CHAPTER SIXTEEN

Functionings and Capabilities

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Abstract

Traditional economics identifies a persons well-being with the goods and services the person consumes and the utility that the person gets from such consumption. This, in turn, has led to the widely used approach of welfarism that uses individual utilities as ingredients for evaluating a societys aggregate welfare. This approach has long been contested as being too restrictive in its view of what constitutes human well-being and for its commodity fetish. What has injected new life into this critique is the emergence of an alternative approach, which replaces the traditional concern for commodities and utility with functionings and capabilities. While the origins of this 'capabilities approach go back to the works of John Stuart Mill, Adam Smith, and, in spirit if not in form, to Aristotle, it was the seminal contribution of Amartya Sen in the form of his 1979 *Tanner Lectures* that gave it shape and structure. Subsequent works by Sen and an enormous outpouring of writing by various authors in economics, philosophy, and sociology have made this a major field of inquiry, which has also led to important practical applications. The present chapter is a survey of this new field of study. In Sens terminology a functioning is what an individual chooses to do or to be, in contrast to a commodity, which is an instrument which enables her to achieve different functionings. While functioning is central to the notion of human well-being, it is not merely the achieved functionings that matter but the freedom that a person has in choosing from the set of feasible functionings, which is referred to as the persons capability. Beginning with a discussion of these ideas in history, the present chapter tries to present a comprehensive review of the recent literature, including formalizations and applications. It is important to recognize that a full formalization may not be feasible, since there are important dimensions of life that are germane to the capabilities approach that may be impossible to capture in a single

formalization. Nevertheless, the capability approach itself has been immensely useful in the context of studying poverty, gender issues, political freedom, and the standard of living. It has also resulted in the creation of the Human Development Index (HDI), popularized by UNDPs Human Development Reports since 1990. This chapter critically examines the HDI and recent advances in the human development literature.

1. THE CAPABILITIES APPROACH: AN INTRODUCTION

Traditional welfare economics tends to identify a person's well-being with the person's command over goods and services. This naturally leads to a focus on income, since a person's income determines how much he or she can consume. Going a step further, this approach often views each person as being endowed with a "utility or welfare function," and the person's income as an important variable that determines the level of utility that the person enjoys. *Social* welfare, according to this approach, is represented by aggregating the utility levels of all individuals in society.

An alternative route to this beaten track is the "capabilities approach," which replaces the traditional concern for commodities and utility with, respectively, functionings and capability. While the origins of the capabilities approach go back to John Stuart Mill, Adam Smith, and in fact Aristotle, it is only over the last one or two decades—after these early suggestions were resurrected, reinterpreted, and partially formalized by Sen (1980, 1985)—that the capabilities approach gained some currency within the economics profession, culminating in the heroic effort undertaken by the annual *Human Development Reports*, which try to make some of these ideas operational.

While the capabilities approach now has a substantial literature, discussing and debating the ideas, exploring variants, and applying them to evaluating the standard of living of different nations or regions, the crux of its discord with traditional welfare economics is to be found in the distinction between "goods" and "functionings" and also between achievement and freedom. A *functioning* is what a person manages to do or to be. A *good* can *enable* a functioning but is distinct from it. A bicycle is a good, whereas being able to transport oneself rapidly to work (or, more importantly to most people, away from work) is a functioning. Two persons, each owning a bicycle, may not be able to achieve the same functioning. If, for instance, one of them happens to be handicapped, she may not be able to use the bike to go as far as the other person can. This is one of the central operational distinctions between commodities and functionings. Whereas we need not know anything about the individual concerned in asserting that he owns a certain good (for instance, a bike), we may need to know a good deal about a person, over and above what commodities he owns, in order to know what functionings he can achieve.

Just as a functioning must not be confused with a commodity, which may well play an enabling role, a functioning must not be confused with utility. It is possible to develop the capabilities approach without reference to utility, but it is not incompatible with the idea of human beings striving to achieve a certain level of or even aiming to maximize utility. If we were to use the idea of utility in conjunction with functionings, then it is important to recognize that functionings are prior to utility. Just as commodities make it possible to achieve certain functionings, functionings may enable a person to reach certain levels of utility.

However, the functionings *achieved* by a person may not be sufficient in determining a person's overall quality of life or well-being. For the latter we need to know, minimally, the person's "capability," the functionings that the person *could* have achieved. Hence, capability is closely related to the idea of opportunity, freedom, and advantage. According to the capabilities approach, in determining the overall quality of life of a person, it is not enough to know what functionings he achieved, for instance that he did not go to Florida and instead remained in Poland. We need to know, if he *could* have gone to Florida and chose not to, or he did not have the money to go to Florida, or was denied a visa to get to the United States.

It should be clear that it is not just a comparison of capabilities that we need to undertake but also the choice that a person made. So, at a minimum what we need to know about each person is a set and a singleton—the set from which she was free and able to choose, and the singleton that she actually achieved (see Suzumura and Xu 1999). At times we may for simplicity's sake focus on the achieved functionings alone or the capabilities set alone without information on what functionings were achieved, but given free information, we would ideally want information on both in assessing a person's or a society's quality of life.

Another thing that must be evident is, as Sen (1994) has stressed, that the capabilities approach suffers from the embarrassment of riches because in life the functionings that we may or may not achieve are manifold. This approach recognizes that real society is peopled with characters whose entire quality of life cannot fully be captured by a unique real number, characters who have distinct notions of well-being, happiness, and desire-fulfillment. One consequence of this is that the idea of capability is not fully formalized and perhaps not even fully formalizable. How easily a concept yields to formalization is often treated by economists as an index of the concept's usefulness. To take such a view would, however, be erroneous. There are many important ideas or concepts, for example, utility, liberty, or happiness, which may be impossible to capture fully in a single formalization but are nevertheless useful. That is the view we take of capability here. One consequence of taking such a view is that, in trying to empirically compare the quality of life achieved by different societies using the capabilities approach, we may need to focus on a few salient functionings (risking the charge of idiosyncrasy). Do people in society *x* have the option of a long and healthy life? Are people able to live

lives free of political oppression? Are people able to read and write and therefore enjoy literature and communication with others? Do people have enough to eat and drink? Of course, empirically one has to face tricky questions like whether one should provide the information on achieved functionings as a vector or aggregate them into a single number (see Ray 1998, for discussion). But the dilemma should not be used as reason not to do either.

2. THE IDEAS IN HISTORY

The origin of the idea of functionings and capability can be traced back to Aristotle. The two fundamental observations related to this concept take place in his discussion on political distribution in *Politics* (Book VII, chapters 1–2) and the concept of the "good" and the "good man" in the *Nicomachean Ethics* (Book I, chapter 7). The Aristotelian foundation has been discussed at length by Nussbaum (1988, 1992) and Cohen (1993). In *Politics* (mainly VII.1–2), when discussing the idea of the "best political arrangement," Aristotle argues that the aim of political planning is the distribution of the conditions for a good life to the people in the city. These conditions are understood by him as producing capabilities, that is, the possibilities of having a "flourishing life." It is not the allotment of commodities that we should be concerned about, but the possibility to function in a certain human way, as explained in the interpretation by Nussbaum (1988).[1] When we ask concretely what he meant by the idea of "functioning in certain human ways," it is useful to look at his argument on "human functioning" in the *Nicomachean Ethics,* which we shall discuss presently. These two references are the core that establish the Aristotelian foundation of Sen's criticism of utilitarianism and of the Rawlsian ethics in his *Tanner Lectures* (Sen 1980; see also Robeyns 2009).

Aristotle has a famous argument on human functioning in his discussion of "the good human life."[2] While admitting that most human beings live their lives in the pursuit of happiness, he argues against a purely hedonistic view of life and proposes a different definition of the good human life. This definition emphasizes the rational

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[1] Nussbaum (1988) says that "Aristotle's statement of the [proposed] view is full of internal obscurity and inconsistency; and sorting our way through all of this will take us at times away from a straightforward investigation of the view" (p. 145). Discussion and criticisms of Nussbaum's interpretation of Aristotle can be found in Crocker (1995) and Des Gasper (1997b).

[2] The concept of the "good life," the one in which you reach the state of happiness as the final end, is related to the Greek words *eudaimonia* ("good state, sense of peace and happiness") and *makarios* ("being pure, free of sins, being happy"). Nussbaum argues in different writings that Aristotle used these two words interchangeably to refer to a "flourishing life" or a "good life." On the other hand, the Greek word *dunamin,* used by Aristotle in his discussion of the human good, can be translated as "capability of existing or acting," though it has been sometimes translated as "potentiality." See Sen (1993).

nature of human beings as the specific difference that makes them distinct from animals. Aristotle tells us that "now the mass of mankind are evidently quite slavish of their tastes, preferring a life suitable to beasts."[3] In this way, he would argue later that a good human life would not only require adequate functioning in terms of "nutrition and growth," a purely animal feature, but the possibility of exercising choice and practical reason. A purely hedonistic life, as well as one devoted to contemplation or to the accumulation of wealth, are rejected as definitions of a "good human life."[4]

He establishes thus that a good life is one in which a person can function not only in the biological sense but also by exercising choice and reason. On the other hand, "it is evident that the best political arrangement is that according to which anyone whatsoever might do best and live a flourishing life (*zoie makarios*)" (*Politics,* VII.2). The fact that "anyone whatsoever might do best" gives us the egalitarian perspective, but egalitarian in the realm of capabilities, as possibilities to function as human beings. This involves biological functions, as well as possibilities to exercise reason and actively participate in the political life.[5] This perspective is called the "Distributive Conception" in Nussbaum (1988).

More than twenty centuries later, Marx (1973) and Marx and Engels (1947) proposed a view of human functioning and effective freedom that can be interpreted from an Aristotelian perspective. Marx described a commendable human life as not only one in which the person's material needs are satisfied (biological functioning), but also as one in which the human being is able to use reason. He makes a strong case for differentiating activities that are purely animal from those which distinguish men and women as human beings. When discussing the meaning of "alienation of labor," Marx says that "man (the worker) feels that he is acting freely only in his animal functions—eating, drinking, and procreating, or at most in his dwelling and adornment—while in his human functions, he is nothing more than animal" (Marx 1973). For Marx, the biological needs of eating, drinking, or procreation, are "genuinely human functions," but without freedom of choice and freedom from immediate want, these will be performed in a merely animal way.[6]

Not only was Marx using the concept of "human functions," but Marx and Engels (1947) also discussed the idea of effective freedom in a way that we can relate to the concept of functionings and capabilities. The real liberation of human beings is discussed

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[3] *Nicomachean Ethics,* I.5. Also, in a different translation, "Choosing a life of dumb grazing animals" (Nussbaum 1988).

[4] The life of money-making is one undertaken under compulsion, and wealth is evidently not the good we are seeking; for it is merely useful and for the sake of something else. And so one might rather take the aforenamed objects to be ends; for they are loved for themselves. But it is evident that not even these are ends; yet many arguments have been wasted on the support of them" (*Nicomachean Ethics,* I.6).

[5] The idea of the ability to participate in the political life has been discussed in Bohman (1997) and Sen (1998).

[6] For this interpretation of Marx's writings see Nussbaum (1988). Des Saint Croix (1981) discusses the influence of Aristotle in Marx's writings.

as being related to economic progress and the strengthening of real capabilities. Thus they tell us:

> That real liberation is not possible outside the real world and through real means, that it is not possible to abolish slavery without the steam machine, the mule jenny, that it is not possible to abolish a regime of serfdom without an improved agriculture, that, in general, it is not possible to free men if they cannot be assured access to food, drink, housing, and good quality-clothing. (p. 22)

But they also add that the liberated society would

> make it possible for me to do one thing to-day and another tomorrow, to hunt in the morning, fish in the afternoon, rear cattle in the evening, criticize after dinner, just as I have in mind, without ever becoming hunter, fisherman, shepherd or critic. (p. 22)

These statements also show a view of freedom in the sense of what individuals, every-thing considered, are indeed able to do, as opposed to what they are formally prevented from doing. This introduces the discussion of what shall be called "actual freedom," as opposed to "formal freedom," the latter being consistent with the view of the classical liberals. T. H. Green, foreshadowing the famous later work of Isaiah Berlin, wrote on this topic, emphasizing the distinction between freedom in the sense of not being prevented from doing something and the actual ability to do something. Green (1900) tells us that:

> We shall probably all agree that freedom, rightly understood, is the greatest of blessings; that its attainment is the true end of all our efforts as citizens. But when we thus speak of freedom, we should consider carefully what we mean by it. We do not mean merely freedom from restraint or compulsion…. When we speak of freedom as something to be so highly prized, we mean a pos-itive power or capacity of doing or enjoying something worth doing or enjoying, and that, too, something that we do or enjoy in common with others. (p. 371)

Development of better living conditions seems to be related to that *positive* capacity of doing things, as in Aristotle's and Marx's writings. Green says that "in a sense no man is so well able to do as he likes as the wandering savage. . . He has no master. . . Yet, we do not count him really free, because the freedom of the savage is not strength, but weak-ness" (p. 371). One sees in this echoes of Berlin (1969) ideas of "positive freedom" and "negative freedom," the latter being as understood by the classical liberals. Berlin says:[7]

> The first of these political senses of freedom or liberty…which (following much precedent) I shall call the "negative" sense, is involved in the answer to the question "what is the area within which the subject—a person or group of persons—is or should be left to do or be what he is able to do or be, without interference by other persons?" The second, which I shall call the "positive" sense, is involved in the answer to the question "what or who, is the source of control or interference that can determine someone to do, or be, this rather than that?" The two questions are clearly different, even though the answers to them may overlap. (p. 122)

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[7] The original publication of the essay "Two Concepts of Liberty" took place in 1958. Sen discusses this perspective in, for example, Sen (1989).

The fact that the goods are required to satisfy the need to function biologically and socially, as well as to be able to exercise reason and choice, is at the core of the capability approach (see, for instance, Roemer 1996, and Herrero 1996). This idea is also related to Smith (1776). Smith discusses the notion that commodities give individuals not only consumption possibilities but the ability to interact socially as well. This is the way in which Smith (1776) defines "*necessaries*":

> By necessaries I understand, not only the commodities which are indispensably necessary for the support of life, but whatever the custom of the country renders it indecent for creditable people, even of the lowest order, to be without. A linen shirt, for example, strictly speaking, is not a necessary of life. The Greeks and Romans lived, I supposed, very comfortably, though they had no linen. But in present times, through the greater part of Europe, a creditable day-labourer would be ashamed to appear in public without a linen shirt, the want of which would be supposed to denote that disgraceful degree of poverty… . (pp. 870–871)

When Malinowski (1921), describing the primitive economy of the Trobriand Islanders off the coast of New Guinea, notes that "to the natives the possession and display of food are of immense value and importance *in themselves*" (p. 8, my italics), he is referring to the same idea of goods being used to give social dignity. "One of the greatest insults," writes Malinowski, "that can be uttered is to call someone 'man with no food,' and it would be bitterly resented and probably a quarrel would ensue. To be able to boast of having food, is one of their chief glories and ambitions" (p. 8).

This perspective is an example of the instrumental nature of commodities acquisition, as a means to achieve certain human functionings that include social interaction, dignity, and the participation in the life of the community. Sen (1983a) would discuss later, based on Smith's definition, the concept of poverty as being *relative* in the realm of commodities but *absolute* in the realm of capabilities.

The foundations of Sen's new perspective on well-being are thus Aristotle's concept of the "good life" and the "goodness" of a political arrangement, as well as Marx's view of a true human life and real liberation. Moreover, those ideas are enriched by Smith's definition of necessary goods and by T. H. Green's and Berlin's distinction between "positive" and "negative" freedom.
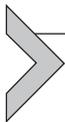
3. SEN'S CRITIQUE AND FORMULATION

Even though the concept of capabilities is related to the subject of human well-being in general, its contemporary treatment originated in Sen's *Tanner Lectures* (Sen 1980) at Stanford University in 1979, which were focused on alternative interpretations of egalitarianism. Starting with a critique of utilitarianism and Rawlsianism, Sen (1980)

went on to develop the idea of "functioning" and proposed "capability" as a new answer to the question, "Equality of what?" In a series of subsequent papers (Sen 1985, 1987, 1990, 1992, 1993) he developed these ideas further and tried to establish capabilities as a general approach to evaluating human condition.

Chronological fidelity is not always desirable when surveying a field of study, but in this case it is useful to start with Sen's *Tanner Lectures* (Sen 1980). In these lectures Sen began with an evaluation of utilitarianism as a moral principle. Utilitarianism requires that given a choice from among several alternatives, we select the one that maximizes the sum total of utility among all human beings.[8] This, combined with the standard assumption that marginal utility from income for each person diminishes as a person has more income, implies that under utilitarianism when a fixed income is being distributed among a set of individuals, this will be done so that each person gets the same marginal utility. Hence, to the question "Equality of what?" the utilitarian answer is "marginal utility." Sen then goes on to remind us that this may be fine when the human beings in question happen to be similar but comes apart once we recognize the essential diversity of human beings.

Sen criticizes utilitarianism both by appealing to more general moral principles that conflict with it (the "prior-principle critique"), and constructing examples of special cases that check our "moral intuition" (the "case-implication critique").

To take first the case-implication critique, he considers the example of a person with a handicap who has great need for money and another person who has no handicaps but is a pleasure machine who derives a lot of satisfaction from every dollar that she is able to spend. Plainly, equalizing marginal utility requires giving more money to the latter. The needy person, in other words, gets less, which does not seem to square up with our moral intuition about equity.

Sen also considers Rawls's critique that people behind a "veil of ignorance" would not opt for a society that maximizes the sum total of utility, opting instead for a more equitable distribution of utility. In the spirit of prior-principle critique, Rawls (1971) also emphasized how utilitarianism does injustice to some of our basic notions of liberty and equality.

Rawls proposed a principle in which society is evaluated in terms of the level achieved by the worst-off person in society, measured over an index of primary goods—the so-called "maximin" principle.[9] Economists usually attribute to Rawls a different principle that follows the same criterion but measures the level on the dimension of utility. But as Sen points out, this and also the closely related "leximin" go to the other extreme of utilitarianism in ignoring claims arising from the intensity of one's needs.

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[8] The classical reference on the utilitarian perspective is Bentham (1789). For the axiomatic foundations of utilitarianism, see d'Aspremont and Gevers (1977), Maskin (1978), Roberts (1980), and Basu (1983).
[9] For the axiomatic foundations of this principle see Hammond (1976), Strasnick (1976), and d'Aspremont and Gevers (1977).

Utilitarianism and Rawls's criterion as interpreted by economists belong to the more general category of "welfarism." Welfarism, which in turn is a special case of consequentialism, is the view that the goodness of a society can be judged entirely from information on the utility levels achieved by every human being in that society (see Scanlon 2001, Sen 1977). The most important prior-principle critique that Sen mounts against utilitarianism is to argue that, in evaluating a society or state of affairs fully, we must make room for nonutility information.

The critique does not apply to the moral criterion that Rawls had originally developed. Rawls (1971) moved away from welfarism by eliminating the emphasis on utilities and proposing a view based on what he called *primary goods.*[10] Rawls's criterion would be the first step towards a formal theory in which equality of opportunity becomes the concept of moral importance for distributive justice. The Rawlsian principle of justice can be summarized by the following mandate: *maximize the minimum, over all persons, of the bundle of primary goods.*[11] This mandate is called the "difference principle." The definition of primary goods is of essential importance for the understanding of Rawls's theory.

Following Rawls (1971, 1982), we can identify five groups of primary goods:

(a) basic liberties,
(b) freedom of movement and choice of occupation,
(c) powers and prerogatives of offices and positions of public responsibility,
(d) income and wealth, and
(e) the social bases of self-respect.

Rawls proposes that the first two sets are formally prior to the pursuit of the other three. The political setting must first provide the conditions stated in (a) and (b) in order for the economic system to provide the conditions for (c), (d), and (e).

From a prior-principle point of view, Sen argues that the difference principle can be criticized for being concerned with means (commodities), not ends (freedoms). Indeed, it has some tendency to be "primary good fetishist" in analogy with Marx's (1973) discussion of "commodity fetishism." Moreover, by applying the case-implication critique we would find that the difference principle could be unacceptably indifferent to heterogeneity.

Consider the case of a person with a handicap who has a marginal utility disadvantage: He is not very efficient at converting dollars into utils at the margin. In addition, suppose that he is no worse off than others in utility terms despite his handicap, perhaps because he has an innately jolly disposition, or because of a deep religiosity. It is now evident that neither utilitarianism nor the leximin criterion will do much for him. Indeed, he seems to be beyond the reach of virtually all reasonable welfarist principles.

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[10] He has elaborated on his original theory in Rawls (1975, 1982, 1985).
[11] There is of course some ambiguity in this, because it is not always obvious how one compares between bundles. This is addressed later through the work of Herrero (1996).

What about authentic Rawlsianism, based on deprivation in terms of primary goods? Unfortunately that, too, is limited by its concern for goods, even though "goods" are defined in a fairly broad way.

Roemer (1996) has also criticized Rawls, though on different grounds. This criticism relates to the fact that the difference principle does not consider people's evaluation of their state. He shows that Rawls's notion of primary goods "must depend on the conceptions of the good that individuals have, though it cannot be recovered solely by knowing those conceptions" (Roemer 1996, p. 169). The conceptions of the good by individuals are related to their "life plans," in Rawls's terminology, so utility would be interpreted in that sense as "satisfaction" or "desire-fulfillment."[12] The relevance of responsibility—deciding on one's life plan—would become the feature analyzed in later discussions on inequality. This point relates to one of the most important features of Rawls's and Sen's theory, namely the emphasis that is put on *ex ante* opportunity, as opposed to *ex post* outcomes. The typical utilitarian solution is clearly based on the latter.

Another feature of Rawls's theory consists of using the "veil of ignorance" argument to claim that individuals behind that "veil" would choose the maximin principle over an index of primary goods as the accepted social contract.[13] By constructing a formalization of this statement, Roemer (1996, chapter 5) has tried to show that the argument is flawed. Using von Neumann–Morgenstern utility functions for the *souls* behind the "veil of ignorance" choosing a social contract—a tax scheme that redistributes resources according to the Maximin principle—it is shown that maximin would not be chosen by the agents, unless they are infinitely risk-averse.[14]

Summarizing, Rawls defends the difference principle from two perspectives: first, by claiming its "impartiality" (justice as fairness), and second, by appealing to "mutual advantage" (choosing social contract from behind the "veil of ignorance"). Both arguments are criticized by Sen (1980, 1993) and Roemer (1996). Those Rawlsian ideas, however, set the basic notion of justice as equality of *ex ante* opportunity, as opposed to the emphasis on outcomes embedded in the welfaristic theories of justice.[15]

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[12] While for Sen utility is a sense of pleasure or happiness.

[13] The idea of the "veil of ignorance" comes originally from Adam Smith. See Harsanyi (1982).

[14] Instead of assuming infinite risk-aversion of the agents, Roemer (1996) suggests that we consider choice under ignorance, as in Maskin (1979), in which the choice of an alternative that maximizes the minimum possible utility is advocated, in a framework in which agents do not know the probability distributions over goods and states. Maskin (1978) actually refers to his work (published later as Maskin 1979) saying that, if the framework of decision making under ignorance is considered, the utilitarian rule is an "immediate consequence."

[15] Kolm (1972) independently developed an egalitarian theory similar to Rawls's, in fact, almost simultaneously. Kolm also emphasizes the existence of a basic set of goods as an index to evaluate equality. He claims that "Fundamentally, all individuals have the same needs, the same tastes, and the same desires" (Kolm 1972, p. 79). In that sense, he is consistent with Rawls in the sense that there exists a basic set of goods whose provision guarantees equality of opportunity across individuals. Individuals that seem to be different are so because of some specific feature that can be added to the commodity space, as long as it is needed for individuals to look the same. Once that reductionist process takes place, we arrive at the level of some "fundamental preferences," under which all individuals are the same.

What we need, so argues Sen (1980), is a moral system that is concerned not just with "good things," but

> with what these good things do to human beings… I believe what is at issue is the interpretation of needs in the form of basic capabilities. The interpretation of needs and interests is often implicit in the demand for equality. This type of equality I shall call basic capability equality (p. 218).

Thus, through this discussion of equality, the idea of capability and, implicitly, functioning was conceived.

The formalizations of this approach occurred later. One of the first efforts was by Sen (1985), who tried to give structure to the perspective of well-being based on the concepts of functionings and capabilities. Goods have an instrumental value in that they allow individuals to "function." A functioning is an achievement of a person: what he or she manages to do or to be. Formally, we start from the commodities vector. Let us use $\mathbf{x}_i$ to denote the vector of commodities possessed by person i.

Following Gorman (1968) and Lancaster (1966), Sen used the fact that commodities can be converted into characteristics. Thus if c is the function converting a commodity vector into a vector of characteristics, the vector of characteristics consumed by person i will be given by $c(\mathbf{x}_i)$.[16] Next, let f_i be person i's "personal utilization function," that is, a function that converts characteristics into functionings. Given that in this exercise c is exogenous to the person, we could actually think of f_i as a function, which directly converts commodity vectors into functionings. But let us for now continue with Sen's treatment. In Sen's model f_i is partly a matter of person i's choice. She chooses a utilization function from a feasible set, $\mathbf{F}_i$, of utilization functions.

A *functioning* is a function that tells us what person i has achieved (a *being*) given her choice of a utilization function $f_i \in \mathbf{F}_i$. We represent it as:

$$\mathrm{b}_i = f_i(c(\mathbf{x}_i)).$$

The vector b_i represents the *beings* that a person has managed to accomplish by using the commodities she possesses and choosing a utilization function from $\mathbf{F}_i$. Those functionings are, for example, being well-nourished, well-clothed, mobile, and participating actively in the life of the community. In the Aristotelian view, these would imply "functioning in a human way."

Next, define $\mathbf{P}_i(\mathbf{x}_i)$ as the set of functioning vectors *feasible* for person i as:

$$\mathbf{P}_i(\mathbf{x}_i) = [\mathrm{b}_i|\mathrm{b}_i = f_i(c(\mathbf{x}_i)), \quad \text{for some} \quad f_i \in \mathbf{F}_i].$$

Let us suppose the person i has access to any of the set of vectors of commodities in $\mathbf{X}_i$. Then $\mathbf{X}_i$ is her entitlements. Now, we can define the effective "freedom" that

[16] The function does not have to be necessarily linear.

a person has, given her command over commodities and her individual possibilities of converting the characteristics of goods into functionings. Such a set represents person i's *capabilities.* Formally, person i's *capability* is given by:

$$\mathbf{Q}_i = [b_i | b_i = f_i(c(\mathbf{x}_i)), \quad \text{for some} \quad f_i \in \mathbf{F}_i, \quad \text{and some} \quad x_i \in \mathbf{X}_i].$$

This sums up Sen's own formalization of one way of going from commodities, via functionings, to capability.

4. FURTHER FORMALIZATIONS

Roemer (1996) noted that the approach proposed by Sen has four similarities with that of Rawls: (a) both are nonwelfarist, (b) both are egalitarian, (c) both emphasize *ex-ante* opportunity as opposed to *ex-post* outcome evaluation, and (d) both take a concept of freedom from the perspective of actual possibility to achieve, as opposed to formal liberty that considers only legal barriers to individual action. Utilitarianism is nonegalitarian and emphasizes outcomes. On the other hand, from characteristics (c) and (d) we can see the relevance these theories assign to individual responsibility. A comprehensive review of the formalization of this approach and its empirical applications is found in Kuklys (2005).

Dworkin (1981) has suggested an approach that assigns a higher importance to individual responsibility, thus advocating "equality of resources." That would eliminate the "paternalistic" bias in the capabilities view and would force individuals to be responsible for their life plans. The importance of individual life plans and responsibility had already been discussed in Rawls (1971). "Agency achievement" is the term used by Foster and Sen (1997) when discussing the satisfaction of those individual plans. Roemer (1986) has shown that, under a specific interpretation of what resources are, equality of resources and equality of welfare cannot be distinguished, which would put Dworkin's idea within the realm of the welfaristic perspective.

The concept of a *functioning* represents the *state* of a person, a set of things that she manages to do or to be in her life. The *capabilities* reflect the alternative combination of functionings that a person can achieve, from which the individual will choose one collection. If, say, there are n relevant functionings, then that person's level of achievement will be represented by an n-tuple. Well-being will be defined as the *quality* of a person's being, based on those functionings the person can indeed choose from. How many and what specific functionings should be included in evaluating a person's well-being has been a subject of debate. However, as Sen (1992, p. 31) has claimed, "We may be able to go a fairly long distance with a relatively small number of centrally important

functionings and the corresponding basic capabilities," especially when analyzing issues like poverty in developing countries. Those centrally important functionings would include the ability to be well–nourished and well–sheltered, as well as the capability of escaping avoidable morbidity and premature mortality, among some basic ones.

Suppose now that the problem of choosing the relevant functionings is somehow resolved. Given that functionings are vectors, there is a large problem of aggregation that is bound to occur as soon as we try to use this approach for normative purposes. Suppose we decide to follow Rawls and commend the society in which the capability of the least capable person is the highest. How shall we do so? This is exactly the question that Herrero (1996) investigates in an important paper based on Roemer (1988).

Herrero's (1996) and Roemer's (1996) exercises in interpreting Rawls's difference principle in terms of capability sets provides a nice example of one way in which we may proceed to formalize the capability approach. As noted previously in Section 3, economists using Rawls's principle have usually worked with utility as the indicator of individual well–being. Rawls himself had based much of his normative analysis on the primary goods consumed by individuals. Herrero moves away from both utility and primary goods to capabilities. Rawls's difference principle would then recommend that we maximize the capability of the person having the smallest capability. Since a person's capability is a set of functionings, it is not always obvious whether one person has a larger capability than another (consider the case where the capability set of neither is a subset of the other's). Hence, we are immediately confronted with the problem of comparison, which somehow needs to be formalized. Herrero proceeds to develop her argument axiomatically. In what follows we provide a sketch of her model, while cautioning the reader that there may be other ways to formalize the capabilities approach.

Let us suppose that there are h commodities and $\Re_+^h$ is the set of all possible commodity bundles. There are m functionings and $\Re^m$ is the set of all possible functionings. For each person i there exists a correspondence $C_i : \Re_+^h \to \Re^m$ such that, for all $\mathbf{x} \in \Re_+^h$, $C_i(\mathbf{x})$ is the set of all functioning vectors available to person i. In Herrero's model, $C_i(\mathbf{x})$ is person i's *capability* or *capability set*. Note that, in keeping with the discussion in the previous sections a person's capability depends not just on the goods he consumes but also on who he happens to be. Hence, the subscript i. In what follows, we use $B(\mathbf{X})$ to denote the set of boundary points of the set $\mathbf{X} \subset \Re^m$. The following conditions are assumed throughout this exercise:

(1) $C_i(0) = \varnothing$

(2) If $\mathbf{x} > \mathbf{y}$, then $C_i(\mathbf{x}) \supseteq C_i(\mathbf{y}), \forall \mathbf{x}, \mathbf{y} \in \Re_+^h$

(3) $\forall \mathbf{x} \in \Re_+^h, C_i(\mathbf{x})$ is such that, $\forall g \in B(C_i(\mathbf{x})), [0,g) \subset C_i(\mathbf{x}) \backslash B(C_i(\mathbf{x}))$

(4) $\forall \mathbf{x} \in \Re_+^h, C_i(\mathbf{x})$ is compact

(5) If $\{\mathbf{x}_n\}$ is a sequence such that $\mathbf{x}_n \to x, f_n \in C_i(\mathbf{x}_n)$, and $f_n \to f$, then $f \in C_i(\mathbf{x})$

(6) $\exists \mathbf{x} \in \Re_+^h$ such that $f \in C_i(\mathbf{x})$ and $f \gg 0$

Conditions (1) through (6) are a combination of self-evident axioms and some technical conditions needed for the results to be proven in Herrero's (1996) setting.

A person's utility depends both on the goods he consumes and the functionings he achieves. Hence, person i's utility function, v_i, may be thought of as a function

$$v_i : \Re^h \times \Re^m \to \Re.$$

While Sen does not always assume utility maximizing behavior on the part of agents, we shall here go along with Herrero (1996) and assume that if person i consumes a commodity bundle $\mathbf{x}$, she will choose a functioning vector f^* such that

$$v_i\left(\mathbf{x}, f^*\right) \geq v_i\left(\mathbf{x}, f\right), \forall f \in C_i(\mathbf{x}).$$

Let us now define

$$v_i(\mathbf{x}) = \max_{f \in C_i(\mathbf{x})} v_i(\mathbf{x}, f).$$

It is interesting to note that this formulation is general enough to allow for the possibility that even if a person's capability increases, her utility falls. In other words, we can have

$$C_i(\mathbf{x}) \subset C_i(\mathbf{y}) \quad \text{but} \quad v_i(\mathbf{x}) > v_i(\mathbf{y}).$$

The normative problem in this model is posed in terms of a planner, who has a vector, $\mathbf{w}$, of commodities to be distributed among the n individuals in society. The planner's aim is the Rawlsian one of maximizing the capability of the individual with the least capability. So she has to confront head on the problem of comparing capability sets. Comparison of sets, when this has to be consistent with some underlying preference over the elements of the sets, is problematic (see, for example, Kannai and Peleg 1984, and Barberá and Pattanaik 1984). Herrero circumvents this by thinking of an index of capability sets, which is a primitive.

Individual i's *capability index* is a concave and continuous function, $c_i : \Re^h_+ \to \Re$, such that $c_i(0) = 0$, $C_i(\mathbf{x}) \subset C_i(\mathbf{y})$ implies $c_i(\mathbf{x}) \leq c_i(\mathbf{y})$, and $\lim_{t \to \infty}(1/t)c_i(tx) = 0, \forall \mathbf{x} \in \Re^h_+$. The interpretation of this is as follows. If $c_i(\mathbf{x}) = r$, then person i having a capability set $C_i(\mathbf{x})$ is described as having a capability index of r. An increasing capability index suggests greater capability.

A planner's problem may now be expressed as a quadruple $\sigma = < n, h, w, \mathbf{c} >$, where we are describing any distribution problem by the following pieces: number of agents in the economy, n; number of commodities, h; available resources for distribution, $w \in \Re^h_+$; and an n-tuple of capability indices, $\mathbf{c} = (c_1, \ldots, c_n)$, where $c : \Re^h_+ \to \Re$. Let Σ be the

collection of all possible planner's problems. This formulation, mathematically, is the same as the one in Roemer (1988).

Given a planner's problem σ, the set of all feasible allocations, $Z(\sigma)$, is defined as follows:

$$Z(\sigma) = \left\{ (x_1, \ldots, x_n) \,|\, \sum_{i=1}^{n} x_i \le w \quad \text{and} \quad x_i \ge 0, \forall i \right\}.$$

We are now in a position to formalize the Rawlsian Solution (with capabilities as fundamentals) of a planner's problem. Given $r \in \Re^n$, let $\alpha(r)$ be a permutation of r such that $\alpha_1(r) \le \alpha_2(r) \le \ldots \le \alpha_n(r)$. Given that $r, k \in \Re^n$, we write $r \rangle^L k$ if $\exists\ i$ such that $r_i > k_i$ and, for all $j < i$, $r_j = k_j$.

The Rawlsian solution of a planner's problem σ is denoted by $L(\sigma)$ and defined as follows:

$$L(\sigma) = \{\mathbf{z} \in Z(\sigma) | [\alpha(c(\mathbf{y})) \rangle^L \alpha(c(\mathbf{z})) \Rightarrow \mathbf{y} \notin Z(\sigma)]\}.$$

$L(\sigma)$ is the collection of those feasible allocations that endow the n individuals with capabilities such that no n-tuple of capabilities exist that is feasible and lexicographically dominates this (that is, dominates in terms of the binary relation $\rangle^L$). Herrero also considers $L(\sigma)$ as the collection of fair allocations a la Sen, since "they provide equal capability indices up to the point at which it does not come into conflict with optimality in capability terms" (Herrero 1996, p. 79).

A logically interesting exercise that is undertaken in Herrero (1996) is to consider mechanisms and desirable axioms (in the spirit of Roemer 1988 and Nieto 1992), which turn out to be equivalent to the Rawlsian solution. To convey an idea of this, define an *allocation mechanism, F*, to be a mapping

$$F: \sum \rightarrow 2^{z(\sigma)}$$

such that $\forall \sigma \in \Sigma, F(\sigma)$ is nonempty.

The axioms that Herrero imposes on F are, stated informally, as follows:

 (i) If two allocations are indistinguishable in terms of their capability implications, then if the allocation mechanism chooses one of them, it must pick the other.
 (ii) The chosen allocations must be Pareto optimal in capabilities (instead of the usual utilities).
(iii) F must be anonymous over the agents.
(iv) Suppose a certain good, k, is "personal" for agent i in the sense that the capability set of other agents is independent of their consumption of k. Then F should have

the property that a change in the planner's problem that simply eliminates the personal good should leave the allocation unchanged for everybody over the other goods.

(v) If the amount of personal good for agent j increases, j's capability index should not fall.

(vi) If some agents disappear with the goods allocated to them, the allocation made in the revised planner's problem should be such that all other agents get exactly what they got before the agent's disappearance.

Herrero proves that F satisfies axioms (i) to (vi) if and only if it is the Rawlsian solution, as defined earlier.

As always, the advantage of an axiomatization is that it allows us to evaluate a large moral principle by breaking it up into parts. To us it seems that axioms (iii) and (vi) are the ones that can be contested. Sen himself has challenged anonymity, though there is less scope for that criticism in this framework since individuals are allowed to have different C_i and c_i functions.

Nevertheless, there may be traits associated with who the person happens to be that anonymity, that is, axiom (iii), tends to ignore. Axiom (vi) suggests a kind of absence of externality, which may well be questioned.

This formal exercise may not fully capture the intuition behind the capabilities approach, but it sets up a useful agenda and also helps to potentially break up and evaluate the whole new approach.

Once the allocation is made in a way consistent with the leximin rule in the dimension of capabilities, it is worth investigating what is the result in the dimension of utilities, under the given assumptions. When defining and constructing the set of capability-Pareto optimal allocations, the information regarding utilities is irrelevant. No clear relation can be derived, in principle, between allocations that are capability-Pareto optimal and the set of Pareto optimal allocations in the utility sense.

This link can be established, however, as long as the utilities depend on functionings that are relevant for the capability index in a specific way.[17] The specific assumption that Herrero examines is one with the property that $c_i(\mathbf{x}_i) > c_i(\mathbf{y}_i)$ implies $u_i(\mathbf{x}_i) > u_i(\mathbf{y}_i)$, that is, a higher capability index implies higher utility.[18] This assumption can be added to the description of the allocation problem. That specific property of the utility functions is added to the information set. Thus, the problem is characterized by $\tau = \{\sigma, \mathbf{u}\} = \{< n, h, w, \mathbf{c} >, \mathbf{u}\}$, where σ describes the problem, as before, and $\mathbf{u} = (u_1, \ldots, u_n), u_i : \Re^n \to \Re, \forall i = 1, \ldots, n$, and $c_i(\mathbf{x}_i) > c_i(\mathbf{y}_i) \Rightarrow u_i(\mathbf{x}_i) > u_i(\mathbf{x}_i)$.

Under this framework, two important results relating capabilities and utilities can be established. The first one states that when an allocation is chosen from the set of

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[17] Commodities can be divided into a set that is relevant for the "basic" functionings and those that are only valued by specific individuals, called "personal" commodities, or "primary" and "secondary" resources, as in Roemer (1996).

[18] This is, of course, a rather straightforward assumption. But it is worth keeping in mind that this assumption is compatible with $c_i(\mathbf{x}_i) = c_i(\mathbf{y}_i)$ and $u_i(\mathbf{x}_i) > u_i(\mathbf{y}_i)$.

capabilities-Pareto optimal allocations, recontracting among agents aimed at improving well-being cannot result in a suboptimal outcome in capability terms. Moreover, if the positive relationship between comparable capability indices and utilities does exist, the intersection between the set of capabilities-Pareto optimal allocations and *u*-Pareto optimal allocations is not empty.

Finally, one more assumption allows us to establish the result that the set of capabilities-Pareto optimal allocation is contained in the set of utility-Pareto optimal allocations in problems of this class. The assumption is "local nonsatiation" of the capability indices. Though restrictive, within that setting it is possible to state that choosing an allocation that is optimal in capability terms would also imply that the allocation is optimal in utility terms. Herrero (1996) goes beyond these results to show under what conditions the mechanisms would necessarily result in allocations that are Pareto optimal in capability terms. As explained earlier, the most important assumption that drives the result of the interaction between capabilities and utilities is that capabilities and utilities move in the same direction.

Other formalizations have emerged from the idea that capability is a fuzzy concept.[19] The idea that deprivation is not an "all-or-nothing" condition lies behind that conception. Instead of assigning a 1 or 0 to elements depending on whether they belong or not to a specific set, it uses a function, called "membership function," which takes values in the closed interval [0,1], corresponding to the degree of membership. Chiappero-Martinetti (1994, 1996) shows the empirical obstacles and possible solutions to the implementation of "fuzzy" measurement of well-being from the capabilities perspective. Relevant examples include Chakravarty (2006) and Qizilbash and Clark (2005).

Once one enters the domain of the "partial," new avenues of inquiry open up. Basu and Foster (1998), for instance, consider the case of education, where the mere presence of a literate person in the household confers some partial benefits of literacy on the illiterate members of the household. The deprivation of illiteracy in their model is total if a person is an "isolated illiterate," that is, an illiterate who lives in a household with no literate member, and partial if the person is a "proximate illiterate." It may be possible in the future to exploit the algebraic affinity between such a model and Chiappero-Martinetti's (1996) fuzzy approach to gain new insights.

5. CAPABILITY, PREFERENCE, AND CHOICE

The subject of capability is closely related to that of freedom (see Arrow 1995, 2006, Pettit 2001, Alkire 2007).[20] Viewed as a concomitant of freedom capability gives

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[19] On this, see Chiappero-Martinetti (1994, 1996) and Sen's (1994) comments on that work. For previous work on the application of fuzzy set theory to the measurement of inequality see Basu (1987b).
[20] Also see Sen (2004, 2006).

rise to some special problems, especially when we consider the choices of several individuals. To put this in a simple framework, it is best to start with the formulation of Foster and Sen (1997, pp. 199–203). They begin by assuming that there are n different kinds of functionings; a capability set, K, is a subset of $\Re^n$; and a person facing a capability set chooses some point, x, in the capability set. A focus on achievement would require us to focus exclusively on choices. Most traditional evaluations of well-being in economics do precisely that. Suzumura and Xu (1999) call this "pure consequentialism."

Before going to the case of several individuals let us examine one especially interesting argument put forward by Foster and Sen (1997), which makes the concern for capability almost a *logical* consequence of the concern for functioning. This stems from the realization that, at one level, the "ability to choose" is itself a kind of functioning. Hence, a functioning vector x chosen from the opportunity set S and the functioning vector x chosen from the set T may be thought of as denoting different achievements in functioning (see Foster and Sen 1997, p. 202). There is scope for some ambiguity here about what constitutes the functionings' space. Though Foster and Sen are imprecise in stating this, the essential idea is formalizable and important. The first step in formalizing this is to recognize that the functioning representing the ability to choose is a very different kind of functioning from the other functionings that they talk about. Let us call these other functionings the *basic* functionings and the functioning of choosing as a *supervenient* functioning. When Foster and Sen begin by assuming that there are n different kinds of functionings and they use $\Re^n$ to represent the functionings' space, clearly what they are talking is basic functionings, because the interesting characteristic of the functioning of choosing (the supervenient functioning) is that it cannot be represented by real numbers because it is supervenient on the other functionings. Moreover, typically, one cannot choose between different levels of this functioning.[21]

The supervenient functioning level presented to a person is represented by a subset of the other functionings—the subset from which the person is allowed to choose. In other words, in this more generalized space, a capability set is:

$$\{(x, K) : x \,\varepsilon\, K\},$$

where $K \subset \Re^n$. When a person facing such a capability set chooses a point, for instance (x, K), the information about the capability that he faced is contained in his choice. Hence, an evaluation based on achieved (or chosen) functionings can be made sensitive

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[21] The reason why this need not always be so is that individuals can at times choose the set from which they choose. Schelling (1985) and Akerlof (1991), in particular, have written about how individuals do at times take actions to restrict the set from which they choose. People often set rules for themselves that they then treat as constraints: I will not smoke more that 10 cigarettes a day or, if I drink more than one drink I will not drive. Alternatively, they often make choices that restrict their own future options, such as the person who does not carry his cigarette pack with him or the woman who throws away the painkiller before the labor pain begins. Basu (2000) shows that such behavior may be fully compatible with individual rationality.

to the capability set that the person faced. In this formulation, an evaluation based on capabilities alone is more restrictive than an evaluation based on the chosen functionings.

This formulation in terms of basic and supervenient functionings is a coherent one, as we tried to show above, and can be used for the actual evaluation of the quality of life of peoples; but we shall not pursue this line further. There are other problems to tackle concerning capabilities, even without going into this more sophisticated structure. So let us remain with the structure presented by Foster and Sen, where the functionings' space is given by $\Re^n$, a capability set is a subset of $\Re^n$, and a chosen functioning vector is an element of the capability set.

There is, first of all, the question of ranking *sets* of functionings, to capture the idea of "greater capability." That is, when can we say that one set represents a larger amount of capability or freedom than another set? This has been the subject of some inquiry (Kannai and Peleg 1984, Barberá and Pattanaik 1984, Pattanaik and Xu 1990) and it has had its share of impossibility theorems. But that takes us more into the domain of freedom. Staying closer to the concept of capability, we want to here draw attention to a very different kind of controversy—an ambiguity in the concept of opportunity as defined in economics. To understand this, the contents of the sets are unimportant. It does not matter whether they consist of commodities or functionings or something else. So let us introduce the problem, as in Basu (1987a), by using the standard Walrasian general equilibrium as the benchmark.

Keeping the framework abstract (and therefore widely applicable) let us use X to denote the universal set of alternatives. Assume X is finite and has at least three elements. We shall say that (x, A) is an extended alternative if $x \in A \subset X$. An extended alternative, such as (x, A), denotes the action of choosing x when the set A of alternatives is available to choose from. The central idea that Suzumura and Xu (1999) introduce, formalizing the notion that human beings care not just about their final choice but also their freedoms, is to argue that human beings have preferences over extended alternatives. To formalize this, suppose Ω is the set of all possible extended alternatives. An individual's extended preference, R, is defined as an ordering (that is, a reflexive, complete, and transitive binary relation) on Ω. It will now be seen that imposing some mild-looking axioms on R can lock us into taking a very structured view of "how" capabilities enter human preferences.

We shall in particular consider three among the several axioms that Suzumura and Xu (1999) have discussed. Let us use P and I to denote the asymmetric and symmetric parts of R.

Axiom I (Independence) For all $(x, A), (y, B) \in \Omega$ and $z \notin A \cup B, (x, A)R(y, B)$ if and only if $(x, A \cup \{z\})R(y, B \cup \{z\})$.

Axiom S (Simple Independence) For all distinct alternatives $x, y, z \in X, (x, \{x, y\})$ $I(x, \{x, z\})$.

Axiom M (Monotonicity) For all $x \, 0 \, X$, there exists $(x, A) \, 0 \, \Omega$ such that $(x, X)P(x, A)$.

The interpretations of these axioms are straightforward. Axiom I says that if a person is indifferent between choosing x from A and choosing x from B, then if the capability set is expanded by adding another alternative (z), while keeping the choice the same, the person must continue to be indifferent over the new pair of extended alternatives. Axiom S says that when a person chooses from a pair of alternatives, as long as the chosen element is the same, the person must be indifferent. And finally, Axiom M asserts that for every alternative x, there exists a sufficiently small set $A \subset X$ such that a person prefers to choose x from X than x from A. A special instance of this is the assertion $(x, X)P(x, \{x\})$, for all $x \in X$.

These three axioms together, however, turn out to be very restrictive, as the following theorem, proved by Suzumura and Xu (1999), shows.

Theorem 1 *If R satisfies axioms* I, S, *and* M, *then for all* (x, A), $(x, B) \in \Omega$, (x, A) $R(x, B) \leftrightarrow \#A \geq \#B$.

In other words, a person whose preference satisfies these three axioms is concerned about capability, but his concern for capability takes a rather narrow "counting" approach. The more alternatives he is able to reject, the better off he is.

Apart from the analytical elegance of the theorem, it is valuable in showing how the concern for capability emerges easily from elementary notions regarding human preference. On the other hand, it demonstrates how quickly we can get locked into a rather mechanistic view of preferences for freedom. To break out of this we can try to relax these axioms—several variants of these are discussed by Suzumura and Xu (1999)—but, more interestingly, we can question the domain of this discourse. How reasonable is it to assume that the domain of human preference is Ω?

Consider the case where a person prefers z to x and x to y. Then the person is likely to view the feasible set $\{x, y\}$ very differently from $\{x, z\}$. And Axiom S begins to look less plausible than it did earlier. Moreover, it is no longer clear how we should interpret the extended alternative $(x, \{x, z\})$ since the person will not ever choose x when x and z are available. If by $(x, \{x, z\})$ we mean a situation where x is forced on this person from $\{x, z\}$, then it is not clear that "choosing" is the right word to describe this person's achieving x. In light of this, one way to modify the Suzumura–Xu framework is to restrict their domain, based on the agent's preference, R, on X.

Given R, let us define $\Omega(R)$ as the domain of all possible extended alternatives as follows: $(x, A) \in \Omega(R)$ if and only if $x \, 0 \, A \subset X$ and xRy, for all $y \, 0 \, A$. It will be interesting to explore the consequences of imposing reasonable axioms on the person's extended ordering on this more restricted domain. But such an exercise lies beyond the scope of this chapter.
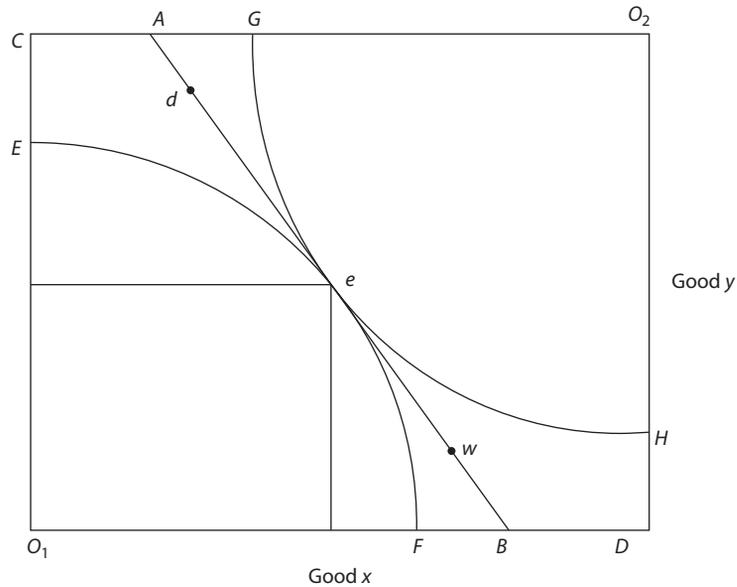
Figure 16.1. Edgeworth Box and Strategic Interaction.

Let us now turn to the problem of interpersonal freedoms. Let Figure 16.1 be a usual Edgeworth box of a two–person, two–good exchange economy. It depicts a general equilibrium. Let w be the point representing initial endowment. They face prices depicted by the line AB. Given the indifference curves as shown, equilibrium occurs at e. In this economy, person 1's *choice* or *achievement* is point e, but his *opportunity set* or *capability* (the concept here being restricted to the domain of commodities rather than functionings) is $CABO_1$. Likewise for person 2, whose opportunity set is $ABDO_2$.

The question that we want to raise now is whether these individuals are "really" free to choose any points within their opportunity sets. In an important sense the answer is no. This is because what is actually open to one person depends on what the other person chooses. For instance, in Figure 16.1 it is not possible for one person to choose point w and the other to choose d. Similarly, if person 2 chooses point e, person 1 cannot choose point d; person 1's belief (in the competitive model) that he can choose d is, in a sense, illusory. Once person 2 has chosen e, the only choices open to person1 are the points in the rectangle between e and O_1.

Given that opportunity sets have this element of illusion of choices, how much significance can we attach to opportunity sets as expressions of opportunity or capability or advantage? Also, once this problem is appreciated, it becomes clear that opportunities can be increased vastly without changing anything of significance. Consider the closed set bounded by $DFeECO_2$. From this remove all points on the curve FeE, except e.

Let us call the set that remains Z_2. If instead of restricting person 2's opportunity set to $ABDO_2$ we allow him to choose from the set Z_2, the equilibrium would remain unchanged. If we were evaluating this society in terms of opportunities open to individuals, this exercise of making person 2's opportunity set Z_2 would make this society appear better, but clearly our evaluation of this society should not hinge on such ploys.

To understand the problem further note that because agents 1 and 2 cannot simultaneously choose points d and e does not mean that they do not have the freedom to choose those points. The trouble stems from the fact that you cannot invariably say that they *have* the freedom to choose those points.

Consider a cocktail party for 100 persons. At the venue of the party there are 10 chairs, but most people show a preference for standing around, drinking and chatting; so that one chair remains vacant throughout. It seems reasonable to say that each person has the freedom to sit. This is so even though everybody cannot exercise this freedom. Next think of a train compartment with 10 seats for which 100 passengers have been sold tickets. These are polite people and so one seat remains vacant throughout the journey, no one wanting to appear impolite and grabbing the last seat. Here it would be wrong to say that everybody has the freedom to sit, even though at a purely behavioral level the situations (the party and the train) are the same. If there were no seats or chairs, we could unequivocally assert that people did not have the freedom or opportunity to sit; if there were 100 seats, we could say equally firmly that everybody had the opportunity to sit. What is interesting about the intermediate case, as illustrated by the above examples, is that freedom or capability has more to it than pure physical availability. One person's freedom can depend on another person's preference. At the party no one wanted to take that seat whereas in the train there were many who would have liked to have taken that last seat. That is what changes the fact that at the party each person has the freedom to sit, but in the train that is not the case.

It should be emphasized that this is not an argument that dismisses the importance of freedom nor one that claims that individuals in a Walrasian economy face no freedom. It simply shows that the extent of freedom faced by an individual in such an economy is a philosophically contested matter; that the traditional textbook view of equating this with the opportunity set may be too simplistic. Interestingly, this problem does not arise in a game-theoretic characterization of an economy or a game-form depiction of the choice problem faced by individuals (see, for example, Deb 1994, Fudenberg and Tirole 1993, Gaertner, Pattanaik, and Suzumura 1992), because in a game, as opposed to a market economy or a pseudo-game, an individual's set of opportunities or strategy set is independent of other people's choices.

This problem makes capabilities much harder to use in the actual evaluation of social states or societies, and so may mean that for the time being one is forced to use achieved functionings as the basis for evaluating societies. This is the line taken by Brandolini and D'Alessio (1998), the approach taken by the Swedish approach to social welfare

(Erikson 1993), and also the basis of the human development index of the UNDP, as in
Section 8.[22]

6. APPLICATIONS OF THE CAPABILITIES APPROACH TO POVERTY MEASUREMENT AND GENDER ISSUES

Several applications of the capabilities approach to well-being have been used in
the literature. One application is related to the concept of poverty, seen as "capability
deprivation" (Sen 1983a, 1992, 1998). Poverty can be seen as being relative in the
dimension of income, but absolute in the realm of capabilities (Sen 1983a).

The idea that poverty is not completely understood just by looking at income data
is not new. In 1901 Rowntree wrote the book *Poverty: A Study of Town Life,* already
calling for a distinction between "primary" and "secondary" poverty. Only the for-
mer was defined in terms of inadequacy of income, incorporating in the latter aspects
such as influences that affect the family's consumption behavior. Rowntree's book also
highlighted the need for defining several poverty lines because of variations in people's
characteristics.[23]

In the late 1970s, new research tried to incorporate the "fact" that poverty has
a multidimensional nature (Townsend 1979), though this was done without making
use of the capabilities approach. One example of this is the so-called "Scandinavian
Approach to Welfare Research" (Erikson 1993, Erikson and Uusiatlo 1987). This mul-
tidimensional approach to poverty measurement has been formalized by Bourguignon
and Chakravarty (2003), and there are also papers that combine the capabilities approach
to poverty with the multidimensional approach.[24] In the first decade of the twenty-first
century the literature addressing multidimensionality has been related to methods
based on axiomatic derivations of poverty indices. Examples in this field include the
contributions of Bourguignon and Chakravarty (2003) and Alkire and Foster (2008).

The closest empirical approach to the idea of capabilities in poverty assessment, the
"Scandinavian" approach, started with research centered around the Swedish Level of
Living Surveys from 1968 to 1981. The Swedish multidimensional approach included
nine groups of indicators of standard of living, namely health and access to health care,

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[22] An idea that has gained ground in the recent literature refers to "adaptive preferences," where people might adapt to
unfavorable circumstances, suppressing their wants and needs, rendering the evaluation of well-being complex. Several
authors have posed interesting answers to this issue, for example Teschl and Comim (2005), and Qizilbash (2006).

[23] See Foster and Sen (1997), without A.7.4.

[24] An example of empirical evaluation of well-being explicitly from the functionings perspective is Brandolini and
D'Alessio (1998). An attempt to construct poverty indices from the capabilities perspective taking into account imple-
mentation issues is Desai (1990). See also Balestrino (1992, 1994). A theoretical discussion of the applicability of the
framework can be found in Alkire and Black (1997), and an extensive discussion of the foundations and the usefulness
of the approach is in Alkire (2000).

employment and working conditions, economic resources, education and skills, family and social integration, housing, security of life and property, recreation and culture, and political resources. Each component included several indicators.[25] Though this approach is akin to the capabilities approach, criticisms have been made that in measuring certain indicators of well-being the approach is not clear as to what exactly is being measured. For example, "housing" is measured by people having access to a dwelling, whereas from a conceptual perspective the concept of "homelessness" is broader than the idea of not "having access to a shelter" (Brandolini and D'Alessio 1998, Foster and Sen 1997). The Scandinavian approach established, however, a broad framework for an empirical application of the capabilities approach, for a certain set of functionings.

Why is it necessary to introduce this new concept instead of the existing income-based poverty assessment? According to Sen (1998), there are three reasons for this: (i) income is only instrumentally important, whereas poverty can be sensibly characterized in terms of capability deprivation; (ii) there are influences on capability deprivation—on poverty—that are different from lowness of income; and, (iii) the instrumental relation between low income and low capability varies across communities and even across families and individuals.

The second point has to do with the capacity of individuals to convert income into functionings, introducing the aspects of disability, which were discussed in Sen's original formulation of the capabilities approach.[26] Establishing poverty lines in terms of income implicitly assumes equal capacity of conversion, which may not necessarily be true. The third point, that of the variability of the relation between income and functionings across communities, families, and individuals, allows us to deal with issues like gender discrimination in intra-household allocation of resources.[27] From the new perspective it is possible to identify instances of "functioning-poverty" even in relatively affluent societies and for levels of income that would not be regarded as being below an income-based poverty line.[28] Empirical work carried out by Ruggeri (1997, 1999) has shown that the identification of poverty may differ once the multidimensional approach is used instead of the common monetary poverty lines.[29] A similar conclusion is reached by Klasen (2000), using data for South Africa. Finally, another interesting application uses data for the unemployed population in Belgium to show that income is a poor indicator of capability deprivation for Belgian men (Schokkaert and Van Ooteghem 1990).

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[25] For example, for "health and access to health care," the survey would typically include indicators such as ability to walk 100 meters, symptoms of illness, and contacts with doctors and nurses Erikson 1993.

[26] For more recent contributions in addressing the capability set of the disabled see Terzi (2005).

[27] See Sen (1998, Chapter 5) and Valdez (1995). For a criticism of the capabilities approach from the perspective of gender justice see Qizilbash (1997) and Robeyns (2008).

[28] An interesting case study is Balestrino (1996), based on a report requested by the Bishop of Pistoia, Italy, about poverty in that region.

[29] These applications use data for Chile (Ruggeri 1997) and Peru (Ruggeri 1999).

The Human Development Reports, published by the United Nations, have applied these principles to the measurement of human development from the perspective of gender equality. This resulted in the "gender-related development index," which corrects the Human Development Index for disparity of achievement between women and men (UNDP 1997). Razavi (1996) is another example in which the concept is used for the analysis of gender discrimination using village-level data from Iran.[30]

Besides the use of the capabilities approach in the analysis of well-being, inequality, poverty, the standard of living, and gender issues, there are other applications in the literature. These include political participation (Bohman 1997), freedom (Bavetta 1996, Carter 1996, Sen 1998), project evaluation, and environmental issues (Casini and Bernetti 1996), and health (Coast, Smith, and Lorgelly 2008).
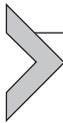
7. CAPABILITY AND EXCLUSION

The link between capability and poverty, as discussed in Section 6, is an important one. Access to the market is a form of capability that can enable a person to escape abject poverty. Yet in poor countries many people do not have access to markets, which all of us seem to take for granted. This is more than a matter of possessing enough money. It has to do with the structure of markets and the nature of industrial organization. Atkinson (1995) has explored this link between capability and market exclusion. In his own words, what he was trying to explore was "the link between a specified capability and the distribution of income in the society, by introducing an aspect not typically considered: the conditions under which goods are supplied" (Atkinson 1995, p. 18). His model is based on Sen's (1983a, p. 161) view: "At the risk of oversimplification, I would like to say that poverty is an absolute notion in the space of capabilities, but very often it will take a relative form in the space of commodities or characteristics."

To understand the core idea behind Atkinson's model assume that we have an economy in which there are n workers and the productivity of the workers vary, uniformly, from $\underline{w}$ to $\overline{w}$, where $\overline{w} > \underline{w}$. The "productivity" of a worker is defined in terms of what the worker can produce in this village. In other words, the least productive worker will produce $\underline{w}$ units of output when employed by a firm *in this village,* and the most productive worker will produce $\overline{w}$ units when employed by a firm *in this village.* And the number of workers who have productivity in the interval $[\underline{m}, \overline{m}]$, where $[\underline{m}, \overline{m}] \subset [\underline{w}, \overline{w}]$, is given by $(\overline{m} - \underline{m})n/(\overline{w} - \underline{w})$.

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[30] For a discussion on the application of the capabilities approach to gender justice and women's capabilities, see Nussbaum (1995a, 1995b, and 1999, Chapter 1, "Women and Cultural Universals").

We shall now consider the market for bicycles. A bicycle is a commodity but one that can enable a person to achieve functionings otherwise not available, as in de Sica's classic film, *The Bicycle Thief.* The person can, for instance, enable him to ride to a neighboring village, where there is more capital and so one can earn more than in this village. Let us now, following Sen (1985), allow for the fact that what a bicycle can achieve for a person depends on who the person happens to be. Let us in particular assume that for a person with productivity $m \in [\underline{w}, \overline{w}]$, the availability of a bicycle enhances what he can produce by himself. In other words, what he can earn with a bicycle is $(1 + h)m$ (by going to the neighboring village for work).

To see how some individuals may be excluded from the market, we have to now turn to the organization of the bicycle industry. Note that if the price of a bicycle is p, only those individuals will buy bicycles whose productivity, m, is such that $hm \geq p$.

Let c be the cost of manufacturing a bicycle. If $h\underline{w} < c$, then from the society's point of view it is inefficient to provide everybody with a bicycle. To rule this obvious kind of exclusion out, we shall henceforth assume that $h\underline{w} > c$. In other words, it is inefficient to exclude anybody from having a bicycle. We shall now show how, if the market is allowed to function without intervention, some individuals, in particular those with handicaps, will get excluded from the market.

The case of perfect competition in the bicycle market is easily dealt with, and is a useful benchmark. If by perfect competition we mean price-taking behavior and free entry of firms to the industry, then it is clear that the price of each bicycle will drop to c and all n individuals will get to own a bicycle.

The interesting cases arise when the industry is not fully competitive. For reasons of brevity, let us confine our attention to the case of pure monopoly, where the monopolist has to set one price for all buyers (that is, there is no price discrimination). If the monopolist sets price equal to p, his profit, π, will clearly be given as follows:

$$\pi = \{(\overline{w} - (p/h))/(\overline{w} - \underline{w})\}n(p - c).$$

From the first-order condition, it is evident that the monopolist will set the price at $p*$, such that:

$$p* = (h\overline{w} + c)/2.$$

This means that all individuals with productivity below $p*/h$ are excluded from the bicycle market. It is not in the interest of the monopolist to sell to individuals who are relatively less productive and, therefore, relatively poor. The number of persons thus excluded is given by e^*, where

$$e^* = n[\{(h\overline{w} + c)/2h\} - \underline{w}]/(\overline{w} - \underline{w}).$$

It may be checked that, since $c > h\underline{\underline{w}}$, hence $e^* > 0$. Hence, a positive number of individuals will be excluded even though each person values a bicycle more than the cost of producing a bicycle.

From the definition of p^* above, it follows that all individuals with productivity less than w^* will be excluded from the cycle market, where w^* is given by:

$$w^* = (h\underline{\underline{w}} + c)/2h.$$

It is now easy to see that a person's capability can alter even without any change that is internal to her, purely by virtue of changes in other people's income, or by the income distribution or the arrival of immigrants, or by the out-migration of people. Just to take an example, suppose that the distribution of income worsens in this society, so that the richest person becomes richer, that is, $\underline{\underline{w}}$ becomes higher. This will cause w^* to rise, so that a longer tail of low productivity persons are now denied access to a bicycle. Likewise, if a group of wealthy migrants (productivity above $\underline{\underline{w}}$) come into this economy, then a larger number of poor persons will be excluded from the market. In the language of famines, the entitlements of poor individuals may diminish, without any change in the productive capacity of the economy or any innate change in the poor people. This also illustrates the possibility of an entitlement-based famine (Sen 1981), without any diminution, not just in production but in productive capacity.

Atkinson (1995) has taken this model further, and it is in fact possible to treat this as a base model to raise a variety of questions concerning poverty and famines caused by what appear to be unrelated factors, such as changes in the market structure and alterations in income distribution at the upper end of the income distribution, which seemingly leave the poor unaffected. But in the present context, the model is best viewed as one that brings "together the notion of poverty, in terms of an incapacity to function arising from the inability to purchase goods essential to that functioning, and the treatment of price and quality decisions in the industrial organization literature" (Atkinson 1995, p. 29).

8. THE HUMAN DEVELOPMENT INDEX

One important practical consequence of the capabilities approach is the emergence of the human development index (HDI), which is computed and made available annually since 1990 in the Human Development Reports of the UNDP. There is now a substantial literature using, criticizing, and advancing further these indices,[31] and the HDI has become part of the popular basis for criticizing or praising societies.

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[31] Also see Anand and Ravallion (1993), Dasgupta and Weale (1992), Desai (1991), Ray (1998), Srinivasan (1994). Recent contributions are Foster, López-Calva and Szekely (2005) and Seth (2009).

The HDI is a method of ranking economies based on three summary measures of functioning. The three measures pertain to life expectancy or the basic functioning of living, literacy, or the ability to read, write, and communicate better, and finally, the economic standard of living, or the ability to buy goods and services that one desires.

To understand this more formally, let an average person's life expectancy at birth (in a certain nation) be given by l. Next let us turn to education. A nation's educational achievement is calculated by the *Human Development Report 1998* as follows. First the nation's adult literacy rate is measured, then the nation's school enrolment ratio is measured, and then a weighted average of these two is calculated with a weight of 2/3 on literacy and 1/3 on enrolment. Let us denote the nation's educational achievement level, thus calculated, by e. Finally, a nation's economic standard of living is measured by taking its "adjusted" per capita income. The adjustment is of the following kind. First the nation's per capita income with purchasing power parity correction is estimated. Then for incomes above a certain level the adjusted income is treated as one discounted by Atkinson's formula for the utility of income (see UNDP 1998, p. 107). Let a country's adjusted per capita income be given by γ.

Now, for each of these three indices, l, e, and γ, levels are chosen for the maximum and the minimum that a nation can have. Let us denote these by, respectively, L, E, and Y, and λ, ε, and ξ. These are of course somewhat arbitrary. Thus, for instance, the maximum possible life expectancy at birth is treated as 85 years and the minimum as 25 years. Once these estimations and choice of benchmarks have been made, the HDI is easy to derive. The country's HDI, denoted by H, is given as follows.

$$H = 1/3\{[l-\lambda]/[L-\lambda] + [e-\varepsilon]/[E-\varepsilon] + [\gamma-\xi]/[Y-\xi]\}.$$

Table 16.1 below takes a sample of ten nations and gives their HDIs and GDP per capita. It is evident from column 3 that the ranks depend importantly on whether we use human development or GDP to evaluate a nation's well-being.

Australia has a lower per capita income than the United States but a higher HDI—in fact, Australia has the world's second highest HDI. Of all the countries reported in Table 16.1 Qatar has the highest per capita income, but it comes way down when it comes to human development. It is pulled down mainly by its lower life expectancy relative to its per capita income. In the case of countries like Qatar and Saudi Arabia, the GDP per capita is a poor indicator of the level of development, as evaluated from a broader perspective that is consistent with the capabilities approach. Qatar and Saudi Arabia go down 30 and 19 places in their ranking in the world, respectively, when the HDI criterion is used.

Other countries, however, rank better from the HDI perspective than they would if one were to consider only their GDP per capita. This is the case of Cuba and Costa Rica, which go up by 44 and 19 places, respectively, under the HDI perspective. In

Table 16.1 Human Development Index, GDP per Capita, and Rankings, 2007

Country	HDI	Real GDP per capita (US$, PPP)	HDI rank minus GDP rank[a]
Australia	0.970	34,923	20
USA	0.956	45,592	−4
Austria	0.955	37,370	1
Qatar	0.910	74,882	−30
Cuba	0.863	6,876[b]	44
Costa Rica	0.854	10,842	19
Mexico	0.854	14,104	5
Saudi Arabia	0.843	22,935	−19
China	0.772	5,383	10
Sri Lanka	0.759	4,243	14
India	0.612	2,753	−6
Nigeria	0.511	1,969	−17

[a] A positive number means that the HDI ranking is higher than the GDP ranking for that country.

[b] Data refers to year other than that specified.

Source: UNDP, *Human Development Report 2009,* Table H.

other cases, such as Austria and Mexico, the criterion does not seem to matter much for the comparison year. It is worth mentioning here that the GDP criterion is also less stable and can be affected by exchange rate disruptions and macroeconomic crisis, whereas the HDI rank is more robust to those short–run fluctuations.

One criticism of the HDI voiced often is that aggregating over literacy, life expectancy, and income is like adding apples and oranges. While such aggregation does hide information and is justifiably a source of concern, we must not go overboard in resisting aggregation. For one thing, there are contexts where we do add apples and oranges. We would do so, for instance, if someone asked us how many fruits there are in a basket that contains apples, oranges, and plums. Secondly, the concept of national income, used so ubiquitously, is itself highly aggregative. Whether a particular aggregation is right or wrong depends on the question that we are trying to answer. There is nothing fundamentally right or wrong in adding different entities together. Once people get to understand intuitively what a measure means, they are willing to accept it. A problem with the HDI is that its aggregation is not simple enough. Perhaps the best way to use the index is in conjunction with the disaggregated data on each country. Thus we could view a country's well–being as represented by a vector. What is interesting about the HDI is not the exact measure but its emphasis on a multidimensional, functionings–based view of development. That there was a need for this is evident from the rapidity with which it has caught on. The World Bank's move to adopt a "comprehensive development framework" is also a move in a similar direction.

9. CONCLUDING REMARKS

The capabilities approach opened an alternative route to welfare economics, traditionally focused on the analysis of well-being from the point of view of command over goods and services. In this new approach, commodities and utility are replaced by functionings and capability. Goods are only relevant in the sense that they allow people to achieve different "doings" or "beings," called functionings. The set of functionings available to a person represents her capability set.

The idea that goods allow people to "function" in a human way and to interact socially goes back to Aristotle, Adam Smith, John Stuart Mill, and Karl Marx. Moreover, the principle that real freedom does not depend on what people are "prevented from doing" by the law but what people are indeed able to do in a "positive sense" has been taken from Karl Marx, T. H. Green, and Isaiah Berlin. Amartya Sen proposed the new approach in his *Tanner Lectures* (Sen 1980) at Stanford University in 1979. After early attempts by Sen himself, several alternative formalizations have been proposed.

Applications of the functionings and capabilities approach have been attempted in the contexts of poverty measurement, gender issues, political freedom, and standard of living assessment. The most important attempt to make the approach operational was the creation of the *Human Development Reports* by the United Nations and the construction of the Human Development Index (HDI). The way countries rank in terms of development when measured by the HDI tends to differ, in some cases widely so, from those rankings based solely on income per capita.

Capability is closely related to the idea of opportunity or advantage. Ideally, in order to fully evaluate a person's well-being from this perspective, we would need to know the set of functionings from which he was indeed able to choose freely—the capability set—as well as a singleton: the functionings that were achieved. The problem of measuring "opportunity" can, however, be problematic from a philosophical perspective, especially when a person's opportunity depends on other people's choices. It is evident, therefore, that for some time to come, the attempts at applying the capabilities approach will run hand in hand with research to give greater rigor to its theoretical foundations.

It is, however, worth keeping in mind that the capabilities approach may well turn out to be (as with some other larger ideas in moral philosophy and social analysis, such as liberty or utility) not amenable to a single overarching formalization. We may have to contend with alternative specific formalizations and algorithms for dealing with different aspects of it. This may be viewed as a criticism of this approach. But it may also be its strength.

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