

2 Social Choice and Welfare Economics

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In the making of acceptable social decisions for a group (such as a nation, a community, a committee, or any other collectivity), the diverse views and interests of members of the group must receive attention and importance. This can be an exacting task, because people's views can differ, and as Horace pointed out a long time ago, there may be as "many preferences as there are people." Choosing actions and policies for a group can be formidably difficult.

And there are, in addition, difficult issues even in describing what exactly is happening to a group as a whole. Is it better off or worse? Are its members happier? Do they have more freedom than before? Is there more poverty or less than in the past? Has social inequality in the group diminished or increased? Can the social decisions that emerge be seen as democratic, or are they, in some important sense, authoritarian? Methods of aggregative assessment are central to the subject of social choice in general and welfare economics in particular.

People have speculated on social aggregation throughout human history. However, social choice theory as a formal 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, particularly J.-C. Borda (1781) and Nicolas de Condorcet (1785). They addressed social choice problems in rather mathematical terms and initiated the intellectual discipline of social choice theory in terms of voting and related procedures. The intellectual climate of the period was greatly influenced by the European Enlightenment, with its interest in reasoned construction of a social order.

Indeed, some of the early social choice theorists, most notably Condorcet, were also among the intellectual leaders of the French Revolution. Condorcet noted that Anne Robert Jacques Turgot, the pioneering French

economist (and also the governor of the province of Limoges), whom Condorcet greatly admired, was the first statesman who “deigned to treat the people as a society of reasonable beings” (Condorcet 1847, 9, 15, 18). Condorcet admonished Jacques Necker, an opponent of Turgot, for “exaggerating the stupidity of people.” Condorcet took great interest, especially in his later works, on interactive decision-making in assemblies, including “assemblées d’administration,” charged with making decisions about taxation, public works, militias, the use of public funds, and the management of public goods.

The motivation for the early social choice theorists included the avoidance of authoritarianism as well as arbitrariness in social choice. 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 its members. However, even the theoretical investigations typically yielded rather pessimistic results. Condorcet noted, for example, that majority rule can be caught in an impasse when every alternative is defeated in voting by some other alternative. To illustrate the “voting paradox,” first spotted by Condorcet, consider a 3-member community in which person 1 strictly prefers x to y and that to z ; person 2 ranks them in the strict order of y , z , and x ; and person 3 strictly ranks them as z , x , and y . Then x will defeat y by majority vote, while y defeats z , and z vanquishes x , thereby generating a “cycle.” More particularly, every alternative is rejected in a majority vote by some other alternative, and there will be no “Condorcet winner,” that is, an alternative that wins against (or at least stays undefeated against) every other alternative.

Even though there is no continuous line of work on social choice theory following the early lead of French mathematicians, the subject received sporadic attention in various writings, often from distinguished intellectuals, such as Lewis Carroll, the author of *Alice in Wonderland* (he wrote some engaging and important papers on group decisions under his real name, C. L. Dodgson (1876, 1884)).

However, in its modern—and fully axiomatized—form, modern social choice theory had to wait until the middle of the twentieth century for its first rigorous foundation in the work of Kenneth J. Arrow. His famous “impossibility theorem,” contained in his PhD dissertation, was first reported in a journal article (Arrow 1950). His thesis was published shortly thereafter as a monograph (Arrow 1951), which became an instant classic.

Economists, political theorists, moral and political philosophers, sociologists, and even the general public took rapid notice of what seemed like—and indeed was—a devastating result. And in a comparatively short time, social choice theory in a modernized and systematically axiomatic form was firmly established as a discipline with immediate and extensive implications for economics, philosophy, politics, and the other social sciences. Very rarely in intellectual history has a young graduate student so profoundly influenced the course of social thought in the world.

Like Condorcet with his “voting paradox,” Arrow was also concerned with the difficulties of group decisions and the inconsistencies to which they may lead. Arrow’s “impossibility theorem” (formally, the “general possibility theorem”) is a result of breathtaking elegance and power. The theorem shows that even some very mild conditions of reasonableness could not be simultaneously satisfied by any social choice procedure in the wide family of such procedures that identify a social ordering for any collection of individual preference orderings over social alternatives.

The fundamental challenge that Arrow considered is that of going from individual preferences over the different states of affairs to a social preference over those states, reflecting something like an “aggregation” of the points of views of all members of the society. He wanted the social preference to be an “ordering” (sometimes called a “complete ordering”). A ranking is an ordering if (1) any two alternatives can be ranked—one preferred to the other, or the opposite, or they are indifferent to each other (this is called the “completeness” of the ranking), and (2) the ranking has a requirement of coherence that goes by the name of “transitivity” (a flash of grammatical language in the field of preferences). Transitivity demands that if an alternative x is taken to be at least as good as y , and y to be at least as good as z , then x must be judged to be at least as good as z . Arrow saw these demands on the social choice as requirements of “collective rationality.”

A social choice procedure that takes us from a cluster (or “profile”) of individual preference orderings (one ordering per person) to a social preference ordering is called a “social welfare function,” as defined by Arrow. Interpreting this in the context of welfare economics, if a state of affairs x is socially ranked above another state y , then state x yields more “social welfare” than does y . The impossibility theorem shows that if there are at least three distinct alternatives and at least two different individuals (though only a finite number of them), then a set of very mildly demanding

conditions of reasonableness cannot be satisfied together by any possible social welfare function.

Consider the following four axioms characterizing a social welfare function, specifying a social ordering of alternative states of affairs for each profile of individual preference orderings over those states.¹

Unrestricted domain (U) claims that a social welfare function must work for every profile of individual preferences (that is, it must generate a social ordering for every cluster of individual preferences).

Independence of irrelevant alternatives (I) requires that the social ranking of any pair of alternatives must depend only on the individual rankings over just that pair (the “relevant” pair).

The Pareto principle (P) instructs that if everyone strictly prefers some alternative x to another alternative y , then social ordering too must place x strictly above y .

Non-dictatorship (D) demands that there should be no dictator such that when that person strictly prefers any x to any y , then society must invariably place x strictly above y .

Arrow’s impossibility theorem shows that these mild-looking axioms U, I, P, and D cannot be simultaneously fulfilled by any social aggregation procedure (or social welfare function).

This is not only an astonishing analytical result, but also one that generated much despair in the search for rational social choice procedures based on individuals’ preferences. It also seemed like an antidemocratic result of profound reach (which, in fact, is not quite the correct interpretation). One common take on this result was that only a dictatorship would avoid social inconsistencies, but a dictatorial rule would, of course, involve (1) an extreme sacrifice of participatory decisions and (2) 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, economic evaluations, and normative statistics would have to be, it seemed, inevitably arbitrary or irremediably despotic.

1. This is a somewhat simplified version of the set of conditions that Arrow himself used (see Sen 1970a).

The Idea of Social Preference

Arrow's framework makes substantial use of the idea of social preference, and Arrowian conditions of "collective rationality" seen in terms of direct use of maximization based on the binary relation of social preference, or indirect use of the idea through imposing internal consistency conditions of choice that has a binary representation. The binary relation can be seen as an "as-if social preference." James Buchanan (1954) has argued powerfully against the alleged cogency of the idea of social preference, because society is not an individual and so cannot have any self-evident attribute of a "preference." The objection is particularly relevant in dealing with political decisions rather than social welfare evaluation, because the latter demands some notion of a socially acceptable idea of a possibly binary social welfare ranking relation. But the case for relying on institutional outcomes rather than on any implicit idea of social preference can be seen to be strong for political processes.

The possibility of a nonbinary formulation of the social choice has received considerable attention in the literature of social choice theory in recent years, led by contributors like Bergt Hansson, Thomas Schwartz, Peter Fishburn, Donald Campbell, and Charles Plott. In some cases, the impossibility results of the Arrow type seem resolved, and in others, they have been revived in the choice-functional framework. The question that arises, however, is whether the impossibility results, thus derived, have been crucially dependent on imposing conditions of internal consistency of choice, which tend to take us in the direction of a binary representation of the choice function. However, it turns out (see Sen 1993) that Arrow's impossibility theorem can be generalized to hold without any condition of internal consistency of choice and without imposing any demands of collective rationality. Through seeing the fuller implications of the relation between individual preferences and social choice (including seeing independence of irrelevant alternatives in a more demanding light), the Arrow impossibility can be shown to resurface without any use of internal consistency in social choice functions and without any idea—explicit or implicit—of a social preference.

Voting and Majority Decisions

As far as political decisions are concerned (postponing for the moment welfare economic investigations), it seems fair to conclude that there is not going to be any perfect resolution through voting procedures of the social choice dilemmas of the kind identified by Arrow. This leads to two different kinds of questions. First, even though there may not be any faultless voting procedure, do some of them function much better than others? Second, is voting a good way at all of trying to resolve social choice problems of all kinds?

Majority voting has many rather attractive qualities and is considered by many as a quintessential component of democratic decision making. Can the grip of inconsistent choices—and more particularly, of not having a “Condorcet winner”—be at least partially subdued? One of the ways of coping with this challenge that has been much explored in this context is the use of a “restricted domain” of the social welfare function—through limiting the preference profiles that are allowed—that would avoid problems of inconsistency in voting results and also avoid the nonexistence of a “Condorcet winner.” Arrow (1951) himself had initiated, along with Duncan Black (1948, 1958), the search for adequate restrictions that would guarantee consistent majority decisions, and he had identified a class of preference profiles (“single-peaked” preferences) that would work.

In fact, the Arrow-Black identification of sufficiency for consistent majority rule (single-peaked preference profiles) can be vastly expanded through using a process of reasoning not dissimilar to Arrow’s own, which results in a much more general condition: “value restriction” (Sen 1966). Value restriction demands that in every triple of alternatives (x, y, z), there is one alternative (say, x) such that everyone agrees that it is either “not best,” or “not worst,” or “not medium” (the position on which there is such an agreement can vary from one triple to another).

Going from sufficiency conditions to the demands of necessity, the necessary and sufficient conditions of domain restriction for consistent majority decisions can also be precisely identified (see Sen and Pattanaik 1969). If individual preferences are strict—that is, they have no indifferences—then these rather complex necessary and sufficient conditions boil down simply to value restriction. However, even though these conditions are much less restrictive than the earlier conditions that had been identified, they are still

quite demanding; indeed, it can be shown that they can be easily violated in many actual situations.

Even though a voting impasse cannot be generally eliminated, it appears that majority rule is, in fact, far less vulnerable to contradictions than other procedures of voting. It can be shown that if there is a domain restriction for which any voting rule other than the majority rule works well, then so will majority rule (see Maskin 1995, 2014; Dasgupta and Maskin 2008). Furthermore, for any nonmajority voting rule, there is a class of preference profiles for which majority rule works well, but the other voting rules do not. This powerful “dominance result” shows that even though all voting rules are subject to impasse or contradictions, the method of majority rule, which has other attractions too, is the least vulnerable among them. The comparative robustness of majority rule is surely a pointer to its strength that cannot but be important for many social and political decisions. But that comfort may not be available for many other types of social choice. For example, voting rules, including majority rule, may be quite inappropriate as a basis for welfare economic judgments (on which more presently).

Liberty and Rights

Majority rule can also be severe against minority rights and may also work against individual liberty. More than a century and a half ago, John Stuart Mill ([1859] 1959) investigated how a good society should try to guarantee the liberty of each person. Liberty has many different aspects, including two rather distinct features:

- 1) *The opportunity aspect*: We should be able to achieve what we choose to achieve in our respective personal domains, for example, in our private life.
- 2) *The process aspect*: We can make our own choices in our personal domains (no matter whether we achieve what we want).

In social choice theory, the formulation of liberty has been primarily concerned with the former, that is, the opportunity aspect.

Seen in the perspective of the opportunity aspect, liberty demands that each person should be decisive in safeguarding certain things in his or her “personal domain,” without interference by others (even if a majority is keen to interfere). J. S. Mill considered various examples of such

personal domains over which the person involved should be able to prevail, including—for example—in the practice of his or her own religion. Note that the “opportunity aspect” cannot be safeguarded, as it is sometimes wrongly presumed, by leaving to the person the choices to be made in her personal domain, as an alleged “process guarantee.” The trouble is that others can interfere in the practice of this person through their own actions (for example, a person may be allowed to choose her religious practices, but others could interfere through making hugely distracting loud noises, or even by organizing disturbing demonstrations outside her home, making life difficult for the person involved). It is the duty of the society, Mill argued, to make sure that the person’s own choices over a personal domain prevail (in this case, guaranteeing that the person can perform his or her private religious actions, without being stopped by others, *and also* without being hindered by the actions of others).

It is the conflict of this opportunity aspect of liberty with the Pareto principle (given unrestricted domain) that is the subject matter of an impossibility theorem, which is sometimes referred to as “the liberal paradox,” or “the impossibility of the Paretian liberal” (See Sen 1970a, 1970b). Unlike the Arrow theorem, this impossibility theorem does not depend on the independence of irrelevant alternatives (condition I), which is not invoked at all. Instead, it is shown that unrestricted domain (U) and the Pareto principle (P) cannot be combined with “minimal liberty,” demanding only that at least two persons are each decisive over the choice over one pair each. There is a huge literature on the subject, including contributions that (1) dispute the result, (2) extend it, (3) attempt to resolve the conflict, and (4) question the interpretation of liberty. The theorem shows the impossibility, given unrestricted domain, of satisfying even a very mild demand for “minimal liberty” when combined with an insistence on Pareto efficiency.

Turning to the process aspect, seeing liberty as a guaranteed process of leaving people free to do certain things in their own personal sphere is a requirement that has been particularly pursued by various writers in this field (led by Robert Nozick (1974), and joined in many distinct ways by others). In this perspective, what liberty demands is that people remain free to choose what to do in their personal domain, but it does not really matter what the actual outcome is (that is, it does not matter as far as liberty is concerned). I cannot pretend that I find this conclusion particularly persuasive, because the opportunity aspect of liberty can also be very important.

In modern societies in particular, it is hard to give people the agency to control what happens in all aspects of their lives. My liberty to fly safely is better guaranteed by leaving many decisions to the pilot, rather than my taking charge of the agencies in the cockpit. Our lives are saved by better policing and effective epidemiology, which involve the agencies of many other people (and not just on what we ourselves do).

However, it is hard to deny that liberty has both opportunity and procedural aspects. If being free to smoke is an important liberty (there can be a debate on this), then surely a procedural system that allows anyone to decide whether to smoke can rightly be seen as a part of liberty. However, if a person who shuns smoking does not want smoke to be blown in her face, her liberty to secure this does not depend primarily on what she does, but mostly on what others do. Leaving her free with her action cannot eliminate this violation of her personal liberty.

In the recent literature, the formulation of process-based liberty has been much refined from the simple statements originally made by Nozick (1974). In particular, the specification of liberty has been given “game-form” formulations (see Gaertner, Pattanaik, and Suzumura 1992), so that agency freedoms are judged by the acceptability of combinations of different persons’ actions (e.g., do not smoke if others are present, or—as a stricter demand—do not smoke in places where others can be present if not deterred by the presence and activities of smokers). This refinement is surely an important one, but as Gaertner, Pattanaik, and Suzumura explain, it does not eliminate the impossibility of the Paretian liberal. Its merit lies elsewhere, in particular, in capturing better the common idea of liberty with the assignment of individual agency freedoms. It does not, however, eliminate the relevance of social choice in assessing different game forms (see Sen 1992; Hammond 1996). Game forms do help the specification and analysis of liberty, but the motivation behind social choice theory would continue to apply in the assessment of alternative game forms. And in that context, we must take note of outcomes as well as processes.

Crisis in Welfare Economics

I turn now to welfare economics. Social choice difficulties apply *inter alia* to what is called “welfare economics”—an old subject aimed at judging social states in terms of the well-being (and other concerns) of the people,

on which A. C. Pigou's (1920) distinguished book, *The Economics of Welfare*, had been something of a classic account. The subject, however, had taken quite a hard hit in the 1930s, even before Arrow's impossibility result further darkened—or seemed to darken—the prospects of systematic welfare economics. The initial crises came because of the economists' newfound—but rather hastily argued—conviction that there was something quite unsound in making use of interpersonal comparison of individual utilities, which had been the basis of traditional welfare economics

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

Bentham's concern—and that of utilitarians in general (John Stuart Mill was the exception here)—was with the *total utility* of a community. The focus, which has problems of its own, was on the total sum of utilities, irrespective of the distribution of that total, and in this, we can see a partial blindness of considerable ethical and political import. For example, in the utilitarian best world of maximizing utility, a person who is unlucky enough to have a uniformly lower capability to generate enjoyment and utility out of income (say, because of a physical or mental handicap) would be given even a lower share of a fixed total income, because of her lower ability to generate utility out of income. This is a consequence of utilitarianism's single-minded pursuit of maximizing the sum-total of utilities—no matter how unequally distributed. 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 do masterfully 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 anti-utilitarian 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 (who were themselves deeply influenced by the then-fashionable philosophical approach of “logical positivism”) 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, 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 each person’s respective ordering of social states, without any interpersonal comparisons of utility gains and losses of different persons. Although utilitarianism and utilitarian welfare economics are quite indifferent to the distribution of utilities among 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 further to the narrow electoral plane of Borda and Condorcet (I should explain that I am referring here to Condorcet as a voting theorist, not as a general social philosopher—in that capacity, his attention was much broader). The use of different persons’ utility rankings without any interpersonal comparison is analytically quite similar to the use of voting information—each individual taken separately—in making social choice.

Attempted Repairs and Further Crises

Faced with this informational restriction, utilitarian welfare economics gave way, from the 1940s on, to what came to be called—hugely overambitiously—“new welfare economics,” which used only one basic criterion of social improvement: the “Pareto comparison.” The Pareto criterion for social improvement only asserts that a situation can be seen as definitely better than another if the change would increase the utility of every one (or at least increase the utility of someone without reducing the utility of anyone

else). A good deal of subsequent welfare economics restricted attention to “Pareto efficiency” only (that is, only to making sure that no further Pareto improvements are possible). This criterion takes no interest whatsoever in distributional issues, which would tend to involve conflicts of interests of different persons). So if one person gains while everyone else loses (no matter how many—and by how much), we were not allowed to declare this change to be a deterioration, if we seek only Pareto efficiency.

This remarkable reticence, it seems fair to guess, would have appealed to Emperor Nero, who evidently enjoyed playing his music while Rome burned and all other Romans were plunged into misery. In general, the Pareto efficiency of a state of affairs would not be disturbed even if many people are forced into terribly famished lives, while some others lead lives of extreme luxury, provided the misery of the destitute cannot be reduced without cutting into the lives of the super-rich.

Some further criterion—beyond Pareto efficiency—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 search led directly to Arrow’s (1950, 1951) pioneering formulation of social choice theory, relating social preference (or decisions) to the set of individual preferences, that is, to the search for what Arrow called a “social welfare function.” It was in the framework of social welfare functions that Arrow (1951, 1963) established his powerful impossibility theorem, showing the incompatibility of some very mild-looking conditions (discussed earlier), including Pareto efficiency, nondictatorship, independence of irrelevant alternatives, and unrestricted domain. This generated further gloom in an already gloomy assessment of the possibility of having a reasoned and satisfactory welfare economics.

To escape the impossibility result, different ways of modifying Arrow’s requirements were tried out in the literature that followed, but other difficulties continued to emerge. The force and 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. By the middle 1960s, William Baumol, a distinguished contributor to economics in general and welfare economics in particular, judiciously remarked that “statements about the significance of welfare economics” had started having “an ill-concealed resemblance to obituary notices” (Baumol 1965, 2). This was certainly the right reading of the prevailing views.

Welfare Economics and Voting Information

It can be argued that the “obitutorial” climate of welfare economics in its postutilitarian phase was related largely to the epistemic penury of welfare economics based on confining informational inflow to voting-like inputs. Voting-based procedures are entirely natural for some kinds of social choice problems, such as elections, referendums, or committee decisions. They are, however, altogether unsuitable for many other problems of social choice. For example, when we want to get some kind of an aggregative assessment of social welfare, we cannot rely on such procedures for at least three distinct reasons.

First, there are some serious problems in the correspondence between actual preferences and the votes cast, which must take note of the possibility of strategic voting, aimed at manipulating the voting outcomes. The impossibility of having strategy-proof voting procedures has been well established.² The subject occupies a huge literature.

Second, voting requires active participation, and if some groups tend not to exercise their voting rights (perhaps due to cultural conditioning or because of procedural barriers that making voting difficult and expensive), then the preferences of those groups tend to have quite inadequate representation in social decisions. Because of lower participation, the interests of substantial groups—for example, of African Americans in the United States—can have a quite limited influence on national politics.

Third, even with the active involvement of everyone in voting exercises, we will still be short of important information needed for welfare economic evaluation. It is absurd to think that social welfare judgments can be made without some understanding of issues of inequality and disparities that characterize one society or another. Voting information, taken on its own, turns a blind eye to such comparisons—its takes no direct note of how deprived different voters may be, nor of the extent to which their preference reflects large differences or small ones. These limitations are related to the eschewing of interpersonal comparison of well-being, on the impossibility of which for several decades, professional economists remained prematurely convinced.

2. See Gibbard (1973), Satterthwaite (1975), and also Pattanaik (1973, 1978), Maskin (1985) and Maskin and Sjöström (2002).

There was also the exclusion of what economists call “cardinal utility,” which takes us beyond relying merely on the ranking of alternatives in terms of being better or worse (or indifferent)—the so-called ordinal utility—to giving us some idea of the relative gaps between the utility values of different alternatives. Utilitarian welfare economics uses cardinality of utilities as well as interpersonal comparison of these utilities, and the new orthodoxy that emerged in the 1930s disputed the scientific status of both cardinality and of interpersonal comparison of utilities of different persons.

Informational Penury as a Cause of Social Choice Problems

It is also worth recollecting that utilitarian philosophy—and influenced by it, traditional welfare economics as well—had huge informational restrictions of their own. It was not allowed to make any basic use of non-utility information, because everything had to be judged ultimately by utility sum-totals in consequent states of affairs. To this informational exclusion was now added the further exclusion of interpersonal comparisons of utilities, along with cardinal utility, which disabled the idea of utility sum-totals without removing the exclusion of non-utility information. This barren informational landscape makes it hard to arrive at any systematic judgment of social welfare, based on informed reasoning. Arrow’s theorem can be interpreted, in this context, as a demonstration that even some very weak conditions—in this case, Arrow’s axioms—relating individual preferences to social welfare judgments cannot be simultaneously satisfied in a world of such informational privation (see Sen 1977b, 1979).

The problem is not just one of impossibility. Given Arrow axioms U (unrestricted domain), I (independence of irrelevant alternatives), and P (Pareto principle), the relation between the profile of individual preferences and the social ranking emerging from it has to forgo taking any note of the nature of the alternatives (that is, the social states). The relation must simply go by the individual preferences over the alternatives, no matter what they are. If person 1 is decisive in the choice over any pair (a, b)—for whatever reason—then that person would be decisive in the social preference over every other pair of alternatives (x, y) as well, even though the nature of the choice involved may radically differ because of the nature of the social alternatives involved.

This requirement is sometimes called “neutrality” (a usage that had the support—I very much hope only half-hearted—of Arrow (1963) himself). It is, in fact, a peculiarly kind term for what is after all a sanctification of blindness to all information other than utility information. Perhaps the alternative term used for it (namely, “welfarism”) is more helpful, in that it focuses on the limitation imposed by forbidding any direct use of any information about the states of affairs other than the individual welfares they respectively generate—and that again only in the form of utilities. Adding to that the further requirement that the utility information used must not involve any cardinality, or any interpersonal comparison of utilities, amounts to insisting that social choices must be made with extremely little information indeed.

The demand of so-called neutrality tends to play havoc with the discipline of reasoned social choice. Consider, for example, a cake division problem, in which everyone prefers to have a larger share of the cake. If, in this cake division problem, an equal division between two persons in the form (50, 50) is socially preferred to person 1 having 99 percent of it, with the other having only 1 percent in the form (99, 1), it is clearly being judged that person 2’s preference should prevail over person 1’s, in this case. But if so-called neutrality is demanded, then due to the insistence that the nature of the alternatives should not make any difference to whose preference prevails, an opposite type of inequality—with person 2 having nearly all in the form of (1, 99)—should be socially preferred to a (50, 50) division, through the requirement that person 2, decisive over the earlier choice, should be decisive over all other pairwise conflicts as well. It is hard to escape the thought that something has gone badly wrong in the underlying intellectual system—and that problem arises even before any impossibility result emerges.

What is being presumed here is to insist that welfare judgments must be based on something like voting data, taking note of who prefers what but ignoring who is rich and who is poor, and who gains how much from a change compared with what the losers lose. 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, particularly in welfare economics.

Arrow had ruled out the use of interpersonal comparisons, because he had followed the general consensus that had emerged in the 1930s that (as Arrow put it) “interpersonal comparison of utilities has no meaning” (Arrow 1951, 9). The totality of the axiom combination used by Arrow had

the effect of confining social choice mechanisms to rules that are, broadly speaking, of the voting type. His impossibility result relates, therefore, to this class of rules with this informational abstinence.

It should be emphasized that, unlike ruling out the use of interpersonal comparison of utilities, which Arrow explicitly invoked, the insistence on restricting social choice procedures only to voting rules is not an assumption that is directly imposed by Arrow. It is, in fact, a combined result—quite startling in its own right—of the different axioms that Arrow uses. It can be seen as an analytical consequence of a set of apparently reasonable axioms postulated for social choice. Interpersonal comparison of utilities is, of course, explicitly excluded, but in the process of proving his impossibility theorem, Arrow also shows that a set of seemingly plausible assumptions, taken together, logically entail other features of voting rules as well, in particular something close to so-called neutrality (discussed earlier). This requires that no effective note be taken of the nature of the social states, and that the social decisions must be based only on the votes that are respectively cast in favor of—and against—them. Although the eschewal of interpersonal comparisons of utilities eliminates the possibility of taking note of the inequality of utilities (and also of differences in gains and losses of utilities), the entailed component of so-called neutrality (or welfarism) prevents attention being indirectly paid to distributional issues through taking explicit note of the nature of the respective social states (for example, of the incomes or wealth levels of different persons, as in the cake-division example discussed earlier).

This also brings out the disanalogy between Condorcet's voting paradox and Arrow's much more general impossibility theorem (in contrast to some common statements in the literature). Condorcet's analysis begins with the world of voting rules, whereas Arrow gets there only after establishing a remarkable analytical theorem showing that the combination of a few very apparently plausible axioms leaves us no option but to confine our vision to voting rules. Some of the hard work in establishing Arrow's theorem ends where the Condorcet exercise begins.

Incorporating More Information in Social Decisions

To lay a broader foundation for a constructive social choice theory (broader than the framework Arrow developed), we have to resist the historical consensus against the use of interpersonal comparisons in social choice that was

dominant when Arrow began his research on social choice. That historical consensus was based on a rather fragile understanding of epistemology, derived from the short-lived boom of logical positivism. The case for unqualified rejection of interpersonal comparisons of mental states is hard to sustain (quite aside from the fact that these comparisons need not be of mental states only—on which more presently).³ Indeed, as has been forcefully 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 such comparisons in social choice.

However, aside from doubts about the evidential basis of interpersonal comparisons, there were also questions about the possibility of a systematic analytical framework for comparing and using the accounting of different persons' welfare magnitudes for social decisions, especially because interpersonal comparisons can take many different forms. John Harsanyi (1955) and Patrick Suppes (1966) made some early departures in that direction. But they were more concerned with using interpersonal comparisons (of "units" in the case of Harsanyi and of "levels" in the case of Suppes) rather than with working out a comprehensive analytical framework for interpersonal comparisons in general, including the possibilities of specific features of interpersonal welfare calculus.

Inspired by this challenge, I tried my hand at developing a comprehensive analytical framework for interpersonal comparisons in my book *Collective Choice and Social Welfare* (Sen 1970a) and in follow-up contributions (Sen 1977b, 1982). Happily, the 1970s and 1980s also saw the publication of major contributions on the subject from a dazzling group of social choice theorists, including Peter Hammond (1976); Claude d'Aspremont and Louis Gevers (1977); Eric Maskin (1978, 1979); Louis Gevers (1979); Kevin Roberts (1980a, 1980b); Kotaro Suzumura (1983, 1997); Charles Blackorby, David Donaldson, and John Weymark (1984); d'Aspremont (1985); d'Aspremont and Mongin (1998); and others. Even Kenneth Arrow (1977) joined this

3. On this issue and that of making actual interpersonal comparisons with factual information, see Daniel Kahneman (1999, 2000), Alan Krueger (2009), and Krueger and Stone (2014).

exploration. It is fair to say that we now have a much clearer understanding of the analytical demands of different kinds and extents of interpersonal comparisons, and the ways and means of making systematic use of that information in social choice.

Without going into the technicalities that have emerged in the literature, it can be said that the extent and reach of different kinds of interpersonal comparisons can be explicitly invoked in a fully axiomatized form (prominent types include full comparability, level comparability, unit comparability, ratio-scale comparability, and so on; see Sen 1977b). Each kind of comparability imposes its own demands on combining welfare numbers of different persons. Consider, for example, a case of full comparability, by beginning with well-being numbers 1, 2, 3 for person 1, respectively, for social alternatives x , y , and z , with the corresponding numbers for person 2 being 2, 3, 1. Because there are no naturally fixed units of well-being, we can easily enough alter the well-being numbers of person 1 for x , y , and z to be 2, 4, 6 instead of 1, 2, 3. Full interpersonal comparability would demand that if we rescale person 1's well-being numbers by doubling them, then we must do the same for person 2, and transform her well-being numbers from 2, 3, 1 to a corresponding set 4, 6, 2. With such tying up (they are axiomatized through "invariance conditions") implied by full interpersonal comparability, it would not make any real difference whether we work with the original numbers (1, 2, 3 for person 1, and 2, 3, 1 for person 2), or deal instead with the symmetrically transformed numbers (2, 4, 6 for person 1, and 4, 6, 2 for person 2). As different types of interpersonal comparability (such as "level comparability" or "unit comparability") are considered, we shall have correspondingly different specifications of the invariance conditions (see Sen 1970a, 1977b; Roberts 1980a).

Through the use of "invariance conditions" in a generalized framework that allow the use of interpersonally comparable well-being numbers, going beyond simple rankings (to different extents, depending on the type of interpersonal comparability), we get what are called *social welfare functions*, which allow the use of much more information than Arrow's social welfare functions permit. 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. To illustrate, we may invoke the same example of Nero and the burning of Rome, discussed earlier. It

seems reasonable to argue that there should be no great difficulty in accepting that Emperor Nero's welfare gain from the burning of Rome was smaller than the sum-total of the welfare loss of all the other Romans put together—perhaps hundreds of thousands of them—who suffered from the fire. But this does not require us to presume that we can put everyone's welfares in an exact one-to-one correspondence with one another. Thus, there may 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 extent of the variations that may be permitted). It can also be shown that terribly refined interpersonal comparisons may not be needed for arriving at definite social decisions. Quite often, rather limited levels of partial comparability will be adequate for making social decisions. Thus, the empirical exercise need not be as ambitious as is sometimes feared.

What Difference Does It Make?

How much of a change in the possibility of social choice is brought about by systematic use of interpersonal comparisons? Does Arrow's impossibility theorem (and related results) go away with the use of interpersonal comparisons in social welfare judgments? In brief, the answer is yes. The additional informational availability allows sufficient discrimination to escape impossibilities of this type. For example, with interpersonal comparability we can use the Rawlsian distributive principle of maximin (what he calls “the Difference Principle”), which takes the form of giving priority to the interests of the worst-off person (or persons).⁴ And this just demands “level comparability,” while the units of different persons' welfares need not be comparable at all.

There is an interesting contrast here. Although interpersonal comparability even without cardinality helps dissolve Arrow's impossibility theorem,

4. For compatibility with the Pareto principle (as well as for making reasonable sense), this Rawlsian approach has to be used in what is called a “lexicographic” form, so that in case where the worst-off persons tie with each other in the comparison between two states of affairs, we go by the interests of the second worst-off. And so on. For the wide reach of Rawls's criterion and its widespread relevance in public policy, see Edmund S. Phelps (1973).

cardinality without interpersonal comparability does nothing of the sort. In the absence of interpersonal comparability, Arrow's theorem can, in fact, be generalized to cover the case of fully cardinal utilities or welfares (see Sen 1970a, chapter 8). In contrast, the possibility of only "ordinal" interpersonal comparisons (so that the rankings of well-being between different persons remain invariant) is adequate to end the impossibility, even without any cardinality. We already know 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. 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 may have to be confined to a relatively small class; see Roberts 1980a, 1980b).

Interpersonal Comparison of What?

Even though the analytical issues in incorporating interpersonal comparisons have been fairly 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: interpersonal comparison of what? Even though the debates about interpersonal comparison of well-being have been, historically, concentrated on the comparison of "utilities" in which utilitarian philosophers were particularly interested, the subject of interpersonal comparison in general is much broader than that.⁵

It must be recognized that the formal structures of social welfare functions are not specific to utility comparisons only, and they can, in fact, incorporate other types of interpersonal comparisons as well. The principal conceptual issue is the accounting of individual advantage. This need

5. Along with broadening the coverage of information for a better understanding of poverty, there is also the important question of making sure that the empirical connections used in the informational expansion are appropriately tested and scrutinized. Recently, randomized trials have been skillfully used to make the informational broadening more sure footed, whenever possible (see particularly Banerjee and Duflo 2011).

not take the form of comparisons of mental states of happiness or desires (which have been exclusively championed by utilitarian philosophers). It could instead focus on some other way of looking at individual well-being, or freedom, or substantive opportunities.

Further, if the aggregation considered is that of individual judgments (not of individual interests), then the question can also be raised about how the divergent opinions or valuations of different persons may be combined (this is a social choice exercise of a rather different kind, on which, see Sen 1977a). This exercise, with complexities of its own, has also received some attention (see particularly Christian List and Philip Pettit (2002) and List (2005)). Furthermore, if utility comparisons are taken to be value judgments themselves, rather than purely observational assessments (this was the position strongly advocated by Lionel Robbins), then the assignment of individual utilities for use in social aggregation could itself be seen as involving aggregation of different individuals' assessments of people's utilities (see Roberts 1995).

Capabilities and Primary Goods

The main problem with relying on mental state comparisons may not be their feasibility but their relevance—at least their allegedly exclusive relevance in social choice. There are many difficulties in judging the well-being of a person by his or her mental state. Utilities may sometimes be very malleable in response to persistent deprivation. A hopeless destitute, or a downtrodden laborer living under inescapably exploitative 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 fulfillment of her downwardly adjusted desires). But her success in such adjustments will not make her deprivation go away. The metric of pleasure or desire may sometimes quite inadequately reflect the extent of a person's substantive deprivation.

There may indeed be a case for taking incomes, commodity bundles, or resources more generally to be of direct interest in judging a person's advantage. The interest in incomes or resources can arise for many different reasons—not merely for the mental states that opulence may help generate.

In fact, the Difference principle in Rawls's (1971) theory of "justice as fairness" is based on judging individual advantage in 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 on by taking note not only of the holdings of primary goods and resources, but also of interpersonal differences in converting them to the capability to live well. Indeed, I have tried to argue in favor of judging individual advantages in terms of the respective capabilities that the person has reason to value, on which, see Sen (1980, 1985a, 1985b) and Nussbaum (1988, 1992, 2000, 2001, 2011). This approach focuses on the substantive freedoms that people have rather than only on the particular outcomes they obtain. For responsible adults, the concentration on freedom rather than only on achievement has some merit, and it can provide a general framework for analyzing individual advantage and deprivation in a contemporary society.

Normative Measurement

The variety of information on which social welfare analysis can draw can be well illustrated by the study of poverty and the battle against it. The intellectual challenges involved in what Angus Deaton (2013) has called "the great escape" are as important to the subject of social choice as they are central to the basic engagements of the social sciences in general.

In the standard measurement literature, 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, which has been an important part of contemporary social choice literature, yields two different types of questions. First, is it adequate to see poverty as equivalent to lowness of income? Second, even if poverty is seen as low income, is the aggregate poverty of a society best characterized by some index of the head-count measure of the number falling below the chosen cut-off poverty-line income?

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, related to, say, epidemiological conditions of a person's regional location. It has been argued that poverty can be more sensibly seen 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.

This is not to deny that lowness of income can be very important in many contexts, because the opportunities a person enjoys in a market economy can be severely constrained by her level of real income.⁶ 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 reasons to look beyond income poverty (see Sen 1984, 1992; Foster and Sen 1997) without ignoring the income information. There are at least four different sources of variation: (1) personal heterogeneities (for example, disability or 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 challenges), and (4) differences in relative deprivation connected with customary patterns of consumption in particular societies (for example, being relatively impoverished in terms of income in a rich society can lead to deprivation of the absolute capability to take part in the life of the community—a point that was made with compelling force by Adam Smith (1776)).

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

6. These issues have been insightfully scrutinized by Philippe Van Parijs (1995).

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.⁷

Among the new developments in the field are multidimensional measures of poverty and inequality, powerfully pursued in different forms by Atkinson and Bourguignon (1982), Alkire and Foster (2011a, 2011b), and others.⁸ To understand poverty and inequality, a strong case can be made for looking at real deprivation and not merely at mental reactions to that deprivation. The point has been brought out particularly clearly by recent investigations of gender inequality that focus not just on happiness or unhappiness but also on women's deprivation in terms of undernutrition; clinically diagnosed morbidity; observed illiteracy; even unexpectedly high mortality (compared with physiologically justified expectations); and in an anticipatory context, sex-specific abortion of female fetuses.

Multidimensional interpersonal comparisons can be sensibly—and comfortably—accommodated in a broad framework of welfare economics and social choice theory, enhanced by the removal of informational constraints that are explicitly invoked or implicitly imposed in traditional welfare economics.

A Closing Remark

Broadening of the informational basis has become a major concern in modern social choice theory. This applies, first of all, to addressing Arrow's impossibility result. Second, it is central to being inequality sensitive in welfare economics. Third, it is relevant to being liberty conscious in politics, law, and the pursuit of human rights. Fourth, it is especially important for having better informed normative measurement of the well-being of people.

7. I will not survey here the huge axiomatic literature on this subject. The measure of poverty on the income space in Sen (1976) 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." See also Foster and Sen (1997).

8. See also Kolm (1977), Maasoumi (1986), Alkire et al. (2015), and Maasoumi and Racine (2016), among many other contributions to the rich literature on multidimensional aggregation in the context of the measurement of inequality and poverty.

As has been discussed and illustrated in different contexts in this chapter, the reasoned use of appropriate information involves both epistemology and ethics. More engagement in each is crucially important for further progress in social choice and welfare economics.

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Comment: Célestin Monga

The Economy of Tastes, Feelings, and Opinions

I still remember vividly the strange mix of excitement and bewilderment that overwhelmed me in my high school years when our professor of accounting taught us the fundamentals of benefit-cost analysis. I immediately went to my dormitory and spent most of the evening trying to apply this powerful technique, not to assess whether the advantages of a hypothetical investment project were likely to outweigh its drawbacks, but to evaluate my own life prospects. Benefit-cost analysis seemed like a rigorous and revealing tool to examine whether my minuscule and uncertain existence was a “profitable” venture, or at least a worthwhile escapade that deserved to be continued. Of course, the few friends to whom I confided this found it a ludicrous idea. They reminded me that a benefit-costs analysis is always controversial, even when circumscribed to real investment decisions or to public policies. They were right: Applying it to one’s life opened even more unresolved conceptual questions. But so what?

I kept running the numbers. To ascertain the net effect of an imaginary list of positive and negative changes to come in my well-being, I first had to come up with a way of measuring the gains and the losses. The identified benefits and costs, even though they were expressed in monetary terms, went well beyond changes in my projected individual income: My well-being was to be affected positively or negatively by nonmonetary factors, whether linked to my individual and personal preferences or related to the well-being of people around me (social benefits and costs).

I also had to decide how to imagine and estimate the prospective benefits and costs of my entire life to come. Using my own personal value scale,

I calculated the costs as the amount of compensation required to exactly offset negative consequences of being alive for the 50 years or so of life expectancy ahead. The compensation required was the monetary amount that would leave me just as well off as before engaging in this exercise. Benefits were measured by my willingness to stay alive and enjoy all the things and emotions that I could reasonably expect for the decades ahead. Knowing that, in the end, life always results in death, typically following either an abrupt and tragic event like a car or airplane crash, or a long and painful illness, I could not find many benefits whose present and expected value could match and compensate for the pains and disappointments of the costs. The results of my benefit-cost analysis were not very promising: Taking into consideration all current and expected streams of good and bad news, life did not appear to be a “profitable” investment.

Shocked by the outcomes, I quickly did some sensitivity analyses to check the robustness of the findings: No matter what discount rates I chose, the calculations still yielded disappointing numbers to the question of whether life was a worthwhile venture. This was all the more puzzling, because I actually loved many aspects of my life. Not knowing what to do with the analyses, I concluded that one should either doubt the validity of certain measurement instruments and our ability to use them “objectively,” or radically give more weight to whatever we define as “positive” outcomes for our actions or inactions, or accept the very probable hypothesis that happiness may be an illusion but those who choose to live should learn to ignore its downsides. I could only forget the outcomes of my own study by learning to radically change whatever assumptions I used in carrying it out. “Life is impossible without the ability to forget,” philosopher Emil Cioran once said. But some memories are just too long lasting to be erased.

Carrying out the same benefit-cost analysis today, even with the same elements and discount rates, would obviously yield different results. This illustrates some of the truly challenging conceptual problems at the heart of the study of well-being, whether it is approached through the lens of welfare, utility, or the standard of living of one individual. The challenges are even more formidable when one tries to assess not just the perspectives and preferences of one person but also the social preferences of people in a group; then one has to aggregate and make sense of the various viewpoints of all members of the society. The complexities are not just “technical” or methodological—after all, these can be addressed with carefully designed

quantitative frameworks and clearly formulated assumptions; they also involve ethical and psychological issues that do not fit nicely in any linear models of aggregative social choice theory.

I should not have been surprised to feel lost trying to determine and assess the validity of my own present and future welfare. Cioran also warned about the dangers of loving oneself, which is falling in love with someone about whom we know nothing. If capturing one's own utility, welfare, and standard of living is so challenging, how about doing the same exercise at the level of a group or society? The instability of my preferences and of my own subjectivity, the constantly changing moods and mental states, and the inability to even decide for myself what my objective functions are or should be explain why my schematic benefit-cost analysis was unsatisfactory and inconclusive. These problems are compounded when one gets to the level of social aggregation. How would one confidently compute and aggregate individual tastes and opinions that are moving targets? What is the right approach to ethical decision-making, both at the individual level and at the social/aggregative level? And what are the appropriate ethical stances for comparative analyses of such scope?

Central to the general topic of social aggregation is the issue of interpersonal comparisons of well-being, which has preoccupied economists, social scientists, and philosophers for centuries. At least three types of problems must be addressed to elaborate intellectual and policy frameworks for making socially acceptable decisions. One must obviously start with valid methods for defining, understanding, capturing, and measuring the notion of individual well-being. Second, these methods should be extended to social groups in ways that make them meaningful and credible. Third, one should remember that the very purpose for carrying out such an exercise may affect the answers to the two initial questions posed (Elster and Roemer 1991). All this supposes that individual preferences can be measured at a satisfactory level of confidence that the intrinsic subjectivity in such exercises are more than compensated by objectivity in the methods used.

The various steps that one must go through (from theory to specific concepts and empirical strategies) are therefore both daunting and exciting. Not surprisingly, many of the most creative minds in economics have tried to climb that mountain, a task that requires not only using the traditional quantitative tools of economics but also taking stock of the relevant findings of philosophy, psychology, and even biology. Amartya Sen's chapter,

“Social Choice and Welfare Economics,” which builds on several important previous contributions (most notably Sen 1970), is the latest attempt to do so. As always with Sen, the reader is taken on an erudite and insightful journey, intellectually challenging but always rewarding. Before offering a summary exposition of his bold thesis, let me provide an initial overview of some of the elements of the puzzle that he heroically tries to assemble.

My comment offers a brief reassessment of the elements of the debate. Section 1 summarizes the intellectual progress made by economists in the search for a valid social choice theory and outlines a few aspects of Amartya Sen’s new contribution on the topic. Section 2 discusses some of the remaining ethical questions and urges economists to be more attuned to the research findings in the other social sciences and the humanities. Section 3 offers a few concluding remarks.

Beyond Utilitarian Calculus: Amartya Sen’s Bold Thesis

How to assess and report our own pleasures, utility, state of mind, and opinions? How to make individual and collective choices? How to prioritize and rank them? And how to compare and aggregate our selections with those of other people in a credible and legitimate social welfare function? How should we make collective decisions that reflect optimally the preferences and welfare of everyone in a social group—so that they can all live, if not happily, at least with the feeling that the decisions are made in ways that are acceptable to everyone? Underpinning these questions of social aggregation of utility, tastes, and opinions is the issue of interpersonal comparisons of well-being, which has preoccupied economists, social scientists, and philosophers for centuries. Various waves of research on the topic have basically identified several types of problems that must be addressed to elaborate an intellectual framework for making socially acceptable decisions. Such frameworks obviously start with valid methods for defining, understanding, capturing, and measuring individual preferences and then extend them to social groups, with a satisfactory level of confidence that subjectivity is more than compensated by objectivity.

Capturing one’s feelings and converting them into indicators of welfare or utility, measuring them and aggregating opinions from groups of people have long been challenging questions for researchers. In an introduction to one of his books, Jevons ([1871] 1970, 85) warned that:

The reader will find again, that there is never, in any single instance, an attempt to compare the amount of feeling in one mind with that in another. I see no means by which such comparisons can be accomplished. ... Every mind is thus inscrutable to every other mind, and no common denominator of feeling seems to be possible.

Economists followed suit and showed a strong reluctance to carry out interpersonal comparisons of utility that were forcefully promoted by logical positivists. The economists justified their position by arguing that ethical statements were always unverifiable and therefore lacked scientific foundations—see Ayer ([1936] 1971).

Utilitarian economists were particularly adamant in their opposition to interpersonal comparisons of utility, arguing that it is unsound to make use of interpersonal comparisons of individual utilities. Jeremy Bentham, the leading proponent of such utilitarian calculus, was concerned only with maximizing the total utility of a community, irrespective of its distribution. Even the early critics of utilitarianism thought 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, 636). Such views were rooted in *logical positivism*, also called *logical empiricism*, a philosophical movement that emerged in Vienna in the 1920s and considered scientific knowledge to be the only kind of factual knowledge.

The general reluctance of researchers to move to that terrain led to major intellectual impasses in both social choice theory and welfare economics. Although positive economics could be carried out without interpersonal comparisons of utility, social choice theory without interpersonal comparisons of utility could not go very far: The scope of normative economics and welfare economics was basically limited to theoretical developments concerning the identification of Pareto efficient outcomes or Pareto improvements to existing economic situations. “Traditional comparisons of utility have to be made if there is to be any satisfactory escape from Arrow’s Impossibility theorem,” notes Hammond (1991, 235). But the lingering fundamental question raised by the logical positivists had to be answered: How can one rigorously construct an interpersonally comparable utility function?

Starting in the 1950s, economists, mathematicians, and philosophers took up the task. Alternative methods of making different forms of interpersonal comparisons of utility were offered by several researchers, with various degrees of complexity and success. The really exciting intellectual journey

in the quest for a more convincing social welfare function was launched by Arrow ([1951] 1963), who put social choice theory in its modern, fully axiomatized form. He tried to identify the most valid procedures for deriving a collective or “social ordering” of the alternatives (from better to worse) from people’s preferences. His search for a “general possibility” theorem, as he called it, led to the conclusion that it was in fact an impossibility—no single procedure could satisfy a few straightforward assumptions concerning the autonomy of the agents and the rationality of their preferences.

Several generations of researchers subsequently attempted to modify Arrow’s requirements and come up with a solution to the impossibility theorem (see Maskin and Sen 2014). Generally these solutions led to other difficulties. This research quickly became a journey into the dilemmas and challenges of normative ethics and how economics has struggled with them. It strongly focused on discussions of utilitarianism, understood in its generic definition as the view that the morally right actions are those that generate the most good, with the implication that the social good is the sum of the welfares of individuals in a group—assuming that the latter are interpersonally comparable. Harsanyi (1953, 1955, 1977) provided the most debated axiomatic arguments in support of utilitarianism. His work set the stage for the issues of utility and preferences as seen by economists and mathematicians, and it suggested a framework for modeling moral value judgments.

Harsanyi’s main insight has been to imagine an impartial observer who can determine a social ordering of the existing alternatives faced by all members of a given group or society. Although detached from the group, the observer in question is also sympathetic to its concerns, and he imagines how he would determine a social ordering of the available alternatives based on an impartial attitude toward the interests of all members of the group. The neutral observer imagines how he would assess the various alternatives if he were in the shoes of, say, individual i , with i ’s objective circumstances, tastes, and opinions. Harsanyi makes two additional and important suppositions: The impartial observer has preferences about these hypothetical alternatives that satisfy the expected utility axioms,¹ and these prefer-

1. The von Neumann–Morgenstern axioms of the expected utility theory that define a rational decision-maker are as follows: completeness, which assumes that an individual has a set of well-defined preferences and can always decide between any two alternatives; transitivity, which assumes consistency in the decision-making of the

ences are represented by a von Neumann–Morgenstern utility function. It is also assumed that the observer (who plays the role of and seeks the interests of society as a whole) respects the orderings of social alternatives by the individuals. With the adoption of the impartial perspective, the resulting judgments computed from the observer's utility can be considered moral judgments, as they give equal consideration to the interests of each person in the group.² Harsanyi used this framework to elaborate aggregation and impartial individual theorems with strong assumptions: the existence of a single profile of *individual* preference orderings and of a single *social* preference ordering of a set of social alternatives (consisting of all lotteries that can be generated from a finite set of alternatives).

Harsanyi's approach is based on the notion of "impersonality," which posits that it is possible for an ethical observer of any situation to free himself from selfish perspectives when weighting moral issues by pretending to be entirely uncertain about which individual the observer will become after the issue has been decided. In sum, one should be willing and capable of becoming somebody else completely: This is a clever device, comparable to Hare's (1963) principle of "universalizability" and Rawls's (1971) notion of the "veil of ignorance." These ideas paved the way for other influential approaches, which recommended inferring interpersonal comparisons from different aspects of the behavior of individuals. Yet in the end, such behaviorist empirical methods were often found to be unsatisfactory, as they typically required ethical judgments and also led to normative statements that could not be made from empirical observations alone.

Then came Amartya Sen, the most daring theorist among those who have studied the issues surrounding the rationality of economic agents from various angles. In this chapter, he revisits the theme but approaches it obliquely and offers a comprehensive analytical framework for interpersonal comparisons. One obvious and striking feature of the chapter is its

individual; independence, which assumes that two lotteries mixed up with an irrelevant third one will maintain the same order of preference as when the two initial lotteries are presented independently of the third one; and continuity, which assumes that when there are three lotteries (1, 2, and 3) and the individual prefers 1 to 2 and 2 to 3, then there should be a possible combination of 1 and 3 in which the individual is indifferent between this particular mix and lottery 2.

2. See Weymark (1991) for an excellent discussion.

style: Sen's prose is always very precise, soft, and elegant. It constantly keeps the reader in focus, even when the issues discussed are technically demanding. Sen is also a master at challenging erroneous ideas without ruffling feathers. It can be said about him what is often said about former US senator Joseph Lieberman: "He is so elegant in his criticism of his opponents that even if he tells you to go to Hell, you would actually enjoy the ride!"

Sen begins with a reexamination of some old questions in the theory of collective decision-making, which he traces back to Jean-Charles de Borda (1781) and de Condorcet (1785). Sen's deconstruction of the problem at hand starts as follows: Suppose a group of people is facing some alternatives to choose among (such as candidates in an election, policy options, projects and programs, and distribution of income). How does one make acceptable social decisions for a group (such as a nation, or a community, or any other collectivity) in a way that the diverse views and interests of members of the group all receive attention and importance? How does one go from individual preferences over different states of affairs to a social preference over those states, reflecting an "aggregation" of the points of views of all members of the society?

In fact, Sen had attempted to answer these questions in many previous works. He gracefully fired multiple salvos to some of the earlier theories of and approaches to social welfare (Sen 1970, 1977, 1986). Building on Arrow's work, Sen did not hesitate to question it, but with elegance and admiration—he always did it in homeopathic doses, relaxing assumptions here, delicately challenging the rigidity of the impossibility theorem there, or taking the tangent whenever he believed that his predecessors' frameworks were erroneous. Sen's analyses have brought new hope to the search for rational social choice procedures based on individuals' own preferences.

Sen begins the chapter with the acknowledgment that there is not going to be any perfect resolution of the social choice dilemmas of the kind identified by Arrow through voting procedures. He rejects the notion that they can be used in all situations: "Voting-based procedures are entirely natural for some kinds of social choice problems, such as elections, referendums, or committee decisions. They are, however, altogether unsuitable for many other problems of social choice."

Sen's reasoning is logical: If it is true that there are no faultless voting procedure out there to be found, the next logical question is whether some of them could yield better results than others. And by the way, is voting itself

a good method to resolve social choice problems of all kinds? Didn't Winston Churchill famously say that "The best argument against democracy is a five-minute conversation with the average voter?" (Priest 2017, 3). Sen is an optimistic economist: He is skeptical of the traditional welfare economics developed by the utilitarian researchers. He is very confident that interpersonal utility can be measured satisfactorily. He challenges the historical consensus against the use of interpersonal comparisons in social choice.

Sen's recommendation is bold and hopeful: One must go beyond the class of voting rules (studied by Borda, Condorcet, and Arrow) to address distributional issues, particularly in welfare economics. The decision to reject the philosophical basis of logical positivism and to believe instead, like philosopher Donald Davidson, that people can understand and relate to other people's minds and feelings only by making some comparisons with their own minds and feelings, allows new ways of thinking about social choice. Then Arrow's impossibility theorem and its related results just go away when different kinds of interpersonal comparisons are used in social welfare judgments.

Sen observes that each kind of comparability requires a particular way of combining welfare numbers of different people in a group. Of course, such comparisons need not be very precise before they can be used systematically in social choice. He writes:

We may be able to make interpersonal comparisons to some extent, but not in every comparison, nor of every type, nor with tremendous exactness. ... It can also be shown that terribly refined interpersonal comparisons may not be needed for arriving at definite social decisions. Quite often, rather limited levels of partial comparability will be adequate for making social decisions.

A very clever way of using minimalism to achieve maximum intellectual impact, indeed.

Beyond Aggregation Techniques: Some Ethical Challenges

Developing a legitimate framework for making social decisions—one that accounts "democratically" for the preferences and interests of the members of the group or society under consideration—is likely to remain an elusive quest. It requires much more than an intellectual consensus on the measurement and aggregation techniques that game theory and mathematics have so far offered. It is indeed impossible to carry out any social choice

theory without acknowledging the underlying question that is the basic problem of moral philosophy: “What should I do?” Issues of individual and group preferences or interests are likely to collide in ways that cannot be fully captured by the rigid laws of averages, which underpin most aggregative theories. Group decisions are also mired in ethical dilemmas and conceptual inconsistencies that economics is not equipped to handle.

The impossibility theorem, which Sen describes as a result of breathtaking elegance and power, is a very useful tool for assessing which outcome is “right” when thinking about social choices. Each of its axioms is reasonable and compelling, but taken together, they are overwhelming. I agree with Sen that Arrow may have overstated the negative case by insisting that each rule under consideration satisfies all the axioms no matter what people’s rankings of their preferences and choices turn out to be.³ I also agree that to lay a broader foundation for a constructive social choice theory, we have to reject the historical consensus against the use of interpersonal comparisons that was prevalent in the first part of the twentieth century and became conventional wisdom. Sen argues that we should resist such historical consensus, because it “was based on a rather fragile understanding of epistemology.” I would suggest that we explore new frameworks for different levels of interpersonal comparisons of utility but remain mindful of the intrinsic limitations of such analytical tools, which clearly rely on rigid and sometimes simplistic assumptions, and that lessons from various disciplines be considered.

Sen believes that the search for a social welfare function may not even need to be very precise. This valid point also leaves open many questions about the “appropriate,” acceptable standards of comparability of welfare numbers of different persons. Even in situations of full comparability of self-reported well-being numbers (which Sen would use to justify full interpersonal comparability), one obvious question is how much faith should be given to self-assessments. How much trust should be given to self-reported welfare numbers? The legitimacy of someone judging her own welfare and giving a metric to characterize it doesn’t solve the problem of being “wrong” in that self-assessment. As Cioran reminded us, among the many reasons for invalidating narcissism is the fact that it is based on profound

3. See Maskin (2009) and Sen and Maskin (2017) for new and interesting ways of approaching voting measures.

uncertainty and randomness, because it is basically an exercise in which we fall in love with someone we know very little about.

Fortunately, Sen also believes that rigorous interpersonal comparisons need not be of mental states only. He is right in his benign neglect of the validity of self-evaluation of mental states in interpersonal utility comparisons. Can we trust ourselves to know what we actually go through in each particular life situation, how we actually feel, what we actually believe in each situation, and how we actually convey it to ourselves and to others? And does what we believe and how we feel matter if our behavior, actions, objective welfare, and standards of living are not really impacted by such perceptions? If the answers to such questions are positive, what are the implications for the analytical frameworks for interpersonal comparisons that rely on self-reported indicators of welfare?

Self-reported welfare and happiness numbers may be too subjective to be relied on. The problem goes beyond narcissism. Recent work on the economics of “motivated” belief distortions, both individual and social, shows how agents often try even unwittingly to maintain positive self-images and identities (Bénabou 2015). It has been shown, for instance, that most people believe they are more likely than others to experience favorable life events and less likely to suffer adverse ones, such as unemployment, accidents, divorce, or major illness (Weinstein 1980).⁴ “We also commonly see ourselves as better drivers, better citizens, less biased and more attractive than others. Some widely held beliefs are just plainly implausible or demonstrably false, given publicly available knowledge” (Bénabou 2015, 3). Such departures from objective cognition may have subjective or objective value. Still, the prevalence of overoptimism and the reality of overconfidence has heavy economic and social costs. An illustration of the problem is the fact that large numbers of people in high-income countries who could afford life insurance (given the risks they face) choose not to buy it.

“There are many difficulties in judging the well-being of a person by his or her mental state,” Sen rightly points out. “The metric of pleasure or desire may sometimes quite inadequately reflect the extent of a person’s substantive deprivation.” True. Hence, his recommendations that such variables as incomes, commodities bundles, or resources more generally be

4. For a more nuanced analysis, see Harris and Hahn (2011).

“of direct interest in judging a person’s advantage.” Perhaps. But this prescription raises several uncomfortable obvious questions. If mental states (as self-reported) are insufficient or even invalid as metrics of personal utility, who has the legitimacy to select the more “relevant” additional or substitute variables to carry out interpersonal comparisons of utilities? Who gives us the right to judge anyone’s mental states and to even decide that some “objective” variables of their welfare should be given consideration? Who decides that another person is living “well” or “poorly”?⁵

A sequence in Sergio Leone’s epic movie *The Good, the Bad, and the Ugly* shows the main character Tuco (a bandit) is being lectured by his brother Pablo, who is a priest. “Outside of evil, what else have you managed to do?” Pablo asks him. Tuco listens patiently to his sermons and reprimands and then responds vehemently:

You think you’re better than I am. Where we came from, if one did not want to die of poverty ...one became a priest or a bandit! You chose your way, I chose mine. Mine was harder. You talk of our mother and father. You remember when you left to become a priest. I stayed behind! I must have been ten, twelve. I don’t remember which, but I stayed. I tried, but it was no good. Now I am going to tell you something. You became a priest because you were... too much of a coward to do what I do!

In some ways, Tuco emerges from that scene as more than the cartoonish bandit character that he appears to be in the first half of the movie. He also is revealed to be a humble and thoughtful man who simply faced impossible choices in his life and made those that seemed to him to be the most courageous and even “ethical.” When Pablo chose to abandon the family to pursue (selfishly) his calling as a priest, Tuco was left to take care of their parents. He tried to the best of his abilities and presumably in the most ethical way but failed. The only other option left for his own survival was to become an outlaw.

This is more than the often derided “situational ethics”—the notion that when assessing human responsibility, one should keep in mind that the “right” or “wrong” thing to do depends on the situation,⁶ because there

5. See Monga (2015a, 2015b, 2017) for further discussion.

6. Situation ethics (Fletcher 1967) may have its flaws. But one should remember that even John Dewey held views that rejected moral universality: such a stance “would assume the existence of final and unquestionable knowledge upon which we can fall

are no universal moral rules or rights that apply everywhere and always. Tuco's apparently shocking discourse can still be viewed as rational and deeply rooted in moral philosophy—his willingness as a minor child to stay home and take care of his parents when his older brother selfishly left the family home to (egoistically) pursue his personal calling. Tuco may be the worse bandit the West has ever produced, but he would argue that his decision-making is still profoundly moral not just descriptively (in terms of the codes of conduct put forward by his society) but also normatively (the necessary behavior and actions that, given specified conditions, would be put forward by all rational persons). In sum, Tuco is actually a moral agent in the Kantian sense, who simply finds himself expressing what he saw as a "categorical imperative."⁷ If Tuco and other comparable characters are indeed justified in their "perverse" moral stance, perhaps one should conclude that rationality cannot be defined at the moral philosophy level in a way that allows for interpersonal comparisons. This would be another real impossibility theorem.

In fact, rationality assumptions (more precisely, *some* conceptions of rationality) are everywhere in the reasoning and modeling of the social choice procedures offered by all social choice theorists. Without such assumptions, no valid ordering of social preferences can take place, because any ranking must be based on preferred alternatives by people who are supposed somehow to be rational agents. Sen's very sophisticated and extremely elegant framework for interpersonal comparison also shows a lot of faith in some generic level of Rationality (with a capital "R"), which

back in order to settle automatically every moral problem. It would involve the commitment to a dogmatic theory of morals" (Dewey and Tufts 1908, 488). However, Dewey's skepticism of moral universality mainly reflects his skepticism about one method (the method of abstract moral reasoning) in favor of another (what he calls the "experimental" or the "method of democracy"). His proposed method

implies that reflective morality demands observation of particular situations, rather than fixed adherence to a priori principles; that free inquiry and freedom of publication and discussion must be encouraged and not merely grudgingly tolerated; that opportunity at different times and places must be given for trying different measures so that their effects may be capable of observation and comparison with one another.

See Dewey and Tufts (1908, chapter XVI (1)) on "Morals and Social Problems."

7. See Kant ([1797] 1993).

presumes that people always have reasons for their actions. Even when people offer reasons for their actions, such reasons may not necessarily need to be validated identically. Infinitely many explanations exist for why people are (or are not) motivated to do the “right” thing.

Economists should be cautious in their faith in rationality, regardless of its scope and use. Some cognitive scientists have conjectured that reason may be an evolutionary attribute to human beings, just like bipedalism—a trait that occurred only over time. Mercier and Sperber (2017) suggest that reason initially emerged in the savannas of Africa when human beings realized that they needed to cooperate among themselves. In their view, reason, which has become the ultimate and unique characteristic of the human race, developed mainly to allow the resolution of problems posed by living in collaborative groups. Reason had a purely utilitarian genesis as “an adaptation to the hypersocial niche humans have evolved for themselves” (Mercier and Sperber 2017, 330). Reason emerged not to help people solve abstract problems but rather to fill their trust deficit, which was the critical criterion for improved living conditions and for survival.

Reason is therefore a constantly changing human trait, a unique faculty that is also moving target. It is therefore an enigma. If one agrees to link human reasoning to evolutionary processes, such as natural selection, then it is understandable that the dynamics of social change always creates distortions between phenomena that human brains can grasp, study, and debate, and real life—even though most phenomena that humans can grasp may be a part of reality—which sometimes occurs at a much more rapid pace. The Neanderthal man didn’t have to worry about cyber attacks or the ideal curriculum for training a good economist. His life prescription did not include the need to see a dentist twice a year. He lived in small groups of hunter-gatherers, and his reasoning could be used to focus only on the key elements of such an existence. Today, few people live like Neanderthals and have to confront and solve the problems similar to those from 25,000 years ago. Some wealthy people live in spectacular houses or skyscrapers and mainly worry about finding the time to enjoy all the many comfortable features in their lives, or about what is said about them on Facebook. Other individuals live in poverty and permanently face the burden of social exclusion, stigma, and the destruction of their human dignity. In sum, the differential of pace between social change challenges and the adaptation of human reason to them would explain why many

economic agents who seem reasonable often act foolishly—and why reason often fails us.

A good illustration of this differential in pace is the discrepancies often observed in the way societies that strive for morality also seem to tolerate for an inordinate time laws, regulations, and norms of behavior that are subsequently viewed as violating and even damaging their own moral philosophies. Appiah (2010) has examined moral revolutions and campaigns against repugnant practices, and he concludes that appeals to reason, morality, or religion aren't enough to spur fundamental changes in ethical standards. Objectionable practices seem to be eradicated only when they come into conflict with the prevailing conception of honor. Appiah's work convincingly demonstrates how moral codes evolve across space and time, and why we should be skeptical of any form of immanent rationality. Generations of historians have wondered how Thomas Jefferson, the intellectual and visionary humanist who wrote in 1776 the words "all men are created equal," could have been the proud owner of a 5,000 acre working plantation and owned 607 slaves over the course of his life (Thompson 2017). Jefferson, the third president of the United States, was the father of six children of one of his slaves, Sally Hemings. Was he simply another cynical hypocrite? Not necessarily. Simply, perhaps, just another human being going through the tragic contradictions and mysteries of life. One can safely guess that there have always been millions of Thomas Jeffersons and Sally Hemings out there, who would have struggled to define and self-report their well-being, utility, or welfare metrics. If that is the case, then any social choice theory that places too much faith in any conception of rationality runs the risk of being at some level, a non sequitur.

Sen has carefully avoided falling into that trap by making his comparative utility framework broad and flexible enough to accommodate many of the conceptual challenges faced by social choice theorists. His remarkable insights certainly open up interesting new avenues for solving Arrow's impossibility theorem. He also provides valid arguments for ignoring the skepticism of the likes of Lionel Robbins. He emboldens researchers who struggle with the complex issues of social aggregation to rethink utility comparisons at levels that may not require the types of rigid conditions imposed by Arrow. Sen's more relaxed approach makes possible the design of consistent analytical frameworks to assess and measure interpersonal welfare. But one can only take his proposed intellectual route at the

(somewhat heavy) cost of accepting the big assumptions that such exercises should be done at several different levels and that the exclusive reliance on mental state comparisons may not be relevant in social choice. These are elegant but big assumptions.

Conclusion

In the end, we should perhaps acknowledge that there are situations in which one simply cannot win. Francis Blanche, the late French comic, often said in one of his sketches: "I was married twice, two catastrophes: The first time my wife left; the second time, she stayed!" He never wondered whether the problem was with his wife-selection skills, or with him more generally. But would it matter? The more serious points are our innate inability to look beyond our intrinsically self-centered natures, our shifting egos and psyches, and our unstable preferences; our inability to consistently define our own tastes, feelings, and opinions; and the structural limitations of any attempt to consistently capture and aggregate the criteria for common well-being.

Such a perspective alters one's view of rationalities. It also allows me to regard rather favorably the various attempts by economists and other social scientists to free their disciplines from the tyrannies of rationality. In this critical endeavor, Sen's contribution in particular, has been salient and spectacular. I still am hopeful that, one day, perhaps using Sen's analytics, I will be able to carry out a rigorous benefit-cost analysis of my life and find out whether it had enough meaning to look like a "profitable" investment. But the constantly shifting values of time, discount rates, and ethical criteria for interpersonal welfare comparisons may render my intellectual journey irrational and foolish.

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Comment: James E. Foster

Measurement as Social Choice

I am terribly biased when it comes to Professor Sen and hence feel obligated, in the spirit of full disclosure, to let you know why. I first met A. K. Sen in a welfare economics class at New College, Florida, in 1976—not in person, but through his book *Collective Choice and Social Welfare*. The starred chapters captured me and wouldn't let go until I had extended his liberal paradox to a world where groups, rather than persons, were decisive. I sent a draft to Professor Sen, and he responded with guidance on how to revise the paper and where to publish it, which happened soon after. Thus began my journey from mathematics to economics via social choice theory, guided at a distance by Professor Sen.

We met in person a few years later, when I was a graduate student at Cornell. As Andrew D. White Professor-at-Large at Cornell, Professor Sen encouraged me to consider research in poverty measurement, which led to my work with Joel Greer and Erik Thorbecke. He also provided a list of problems on partial orderings to explore along with my thesis advisor (and his coauthor), Mukul Majumdar, which—alas—we never jointly pursued. In 1982, there was a wild ride from London to Oxford in a yellow Alfasud, during which Professor Sen explained how, despite Thatcher's cutbacks, he was able to conduct a research project on gender discrimination in Indian villages by diverting funds from his telephone budget. In 1993 we began a project to expand his classic *On Economic Inequality*, which led to many late nights, as my wife remembers well. Then in 2008, we co-taught Economics 2054, *Social Choice and Welfare Economics*, at Harvard. Now an expanded edition of *Collective Choice and Social Welfare* has been published—the book that began the process some 40 years ago. Professor Sen has been an

inspiration to generations of researchers. I have received a full measure of his generosity, for which I am most grateful.

The present chapter is a prime example of why we love to read Sen: remarkably clear summaries of difficult literatures, woven together with entertaining quotes and remarkably apt phrases. On one hand, it is a lucid exposition of the key results from social choice, including Condorcet's voting paradox, Arrow's pathbreaking general possibility theorem, Gibbard's equivalent result on strategic voting, the Arrow-Black theorem on single-peaked preferences and majority voting, and Sen's result on the impossibility of a Paretian liberal. On the other hand, it is a masterful exposition of the downs and ups of welfare economics: including Bentham's utilitarianism, the Robbins "logical positivist" revolution and its progeny, "new welfare economics," which privileged "Pareto efficiency" and its "remarkable reticence" to discuss distributional issues. Then the paper moves on to Bergson-Samuelson social welfare functions and back to Arrovian social welfare and its accompanying informational privations, with no cardinal or interpersonal comparisons allowed and in a world of purely welfarist information. The final section breaks free from the tyranny of impossibility and narrow informational bases, through rigorous definitions of partial comparability and an expansion of the informational basis of comparisons to human capability and freedom. It concludes with a discussion of poverty measurement—both monetary and multidimensional.

All right, you say, this is a fine exercise in the history of economic thought. But what practical lessons does social choice and welfare economics have for the World Bank, or for that matter, policymaking in general? My answer focuses on metrics and measurement, a topic of particular interest to me, and the foundation of policy analysis, wherein data are identified and aggregated in meaningful ways to inform social decisions. Let us examine a few of the messages that are especially pertinent to the process of measurement.

Broadening the informational basis. Sen attributes the impossibility in Arrow's theorem to the paucity of information contained in its preference profiles. His characterization of the Pareto-extension rule also illustrates how restricting consideration to interpersonally noncomparable profiles of individual orderings leaves decision-makers unable to address distributional issues.¹ Broader bases of information are necessary to overcome

1. See Sen (2017, Theorem 5*3).

these challenges. The capability approach, which operates in the space of “functionings” and considers achievements as well as “capability sets” of achievements (containing both chosen and unchosen alternatives), is one answer. The approach has become a generally accepted way of conceptualizing well-being, opportunity, and empowerment, and it is the notion of progress underlying Sen’s (1999) masterpiece *Development as Freedom*. The approach also leads to measures that are multidimensional and linked across dimensions at the individual level, such as the multidimensional poverty measures of Alkire and Foster (2011). However, it presents challenges to empirical researchers, as traditional datasets and measurement methodologies may not be applicable.

The measurement properties of variables. Broader information brings with it the need to use that information appropriately. After data have been identified, the next important task is to understand the measurement properties of the data’s underlying variables and apply a methodology that is suitable. For example, ordinal variables are commonly used in measurement, whether as part of self-reports (such as self-reported health or life satisfaction) or due to the inherently qualitative characteristics of the indicators (such as the quality of floors or sanitation facilities). In addition, issues of noncomparability or partial comparability can easily arise across persons or dimensions. The variables cannot simply be treated as if they were monetary—fully cardinal and fully comparable across different individuals. An intuitive way of thinking about this issue is to view it as a form of robustness. If many rescalings of the data are possible, or if many ways of relating the data across persons (or across dimensions) could be used, would each of the possibilities yield the same results? The results for a single cardinalization or one way of one of linking data across persons or dimensions are not enough. Meaningful interpretation of the data requires agreement across the full range of possibilities.²

Axioms as policy. A third message pertains to the centrality of axioms and the axiomatic approach in this literature.³ Although it is not always apparent, axioms are in essence chunks of policy—basic requirements or qualities that an object must exhibit if it is to be seen as functioning appropriately. For an Arrovian social welfare function, axioms can ensure that it is broadly

2. See Alkire et al. (2015, section 2.3).

3. See Foster and Sen (1997, 119).

applicable, is appropriately oriented when preferences are in agreement, ignores irrelevant information, or rules out unambiguously problematic methods. For measurement, axioms ensure that a measure is capturing the desired phenomenon. The main axioms come in three varieties: invariance axioms (like anonymity), which identify the sorts of information a measure should ignore; subgroup axioms (like decomposability), which specify how local and national measures are to be linked; and dominance axioms (like the transfer principle), which require the measure to move in a specific direction in the presence of an unambiguous change in the data.⁴ Axioms help define what the measure should be measuring.

Desiderata. Some authors also include a list of desiderata or “proto-axioms” to help guide the construction of measurement methodologies.⁵ A common desideratum is that the measure should be understandable and easy to describe—a requirement that can trump formal axioms when communication is important. This property might explain: the prevalence of the headcount ratio in poverty measurement despite its axiomatic failings; how the traditional Human Development Index (based on the arithmetic mean) might be preferable to the post-2010 Index (based on the geometric mean); and why the mean of the bottom 40 percent—the measure underlying the World Bank’s shared prosperity goal—was selected instead of an Atkinson “equally distributed equivalent” income function or the Sen welfare measure. There is a clear tension between this key desideratum and the more nuanced policy aims embodied in axioms.

The use of partial orderings. Partial orderings are central to Sen’s presentation of social choice theory and also are at the core of measurement.⁶ To determine whether the income distribution has taken an unambiguous turn for the worse, the Lorenz criterion or the various orders of stochastic dominance can be consulted. Likewise, poverty orderings point out when poverty has fallen for an entire range of poverty lines (or measures). In multidimensional analysis, dashboards of dimensional achievements provide a partial order for assessing well-being when there is little guidance on how to value dimensions.

4. See Alkire et al. (2015, section 2.5).

5. See, for example, Székely (2005), who gives the list used in setting the Mexican income poverty methodology.

6. See Sen (2017, xxix–xxxi) and Foster and Sen (1997, 120–121).

Partial orderings identify unambiguous (or unanimous) changes; however, they are also incomplete and unable to decide between certain pairs of options. Axioms and desiderata can help narrow options and reduce the incompleteness. But policy discussion typically demands a headline measure that is real valued as well as complete, facilitates discussion, and encourages policy analysis. Once again, there may be tension between communication and other policy objectives. In some circumstances, however, a partial ordering can actually facilitate the selection of a specific measure. For example, the choice of a specific monetary poverty line seems less problematic when a poverty ordering is available to test robustness for a range of poverty lines.

Measurement as choice. The process of measurement, like that of description, “involves the exercise—possibly difficult—of selection” across the many ways of viewing a phenomenon.⁷ Over time, the justification for the choices underlying measurement tends to become “this is how it has always been done.” Institutions like the World Bank are the repositories of the art of measurement, and they have the responsibility of being transparent and, from time to time, re-evaluating their methods. With the establishment of its Commission on Global Poverty, the World Bank is working toward fulfilling this goal for the flagship monetary poverty measure and may consider a multidimensional approach to poverty as outlined in the present chapter and other writings. In any event, Professor Sen’s many contributions to measurement will undoubtedly prove useful in guiding this and other related efforts.

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7. Sen (1980, 353).

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