

Sustainability Science: An Introduction^a

Chapter 4

Human Well-Being

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Contents

- 4.1 From Personal to Social
 - 4.1.1 Personal Well-Being
 - 4.1.2 Social Well-Being
- 4.2 Direct Measures: Constituents
 - 4.2.1 Tradeoffs Among the Constituents
 - 4.2.2 Constructing Social Well-Being
- 4.3 Some Ethics
 - 4.3.1 Efficiency
 - 4.3.2 Additivity
- 4.4 More Ethics: Goals, Rights, and Opportunities
 - 4.4.1 Social Goals and Individual Rights
 - 4.4.2 Positive and Negative Rights
 - 4.4.3 Opportunity Sets
- 4.5 Indirect Measures: Determinants of Well-Being
 - 4.5.1 Inequality
 - 4.5.2 Happiness, Status Goods and Overconsumption
 - 4.5.3 Difficulties in Measuring Personal Well-Being
- 4.6 Shadow Prices and Social Cost-Benefit Analysis: Introduction
- 4.7 Rich and Poor Worlds: An Application
 - 4.7.1 Reproducible Capital and Human Capital
 - 4.7.2 Ideas
 - 4.7.3 Population
 - 4.7.4 Mutual Causation Among Factors
 - 4.7.4 Knowledge and Institutions
 - 4.7.5 What Have We Learnt From The Statistics?

Table 4.1

References

Figure 4.1

In evaluating an economy, we can ask five types of questions: (A) How is the economy doing? (B) How has it performed in recent years? (C) How is it likely to perform under "business as usual"? (D) How is it likely to perform under alternative policies? (E) What policies should be pursued there?

National income accounts offer information relevant for answering question (A), although we will argue below that they do so in an unsatisfactory way. Policy evaluation, including social cost-benefit analysis (Section 4.6 and Chapter 5), is a way to answer questions (D) and (E). The idea there is to evaluate an economy at a point in time before and after a hypothetical change (e.g., the undertaking of an investment project), has been implemented. In contrast, sustainability analysis (Chapter 5) responds to questions (B) and (C). It does so by evaluating the change that is experienced in an economy owing to the mere passage of time; as in response to such a question as, "Has the economy improved during the decade?" We engage in policy evaluation when we wish to prescribe economic change, whereas we conduct sustainability analysis when we wish to assess an economy's performance over a period of time.

Question (A) stands apart from questions (B) to (E), at least if conventional practice among national income statisticians is any guide. For it is common practice to summarize the state of an economy by its gross domestic product (GDP), or equivalently its (gross) domestic income. That is why, when in Chapter 2 we studied long-term trends and transitions in Human-Environment Systems, we found it natural to give a prominent role to GDP.

What we mean by an "economy" depends on the context in which the above questions are asked. The economy could be a person, a household, a village or town, a district or state, a country or region, or even the whole world. But no matter what the context happens to be, we need first of all an account of human well-being. Below and in Chapter 4* we show how to apply various notions of human well-being to each of the above questions. In Chapters 5, 5*, and 8 we use that apparatus to put flesh into the idea of sustainable economic development. There we also construct a useable language for policy evaluation.

4.1 From Personal to Social

A notion that appears prior to the idea of human well-being, prior even to ethics, is that of a social state. Formally, a social state is a complete history of the world, extending from the known past to the indefinite future - as complete, that is, as current powers of discrimination will allow. All ethical theories evaluate social states; theories differ on what should be judged as ethically significant in social states.

The fundamental ethical concept with which we work here is well-being. The term denotes something like the "quality of life", but is not the same. As well-being involves both subjective and objective elements, much has been written on that distinction. But in applied social ethics, a different distinction turns out to be more salient, namely, between the "constituents" and "determinants" of well-being. We develop that below.

4.1.1 Personal Well-Being

The idea of well-being has been explored for over two millennia by some of the deepest minds. The concept nevertheless remains unsettled because well-being is tied to conduct, and conduct cannot be evaluated without a conception of the ethical life. The Buddha and Aristotle, to whom we owe perhaps the earliest and most searching explorations into the notion of personal well-being, showed that it is tightly knit to the idea of a "well-lived life". The classical utilitarians of the late seventeenth and eighteenth centuries advanced a more narrow version of the concept, built on pleasure and an absence of pain. But even they recognised that a purely hedonistic formulation won't do. In an oft-quoted passage, Mill (1861 [1998]) observed that "It is better to be a human being dissatisfied than a pig satisfied; better to be Socrates dissatisfied than a fool satisfied." Of course, his book also attempted to explain why.

Contemporary welfare economics has been built on a behavioural interpretation of hedonistic utilitarianism. The idea is to infer someone's well-being from her behaviour. So, for example, if a person is found to have chosen option *A* when option *B* was available to her, we are to infer that her well-being in the social state resulting from *A* is higher than her well-being in the social state resulting from *B*.

The thought that it may be possible to measure something that is "subjective" (happiness) with an "objective" rod (behaviour) has proved so attractive, that it has dominated welfare economics for over six decades. Advances in neuroeconomics suggest, however, that pleasure and pain can be tracked to neural activity at specific sites. Some argue, therefore, that even states of mind are objectively measurable. There is also a tradition in welfare economics of studying behaviour in perfectly competitive markets. Prices in such markets provide cues for eliciting individual well-beings. Among ecological economists, the approach has been adopted in ingenious ways for valuing environmental amenities (e.g., places of scenic beauty). We study some of those ways in Chapter 5*.

But there is another route for measuring personal well-being. It involves asking people to state their preferences over social states. The idea is to identify personal well-being with personal preferences and to elicit those preferences from a set of hypothetical choices that people are offered. Among ecological economists, the approach has been adopted not only for valuing environmental amenities, but also for eliciting the value people place on resources that have intrinsic worth (e.g., endangered species). The overall approach has been called the "contingent valuation method" (or CVM). We describe the method briefly in Chapter 5*.¹

In recent years, measuring personal well-being on the basis of answers to questionnaires has been adopted more generally by economists and psychologists. Perhaps the most widely discussed body of research asks randomly selected people to report their subjective well-being

¹ Freeman (1992) is an excellent treatise on the subject.

in such terms as "very happy", "pretty happy", and so forth. The resulting "happiness literature" has generated a number of surprising, though at times conflicting, findings. We discuss them in Section 4.5.2.

4.1.2 Social Well-Being

Our aim in this chapter is to explore ways to measure social well-being. However, as the locus of sensation, perception, and feeling is at the individual level, not only is the socio-economic personal, the political is personal too. It is appropriate therefore to start at the individual level, which means that our measure of social well-being is built from the ground up. The broad class of ethical theories we adopt here begins by identifying individual well-beings as the ethically significant features of social states and proceeds to aggregate them into a measure of social well-being. We are setting aside here arguments that have been offered for including the "rights" of animals in our ethical calculus.² Their acceptance would have far-reaching implications for many of our institutions and ways of life, but as we will confirm in Chapters 5 and 5*, we don't lose much conceptually by limiting ourselves to measures of human well-being, which we will regard to be a numerical quantity.

A not infrequent criticism of the practice of building measures of social well-being on individual well-beings is based on the thought that "the whole is greater than the sum of the parts". Taken literally, this view acknowledges that the processes that shape the way individual values and opportunities get translated into social outcomes are non-linear, with positive feedback. Usually, though, the thought is not taken literally, but is regarded more as offering a metaphor for the collective body. It is true that those who espouse collectivist goals (e.g., national prestige) do sometimes offer reasons why such goals are desirable; but the ones usually mentioned would seem to reduce to a concern over the well-being of members of the collective (e.g., securing pride among members so as to enable them to cooperate and flourish). To have a pluralist outlook is to acknowledge that the character of a well-lived life is not uniquely given, but is shaped in part by a person's dispositions and abilities and the contingencies she faces. Tolerance encourages people to lead their lives in the light of their own perceptions - so long, that is, as they do not infringe on the rights and liberties of others (see below).

4.2 Direct Measures: Constituents

A person's well-being is made of a variety of components. Health, relationships with others, satisfaction at work, and pure (but never simple!) "happiness" are but four. They are interrelated of course. For example, health contributes to happiness and is in turn influenced by the person's state of mind. Nevertheless, health and happiness aren't the same. And so on for the other components. We call them the constituents of well-being, because they are the contents of well-being. As someone's well-being is a numerical aggregate of those constituents, measuring

² See especially Singer (1976).

personal well-being involves an aggregation exercise. That means we have to acknowledge trade-offs among the constituents, which in turn means that numerical weights are needed for the constituents.

It has been argued by scholars that several of those constituents are incommensurable, so that personal well-being should be seen as a vector of numbers, not a scalar number. In applied work that is often how both personal and social well-beings are treated (Section 4.7). But to begin an account of human well-being by asserting that its constituents are incommensurable is to give up far too early and leave vital ethical concerns unattended. It pays to insist that the constituents can be weighted in terms of a common denominator, because it forces the analyst to study the ethical force of those constituents. The thought we are exploring here is that it is fruitful to start with an uncompromising attitude toward the measurement of well-being, and to relax that attitude only when applying the theory to data. In applied work the practice would involve sensitivity analysis, by the choice of alternative sets of weights to the constituents. Accommodating a range of weights is a way of saying that in practice well-being is a vector, not a scalar. That is the approach we take here.

4.2.1 Tradeoffs Among the Constituents

Say, a person values her health, but also values a creative life that (in her case) involves a certain neglect of her health. Improvements in her health and enrichment of her creative life involve a trade-off. In order to evaluate her personal well-being, she could use her health as the benchmark and reflect on what weight she should rationally place on her creative life. Alternatively, she could use her creative life as the benchmark and reflect on what weight she should rationally award her health. Unless the person suffers from reasoning defects, it should not matter which way she evaluates her alternatives: she will reach the same conclusion. It should not be supposed, however, that the weights she rationally places on these two constituents are fixed. If her health were bad, she would at the margin place a higher weight on her health relative to her creative life, than if her health were good, other things being equal.

It will pay to formalise these considerations.

Consider an N -person society. People are denoted variously by i, j , and k ($i, j, k = 1, 2, \dots, N$). As they are not necessarily contemporaries, the set $\{1, 2, \dots, N\}$ could (and should!) include future people (see Chapters 4* and 5). As most among those who will be affected by contemporary decisions that bear significantly on the environment are people who will appear only in the future, we shall pay particular attention to intergenerational well-being. However, in order to settle our ideas, in this chapter we don't consider time explicitly. Instead, we study a timeless economy.

Let x be a social state and let $U_i(x)$ be individual i 's well-being in x . $U_i(x)$ is a scalar function, meaning that U_i is a numerical index. As it is an aggregate of the constituents of i 's well-being, the units in which $U_i(x)$ is measured could be any one of the constituents of her well-

being. For example, it could be health (measured in terms of, say, her nutritional status (e.g., BMI)).

Personal characteristics that are of ethical relevance are embodied in the U_i functions. Other things being equal, the well-being function of an infant differs from that of an adult male, that of an adult male differs from that of a lactating female, and so on. The point is that, if nothing else, their nutritional, health-care, and emotional needs differ. The subscript under person i 's well-being function captures such differences. When nutritionists refer to "adult-equivalent" scales for food or income needs in a household, it is to this they allude. For empirical purposes, nutritionists use deflators and magnifiers to construct the well-being functions of various categories of people from a representative adult's well-being function.

4.2.2 Constructing Social Well-Being

The move from individual well-being to the notion of social well-being is fraught with difficulty, but is a necessary exercise. As social well-being is an aggregate of individual well-beings, we have to identify ethically justifiable aggregation methods.

Imagine that person k is conducting the aggregation exercise. k could be a citizen thinking about the plight of the world or wondering which political candidate to vote for; he could be an ethicist invited to offer guidance to his government or to an international aid agency; he could be a government decision maker; and so on. We call k the social evaluator. Now, k 's evaluation of person i 's well-being is unlikely to be the same as someone else's evaluation of i 's well-being. This isn't to claim that well-being is an entirely subjective matter (although aspects of it surely are); but if nothing else, there are always differences in the way any two people measure the same object. Let $U_{ki}(x)$ denote k 's evaluation of i 's well-being in social state x and $U_{ki}(y)$ his evaluation of i 's well-being in social state y . We assume that k has a theory of how economic and social policies influence outcomes. Suppose he believes that policy A would result in x , whereas policy B would lead to y . k 's role as a social evaluator is to compare A and B . He would then want to compare social well-being in x and y . In other words, he would compare A and B by evaluating the relative merits of their consequences.

It may appear reasonable that if in k 's evaluation the well-beings of individuals i and j are expected to be higher in x than in y , then, other things being equal, k should conclude that social well-being is greater in x than in y . Suppose however that in k 's evaluation, individual i 's well-being is expected to be higher in x than in y , but that the reverse is expected for individual j . Other things being equal, how should k rank x and y ?

Imagine that certain types of interpersonal comparisons of individual well-beings are possible (e.g., that person i is healthier in x than person j). Like individual well-beings, social well-being is a numerical index. It is so constructed as to reflect the ethically justifiable rates of trade-off between individual well-beings. The units in which social well-being is measured could be some particular person's well-being, which, as we observed earlier, would be measured in

terms of one of the constituents of that person's well-being. To give an example, it could be that social well-being is measured in terms of an index of person i 's health (e.g., her nutritional status).

Let us write k 's evaluation of social well-being in x as $V_k(x)$, which is a scalar function of k 's evaluation of the N individuals' well-beings in x . This we write as

$$V_k(x) = V_k(U_{k1}(x), U_{k2}(x), \dots, U_{kN}(x)). \quad (4.1)$$

k would judge x to be socially more desirable than y if and only if $V_k(x) > V_k(y)$. V_k is k 's social well-being function. It embodies ethical values, not only through each of the U_{ki} functions, but also through V_k 's functional form.

V_k is the basis on which k would make policy recommendations. Suppose $V_k(x) > V_k(y)$. Since k believes that policy A leads to x and policy B leads to y , he would recommend A over B . This mode of reasoning is called "social cost-benefit analysis". However, the exercise reflects the social cost-benefit analysis of evaluator k . What if person k^* were the social evaluator? Her evaluation of i 's well-being in x , which we write as $U_{k^*i}(x)$, would typically differ from k 's evaluation, which is $U_{ki}(x)$. Moreover, her evaluation of the N individuals' well-beings in social state x , which we write as $V_{k^*}(U_{k^*1}(x), U_{k^*2}(x), \dots, U_{k^*N}(x))$, would typically differ from that of k (expression (4.1)). In democratic societies, the difference between k 's and k^* 's evaluations of alternative social states would be resolved through a process involving discussion and public engagement, followed by a formal vote. That dialogue should ideally be carried out by sensitivity analysis, which amounts to changing the assumptions about the way policies lead to eventualities and working through their implications.

Having noted that k and k^* would typically differ in their judgments and that their differences would be resolved, hopefully, through democratic processes, we now simplify our exposition by dropping the subscript denoting the social evaluator.

4.3 Some Ethics

What ethical principles should V be required to satisfy? Here we develop two principles that have been widely adopted.

4.3.1 Efficiency

A relatively weak principle requires V to satisfy monotonicity, which says that if x and y are identical in all respects other than that at least one of the constituents of someone's well-being is greater in x than in y , then $V(x) > V(y)$. We appealed to this principle as a starting point in Section 4.2.2. Monotonicity yields a powerful further principle of ethics that has been adopted today universally by economists, moral philosophers, and policy makers. It is the principle of efficiency.

To see what "efficiency" means, imagine that the social evaluator's task is to prescribe a social state from a set of realizable social states, say, Z . So far we have assumed Z contains only two social states, x and y . Generally speaking, though, Z would contain more than two social

states; we would expect it to contain a great many more. Economists call Z a feasible set. We write the elements of Z as x, y, w, z , and so on.

Suppose now that the well-being of at least one person is higher in x than in y , and that there is no one whose well-being is higher in y than in x . We say that y is an inefficient social state. We also say that a social state, say z , is efficient if it is not inefficient.

The social evaluator wants to find the element in Z at which V attains its largest value. Suppose x^* maximizes V in Z . Obviously, the social evaluator would recommend that x^* be chosen. x^* is called the optimum social state.³

Consider any other social state in Z , say y . If V satisfies monotonicity, the well-being of at least one person would be less in y than in x^* . Put another way, as V satisfies monotonicity, the optimum social state, x^* , must be efficient. Because the optimum has this property, we say V selects only efficient outcomes, or alternatively, that V satisfies the principle of efficiency. Intuitively, "efficiency" means an absence of waste. The ethical principle embodied in the requirement that V should be monotonic is that waste (in well-being) should be rejected.

But optimality demands a lot more than efficiency. A social state could be efficient in Z but not optimal in Z . In other words, efficiency is a necessary condition for optimality, but isn't sufficient. The social evaluator's V satisfies a lot more than merely the efficiency property. He would insist that V should embody principles of justice over the distribution of goods and services. Such a demand could, for example, be that inequality in the distribution of income and wealth has to be justified (say, in terms of incentives, just desert, and so forth). Below we show how considerations of distributive justice can be embodied in V .

4.3.2 Additivity

Ethical theories differ in regard not only to the way the U s are interpreted, but also to the functional form of V they commend. Economists and philosophers have explored alternative structures of V . Of particular interest is the case where V is additive in the U s. In that case social well-being in x is

$$V(x) = U_1(x) + U_2(x) + \dots + U_N(x) = \sum_i^N [U_i(x)]. \quad (4.2)$$

Additivity says that the tradeoff between the personal well-beings of a pair of individuals is independent of the well-beings of all other individuals. The weakness of the additive form of V isn't so much that it is additive, but that it is insensitive to the distribution of well-beings. Notice though that expression (4.2) satisfies monotonicity.

A more subtle form of V can be obtained by transforming each of the U s by an increasing, scalar function, G , and summing the transformed functions. Continuing to denote social well-being generically by V , the function now takes the form

$$V(x) = G[U_1(x)] + G[U_2(x)] + \dots + G[U_N(x)] = \sum_i^N [G[U_i(x)]]. \quad (4.3)$$

³ Although x^* is optimum on Z , it need not be the optimum if the feasible set of social states were different. In using the term "optimum", we must first specify the feasible set.

As G is by construction an increasing function of the U s, expression (4.3) also satisfies monotonicity. Notice that the formula is a generalization of the one given in expression (4.2): If G is the identity function, the two expressions are the same.

What is the point of the generalization? The answer is that G can be so constructed that it reflects principles of equity with regard to the distribution of well-beings (see below). As the additive form makes expression (4.3) easily useable, it is commonly applied to empirical data.

Although expressions (4.2)-(4.3) have the mathematical form of "utilitarianism", they can be derived from a wide variety of ethical theories. If the U s are taken to be "happiness" or "satisfaction", and the social evaluator is interpreted as being "an ideally rational and impartial spectator" (Rawls, 1972: 184), expression (4.2) would represent the classical utilitarianism of Mill (1861 [1998]) and Sidgwick (1907). However, there are other interpretations of "utility" that can be deployed by the "ideally rational and impartial observer". We noted earlier that in one variant, the U s are constructed from the choices people actually make, which is to say they are elicited from "revealed preference" (Chapter 5*). In another variant, the U s are constructed from responses to questionnaires in which people are asked how they would choose among social states (Freeman, 1992; Chapter 5*). As noted previously, there is also the recent literature on "happiness", which has been revived within the broad canvas of neuroeconomics. The literature advances a hedonistic version of utilitarianism (Layard, 2005).

The additive form of V is not restricted to ethical theories that invoke an impartial observer. Koopmans (1972) and Maskin (1978), among others, identified appealing ethical axioms which, when imposed on $V(x)$, require the function to be expression (4.3). Such axiomatic studies are exercises in what can be called "intuitionist" ethics.

It is possible to arrive at expression (4.3) even from social contract theories. In his theory of justice, Rawls (1972) argued that the principles of justice are to be derived from the (hypothetical) choices a social evaluator would make behind a "veil of ignorance"; that is, in ignorance of the position in society he would himself occupy if those principles were to be adopted. One way to formulate that ignorance would be for the social evaluator to assign an equal probability of being in any person's situation. In that case, expression (4.3) - more precisely, $1/N$ th of the expression - would reflect the expected value of the social evaluator's well-being under the veil of ignorance. So, the assumption of equi-probability behind the veil of ignorance yields expression (4.3) as social well-being in x (Harsanyi, 1955). We note in passing that the function G in this theory reflects the social evaluator's attitude to risk behind the veil of ignorance.

Experience shows that there are enormous computational advantages in adopting expression (4.3). That is why much work on the economics of sustainable development is based on it.

4.4 More Ethics: Goals, Rights, and Opportunities

As the conceptual move from individual to social well-being involves an aggregation exercise, V is frequently viewed by moral philosophers as being "goal-based". Rights-based theories are offered in contrast. "The distinction between rights-based and goal-based theories", writes Waldron (1984: 13), "[lies in the idea] that a requirement is rights-based if it is generated by a concern for some individual interest, goal-based if it is generated by concern for something taken to be an interest of society as a whole." Rights-based theories according to this reckoning reject aggregation, because it is held that in such an exercise the interests of the individual can get swamped by claims made on behalf of a multitude of others. "A goal", writes Dworkin (1978: 91), "is a non-individuated political aim." Goal-based theories are thought to be collectivist. Worse, they are dismissed as being technocratic, formulaic, and ultimately, "algorithmic" (O'Neill, 1986).

4.4.1 Social Goals and Individual Rights

It isn't easy to uncover the distinction drawn by these authors. In the theories they commend, rights don't go against (human) interest, instead they reinforce some interests against the claims of other, less urgent or vital, interests. Moreover, rights need to be justified, they can't be plucked from air. Even those rights that are regarded as fundamental have as their basis the thought that they are necessary for human flourishing. They are seen as protecting and promoting a certain class of human interests, such as agency, independence, choice, and self-determination (Section 4.4.3). That means, other things being equal, individual well-beings are lower in social states in which people enjoy less of those advantages.

The starting point in this line of thought is the unarguable fact that different people know different things, possess different skills and talents, and not all people can learn or observe the same things. These features of life offer a powerful justification for the right to individual discretion in thinking, choosing, and acting. Freedom of expression, including a non-docile press ("the public have a right to know"), are examples. (They enable people to create and innovate.) The legal right to certain kinds of property is another. (It can be justified on the grounds that it creates incentives to accumulate and innovate, enabling economies, and thus people, to prosper.) Democracy is still another. (There is some evidence that in poor countries democracy has helped to spur economic development). The household as an institution is yet another, because they have instrumental value for the individual. (The cost per person in a household declines initially with numbers in the household.) The search for the instrumental worth of institutions, activities, advantages, and goods has been a recurring feature of modern economics.

Meanwhile, problems of interpretation have been compounded by the claim that fundamental rights are inviolable: "Individuals have rights, and there are things no person or group may do to them [without violating their rights]" (Nozick, 1974: ix). Such rights impose rigid constraints on what people may or may not do. Social states in which Nozickian rights are violated to the slightest extent are rejected in Nozick's scheme of things. Trade-offs are not

permitted. In an otherwise very different theory of justice, Rawls (1972) arrived at a lexicographically ordered hierarchy of rights.

4.4.2 Positive and Negative Rights

In an important but much neglected work, Fried (1978) classified rights in a binary way. We are to think of positive rights as a claim to something, a share of material goods or some particular commodity, such as education when young and medical attention when in need. It is to the satisfaction of such needs that we may be thought to have positive rights, and Fried argued for them in terms of the primary morality of respecting the integrity of persons as free, rational, but incorporated beings. A negative right, on the other hand, is a right that something not be done to one, that some particular imposition be withheld. It is a right not to be wronged intentionally in some specified way. Fried argued for them in terms of the primary morality we have just alluded to.

Fried also observed that positive rights are asserted to scarce goods and that scarcity implies a limit to their claim. He also suggested that negative rights, for example the right not to be interfered with in forbidden ways, do not have such natural limitations. ("If I am let alone, the commodity I obtain does not appear of its nature to be a scarce or limited one. How can we run out of people not harming each other, not lying to each other, leaving each other alone?" Fried, 1978: 110.) This is not to say that protection against unauthorized violence doesn't involve material resources; but the claim to protection from, say, the government against such violence is, in Fried's sense, a positive right, not a negative one.

Differences in the costs of protecting and promoting positive and negative rights may even explain the powerful hold negative rights have on our moral sensibilities. It is always feasible to honour negative rights (there are no direct resource costs, remember), but it may not be feasible to honour positive ones: the economy may simply not have sufficient resources to enable all to enjoy adequate nutrition. It is then possible to entertain the idea that negative rights are inviolable, in a way that positive rights are not. For how can a right be inviolable if it is not always possible to protect it?

The large difference between those costs also offers an explanation for why we regard all persons to have equal rights to such goods as freedom of speech and freedom from arbitrary arrest, even while we eschew the idea of full equality in the distribution of goods to which Fried would argue we have positive rights. Negative rights don't have to be created, they have only to be protected. In contrast, goods to which we have positive rights are produced goods, and in deliberating their distribution we have to care about differences in individual talents to produce, we have to worry about incentives and the concomitant notion of obligations (to honour agreements, not behave opportunistically, and so forth), we have to worry about needs, as well as the related matter of deserts. The realization of positive rights involves a resource allocation problem, with all its attendant difficulties.

Fried's analysis tells us to be wary of attaching rights to every human good we happen to identify. Food and water, health-care, clothing, and shelter are vital human needs. In the 1970s development economists used to refer to them as basic needs. One cannot survive without them, but one can survive without political freedom; which suggests that needs (even the deepest of human needs) and rights do not point to the same set of human goods. It is therefore as well to regard political and civil liberties, on the one hand, and economic development, on the other, as separate types of human goods.

Nevertheless, the language of rights increasingly fuels our political imagination. In the previous section we concluded that the protection of "rights" is a useful inclusion in the notion of well-being, because it reminds us that not all constituents of well-being are of equal ethical significance. However, the domain of rights has expanded continuously since the United Nations made their Universal Declaration of Human Rights. That may not be unrelated to the fact that the majority of the world's poorest countries have been violating their citizen's civil rights with vengeance (Table 4.1 below). The concept of "rights", in the sense political theorists speak of them, was developed only some 350 years ago in connection with the rights of citizens against the State. Since then the word has become so elastic, that it is used today not only in connection with such goods as "freedom of expression", but also to a "35-hour working week". That creates obvious problems, because it shades differences between such commonly expressed demands as (i) the right to speak freely, (ii) rights to the satisfaction of basic needs, and (iii) rights that have a purely instrumental value. If all human goods are made into rights, the term is unable to do much for us. Societies inevitably face trade-offs between the human goods we care about and want to protect and promote. We do not have to follow Dworkin (1978) into believing that rights trump all other human goods, but we should applaud him for explaining why civil and political rights matter and why we should expect trade-offs among the multitude of human goods.

4.4.3 Opportunity Sets

Rights are sometimes taken by ethicists and development activists to be associated with the extent to which human capabilities are protected and promoted (UNDP, 1990). Formally, capabilities have been taken to be "the alternative combinations of functionings that are feasible for [a person] to achieve" (Sen, 1999: 75). A seeming advantage of working with capabilities is that they appear to be clear and objective, whereas the notion of well-being is vague and, possibly, subjective. The problem is that it hasn't been uncommon of authors to champion capabilities as an alternative to the welfare economist's mode of discourse, even while displaying an unwillingness to offer much in the way of an account of how various capabilities are to be compared with one another.

Capabilities are a version of what economists call opportunity sets. The earliest attempts (e.g., Suppes, 1987) to rank opportunity sets without first offering an account of ways to value and rank the objects in those sets showed that the enterprise wasn't promising. Many would even

regard it absurd that an ethical theory could value the capacity to form life plans but remain indifferent to its realization and the experiential states that go with its realization. Rawls (1972), in an extended discussion (pp. 424-433), called the connection between well-being and the exercise of our capacities the Aristotelian Principle. Let us see how the formation of human capacities can be valued in terms of well-being.

The acquisition of skills involves resources, meaning that there are trade-offs among the skills. But not all skills have equal weight. Numeracy and literacy are basic skills: they prove useful to people no matter what they wish to be and do. Health is also a vital aspect of well-being. Good health is not only desired and desirable in itself, it is also necessary for one's projects and purposes regardless of what they happen to be. In a similar vein, it wouldn't be odd if someone were to insist on her freedom to speak, even if she had no immediate intention of speaking. We value freedom of speech because it would be vital to our well-being under many, possibly unforeseen, circumstances. In contrast, there are skills and privileges that are so specialised (training to be a violinist or mathematician) that only those with very specific aptitudes and desires would rationally wish to acquire them. These considerations tell us that the ethical worth of capability sets rests on the prior notion of well-being, which is to say that capability theory reduces to an ethics grounded on individual and social well-being.⁴

These considerations bring us back full circle to the notion of individual and social well-being. Needs, rights, desires, and preferences are built into the concept of well-being, they are not separate from it. As noted earlier, theories that regard human well-being to be the ethically significant feature of social states permit trade-offs between different people's interests, while rights-based theories prohibit trade-offs between urgent (or vital) interests and mere desires. But there are always degrees to which interests are frustrated and the corresponding rights (if there are corresponding rights) aren't met. Moreover, as inviolability means a zero rate of trade-off, we wouldn't depart from the practical spirit of inviolability (assuming that rights are inviolable), if we allowed trade-offs between rights, and between rights and other human aspects of human

⁴ Arrow (1995) provides a formal demonstration. For a simplified version of Arrow's argument, see Dasgupta (2009a).

Theories of justice that are accommodated within the broad perspective of modern economics are often contrasted with those deontological theories that are based on ideas of procedural fairness (Hayek, 1960; Rawls, 1972; Nozick, 1974). In those theories, the criteria used for judging the fairness of a procedure are taken to be independent of any prior assessment of the possible outcomes in applying the procedure. Illustrations are often drawn from gambling. So, if there are two people on a lifeboat and food enough for only one, a procedure frequently advocated in those theories is to allocate the food on the basis of the toss of an unbiased coin. The rogue word here is "unbiased". While it means equal chance of either outcome, its ethical force obtains from the idea of empirical probabilities, that if such a coin were tossed over and over again, each outcome would occur approximately 50% of the time. Never mind that the procedure itself relies on a single toss. Were we to know nothing about empirical probabilities, we wouldn't even begin to have an intuitive sense of what an unbiased coin is. The fairness of the procedure rests squarely on our previous evaluation of probable consequences.

well-being, provided that the trade-off rate is very small in appropriate regions of the space of states of affair. That is the approach we follow in this book.

4.5 Indirect Measures: Determinants of Well-Being

We have thus far focused on the constituents of well-being. Another way to measure well-being is to value its determinants. By determinants we mean the factors that produce well-being. They range from consumption goods and services, such as clean air, food, medical care, clothing, potable water, shelter, communication devices, access to knowledge and information, and resources devoted to national security, to society's institutions. When thinking in aggregate terms, however, the determinants of well-being can be summarized as "wealth", which offers a means of accessing goods and services.⁵

Many have argued though that the real determinants of human well-being aren't goods and services, but human activities (work, leisure pursuits, vocation, relationships). Moral philosophers, for example, have sought to identify the character of a "well-lived life", not the "well-consumed life". One would not doubt their arguments, but goods and services are a means for people to pursue their projects and purposes. Even the development of skills requires goods and services as inputs (books, teachers, equipment), in addition to the innate talent of the student. So, in identifying goods and services as determinants of human well-being, we are acknowledging that the process that transforms commodities into well-being involves at least two steps: the consumption of goods and services to human activities, thence to human well-being.

Let \underline{C} be the generic notation for an allocation of goods and services. \underline{C} is a vector specifying who receives, consumes, and produces what, how much, when, and where. So \underline{C} is a multi-dimensional vector of the quantities of goods and services. As \underline{C} differs from social state to social state (if there is a one-one correspondence between social states and the \underline{C} s, the latter could even be used to define social states!), let $\underline{C}(x)$ denote the allocation of goods and services in social state x , and $\underline{C}(y)$ the allocation in social state y . So, expression (4.2) assumes the form

$$V(\underline{C}(x)) = U_1(\underline{C}(x)) + U_2(\underline{C}(x)) + \dots + U_N(\underline{C}(x)) = \sum_i^N [U_i(\underline{C}(x))], \quad (4.4)$$

and similarly, for social well-being in y .

In like manner, the expression corresponding to (4.3) assumes the form

$$V(\underline{C}(x)) = G[U_1(\underline{C}(x))] + G[U_2(\underline{C}(x))] + \dots + G[U_N(\underline{C}(x))] = \sum_i^N [G[U_i(\underline{C}(x))]], \quad (4.5)$$

and similarly for social well-being in y .

This formulation of social well-being can be applied immediately to two issues that arise regularly in discussions on sustainable development: inequality in consumption and excessive consumption. We study them briefly.

4.5.1 Inequality

Although social well-being in expression (4.4) is linear in individual well-beings, it is not

⁵ Rawls (1972), for example, defined the distribution of income and wealth to be the objects of economic justice. We study the idea of wealth in Chapter 5.

linear in the determinants of well-being, unless the U s are themselves linear functions of \underline{C} . Consider the simple case where people have identical well-being functions. In that case we may drop the subscript from U_i . It is then simple to confirm that if U is a linear function, V in expression (4.4) is insensitive to inequality in the distribution of goods and services, by which we mean that you could shuffle consumption round among people without affecting the value of V . We should conclude from this that social well-being in expression (4.4) would respond to inequality in the distribution of goods and services only if U is a non-linear function.

To confirm, consider a community of two identical individuals who are discussing how to share a given stock of a resource, say, of amount $2C^*$. Let C_1 and C_2 be their shares, so that $C_1 + C_2 = 2C^*$. Suppose each person cares only about his share, meaning that i 's well-being, which we write as $U(C_i)$, is an increasing function of C_i . Social well-being is $U(C_1) + U(C_2)$.

Now it is an elementary mathematical fact that if U is strictly concave⁶, a more equal distribution of $2C^*$ would yield a higher numerical value of $U(C_1) + U(C_2)$. Figure 4.1 offers a diagrammatic proof. Suppose each person is awarded exactly half of the endowment, namely, C^* . Then social well-being would be $2U(C^*)$. But suppose the endowment is distributed unequally, say, C_1^+ and C_2^+ . Then, as Figure 4.1 shows, $U(C_1^+) + U(C_2^+)$ is less than $2U(C^*)$. The argument generalises to more than two people and to more than one resource.⁷

The argument that has just been offered in favour of equality has relied entirely on a contingent fact, namely, the strict concavity of U . What if the empirical evidence was that U is linear, but the ethics to which our social evaluator is drawn favours equality? Expression (4.5) now becomes a useful tool of analysis. Consider the case where U is linear, but G is taken to be a strictly monotonic function of U . In that case Figure 4.1 once again comes into play, with $G(U)$ replacing U in the figure. The figure shows that deploying a strictly concave G in expression (4.5) is a way not only to introduce concerns over inequality in the distribution of goods and services, but the distribution of well-beings in the population. We apply this device in Chapter 4* when considering the distribution of goods and services across the generations. We show there that those considerations have a bearing on "social rates of discount", a contentious set of economic objects of great importance in sustainability science.

4.5.2 Happiness, Status Goods, and Overconsumption

Consider person i . Although U_i has been assumed to be a function of \underline{C} in expression (4.4) and (4.5), we shouldn't imagine that every component of \underline{C} affects i 's well-being. Most of the components that comprise \underline{C} are quantities of goods and services enjoyed by others. It could be argued that they aren't determinants of i 's well-being, unless those people matter to him. If i cares

⁶ A numerical function $U(\underline{C})$ is strictly concave if, for all numbers α ($0 < \alpha < 1$) and all vectors \underline{C}_1 and \underline{C}_2 for which U is defined, $U(\alpha\underline{C}_1 + (1-\alpha)\underline{C}_2) > \alpha U(\underline{C}_1) + (1-\alpha)U(\underline{C}_2)$.

⁷ Inequality is a complicated notion when the number of people among whom the concept is to be deployed exceeds 2. For a good exposition of the issues, see Sen (1973).

about some people (his family and friends), their consumptions would be determinants of his personal well-being. Applied economists avoid the problem of having to include such other people's consumption in individual well-being functions by regarding the household as the unit of analysis. By that device family relationships are internalised in the model.

However, it could be that other people's consumption of goods and services affect personal (even household) well-being in an entirely different way. Duesenberry (1949) and Leibenstein (1950) studied consumption behaviour under the assumption that personal well-being depends not only on one's own consumption level but also on one's consumption level relative to the consumption levels of other people (e.g., one's peers). The latter influence on personal well-being is known as the Demonstration Effect.

The Demonstration Effect fell by the wayside pretty quickly following its introduction into the literature. Both the theory and empirics of macro-economic growth (Barro and Sala-i-Martin, 2003; Acemoglu, 2009) and the micro-economics of consumption behaviour (Deaton and Muellbauer, 1980) have instead been studied on the assumption that personal well-being depends solely on personal consumption.

In recent years perceptions have changed somewhat. The idea that personal consumption may not be the sole determinant of well-being has reappeared in a recent literature, on "happiness". National surveys, conducted periodically over decades, in which people were asked to report how "happy" they were, have confirmed that income (read "consumption") matters to people in poor countries (reported happiness among them was found on average to have increased with rising incomes), but they have also suggested that income does not contribute to happiness (or life satisfaction) among people who have a good deal more than the basic necessities of life. Analysts have noted that even though those who are poorer in rich countries say they are less happy, the distribution of declared happiness remained much the same there, even though those countries enjoyed economic growth in the periods covered in the samples. Clark, Frijters, and Shields (2008) have estimated that since 1973, average life satisfaction in a number of European countries has remained approximately constant, even though real income per head in each country in the sample increased greatly. If we are to take reported happiness (or life satisfaction) at their face value, it would seem that happiness levels run flat through time as rich countries grow richer. The finding, noted first by Easterlin (1974), is today known as the Easterlin Paradox.⁸

There are several possible explanations for the paradox. Easterlin has speculated that a

⁸ Clark, Frijters, and Shields (2008) record data on "happiness" from the General Social Survey and on "life satisfaction" from the Eurobarometer Survey. The authors review the Easterlin Paradox extensively. We are summarising a large and dispersed literature without noting the many qualifications that are embedded in the survey data. For other reviews of the evidence, see Easterlin (1995, 2001), Oswald (1997), Blanchflower and Oswald (2004), Layard (2005), and Bok (2009), among others.

person's aspirations increase with income, with the consequence that the happiness number she reports remains constant over her life cycle despite growth in income (Easterlin, 2001). One way to model that would be to suppose that past (or habitual) consumption influences the person's aspirations. A related explanation is based on an idea that was explored by Duesenberry (1949) in his effort to explain cyclical movements in the demand for consumer durables. It is built on the assumption that people get habituated to the consumption they have enjoyed, so that unless consumption increases sufficiently fast, people are unhappy. One way to model that is to assume that a person's well-being depends not only on her consumption level, but also its (percentage) rate of change. So, even when consumption rises over time, reported happiness would remain constant if the rate of growth in consumption were to decline at a rate that just cancels the increase in consumption. The explanation suffers from a weakness: it requires many seemingly unrelated factors to cancel one another.

An appealing way to interpret the Easterlin Paradox is to assume that for someone who is not poor, personal happiness depends only on her consumption relative to those she regards as her peer group. Her personal consumption per se does not matter. This interpretation has proved immensely attractive among commentators of the happiness literature (Layard, 2005; Bok, 2010). Let us study it.

Suppose status matters to person i , and suppose there is a class of goods whose consumption (or public display of ownership) confers status. In that case i 's well-being would be influenced adversely by the consumption of those goods by his peer. If others are status conscious as well, they too would be influenced by the consumption of those status goods by their peers. The phenomenon was studied in the classic work by Veblen (1925), who had drawn attention to excessive consumption among the rich in the Gilded Age, under the title, "conspicuous consumption".

It is easy to imagine that everyone consumes too much of status goods, by which we mean that no one is happier consuming them than they would have been had they refrained from doing so. The underlying phenomenon is similar to the "tragedy of the commons" (Hardin, 1968): everyone scrambles to consume more than others, but fails to enjoy the additional well-being that goes with that consumption, because all others are scrambling too.

What does consuming "too much" mean in terms of resources? In the present example, it means that the pattern of consumption involving the consumption of status goods is inefficient (Section 4.3.1). It means that if people reduced their consumption of status goods because, say, a stiff tax on status goods has been levied by the government, they would all be happier. They would have spare resources for purchases in other activities that increase their personal well-being.⁹

⁹ For a formal analysis of the Veblen Effect, see Arrow and Dasgupta (2009). They have identified classes of personal well-being functions for which conspicuous consumption does not

Anthropologists have observed though that even poor people care about status. They spend resources on status goods (e.g., polished rice), even though certain basic needs remain unsatisfied. The anthropologist's interpretation of status among the poor is somewhat different though. Associational life matters to all, and consumption is an essential contributor to that life (Douglas and Isherwood, 1996 [1979]). Mary Douglas once remarked that you are poor when you cannot afford to invite someone to tea in your home. So, status goods are present even among the poor.

There is evidence, though, that casts doubt on the Easterlin Paradox. In an analysis of data from representative national surveys undertaken from 1981 to 2007, Inglehart et al. (2008) have reported that happiness rose in 45 of the 52 countries for which substantial time-series data were available and that the 45 countries in question include the United States and most European countries. Deaton (2008) also found no evidence of the Easterlin Paradox in cross-country data generated by a Gallop World Poll that sampled people in 132 countries.¹⁰ The safe conclusion would be that, while relative consumption matters for happiness, absolute consumption also matters, even among the rich. There is evidence also that relative consumption weighs more heavily among the rich than among the poor. The point to remember, though, is that generally speaking when relative consumption is a determinant of personal well-being, the allocation of resources in the marketplace can be expected to be inefficient.

Status goods are frequently rapacious in their use of natural resources (air travel, ivory products). Because vital natural resources such as the atmosphere, and animal populations such as elephants and rhinos are underpriced in the market (Chapter 5), those status goods are themselves underpriced relative to their social worth. That leads to a further dose of inefficiency.

That said, there are status goods that are friendly toward the environment. When public donations confer status and donations for Nature conservation are a way of displaying status, Nature receives a helping hand. Eco-tourism, when managed carefully, can be a status activity with conservation value. As elsewhere in sustainability science, answers to important questions are frequently ambiguous.

4.5.3 Difficulties in Eliciting Personal Well-Being

The diversity of empirical findings on happiness and consumption should be interpreted cautiously. There are at least five questions that can be, and have been, used as possible entry points in empirical research and policy analysis on consumption. Even though the questions are distinct and may not even be closely related, they are often taken to be tightly linked to one another. The questions are:

result in the tragedy of the commons.

¹⁰ See also Alipizar, Carlsson, and Johansson-Stenman. (2005) in their contrasting, small-scale survey-experimental work in Costa Rica, which also revealed the salience of both absolute and relative consumptions.

- (a) What is the human good?
- (b) What do people care about?
- (c) What do people say when asked how they are, or how they feel?
- (d) What considerations do people take into account when choosing?
- (e) What do they choose?

It is tempting to assume that one may move seamlessly from (a) to (e). But (a) is a deep question in ethics, whereas (c) is about the responses people make to questionnaires and (d) and (e) involve the psychology and sociology of behaviour. As there are potential bottlenecks at each link in the chain leading from (a) to (e), it could be that some of the puzzles in the theory and empirics of consumption are not puzzles after all. In any event, while happiness does indeed matter, there are other things that matter as well. Identifying personal well-being with happiness, in the sense the term is used in the "happiness literature", is a mistake.

4.6 Shadow Prices and Social Cost-Benefit Analysis: Introduction

The formal apparatus we have created for the study of social well-being contains a framework for policy analysis. Imagine that policy A is expected to result in social state x , and policy B to social state y . The social evaluator would make his recommendation on whether $V(\underline{C}(x))$ is greater or less than $V(\underline{C}(y))$.

Projects frequently involve small changes to a prevailing state of affairs. By "small" we mean small relative to the relevant part of the economy. A project involving 10 million dollars of investment is small if the people affected enjoy an income of a billion dollars in the aggregate. It transpires that small projects can be evaluated without any need to estimate the entire shape of the V -function.

To illustrate, imagine that A is the current policy ("business as usual") and B involves a small shift from A . That means the difference between allocations $\underline{C}(x)$ and $\underline{C}(y)$ is small. Denote a small change by the sign Δ . We call $\Delta\underline{C}$ a (small) perturbation to allocation \underline{C} . So we have

$$\underline{C}(y) = \underline{C}(x) + \Delta\underline{C}.$$

If the policy change were undertaken, social well-being would be

$$V(\underline{C}(y)) = V(\underline{C}(x) + \Delta\underline{C}). \tag{4.4}$$

Would that be a good thing or a bad thing? To find out, we take the difference between social well-being after and before the policy change. Using (4.4), the difference can be expressed as

$$V(\underline{C}(x) + \Delta\underline{C}) - V(\underline{C}(x)).$$

But because $\Delta\underline{C}$ is small,

$$V(\underline{C}(x) + \Delta\underline{C}) - V(\underline{C}(x)) = \partial V(\underline{C}(x)) / \partial \underline{C} \cdot (\Delta\underline{C}), \tag{4.5}$$

where ∂ is the sign for partial differentiation and $[\partial V(\underline{C}(x)) / \partial \underline{C}] \cdot (\Delta\underline{C})$ is a vector product. Expression (4.5) represents the sum of all the small changes ($\Delta\underline{C}$) that are brought about by the policy change, valued at the vector of shadow prices, $\partial V(\underline{C}) / \partial \underline{C}$. That means (4.5) is the social profitability of the project. The goods and services involved in the project are evaluated at the

vector of social weights, $\partial V(C)/\partial C$. We call those weights shadow prices. In Chapters 5 and 5* we report on the various methods economists have devised for estimating shadow prices. Here we merely note that the policy change from A to B would be socially desirable if

$$V(\underline{C}(x)+\Delta C) - V(\underline{C}(x)) = \partial V(\underline{C}(x))/\partial C \cdot (\Delta C) > 0. \quad (4.6)$$

Condition (4.6) offers us the criterion for social cost-benefit analysis. It says that projects ought to be recommended if and only if they yield a positive social profit. We make frequent use of this basic result in later chapters.

4.7 Rich and Poor Worlds: An Application

The most common yardstick for judging the quality of life in an economy is gross domestic product (GDP) per head. In Chapter 5, where we study intergenerational well-being, we show that as an index, GDP per head can be a very bad guide to sustainable development and policy evaluation. Here we study current well-being. For a study of that, however, GDP is a very useful index. That's because in the contemporary world, GDP per head appears to be correlated with other indicators of well-being, such as life expectancy at birth, literacy, and women's status in society.

If you were to line up countries according to GDP per capita today, you would find two clusters: one poor, the other rich. The world would appear to be polarized. Moreover, with the possible exception of India, there is little sign that the poor world will catch up with the rich world in the foreseeable future. During the past four decades, real per capita GDP has grown at an average annual rate of 2.4% in rich countries, whereas it has grown at 1.8% in poor countries. Worse, within the poor world sub-Saharan Africa has experienced a small decline in real GDP per capita during the past four decades. Table 4.1 summarizes data on the rich and poor worlds, respectively.

What enables people in the rich world to be so much richer than people in the poor world? In recent decades that has been a central question in the social sciences. In answering it several factors suggest themselves:

4.7.1 Reproducible Capital and Human Capital

People in rich countries have better equipment to work with (electric drills are more powerful than pick axes; tractors are superior to ploughs; and modern medicine is vastly more effective than traditional cures). So, one argument goes that the accumulation of physical capital - more accurately, reproducible capital - in today's rich regions has been a significant contributor to the high standard of living people enjoy there.

Others have noted that people in rich countries are far better educated (Table 4.1), implying that they are able to make use of ideas to produce goods that are out of reach for people in countries where large numbers are illiterate. Gender inequalities are considerably greater in the poor than in the rich world (Table 4.1). Allied to education is health. Life expectancy at birth in rich countries is high, while in poor countries it is low (Table 4.1). The under-5 mortality rate

is high in poor countries, it is low in rich countries (Table 4.1). Relatedly, clean water and good hygiene have reduced morbidity in rich countries greatly. About a quarter of the population in the poor world suffer from undernourishment, whereas the corresponding figure in rich countries is negligible. As undernutrition and vulnerability to infections reinforce each other, poor nourishment and morbidity go together. There is evidence that undernourishment in early childhood affects the development of cognitive faculties. Taken together, the average person in the rich world is capable of supplying work of far higher quality and for many more years than his counterpart in a poor country. Education and health go by the name, human capital. A large contemporary literature in economics reveals that the accumulation of human capital has been a significant factor behind the high standard of living people in the rich world enjoy today.¹¹

4.7.2 Ideas

Many economists, however, regard the production of new ideas as the prime factor behind economic progress. They say that rich countries have become rich because people there have been successful in producing ideas not only for new products (printing press, steam engine, electricity, chemical products, the electronic computer), but also for cheaper ways of producing old products (transportation, mining). Of course, education and advances in science and technology combine as an economic force. Primary and secondary education alone can't take a society that far today. A country where tertiary education is low would not have a population capable of working with the most advanced technology. Nor are scientific and technological advances capable of being achieved today by people with no advanced education.

4.7.3 Population

Even unaided intuition suggests, however, that if numbers grow quickly, the rate at which capital assets must increase would need to be high in order to maintain living standards. If the desire to accumulate physical and human capital is the same in two countries and if rising numbers don't reduce the cost of accumulating that capital, the country where population grows at a slower rate can be expected to enjoy a higher living standard in the long run. Since the mid 1960s, population in what is today the poor world has grown at an average annual rate of 2.4%, while the corresponding figure in today's rich world has been 0.8% (Table 4.1). The total fertility rate (TFR) in the rich world today is 1.8 (below 2.1, the figure at which population would stabilise in the long run), whereas it is 3.7 in the poor world (Table 4.1). Despite a significant decline in child mortality rates, the TFR in a number of countries in sub-Saharan Africa continues to be between 6-8. These reflect big demographic differences between the rich and poor worlds. Statistical demographers now agree that, controlling for other factors, countries where population increase has been large in recent decades have experienced slow growth in real GDP per capita. High population growth in today's poor countries has also put enormous pressure on their

¹¹ Schultz (1974) is the classic on the subject.

ecology, creating further problems for rural people.

4.7.4 Mutual Causation Among Factors

No one should claim that there is a single driving force behind economic growth. There is widespread agreement among economists that the accumulation of manufactured capital, human capital, the production, diffusion and use of new scientific and technological ideas, and even personal aspirations to achieve intellectual and material success, go together, each contributing positively to the contributions of the others. In the contemporary world, an accumulation of, say, manufactured capital goods raises real GDP, other things being equal. This enables societies to set aside more of their incomes for education and health, triggering a reduction in both fertility and child mortality, and widening people's intellectual horizons. Increases in education and aspiration increases GDP further, other things being equal, while reduced fertility and child mortality typically lower population growth; which, taken together enable societies to set aside more of their incomes for the production of new ideas. This raises the productivity of manufactured capital; which in turn brings forth further accumulation of manufactured capital; and so on, in a virtuous cycle of prosperity. The flip side of this is, of course, a vicious cycle of poverty. The polarization that separates the rich and poor worlds today is a manifestation of those two movements. Economists use the terms virtuous and vicious cycles to characterise polarization. Some refer to vicious cycles as poverty traps.¹²

4.7.5 Knowledge and Institutions

What are the relative importance of the various factors that influence economic growth? No doubt the answer is different in different places and in different periods of history, but Solow (1957) showed how to investigate the question, by devising a way to decompose recorded changes in an economy's real GDP into their measurable sources. Suppose that over an interval of time a country's real GDP has increased. Solow, and subsequently others, showed how to attribute that growth to increases in labour force participation (population growth; increases in women's employment in paid labour), the accumulation of human skills and manufactured capital, improvements in the quality of machinery and equipment, and so on. Now suppose that when we have added up all the contributions made by these factors of production, we find that the sum falls short of real GDP growth. We are entitled then to interpret that shortfall as an increase in the overall productivity of the economy's capital assets; by which we mean that more output can be produced now than earlier even if the amounts of such factors of production as machines and equipment and skills had remained the same. This is a formal way of acknowledging that there has been a general rise in the efficiency with which goods are produced. Economists call that rise, growth in total factor productivity.

How does that latter growth come about? It comes about when people acquire knowledge

¹² On formalizing the idea of poverty traps, see Dasgupta (2009b).

and make use of it, or when people make better use of what they already know. Which is why economists often refer to growth in total factor productivity as technological progress. But there are other changes in an economy that could leave an imprint on total factor productivity, such as improvements in the workings of institutions.

Since the Second World War, growth in total factor productivity in the rich world has been considerable. It has been estimated, for example, that during 1970-2000 the average annual rate of growth of total factor productivity in the United Kingdom (UK) was 0.7%. Economists have estimated that, in contrast, total factor productivity declined slightly in a number of countries in sub-Saharan Africa during that same period.

What do these figures mean? Take the case of the UK. The country's real GDP grew at an average annual rate of 2.4%, which means about 29% of that growth (i.e., $0.7/2.4$) could be attributed to increases in total factor productivity. At 2.4% growth rate, real GDP in year 2000 was twice the real GDP in 1970. Nearly a third of that increase can be attributed to growth in total factor productivity. In contrast, the economies in sub-Saharan Africa where total factor productivity declined during that period became less efficient in their use of such factors of production as machines and equipment, skills and labour hours. It's hard to believe that people in those countries systematically forgot technical knowledge they had known in the past. So the decline in total factor productivity there must have been due to a deterioration in local institutions, precipitated by civil wars and bad governance.

These statistics raise a puzzle. Today's poor countries lie mainly in the tropics, whereas the rich countries are mostly in temperate zones. No doubt the tropics are a breeding ground for many diseases, but they also harbour vast quantities of natural resources (timber; minerals; and conditions suitable for the production of spices, fibres, coffee, and tea). During the past several centuries, the countries that are rich today have been importing those very resources and products to fuel their factories and mills, and to make their meals enjoyable. They accumulated machines, human capital, and also produced scientific and technological knowledge. Why didn't the poor world take advantage of their resource endowments to enrich themselves in the same way?

Colonization is a possible answer. Historians have shown that, from the 16th century, European powers have extracted natural resources from the colonies - including cheap (often, slave) labour - but have mostly invested the proceeds domestically. That said, many of the most prominent of those ex-colonies have been politically independent for decades now. During that time real income per head in the rich world has increased over and over again. With the exception of a few striking examples in South and South-East Asia, though, most of the ex-colonies have either remained poor or become poorer still. Why?

Economic historians have argued that the rich world is rich today because, over the centuries, it has devised institutions that have enabled people to improve their material conditions of life. This is a deeper explanation. It says that people in rich countries work with superior

technologies, are healthier, live longer, are better educated, and produce many more productive ideas, because they have been able to get on with their lives in societies whose institutions permit - even encourage - the economy-wide accumulation of such factors of production as machines, transport facilities, health, skills, ideas, and the fruits of those ideas. The accumulation of productive capital assets is only a proximate cause of prosperity, the real cause is progressive institutions.

One can peel away the conceptual onion some more and ask how and why past people in today's rich countries were able to fashion their institutions in ways that enabled those proximate causes of prosperity to explode there. One can even ask whether institutions did it, or whether it was the enlightened policies of the rulers that were responsible for the explosion. But then, policies aren't plucked from air, they emerge from consultations and deliberations within institutions. Nor is it likely that a policy designed to bring prosperity to a country will actually work unless the institutions there are capable of implementing it.

The effectiveness of an institution depends on the rules governing it and on whether its members obey the rules. The codes of conduct in the civil service of every country include honesty, but governments differ enormously as to its practice. Social scientists have constructed indices of corruption among public officials. One such index is based on the perception private firms have acquired, on the basis of their experience, of the bribes people have had to pay officials in order to do business. The index - which is on a scale of 1 (highly corrupt) to 10 (highly clean) - is less than 3.5 for most poor countries (African countries and Eastern Europe are among the worst) and greater than 7 for most rich countries (Scandinavian countries are among the best). It used to be argued that bribery of public officials helps to raise national income because it lubricates economic transactions. It does so in a corrupt world: if you don't pay up, you don't get to do business. But corruption isn't an inevitable evil. There are several poor countries where corruption is low. Having to pay bribes raises production costs; so less is produced. Citizens suffer, because the price they have to pay for products is that much higher.

Economists have speculated that government corruption is related to the delays people face in having the rule of law enforced. The thought is that delays are a way of eliciting bribes to hasten legal processes. To enforce a contract takes 415 days in the poor world, as against 280 days in the rich world. It may be that corruption is also related to government ineffectiveness. To register a business takes 66 days in the poor world, 27 days in the rich world. In poor countries registering property takes 100 days on average, while in rich countries the figure is 50 days. Some economists have suggested that government officials in poor countries create lengthy queues (that's government ineffectiveness) so as to elicit bribes from applicants if they want to jump those queues (that's corruption).

How do government corruption, ineffectiveness, and indifference to the rule of law translate into the kind of macroeconomic statistics we have been studying here? They leave their

imprint on total factor productivity. Other things being equal, a country whose government is corrupt or ineffective, or where the rule of law is not respected, is a country whose total factor productivity is lower than that of a country whose government suffers from fewer of those defects. Some scholars call these intangible but quantifiable factors social capital.

So it would seem that even to say that the ultimate driver of economic growth is the presence of good institutions is to make an error. Good institutions on their own would not deliver economic growth. For good institutions to be effective, people must trust one another to observe the institutional rules and regulations. At the widest level they would involve respecting the rule of law and such norms of behaviour as respecting the rights of others, not disfiguring the public space, and so forth. We should conclude then that for an economy to prosper, there has to be trust, among individuals and groups, and in the social institutions in which they are embedded. Trust is the ultimate driver of economic progress.¹³

4.7.6 What Have We Learnt From The Statistics?

Table 4.1 offered a summary of statistics in rich and poor countries, respectively, on the most commonly used measures of human well-being. Notice that the figures reflect a mixture of the constituents and determinants of well-being. They are in fact a mixture of means and ends (corruption is a characteristic of a society's ability to allocate goods and services, whereas the under-5 mortality rate (or rather, the under-5 survival rate) reflects one of well-being's constituents). However, what is particularly worrying about the indices of human well-being currently on offer (as in Table 4.1) is that they are based mostly on ad hoc considerations. For example, GDP is an index of economic activity; so the link between that and human well-being is not an immediate one. In Chapter 5 we construct an index based on the determinants of well-being that follows straight from the concept of well-being itself. Our analysis there will allow us to formalise the concept of sustainable economic development from first principles.

¹³ For an elaboration of these ideas, see Dasgupta (2009c).

Table 4.1
Rich and Poor Nations

	rich nations	poor nations
population (billions)	1.0	2.3
GDP per capita	\$30,000	\$2,100
Human Development Index	high	low
Annual % population growth rate 1966-2004	0.8	2.4
Annual % (per capita) GDP growth rate: 1966-2004	2.4	1.8
Total fertility rate (TFR)	1.8	3.7
Adult literacy (%) (female literacy (%))	>95 >95	58 48
Index of government corruption	low	high
Life expectancy at birth (years)	78	58
Under-5 mortality rate (per 1000)	7	120
Rural population (% of total population)	10	70
Agriculture's share of GDP (%)	5	25

Source: *World Development Indicators* (World Bank), 2005.

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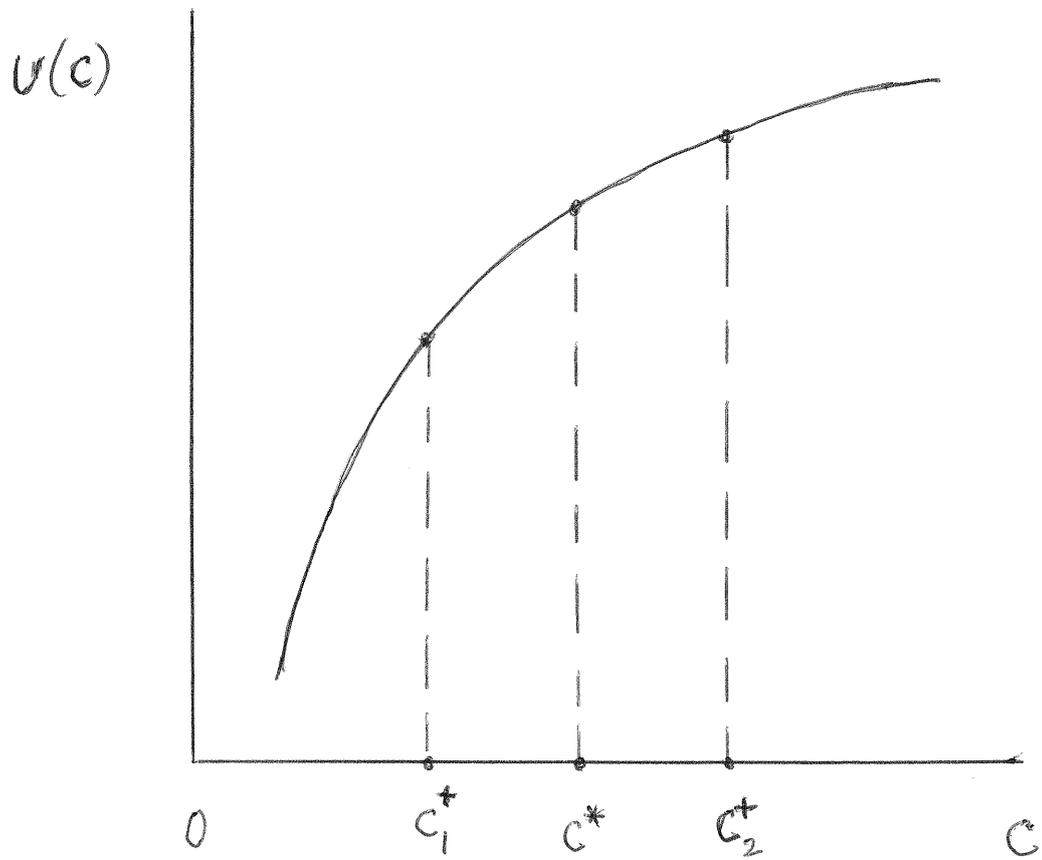


Figure 4.1