through informational broadening. The informational widening considered so far has been mainly concerned with the use of interpersonal comparisons. But this need not be the only form of broadening that is needed in resolving an impasse in social choice. Consider, for example, an impossibility theorem which is sometimes referred to as "the liberal paradox," or "the impossibility of the Paretian liberal" (Sen, 1970a, b, 1976c). The theorem shows the impossibility of satisfying even a very minimal demand for liberty when combined with an insistence on Pareto efficiency (given unrestricted domain).[45]

Since there have been some debates on the content of liberty in the recent literature (see, for example, Nozick, 1974; Peter Gardenfors, 1981; Robert Sugden, 1981, 1985, 1993; Hillel Steiner, 1990; Gaertner *et al.*, 1992; Deb, 1994; Marc Fleurbaey and Gaertner, 1996; Pattanaik, 1996; Suzumura, 1996), perhaps a quick explanatory remark may be useful. Liberty has many different aspects, including two rather distinct features: (1) it can help us to

[43] The methodological issue underlying this problem involves "positional objectivity"–what is observationally objective from a given position but may not be sustainable in *interpositional* comparisons. This contrast and its far-reaching relevance is discussed in Sen (1993c).

[44] The literature on "missing women" (in comparison with the expected number of women in the absence of unusually high feminine mortality rates found in some societies) is one example of such empirical analysis; on this see Sen (1984, 1992c), Vaughan (1987), Dreze and Sen (1989, 1990), Ansley J. Coale (1991), and Stephan Klasen (1994). See also Jocelyn Kynch and Sen (1983); Harriss (1990); Ravi Kanbur and Lawrence Haddad (1990); Agarwal (1994); Folbre (1995); Nussbaum and Glover (1995), among other works.

[45] There is also some analytical interest in the "source" of the impossibility result involved here, particularly since both "Pareto efficiency" and "minimal liberty" are characterized in terms of the same set of preferences of the same individuals. On this see Sen (1976c, 1992b).

achieve what we would choose to achieve in our respective private domains, for example, in personal life (this is its "opportunity aspect"), and (2) it can leave us directly in charge of choices over private domains, no matter what we may or may not achieve (this is its "process aspect"). In social choice theory, the formulation of liberty has been primarily concerned with the former, that is, the opportunity aspect. This may have been adequate to show the possible conflict between the Pareto principle and the opportunity aspect of liberty (on which Sen [1970a, b] concentrated), but an exclusive concentration on the opportunity aspect cannot provide an adequate understanding of the demands of liberty (in this respect, Sugden [1981, 1993] and Gaertner *et al.* [1992] were certainly right to reject the sufficiency of the opportunity-centered formulation in standard social choice theory).[46] However, social choice theory can also be made to accommodate the process aspect of liberty through appropriate recharacterization, and particularly through valuing due process in addition to substantive opportunities (on this see Sen, 1982b, 1997a, 1999b; Stig Kanger, 1985; Deb, 1994; Hammond, 1997; Suzumura, 1996; Martin van Hees, 1996).

It is also important to avoid the opposite narrowness of concentrating exclusively only on the process aspect of liberty, as some recent writers have preferred to do. Important as processes are, this cannot obliterate the relevance of the opportunity aspect which too must count. Indeed, the importance of *effectiveness* in the realization of liberty in one's personal life has been recognized as important for a long time – even by commentators deeply concerned with processes, from John Stuart Mill (1859) to Frank Knight (1947), Friedrich A. Hayek (1960), and Buchanan (1986). The difficulties of having to weigh process fairness against effectiveness of outcomes cannot be avoided simply by ignoring the opportunity aspect of liberty, through an exclusive concentration on the process aspect.[47]

How might the conflict of the Paretian liberal, in particular, be resolved? Different ways of dealing with this friction have been explored in the literature.[48] However, it is important to see that unlike Arrow's impossibility result, the liberal paradox cannot be satisfactorily resolved through the use of interpersonal comparisons. Indeed, neither the claims of liberty, nor that of Pareto efficiency, need be significantly contingent on interpersonal compari-

[46] The "impossibility of the Paretian liberal" does not, however, get resolved simply by concentrating on the process aspect of liberty, on which see Friedrich Breyer (1977), Breyer and Gardner (1980), Sen (1983b, 1992b), Basu (1984), Gaertner *et al.* (1992), Deb (1994), Binmore (1996), Mueller (1996), Pattanaik (1996), and Suzumura (1996).

[47] On these issues, see Hammond (1997) and also Seidl (1975, 1997), Breyer (1977), Kanger (1985), Levi (1986), Charles K. Rowley (1993), Deb (1994), Suzumura (1996), and Pattanaik (1997).

[48] See, for example, Seidl (1975, 1997), Suzumura (1976b, 1983, 1999), Gaertner and Lorenz Kruger (1981, 1983), Hammond (1982, 1997), John L. Wriglesworth (1985), Levi (1986), and Jonathan Riley (1987), among others. See also the symposium on the "`Liberal Paradox" in Analyse & Kritik (September 1996), including: Binmore (1996), Breyer (1996), Buchanan (1996), Fleurbaey and Gaertner (1996), Anthony de Jasay and Hartmut Kliemt (1996), Kliemt (1996), Mueller (1996), Suzumura (1996), and van Hees (1996). My own suggestions are presented in Sen (1983a, 1992b, 1996a).

sons. The force of one's claims over one's private domain lies in the *personal* nature of that choice – not on the *relative intensities* of the preferences of different persons over a particular person's private life. Also, Pareto efficiency depends on the congruence of different persons' preferences over a pairwise choice – not on the comparative strength of those preferences.

Rather, the resolution of this problem lies elsewhere, in particular in the need to see each of these claims as being qualified by the importance of the other – once it is recognized that they can be in possible conflict with each other (indeed, the main point of the liberal paradox was precisely to identify that possible conflict). The recognition of the importance of effective liberty in one's private domain (precisely over particular choices) can coexist with an acknowledgement of the relevance of Paretian unanimity over any pair (over all choices–whether in one's private domain or not). A satisfactory resolution of this impossibility must include taking an evaluative view of the acceptable priorities between personal liberty and overall desire fulfillment, and must be sensitive to the information regarding the trade-offs on this that the persons may themselves endorse. This too calls for an informational enrichment (taking note of people's political values as well as individual desires), but this enrichment is of a rather different kind from that of using interpersonal comparisons of well-being or overall advantage.[49]

XII. A CONCLUDING REMARK

Impossibility results in social choice theory – led by the pioneering work of Arrow (1951) – have often been interpreted as being thoroughly destructive of the possibility of reasoned and democratic social choice, including welfare economics (Sections I-III, XI). I have argued against that view. Indeed, Arrow's powerful "impossibility theorem" invites engagement, rather than resignation (Sections IV-V). We do know, of course, that democratic decisions can sometimes lead to incongruities. To the extent that this is a feature of the real world, its existence and reach are matters for objective recognition. Inconsistencies arise more readily in some situations than in others, and it is possible to identify the situational differences and to characterize the processes through consensual and compatible decisions can emerge (Sections VI–VIII).

The impossibility results certainly deserve serious study. They often have wide – indeed sweeping – reach, not merely covering day-to-day politics (where we may be rather used to incongruity), but also questioning the possibility of any assured framework for making social welfare judgments for the society as a whole. Impossibilities thus identified also militate against the ge-

[49] This may, formally, require a multistage social choice exercise in the determination of these priorities, followed by the use of those priorities in the choice over comprehensive social states (on these issues, see Pattanaik, 1971; Sen, 1982b, 1992b, 1996, 1997a; Suzumura, 1996, 1999).

neral possibility of an orderly and systematic framework for normatively assessing inequality, for evaluating poverty, or for identifying intolerable tyranny and violations of liberty. Not to be able to have a coherent framework for these appraisals or evaluations would indeed be most damaging for systematic political, social, and economic judgement. It would not be possible to talk about injustice and unfairness without having to face the accusation that such diagnoses must be inescapably arbitrary or intellectually despotic.

These bleak conclusions do not, however, endure searching scrutiny, and fruitful procedures that militate against such pessimism can be clearly identified. This has indeed been largely an upbeat lecture – emphasizing the possibility of constructive social choice theory, and arguing for a productive interpretation of the impossibility results. Indeed, these apparently negative results can be seen to be helpful inputs in the development of an adequate framework for social choice, since the axiomatic derivation of a specific social choice procedure must lie in between – and close to – an impossibility, on one side, and an embarrassment of riches, on the other (see Section V).

The possibility of constructive welfare economics and social choice (and their use in making social welfare judgments and in devising practical measures with normative significance) turns on the need for broadening the informational basis of such choice. Different types of informational enrichment have been considered in the literature. A crucial element in this broadening is the use of interpersonal comparisons of well-being and individual advantage. It is not surprising that the rejection of interpersonal comparisons must cause difficulties for reasoned social decision, since the claims of different persons, who make up the society, have to be assessed against each other. We cannot even understand the force of public concerns about poverty, hunger, inequality, or tyranny, without bringing in interpersonal comparisons in one form or another. The information on which our informal judgments on these matters rely is precisely the kind of information that has to be – and can be – incorporated in the formal analysis of systematic social choice (Sections VII–XI).

The pessimism about the possibility of interpersonal comparisons that fuelled the "obituary notices" for welfare economics (and substantially fed the fear of impossibility in social choice theory) was ultimately misleading for two distinct reasons. First, it confined attention to too narrow an informational base, overlooking the different ways in which interpersonally comparative statements can sensibly be made and can be used to enrich the analysis of welfare judgments and social choice. An overconcentration on comparisons of mental states crowded out a plethora of information that can inform us about the real advantages and disadvantages of different persons, related to their substantive well-being, freedoms, or opportunities. Second, the pessimism was also based on demanding too much precision in such comparisons, overlooking the fact that even partial comparisons can serve to enlighten the reasoned basis of welfare economics, social ethics, and responsible politics.[50]

Addressing these problems fits well into a general program of strengthening social choice theory (and "nonobituarial" welfare economics). In general,

informational broadening, in one form or another, is an effective way of overcoming social choice pessimism and of avoiding impossibilities, and it leads directly to constructive approaches with viability and reach. Formal reasoning about postulated axioms (including their compatibility and coherence), as well as informal understanding of values and norms (including their relevance and plausibility), both point in that productive direction. Indeed, the deep complementarity between formal and informal reasoning – so central to the social sciences – is well illustrated by developments in modern social choice theory.

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[50] There are two distinct issues here. First, partial comparability can be very effective in generating an optimal choice (Sen, 1970a, c). Second, even when an optimal alternative does not emerge, it can help to narrow down the maximal set of undominated alternatives to which a maximizing choice can be confined (Sen 1973a, 1993a, 1997a).

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