

## Chapter 8

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# Poverty and Undernutrition

### 8.1. Introduction

There is no more visible characteristic of economic underdevelopment than poverty. It is also the most shocking characteristic—the outgrowth of layer upon layer of inequality. There is, first, the inequality of world income distribution. As if this were not enough, there is the inequality of income distribution within a country. The outcome, for many millions of people, is destitution, squalor, and lack of hope.

It is all too easy to provide “illustrative” examples of the development process: there are many in this book and in every textbook on economic development, but it is not easy to describe, head on, the horrors of poverty and its attendant correlates: illiteracy, undernutrition, ill health, and the utter bleakness of the future. Poverty strikes not only at the core of ongoing existence. By effectively taking away the rights of a human being to live in good health, to obtain an education, and to enjoy adequate nutrition, poverty destroys the aspirations, hopes, and enjoyment of the future as well. Poverty was a medieval scourge for a good reason: the world was generally poor then. There is little excuse for living with poverty today.

Considering that the world has generated significant growth in per capita income, its track record on poverty is pretty dismal. Over the period 1965–75, consumption per capita in developing countries grew by 32%, and then by another 26% over the period 1975–85.<sup>1</sup> However, by fairly conservative estimates that we will discuss subsequently, the number of poor people in the world in 1990 was over a billion (in a total of well under six billion). The figure alone is staggering.

Just as in the case of inequality, poverty is both of intrinsic and functional significance. Most people would say that the removal of poverty is a fundamental goal of economic development. Hence, the characteristics of the poor and the appropriate measure of poverty are important considerations in policies that must be sharply targeted toward the poor. However, poverty is not only of intrinsic interest: it has enormous implications for the way in

<sup>1</sup> See the *World Development Report* (World Bank [1990, Table 3.1]). The figures pertain to consumption in 1985 PPP prices.

which entire economies function. Some of these functional implications were tied up in our discussion of inequality, but there are others that are specific to poverty itself.

This chapter is divided into four parts. First, we discuss the *concept* of poverty, and—something that's obviously related—how to go about measuring it. Next, we apply some of these measures to obtain a sense of the extent of poverty in the world today. In addition to these quantitative estimates, we also describe the *correlates of poverty*: characteristics that are widely shared by poor individuals. Not only does an understanding of these characteristics help to identify the poor, but it may also serve as a focal point for policies that are geared toward ending poverty. Third, we analyze the *functional* impact of poverty. At many stages this issue links up with material in other chapters of this text, and we will point at this material to avoid repetition. Finally, we discuss policies for poverty alleviation.

## 8.2. Poverty: First principles

### 8.2.1. Conceptual issues

At the heart of all discourses on poverty is the notion of a *poverty line*: a critical threshold of income, consumption, or, more generally, *access* to goods and services below which individuals are declared to be poor. The poverty line, then, represents a minimum level of "acceptable" economic participation in a given society at a given point in time. For instance, we could collect data on minimum nutrient levels that make up an adequate diet, on the prices of foodstuffs that contain such nutrients, and on the costs of shelter and clothing, and then add up the consumption expenditures needed to obtain these basic requirements to obtain an estimate of the poverty line for a particular society. We could use the prevailing legally decreed minimum wage in a country as an estimate for the poverty line of that country. Alternatively, we could fix some other norm, say, 60% of the mean income of a country, to arrive at an estimate of its poverty line.

Nutrition-based poverty lines are not uncommon. The poverty line used in the United States is based on Orshansky's [1963, 1965] estimates, which scale by three a minimum-budget estimate for food requirements (the scaling proxies for other requirements such as rent and clothing). Indian poverty lines have traditionally been drawn by using estimates of expenditure necessary to guarantee a minimum consumption of calories. Of course, such poverty lines (and probably *all* poverty lines) should be approached with some caution and scepticism: the poorer the country, the better the nutrition-based approximation. Issues of scaling become more problematic as the average standard of living rises.

The following subsections explain some of the fundamental concerns that surround poverty measurement.

*Overall expenditure or item-by-item consumption?*

Should we declare a person to be poor when her *actual, observed consumption basket* falls below certain prespecified thresholds or when her *expenditure* (or overall income) falls below the minimum required to obtain these consumption standards? Certainly, we could conjure up examples where the two approaches yield different results; for instance, what are we to make of the wealthy ascetic who starves himself on an ongoing basis? At a more serious level, nutrition levels may not unambiguously rise with income.<sup>2</sup> For instance, canned foods may become quite popular at certain levels of income, even though their nutritive value is questionable. Thus, even through elasticities may be high with respect to changes in income, nutrient elasticities may not be correspondingly high. Income represents the *capacity* to consume, not consumption itself. Nevertheless, income- or (aggregate) expenditure-based poverty lines are far easier to use, given the scarcity of available data.

*Absolute or relative?*

Clearly, there is something absolute about the notion of poverty. Regardless of the society we live in, people need adequate levels of food, clothing, and shelter. Whereas it is certainly the case that there are variations in what might be considered "adequate" (shelter, in particular, might be subject to varying society-specific interpretations), nobody would deny the biological imperative of nutrition, for instance, or the near-universal norms of adequate clothing. At the same time, it is unclear that the phrase "acceptable levels of participation in society" can be given absolute meaning, independent of the contours of the society under consideration. In some societies, the ownership of a television may be deemed socially necessary for living a "full" life; in others it is not. Likewise, minimal standards of leisure, access to scientific education, ownership of private means of transportation, and so on, are all concerns that must be evaluated *relative* to the prevailing socioeconomic standards. These considerations quite naturally give rise to the need for poverty lines that share certain common components, but vary (perhaps widely) from country to country.

Note carefully that although poverty lines should (and do) incorporate relative notions of what constitutes "necessity" or "basic needs," we must still think of them as fulfilling some absolute notion of the ability to function in a society. The previous paragraph chooses our examples carefully to make this point.<sup>3</sup> For instance, it would be foolish to define poverty by, say, the percentage of the population earning less than half the average income of society. Such a measure confuses poverty with inequality. For instance, the

<sup>2</sup>On this, see, for example, Behrman and Deolalikar [1987] and the box on nutrition and income in South India later in this chapter.

<sup>3</sup>For a detailed discussion of these matters, see Sen [1983].

measure would remain completely unchanged if all incomes were scaled down by the same proportion, plunging half the population into famine!

#### *Temporary or chronic?*

As we will see, people who live in (or close to) a state of poverty, however that state is measured, often experience significant fluctuations in their income and consumption. This is especially true for the poor or near-poor in developing countries, where a large fraction of the population may depend on a quirky, weather-dependent agriculture. Expressed as fractions of their average earned income, these fluctuations are large. As Morduch [1994] pointed out, notions of "structural" or chronic poverty must therefore be complemented by a study of "temporary poverty." The latter occurs when, because of bad economic shocks (such as poor rainfall or low prices for one's production), individuals temporarily enter a poverty sample. The distinction is not just for the sake of a distinction: the policies required to combat temporary as opposed to chronic poverty may be very different.

The temporary versus chronic distinction is closely related to Friedman's [1957] famous distinction between temporary and permanent income. Income in a given year may be far from capturing the smoothed or "permanent" stream of consumption that an individual or household enjoys over time. For this reason, household or individual expenditures are often thought of as a more reliable way to assess chronic poverty.

#### *Households or individuals?*

Often household-level data on expenditure and income are all that is available. It is tempting, then, to simply express household consumption as individual averages (so that household size can be accounted for), and then apply one's favorite measure of poverty. However, this neglects an exceedingly important issue: that the allocation of expenditures *within* the household are often significantly skewed. Among the potential victims are females and the elderly. There is some evidence that such discrimination grows sharper with the overall level of destitution of the household. Macroestimates of poverty should therefore be complemented by "microstudies" that study intrahousehold allocation. We will study some examples in the subsequent text.

Neglecting altogether the problems of distribution, a second set of concerns arises from the fact that larger households typically have more children. Some correction for the presence of children is desirable, because they consume somewhat less than adults. The construction of *adult equivalence*

scales—conversion factors that express the consumption of children as a fraction of a representative adult—would get around this problem.<sup>4</sup>

Finally, there are fixed costs in setting up and running a household. Smaller households cannot spread these fixed costs over several household members. They are therefore at a disadvantage. We return to this and related issues later.

### *Why a poverty line, anyway?*

It is possible to argue that a fixed notion of the poverty line is untenable. In part this is because of some issues raised earlier; for example, the relativity of poverty or its fluctuating nature. Even if we stick to chronic, nutrition-based measures of poverty, we *still* are unable to find some magic level of nutrition below which people abruptly go up in little puffs of smoke (in which case there would probably be no poverty to speak of, anyway). As we shall see later in this chapter, undernutrition is not the same as immediate and obvious disaster, and therefore it is more insidious. The world can indefinitely carry a stock of undernourished people, living and breeding under impaired circumstances. Although more will be said presently on such issues, it is important to realize that poverty lines are *always* approximations to a threshold that is truly fuzzy, more because the effects of sustained deprivation are often felt *at a later point in time*. There is really little to be done about this criticism except to realize that quantitative estimates of poverty lines are not to be memorized all the way down to the third decimal place and that they are basically (important) pointers to a deeper and less quantifiable concept.

### 8.2.2. Poverty measures

With the preceding qualifications in mind, then, we will consider a poverty line to be an expenditure threshold that is regarded as minimally necessary for “adequate” participation in economic life. People below this threshold will be said to be *poor*.

A little notation will be useful. As in Chapter 6,  $y$  denotes income (or expenditure) and subscripts  $i, j, \dots$ , refer to individuals. Let's denote by  $p$  the poverty line<sup>5</sup> and by  $m$  the mean income of the economy.

One natural measure that comes to mind is simply to *count* the number of people below the poverty line. We might be interested in the numbers per se or in the *relative incidence* of the poor. In the latter case, divide by the total

<sup>4</sup> There are conceptual questions regarding the construction of such scales, although the existing practice of using per capita expenditure (or income) for a household can certainly be improved. For further discussion, see Deaton [1997, Section 4.3].

<sup>5</sup> This is taken to be denominated in the same units of currency as income or expenditure. Thus, for instance, if the poverty line is calorie-based,  $p$  represents the amount of money that is required to attain the acceptable calorie threshold.

population of the country or region under consideration. The first measure is known as the *head count*, and the latter as the *head-count ratio*, which is just head count as a fraction of population. In part because they don't place great strains on available data, these measures are widely used. In our notation, the head count (HC) is given by the number of individuals  $i$  such that  $y_i < p$ , whereas the head-count ratio (HCR) is just

$$(8.1) \quad \text{HCR} = \frac{\text{HC}}{n},$$

where  $n$  is the total population.

An obvious problem with the head-count ratio is that it fails to capture the *extent* to which individual income (or expenditure) falls below the poverty line. This is related, of course, to observation 5 (Why a poverty line, anyway?) in the previous section that poverty is not a "zero-one" concept. People further below the poverty line are "poorer" than people closer to it, and the head count is insensitive to this observation. However, matters are worse than plain insensitivity: use of the head count can lead to problematic policy decisions, as the following example suggests.

**Example 1:** You are a planner in Ping, a poor land, where the poverty line is set at 1000 pah a year. It turns out that in Ping there are two equal-sized groups below the poverty line. One group consists of 100 individuals: they have equal earnings of 500 pah a year each. The second group also has 100 people: they earn 900 pah a year each. Of course, there are also people who are above the poverty line. You have been allocated a budget of 20,000 pah a year. You must allocate this budget among the 200 poor people.

- (i) Suppose you were to forget about the poverty line. Who would you give the money to?
- (ii) Now suppose that you are firmly told by the President of Ping to use this money to minimize, as far as possible, the head count. Who would you give the money to?

The point of the example is very simple. The use of the head count as a measure of poverty systematically biases policy in favor of individuals who are very close to the poverty line. Statistically, these people offer the biggest bang for the buck, because they are most easily taken above the poverty line. Yet of all the poor, they are relatively in the least need of help. A benevolent government that is perfectly secure and without fear of losing the next elections may ignore the problem and act in the best interests of the people, but most governments, like most people, are more interested in maximizing the observable and seemingly objective measures of their success.

One way to partially offset this bias, and more fundamentally take account of the extent of poverty, is to use a measure of the average income shortfall from the poverty line. An example is the *poverty gap ratio*, defined as the ratio of the average of income (or extra consumption) needed to get all poor people to the poverty line, divided by the mean income (or consumption) of the society. The reason for dividing by the average for society as a whole is that this gives us an idea of how large the gap is relative to resources that potentially may be used to close the gap. In this sense, the poverty gap ratio is not really a measure of poverty itself, but a measure of resources required to eradicate it.

In terms of our notation, the poverty gap ratio (PGR) is given by

$$(8.2) \quad \text{PGR} = \frac{\sum_{y_i < p} (p - y_i)}{nm},$$

where  $m$ , you will recall, is mean income.

Dividing by average economywide income might give a misleading impression of poverty in highly unequal (but overall wealthy) societies with a large number of poor people. The poverty gap ratio in such societies may look pretty small, even though the plight of the poor is made no less acute by this maneuver. Therefore, a close relative of this measure, called the *income gap ratio*, is often used. This is exactly the same measure of total shortfall of the poor from the poverty line, except that we divide the shortfall by the total income required to bring all the poor people to the poverty line. This places a slightly different perspective on things. It captures more directly the acuteness of poverty, because it measures it relative to the total income needed to make that poverty go away.<sup>6</sup> Thus the income gap ratio (IGR) is given by the formula

$$(8.3) \quad \text{IGR} = \frac{\sum_{y_i < p} (p - y_i)}{p \text{HC}},$$

where we recall that HC is just the number (head count) of the poor.

The PGR or the IGR is not susceptible to the same kind of policy distortion as the head count, as the following example shows.

**Example 2:** Return to the problem of Example 1. Now imagine that you are told to minimize (as far as possible) the PGR or the IGR. Does the way you now spend your money necessarily contrast with the intuitive reactions you noted in part (i) of Example 1?

It should be clear from the discussion that the PGR or IGR avoids the "bang for the buck" problem by deliberately neglecting *numbers* or *fractions*

<sup>6</sup>Of course, this measure has the *opposite* problem: by ignoring the overall wealth of the society, it tells us little about how easily the problem can be tackled, at least domestically.

of people that are below the poverty line. In a sense, PGR and IGR only capture the "per capita intensity" of poverty. The head count (or HCR), whatever its other failings, does not suffer from this problem. For this reason, it is a good idea to use measures of each type *jointly*, where possible, to evaluate the extent of poverty.

Finally, we note that *both* the head count and the poverty gap class of measures share an additional drawback relating to the fact that both these measures ignore the important issue of *relative deprivation* among the poor.<sup>7</sup> Relative deprivation is just another phrase for inequality *among the poor*. The new phrase is used to capture the fact that we are concerned only with the inequality among the deprived, or poor. The main concern is captured by the following example.

*Example 3:* Return to Example 1, where, as you will recall, there are 200 people below the poverty line; half of them have an income of 500 pah and the rest have an income of 900 pah.

(i) Suppose that each person who earns 500 pah gave 50 pah to each person who earns 900 pah. The new income levels are then 450 and 950 pah. What do you think would happen to the intensity of poverty in this new situation relative to the old? Now compute the HCR and PGR (or IGR) in both situations. Compare what the measures say with what you feel intuitively.

(ii) To make the point even more starkly, transfer 110 pah each (instead of 50 pah) between the same groups and redo the exercise.

Even if we were to take the head count and the gap-ratio measures *together*, there are other aspects of poverty that may be left out. This observation leads to more sophisticated measures of poverty that have been proposed by economists such as Sen [1976] and Foster, Greer, and Thorbecke [1984]. With better data, these more demanding measures can be easily applied. The Appendix to this chapter contains a discussion of the Foster-Greer-Thorbecke index.

### 8.3. Poverty: Empirical observations

We now turn to the data to get a sense of the extent of poverty and the characteristics of the poor. We begin with a universal poverty line to facilitate cross-country comparison. Be aware that this is a tricky business. We already discussed the fact that poverty has relative as well as absolute components. The choice of some "universal" poverty line creates overly high "real poverty" in some countries and too little poverty in others. To partly circumvent this problem, the *World Development Report* (World Bank [1990]),

<sup>7</sup> For a more detailed treatment of this issue, see Sen [1976].



Table 8.1. Poverty in developing countries, 1985 and 1990, using "universal" poverty lines.

| Region               | 1985                    |            |     |                    |            |      | 1990             |            |
|----------------------|-------------------------|------------|-----|--------------------|------------|------|------------------|------------|
|                      | Ultrapoor (Under \$275) |            |     | Poor (Under \$370) |            |      | Poor             |            |
|                      | HC<br>(millions)        | HCR<br>(%) | PGR | HC<br>(millions)   | HCR<br>(%) | PGR  | HC<br>(millions) | HCR<br>(%) |
| Sub-Saharan Africa   | 120                     | 30         | 4.0 | 184                | 48         | 11.0 | 216              | 48         |
| E. Asia              | 120                     | 9          | 0.4 | 182                | 13         | 1.0  | 169              | 11         |
| S. Asia              | 300                     | 29         | 3.0 | 532                | 52         | 10.0 | 562              | 49         |
| E. Europe            | 3                       | 4          | 0.2 | 5                  | 7          | 0.5  | 5.0              | 7          |
| Mid. East/N. Africa  | 40                      | 21         | 1.0 | 60                 | 31         | 2.0  | 73               | 33         |
| L. America/Caribbean | 50                      | 12         | 1.0 | 87                 | 22         | 1.0  | 108              | 26         |
| All LDCs             | 633                     | 18         | 1   | 1,051              | 31         | 3.0  | 1,133            | 30         |

Source: *World Development Report* (World Bank [1990, 1992]).

Note: Poverty lines are at 1985 PPP prices. The 1992 report updates and changes head-count information for 1985 and provides 1990 data. The PGRs for 1985 are unaltered from the 1990 report.

which represents a landmark study on poverty in developing countries, experimented with a choice of two poverty lines: \$275 and \$370 per person per year, expressed in 1985 PPP prices. The range was chosen to reflect that fact that the poverty lines of some of the poorest nations fall between these two limits.<sup>8</sup>

Table 8.1 puts together poverty data from two *World Development Reports*. Keeping in mind that these poverty lines were chosen quite conservatively, the results are staggering, to say the least. In 1990, well over one billion individuals were estimated to earn less than \$370 per year (or \$420 per year at 1990 PPP prices). The time trend does not look very hopeful either. Except for East Asia, which experienced very high rates of growth, the absolute numbers of the poor rose significantly between 1985 and 1990. The overall percentage of people in poverty (at the \$370 line) was roughly constant over this period at 30% of the population of all developing countries.

Even if we were to use the extra-conservative poverty line of \$275 per year per person, we would see that in 1985, over 600 million people were poor even by these unexacting standards. The overall figures for poverty would be significantly higher were we to use country-specific poverty lines.

We now turn to the characteristics of the poor.

### 8.3.1. Demographic features

It is not surprising that those households whose members fall below the poverty line also tend to be large relative to the average family. For

<sup>8</sup> These are Bangladesh, Egypt, India, Indonesia, Kenya, Morocco, and Tanzania. The lower limit, \$275, coincides with a poverty line used for India.

Brazil, Fishlow [1972] reported that 29% of all families had a size of six or more individuals, and over half of such families fell below the poverty line. Similarly, for Malaysia, Anand [1977] noted that the incidence of poverty rises with family size, ranging from 24% in a household of one to 46% in households with ten or more people. The *World Development Report* (World Bank [1990]) observed that in Pakistan in 1984, the poorest 10% of households had an average of 7.7 members; the corresponding national average was 6.1.

Not surprisingly, these larger, poor families often have a high ratio of dependent members, often children. In all the examples cited, the number of children per family was significantly correlated with their poverty. This is of great concern, because it suggests that the burden of poverty often falls disproportionately on the young. Given the immensely important role that childhood nutrition and education play, this is a double tragedy that overall head counts and poverty gap ratios cannot fully capture.

Clearly family size may be both a cause of poverty as well as an effect. Larger families, especially those with larger numbers of children, are likely to have lower per capita income simply because of the higher dependency ratio. To be sure, some of this dependency is eroded by institutions such as child labor, but children are not paid much. More significantly, poverty may actually feed on itself by creating the incentive to have a large number of children. Why this might be the case is a topic for Chapter 9. Suffice it to say that we speak of a correlation here, but as always, we cannot establish causality without more careful study.

There are two reasons, however, to doubt the high degree of observed correlation between household size and poverty. First, there is the problem of using per capita expenditure (or income) of the household as the relevant indicator, as most studies do. Larger households have a greater fraction of children, as we've already noted, and to the extent that children consume less than adults, the use of per capita expenditure overstates the amount of poverty. Second, some allowance should be made for the fact that larger households enjoy significant economies of scale. Once again, per capita measures generally overstate the extent of their poverty.

Correcting for these factors in a way that is conceptually satisfactory is not an easy task, but *some* allowance for adult equivalence is better than none. For instance, one could use a weight of 0.5 for children (although some variation here is also desirable, depending on age and sex). This weighting will certainly lower the estimates of poverty for large households. Correcting for increasing returns to scale—the fixed costs of setting up and running a household—has its own share of conceptual problems as well. One way out of this is to try different parametric values for returns to scale and see if

"reasonable" values overturn the observed correlation between poverty and household size.<sup>9</sup>

It should also be noted that women are disproportionately represented as heads of poor households. The Fishlow study on Brazil cited earlier noted that there are twice as many female-headed households among the poor as among the nonpoor. This trend is widespread, being reflected in Africa, other parts of Latin America, and South and East Asia.<sup>10</sup> The absence of a principal male earner appears to be closely related to poverty.

For more discussion on the connections between gender bias and poverty, see the concluding section of this chapter.

### 8.3.2. Rural and urban poverty

Even if we take into account the differences in rural and urban cost of living, poverty in rural areas is significantly higher. Even countries with substantial advances in creating an equitable agriculture display higher rural poverty than their national averages. Table 8.2 summarizes rural-urban disparities in poverty, as well as in two major indicators of well-being, for selected countries.

### 8.3.3. Assets

A natural characteristic of poverty is that it is correlated with the lack of ownership of productive assets. As usual, we must be careful not to establish a one-way causal relationship between the lack of ownership of assets and poverty. Just as the paucity of assets leads to poverty, a condition of poverty leads to the sale of assets. In a word, the scarcity of assets and poverty must be viewed as closely related phenomena.

Given that poverty is so closely related with location in rural areas, it is not surprising that the bulk of the poor are found among the landless or near landless. Poverty and small-scale agriculture are especially strongly correlated in Africa: most of the poor in countries such as Botswana, Ghana,

<sup>9</sup> Anand and Morduch [1996] used the Bangladesh Household Expenditure Survey, 1988-89, to do this. Let  $x$  be aggregate household expenditure and  $m$  be household size. Then  $x/m$  is per capita household expenditure. Now introduce a scaling factor  $\alpha$  between 0 and 1, and think of  $m^\alpha$  as effective household size. Because  $0 < \alpha < 1$ ,  $m^\alpha$  rises slower than  $\alpha$ , and this is a way of capturing returns to scale. The smaller the value of  $\alpha$ , the higher the returns to scale. This procedure captures some of the adult equivalence issues as well, because it implies that the larger the household, the greater the proportion of children, and so effective household size (in adult equivalents) rises more slowly. Values of  $\alpha$  around 0.8 or lower are sufficient to overturn the observed positive correlation between household size and poverty in the Bangladesh data. Whether this value of  $\alpha$  represents "high" or "moderate" returns to scale requires more careful investigation, however.

<sup>10</sup> As Meesook [1975] and Fields [1980] observed, Thailand appears to be an exception to this rule. Social custom there provides greater assistance to women who are without a principal male earner in the household.

Table 8.2. Rural and urban poverty in the 1980s.

| Region and country | Rural population<br>(% of total<br>population) | Rural poor<br>(% of total<br>poor) | Infant mortality<br>(per 1000<br>live births) |       | Access to<br>safe water<br>(% of<br>population) |       |
|--------------------|--|------------------------------------|---|-------|---|-------|
|                    |  |                                    | Rural   | Urban | Rural   | Urban |
| Sub-Saharan Africa |  |                                    |   |       |   |       |
| Côte d'Ivoire      | 57   | 86                                 | 121   | 70    | 10  | 30    |
| Ghana              | 65   | 80                                 | 87  | 67    | 39  | 93    |
| Kenya              | 80   | 96                                 | 59  | 57    | 21  | 61    |
| Asia               |  |                                    |   |       |   |       |
| India              | 77   | 79                                 | 105   | 57    | 50  | 76    |
| Indonesia          | 73   | 79                                 | 74  | 57    | 36  | 43    |
| Malaysia           | 62   | 80                                 | —   | —     | 76  | 96    |
| Philippines        | 60   | 67                                 | 55  | 42    | 54  | 49    |
| Thailand           | 70   | 80                                 | 43  | 28    | 66  | 56    |
| Latin America      |  |                                    |   |       |   |       |
| Guatemala          | 59   | 66                                 | 85  | 65    | 26  | 89    |
| Mexico             | 31   | 37                                 | 79  | 29    | 51  | 79    |
| Panama             | 50   | 59                                 | 28  | 22    | 63  | 100   |
| Peru               | 44   | 52                                 | 101   | 54    | 17  | 73    |
| Venezuela          | 15   | 20                                 | —   | —     | 80  | 80    |

Source: *World Development Report* (World Bank [1990]).

Kenya, and Nigeria are small farmers or pastoralists (*World Development Report*, World Bank [1990]). Apart from southern Africa, where the rural poor hire out their labor, the poor are largely self-employed. In contrast, in South Asia, landless labor is more widely represented among the poor. India, Pakistan, and Bangladesh all display a mix of poverty that is borne as much by landless labor as by small holders. Note, however, that after a point, the distinction between small landowners and landless laborers is blurred or meaningless: we are talking about pitifully low quantities of land in any case.

Nevertheless, it is true that there is a significant difference in poverty once we move from negligible or near-negligible holdings of land to more moderate holdings. Table 8.3 illustrates this difference.

Latin America shows the same concentration of poverty among the landless or the near landless. In Costa Rica, wage labor counts heavily among the poor, whereas Peru's poor are accounted for by small holders and herders. The poor also participate in rural nonfarm employment, largely cottage and traditional industries, the products of which are destined for home consumption or local markets.

Table 8.3. Poverty and landholding in rural Bangladesh, 1978-79.

| Acres of land owned | % of total households in class | Income (taka per month) | Mean landholdings (acres) | HCR |
|---------------------|--------------------------------|-------------------------|---------------------------|-----|
| Landless            | 7.1                            | 508                     | 0                         | 93  |
| 0-0.5               | 36.1                           | 560                     | 0.1                       | 93  |
| 0.5-1.0             | 10.5                           | 711                     | 0.7                       | 84  |
| 1.0-1.5             | 8.9                            | 783                     | 1.2                       | 78  |
| 1.5-2.5             | 12.1                           | 912                     | 2.0                       | 68  |
| 2.5-5.0             | 13.8                           | 1,163                   | 3.5                       | 45  |
| 5.0-7.5             | 5.7                            | 1,516                   | 6.0                       | 23  |
| 7.5+                | 5.8                            | 2,155                   | 14.0                      | 10  |
| Total               | 100.0                          | 865                     | 2.1                       | 70  |

Source: *World Development Report* (World Bank [1990]).

Urban poverty shows the same mix of self-employment and wage labor. Most of the poor reside in the "informal sector," which we will study in more detail in Chapter 10. Self-employment is common: as vendors, petty traders, tea-stall owners, beggars, shoe-shine boys, garbage sifters, load carriers, rickshaw pullers, roadside hawkers, and so on. Wage employment is often on a casual basis and not subject to minimum wage laws. Because of the chronic lack of assets, the vulnerability of the poor, quite apart from the low average levels of living, can be frightening.

Side by side with the scarcity of physical assets are the low levels of human capital. The most important determinant of the access to human capital is the ability to temporarily remove oneself from the labor force and use this period to acquire skills. This removal must be covered financially, through either loans or the support of close family and relatives. This kind of financial cover is the last thing one can associate with the poor and, consequently, it is far from surprising that the majority of poor have little or no human capital. Illiteracy rates are very high indeed, and among those who are not illiterate, there is little evidence of schooling beyond primary levels.

#### 8.3.4. Nutrition

There is an intimate connection between poverty and undernutrition, especially in low-income countries. With low income, it is difficult for individuals to acquire adequate levels of food and nutrient consumption for themselves and their families. "Adequacy," as we shall see, is a loaded word, because the notion depends fundamentally on the kinds of activities in which an individual is engaged, as well as the nutritional history of that person. Nevertheless, it is not difficult to see the effects of undernutrition. In children

they are particularly severe: muscle wastage, stunting, and increased susceptibility to illness and infection. Undernutrition can also affect cognitive skills. In adults, chronic undernutrition diminishes muscular strength, immunity to disease, and the capacity to do productive work. In the next section, we will see how low nutrition can feed back on a person's capacity to do work, thus perpetuating the state of poverty in which they find themselves.

In many countries, poverty and undernutrition are closely related with each other, because the definition of the poverty line often relies on the expenditure necessary to obtain a certain minimum food or nutrient basket (plus some margin for nonfood items). Examples include Malaysia and India. Authors such as Lipton [1983] have argued that using a calorie-based poverty line, or a *food adequacy standard*, is an appropriate way to measure moderate or extreme levels of poverty in developing countries.<sup>11</sup> In such examples it is not surprising that poverty and undernutrition are highly correlated. Countries such as Brazil have used measures that are not obviously nutrition-based, but nevertheless a correlation persists between the subregions or subpopulations of these countries that display the greatest degree of poverty and the greatest degree of undernutrition. It must be mentioned, however, that as average income rises, *poverty*, as measured by household or per capita consumption (adjusted for the proportion of children in the household), exhibits less of a correlation with direct anthropometric measures of *undernutrition*, such as measures of stunting or abnormally low weight in children.<sup>12</sup>

Although the incidence of poverty and the incidence of undernutrition may be *ordinally* related, in the sense that a poor person is more likely to be undernourished than her richer counterpart, the relationship between *increases* in income (or expenditure) and *increases* in nutrition may or may not be strong. Imagine that you draw a variety of different graphs to illustrate hypothetical relationships between income earned and calories consumed. All of these graphs may be increasing in the sense that greater income translates into more calories consumed. Thus poorer people are more likely to be undernourished, but the flatter curves in that set of graphs suggest that increases in income may translate (at least over some range) into a small increase in calorie consumption, whereas the steeper curves suggest a stronger sensitivity of calorie intake to income. Thus depending on empirical findings, it is perfectly possible for the poor to be undernourished, while at the

<sup>11</sup> This is not to say that poverty should be identified with undernutrition. For one thing, persons counted below the poverty line in any one year might be "temporarily poor" (recall our previous discussion). For another, nutritional requirements vary from person to person, whereas the food adequacy standard used to measure poverty is an overall average.

<sup>12</sup> See, for example, the exercise conducted by Glewwe and van der Gaag [1990] for Côte d'Ivoire, using data from the 1985 Côte d'Ivoire Living Standards Survey. Côte d'Ivoire, however, did not visibly suffer from an overall inadequacy of food supply in 1985. Children were relatively well nourished even among the poor. This is not true of countries where the overall nutritional base is much lower.

same time direct nutrition supplements may have a far greater impact on undernutrition than an increase in income.

There are two effects that might bear on this phenomenon, and they run in different directions. First, individuals attach significance to higher nutrition. A state of good nourishment is itself desirable, because it means greater stamina, physical and mental health, and higher resistance to illness. However, nutrition is also useful in a functional sense, as we shall soon see: it raises work capacity and, therefore, earnings ability. For both these reasons, an increase in purchasing power tends to raise nutritional status, especially if nutritional levels are low to begin with.

The second effect has to do with individual preferences for foods that taste good, or, more insidiously, foods that are well advertised and well packaged, or even worse, foods that are recognized as indicators of social and economic attainment.<sup>13</sup> It is easy enough in economically developed societies to downplay the strength of this effect, but in societies where food is of extreme importance in the budget, great value is assigned to the consumption of different food items, and nutrition may not be at the root of all these decisions. For example, the consumption of meat, or expensive varieties of rice, or even canned food, may be given far more social importance (as an indicator of status or wealth) than considerations of pure nutritive value warrant.<sup>14</sup> The desire to increase nutrition and the desire to increase food consumption for culinary pleasure or to signal social standing generally combine to create an intermediate reaction of nutrition to income.

Evidence on this issue is mixed and varies between strong and weak nutrition responses to budget changes. Overall, an increase in income has a significant effect on nutrition if nutrition is measured by the consumption of calories. However, the effect is not as strong as we might expect from a pure nutritional viewpoint.

What might we expect from such a viewpoint? The answer is best stated in terms of *elasticities*: what is the percentage change in the consumption of calories<sup>15</sup> when household budgets change by one percentage point? An answer of 1 means that there is an equivalent percentage change in nutrition when budgets change. Because there are subsistence minima to nutrition

<sup>13</sup> A classic application of linear programming is to the so-called *diet problem*: find the lowest-cost bundle of foods that will give you at least so many calories, so much protein, certain minima of various vitamins, and so on. The typical solutions to the diet problem offer a very low cost of attaining the required minima, but the foods will not look very appetizing.

<sup>14</sup> Pure *wastage* of food also may be an indicator of social standing. It is unfortunate that very often the deliberate wastage of a scarce resource is a powerful way of signaling one's social rank. Viewed from this angle, the wastage of food is no more horrific than the excessive consumption of power, wood, paper, geographical space, and many other resources in developed countries.

<sup>15</sup> Other nutrients are of importance as well: see the case study box on nutrition and income in South India.

levels below which it is difficult to go, this a priori notion is possibly too high. In other words, if income falls below a certain minimum, individuals may obtain their nutrition from other sources (support from relatives, for instance). As income increases, individuals presumably substitute away from these sources. Thus (and simply as a reasonable guess, no more), elasticities between 0.6 and 0.8 may be good evidence that individuals strongly adjust nutrition to income.

Is this what we observe? The answer seems to be in the negative. Estimates range between elasticities that are close to zero and those that are in the region of our a priori expectations.<sup>16</sup> Table 8.4 summarizes the estimates obtained in various studies; calorie elasticities are arranged in increasing order of magnitude. Of course, the idea isn't to take an average of all these findings, because the methodology and the data sets differ widely, but we can get a sense of what kind of numbers are available.

Overall, we do obtain some evidence that pure nutritional concerns do not entirely drive household decision making. However, these overall findings need to be tempered by two observations. First, there is some evidence that poorer households indeed react more strongly to changes in their budgets by purchasing more nutrients. Second, the pooling of data across the peak and lean seasons may confound the elasticity estimates. Because food supply in the peak or harvest season is more abundant, a change in the budget does not translate into significantly higher nutrient consumption. On the other hand, if food availability is low, as in the slack season, and credit markets are imperfect so that consumption cannot be fully smoothed over time (see Chapter 14), an increase in household income in the slack season is more adequately reflected in the demand for nutrition. Both these points were made by Behrman, Foster, and Rosenzweig [1994] (and by other authors as well). Behrman, Foster, and Rosenzweig use a data set from rural Pakistan, and found that a careful distinction between slack and peak seasons pays dividends. Estimated elasticities are high and significant in the slack. Moreover, they are especially high for people who are landless or near landless.

Later in this chapter, we turn to a converse relationship. What is the relationship between nutrition and the *ability* to generate income, or more broadly, on the ability to perform economically productive work?

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#### *Nutrition and Income: A Case Study from South India*

How do we go about estimating a relationship between nutrition and income? Consider the demand for a basket of food items consumed by households. The statis-

<sup>16</sup> The survey by Behrman [1993] discusses some of these estimates.



Table 8.4. Elasticities of calorie demand with respect to household budget, arranged in ascending order.

| Calorie elasticity <sup>a</sup> | Country and year     | Authors  |
|---------------------------------|----------------------|--|
| 0.01                            | Indonesia 1978       | Pitt and Rosenzweig [1985] <sup>b</sup>          |
| 0.06                            | Nicaragua 1977-78    | Behrman and Wolfe [1984] <sup>b</sup>            |
| 0.07                            | India 1976-78        | Bhargava [1991] <sup>b</sup>                     |
| 0.08                            | Philippines 1984-85  | Bouis and Haddad [1992] <sup>c</sup>             |
| 0.09                            | Philippines 1984-85  | Bouis and Haddad [1992] <sup>b</sup>             |
| 0.09                            | Brazil 1974-75       | Strauss and Thomas [1990] <sup>c</sup>           |
| 0.12                            | Bangladesh 1981-82   | Pitt, Rosenzweig and Hassan [1990] <sup>c</sup>  |
| 0.15                            | Indonesia 1981       | Ravallion [1990] <sup>c</sup>                    |
| 0.15                            | Kenya 1984-87        | Kenney [1989] <sup>b</sup>                       |
| 0.17                            | India 1976-78        | Behrman and Deolalikar [1987] <sup>c</sup>       |
| 0.20                            | Brazil 1974-75       | Williamson-Gray [1982] <sup>b</sup>              |
| 0.29                            | Pakistan 1986-87     | Alderman [1989] <sup>c</sup>                     |
| 0.30                            | Thailand 1975-76     | Trairatvorakul [1984] <sup>c</sup>               |
| 0.33                            | Philippines 1984-85  | Garcia and Pinstруп-Andersen [1987] <sup>c</sup> |
| 0.34                            | India 1983           | Subramanian and Deaton [1996] <sup>c</sup>       |
| 0.41                            | India 1983-84        | Alderman [1987] <sup>c</sup>                     |
| 0.47                            | Indonesia 1976       | Timmer and Alderman [1979] <sup>c</sup>          |
| 0.48/0.37 <sup>d</sup>          | Gambia 1985-86       | von Braun, Puetz, and Webb [1989] <sup>c</sup>   |
| 0.51                            | Nepal 1982-83        | Kumar and Hotchkiss [1988] <sup>b</sup>          |
| 0.53                            | Brazil 1973-75       | Ward and Sanders [1980] <sup>b</sup>             |
| 0.54                            | Indonesia 1978       | Chernichovsky and Meesook [1984] <sup>c</sup>    |
| 0.56                            | Sri Lanka 1984       | Edirisinghe [1987] <sup>c</sup>                  |
| 0.57                            | Ghana 1987-88        | Alderman and Higgins [1992] <sup>c</sup>         |
| 0.58/0.34 <sup>d</sup>          | India 1976-78        | Behrman and Deolalikar [1989] <sup>b</sup>       |
| 0.62                            | Sri Lanka 1980-81    | Sahn [1988] <sup>c</sup>                         |
| 0.80                            | Bangladesh 1974-75   | Pitt [1983] <sup>c</sup>                         |
| 0.86                            | Sierra Leone 1974-75 | Strauss [1984] <sup>c</sup>                      |

Source: Behrman, Foster, and Rosenzweig [1994, Table 1].

<sup>a</sup>Calorie elasticity is estimated at the sample means.

<sup>b</sup>Budget was measured by household income.

<sup>c</sup>Budget was measured by household expenditure.

<sup>d</sup>The first entry pertains to the lean season, the second to the peak season when food is more abundant.

tician's choice of the basket depends on the availability of data. Average estimates of the nutrient content of each food item (its calorie, protein, calcium, and other contents) are available from nutrition data that record such information. Now suppose that household expenditure rises. Then the demand for each of these food items will change, and we can measure these changes. If we multiply all these changes by the average nutrient content (say, calories per gram or protein per liter) for each food item and add up, we obtain a measure of the change in *nutrient* consumption as expenditure changes.

This method does take into account the change in the composition of the food basket as expenditure rises, so that a shift from more to less nutritious foods can be captured as we move up the expenditure scale. The problem is that the *extent* to which such effects can be captured depends on the richness of the data describing food groupings. Often, this is inadequate. For instance, even if we had data on "rice" rather than "grain," there are substitutions between short- and long-grained varieties that cannot be picked up. With the advent of canned, processed, and packaged foods, the possibilities of substitution are endless. Another way of stating the point is that *we cannot assume that nutrient content stays constant within the food item as we move from lower to higher levels of expenditure*. Typically and unfortunately, the nutrient component seems to *fall*.

A study by Behrman and Deolalikar [1987] dramatically displays this possibility. They used the foregoing method to study six villages in two states in the semi-arid region of India, known as the ICRISAT villages.<sup>17</sup> For the years 1976-77 and 1977-78, special nutrition surveys were carried out and nutrient intakes were recorded for households. The nutrition surveys provided information on nine nutrients: calories, protein, calcium, iron, carotene, thiamine, riboflavin, niacin, and ascorbic acid. This suggests a *direct* approach to the problem: simply relate consumption of these nutrients to the expenditure by household.<sup>18</sup> Contrast this with the food basket approach, which the authors discussed as well: they considered consumption changes in six basic foods: sugar, pulses, vegetables, milk, meat, and grains. Table 8.5 summarizes some of their results. Reported in this table are the *elasticities* of expenditure on various items with respect to a change in the household budget. This is done first for the commodity groups and then on the nutrients.<sup>19</sup> Thus an entry of 0.57 for sugar means that *if* household expenditures were altered by 10%, the expenditure on sugar would increase by 5.7%. An elasticity of 1 means that expenditure on that item grows at the same rate as total expenditure.

We see from Table 8.5 that elasticities for food items are large and significant (the weighted average over food groups is 1.18), whereas, apart from carotene, there is no strong nutrient effect to speak of (all the estimated coefficients are insignificant at the 5% level). This raises a puzzle of some significance: Why don't poor individuals who are generally below the food adequacy standard (and the individuals in this sample were below the standard, on average) significantly respond to budget increases by increasing their nutritional intake?

We have discussed this study in some detail because it presents a counterintuitive position in a provocative way. Do not take this to mean that all subsequent studies find the same low relationship between income (or expenditure) and nutrient

<sup>17</sup> For an introduction to the ICRISAT villages, see Chapter 10.

<sup>18</sup> Of course, the nutrient intakes are themselves calculated with respect to a basket of food items and are therefore logically subject to the same problem. However, direct observations on 120 foods were made, and this is a very rich sample indeed, so it reduces, to a large extent, the compositional errors that we have discussed.

<sup>19</sup> The figures that we report are estimates that control for village and household fixed effects by the use of differencing. The overall results are similar without these controls, although the elasticity estimates for particular items, noticeably milk, do change pretty significantly. For details, see Behrman and Deolalikar [1987].

Table 8.5. Elasticities of demand for food and nutrient groups.

| Food type  | Elasticity | Nutrient      | Elasticity |
|------------|------------|---------------|------------|
| Grains     | 1.52*      | Calories      | 0.37       |
| Sugar      | 0.57*      | Protein       | 0.19       |
| Pulses     | 1.00       | Calcium       | -0.22      |
| Vegetables | 0.51*      | Iron          | 0.30       |
| Milk       | -0.13      | Carotene      | 2.01*      |
| Meat       | 1.05*      | Thiamine      | 0.18       |
|            |            | Riboflavin    | 0.69       |
|            |            | Niacin        | 0.21       |
|            |            | Ascorbic acid | 1.25       |

Source: Behrman and Deolalikar [1987, Table 2].

Notes: An asterisk denotes that the variable was significantly affected by household expenditure (see Appendix 2 for a discussion of "significance"). The elasticities were evaluated at the sample means.

intake. There are significant variations over countries, as well as over studies done at different points in time on the same country, as the main text illustrates.

#### 8.4. The functional impact of poverty

There is very little one can say to captures adequately the degradation, the indignity, and the dehumanization of utter economic deprivation, so I will not try. We hear often of the joys of a simple, poor life, unencumbered by materialist ambitions, rich in many ways. There is little doubt that poverty can bring out the best in human beings, in an environment where the common sharing of transient gains and losses has such immense value. On the other hand, that is no excuse for poverty, and people singing the praises of the simple, honest, loyal, trusting poor are well advised to experience a dose of poverty themselves. Economic poverty is the worst curse there is.

We move on, therefore, to arguments that *link* the incidence of poverty to mechanisms that drive its creation. It is also important to understand the informal mechanisms that spontaneously arise to cope with poverty. These mechanisms tell us something about what causes poverty, as well as the wider effects that poverty has on the economic system, and they are fundamental to the creation of appropriate policies.

The fundamental feature of poverty is that it affects the access of the poor to markets, and this change in access has repercussions for the entire economy. Practically all markets are affected: the ability to obtain credit, to sell labor, to rent land for cultivation. What we are going to discuss next are some of these effects. Of course, in a natural way, they all tie in with chapters

that are devoted to a study of such markets, such as Chapters 13 and 14, so we will be brief in these matters and refer you to additional material that can be found elsewhere in this book.

#### 8.4.1. Poverty, credit, and insurance

##### *Credit*

The market for credit naturally fails for the poor. The poor are unable to obtain loans that can be used to better their lives by allowing them to invest in a productive activity. The failure occurs for a variety of reasons.

*First*, the poor lack collateral that can be put up for loan repayment. Collateral is charged for two reasons. One is that the project to which the loan is being applied may *genuinely* be unsuccessful, so that the borrower is *unable* to repay the loan. Collateral is insurance against this possibility. However, this is not the principal reason by far. If projects are, *on average*, successful, then enterprising lenders realize that there are gains to be made (in an expected sense) and they fill such gaps with loans. Collateral is, more fundamentally, a means to prevent *intentional default* on the part of the borrower.<sup>20</sup> The possibility of lost collateral reduces the incentive to walk away without repaying the loan. The poor lack the wherewithal to put up adequate collateral and therefore are denied loans.<sup>21</sup> In Chapter 7, we discussed a model in detail that incorporates this point.

As we will see in more detail in Chapter 14, the inability of the poor to provide appropriate collateral effectively shuts them out from the formal credit market. Sometimes informal credit sources can step in to fill this gap, because they can accept collateral in forms that the formal sector cannot. The most important of these forms is labor. In increasingly mobile societies, this form of collateral is becoming rarer, because although labor services serve the first function of collateral (which is to provide a backup to the lender in the event of involuntary default), they are only of limited use in the prevention of intentional default.

*Second*, it can be argued that the incentives to repay for the poor are limited, independent of (and in addition to) their inability to put up collateral. To understand this, it suffices to note that each additional unit of money in hand means far more to a poor individual than to a rich individual: this is just the familiar principle of *diminishing marginal utility*. Thus when the time to repay loans comes around, the calculus of whether or not to default on

<sup>20</sup> Thus if the local pawnbroker accepts your greatgrandmother's watch, left to you as a family heirloom, as collateral for a loan, it is not so much that the watch will fetch a good price if you default on the loan. The point is that the watch is valuable *to you*, so that if you are contemplating a default in a situation where you can afford to pay, you will think twice about it.

<sup>21</sup> For a more complete discussion of this issue, see Banerjee and Newman [1994]

the loan is naturally twisted in favor of default. Figure 8.1 shows how this works.

In Figure 8.1, we look at two incomes,  $Y_p$  (for poor) and  $Y_r$  (for rich). Compare the two cases in a situation where the same loan  $L$  has to be repaid. Because the utility function exhibits diminishing marginal utility, it is clear that *utility loss* to the poor from repayment (given by the segment of length  $A$  in the diagram) exceeds the corresponding utility loss to the rich (given by the segment of length  $B$ ).

Of course, it can be argued, in response to this observation, that the assumption of similar loan size is not sensible. Typically, the poor receive smaller loans, which destroys the easy comparability of Figure 8.1. In addition, it can be argued that we are not taking the *costs* of default into account (as we explicitly did in Chapter 5). Perhaps the stakes are higher for the poor: they have more to lose from nonrepayment, particularly in lack of future access to credit.

You could make both these points, and you would be absolutely correct in making them. The poor *do* get smaller loans, on average, and for precisely this reason. It is also possible that the poor have much more to lose from default, but this only reinforces our argument that initial poverty reduces access to the credit market. Indeed it is always in the interest of the lender to assure that loans do not permanently change the economic conditions of his borrower, so that the threat of cutting off *future* credit always has bite.

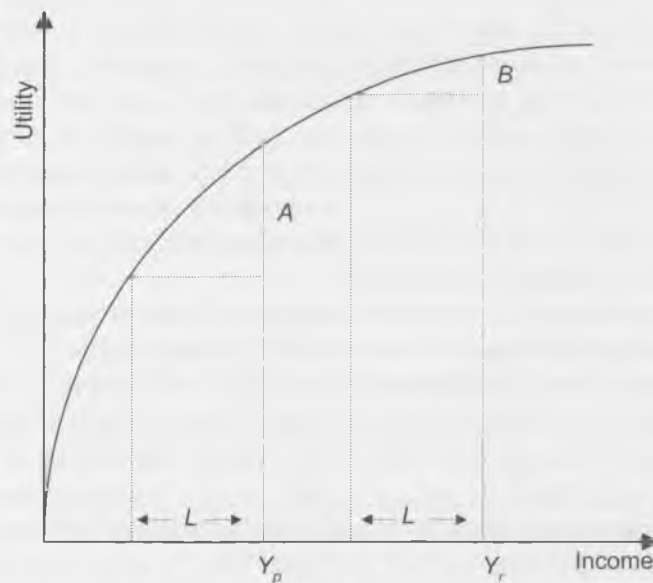


Figure 8.1. Incentives to repay for the poor and rich: a comparison.

We already saw in Chapter 7 that this lack of access implies a loss in national output, because productive opportunities are not being utilized by a properly functioning credit market. To the extent that lenders are unable to capture a share of the returns from these activities (because of the fear of default), they will not lend to allow individuals to exploit these opportunities.

The lack of access to credit market also affects the access of the poor to land tenancy markets. For more on this, see Chapter 12.

### *Insurance*

On the other hand, mutual opportunities of insurance among the poor are perhaps easier to exploit. To see why this informal safety net actually works better under conditions of poverty, it is important to take a quick look at the factors that limit insurance. We take this up in much more detail in Chapter 15, on insurance.

Briefly, then, why do people insure? The reasons are fairly obvious. The future holds risks that we are unwilling to take. Our house may burn down, we may fall sick or be disabled, we may be laid off, we may run over someone in our car, and so on. To *insure* against such contingencies, we typically pay a sum of money, say every year, to an insurance company. The insurance company collects this money, and typically plays no role in your life (apart from trying to persuade you to get other things insured) until one of these bad incidents occurs, say your house burns down. In that case, the insurance company must pay the amount for which you insured your house.

Now consider what is needed for successful insurance. The first feature of all insurance is that the incident against which you are insuring must be *verifiable*, at least to some extent. You will be unable to buy insurance against the possibility that you might be in a bad mood tomorrow. It's not that it's a weird thing to insure against—people have been known to insure far stranger things—but the point is that such outcomes are not verifiable, least of all to the insurance company.

The second feature of successful insurance is that whatever you are insuring against is not subject to *moral hazard*. Moral hazard is an important economic concept that will be studied in detail in Chapters 12–14, but it is easy to convey the main idea. Suppose that I own a personal computer and insure it against damage. Now that I *am* insured, the degree of care that I take to make sure that I do not spill coffee on the keyboard may decrease, because the cost of the damage *to me* has been reduced by insurance. The point is that *there are incidents that you might want to insure against, where the probability of occurrence is influenced by your actions*. This creates a dilemma. Perfect insurance is a good idea in principle, but if it blunts the feeling of re-

sponsibility that people have for their own actions, it might make life very costly for the insurance company, or at any rate for *somebody*.<sup>22</sup>

To avoid moral hazard, then, companies typically retreat from the provision of complete insurance. There are deductibles if you buy a prescription drug or if you spill coffee on the computer keyboard. You typically incur some of the costs if your house is burgled, and if you buy life insurance, companies will not pay in the event of suicide, at least in the first few years of the insurance. The list of restrictions is long and varied.

In developing countries, *formal* insurance schemes are relatively rare. Indeed, on both the above-mentioned counts, there are typically severe problems. With the formal legal system at slow and fairly minimal levels, and with limited powers of verifiability, it is difficult, if not impossible, to obtain formally verifiable accounts of incidents, such as the exact degree of crop failure on someone's land holding. The same lack of information exacerbates issues of moral hazard: it is true that the crop on your land is determined by the vagaries of the weather (which is why you want insurance in the first place), but it is also the case that it can be influenced by how hard you work the land, which is very difficult for an insurance company to control. Moreover, in many cases, what is needed is nonmonetary methods of insurance. Illness in a family might necessitate the provision of care by another resident in the same village or it might require extra labor at the time of harvest. Because of these formidable problems, formal insurance is almost always missing.

We will see in Chapter 14 how these formal schemes are typically replaced by informal schemes at the level of the village community. Village members have access to far better information, and therefore can self-insure as a group in a way that no formal company can replicate.

Of course, the issues of moral hazard still remain. Perfect insurance of idiosyncratic movements in crop output may lead to the underprovision of effort by the family farm. The point is, however, that *these moral hazard problems are likely to be smaller for the poor*.

It is easy to see why. Almost by definition, the opportunity cost of labor for the poor is lower than that of richer people. The poor are more likely to be unemployed or underemployed. Even if this were not true, they are likely to earn lower wages when they are employed and, in general, the cost of their time is lower. This feature, in turn, permits them to credibly supply more effort to the task at hand (such as farming) *without* necessitating a large cutback (or "deductible") in the degree of insurance that they receive. This

<sup>22</sup> A classic example of moral hazard comes from health insurance. The United States is a leading instance of the problem. High levels of insurance create an overuse of the medical system, because patients run to their doctors on the slightest provocation and receive treatments on a scale unparalleled elsewhere in the world. Is this all for free? Of course not. Over time, insurance premiums climb to staggering heights, which creates a situation that is very costly both at the personal and the social level.

low opportunity cost of effort is helped along by the fact that their marginal utility of consumption is very high (see the discussion in the previous subsection). Therefore, even if they are participating in schemes that insure them to a high degree, they will rarely freeload on such schemes. Therefore, when the people involved are poor rather than rich, it is far easier to have informal schemes that involve a large amount of shared labor and effort, as well as transfers of money or grain, to tide over bad times.

We will see more of this kind of analysis—and some caveats as well—in Chapter 15.

### 8.4.2. Poverty, nutrition, and labor markets

#### *Introduction*

We already observed that, even by very conservative estimates, over a billion people worldwide were classified as poor in 1990. We also observed that a large proportion of these individuals are also significantly below adequate standards of nutrition.

The effects of undernutrition vary widely. We have already mentioned outcomes such as muscle wastage, retardation of growth, increased illness, vulnerability to infection, and the diminution of work capacity. In addition, undernourished persons are easily fatigued and exhibit marked psychological changes, manifested in mental apathy, depression, introversion, lower intellectual capacity, and lack of motivation. Life expectancy among the undernourished is low, but the undernourished do not die immediately.

In this section, we study the relationship that exists between a person's nutritional status and his capacity to do sustained work, and we study in Chapter 13 how this relationship creates a vicious cycle in the labor market: poverty leading to undernutrition, hence the inability to work, which feeds back on the incidence of poverty. Thus undernutrition plays a *functional* role apart from being of intrinsic interest. Because undernutrition affects the capacity to work, it affects the functioning of labor markets in a central way.

#### *Energy balance*

To start thinking seriously about this problem, it is useful to examine the simplest story of energy balance within the human body.<sup>23</sup> It has four main components.

1. *Energy input.* The periodic consumption of food is the main source of energy input to the human body. It is also the obvious point where nutrition

<sup>23</sup> The material in this subsection draws on Dasgupta and Ray [1986, 1987, 1990], Ray and Streufert [1993], and Ray [1993].



meets economics. Access to food, in most situations, is the same as access to *income*. In the case of the poor, income chiefly represents returns to labor supply and (to a lesser extent) to nonlabor assets such as small quantities of land.

2. *Resting metabolism.* This is a *significant* proportion of the body's requirements. It represents the energy required to maintain body temperature, sustain heart and respiratory action, supply the minimum energy requirements of resting tissues, and support ionic gradients across cell membranes. For the "reference man" of the Food and Agricultural Organization (FAO), who is a European male and weighs 65 kg, this figure is around 1,700 kcal per day. Of course, the exact number varies significantly with the characteristics of the individual and the ambient environment in which he lives. An important determinant, for instance, is body mass: a higher body mass raises resting metabolism.

3. *Energy required for work.* The second significant component is energy required to carry out physical labor. The FAO's 1973 estimate, applied to their reference man, prescribed 400 kcal per day for "moderate activity." Unfortunately, as Clark and Haswell [1970, p. 11] pointed out, the FAO reference man "appears to be a European weighing 65 kg, and who spends most of his day in a manner rather ambiguously defined, but apparently not working very hard." For the poor in less developed countries, who are subject to hard labor of the most strenuous kind, this may be a somewhat conservative estimate. Although precise estimates are impossible without knowing the kind of work the individual has to perform, it is probably safe to say that the figure is significantly higher than 400 kcal per day.

Clark and Haswell's interesting book contains information on the energy requirements for various types of physical activity, culled from the work of different authors. Thus, in studies of West African agriculture, estimates of calorie consumption vary from 213 kcal per hour for carrying a log of 20 kg, to 274 kcal per hour for hoeing, to 372 kcal per hour for bush clearing, and up to 502 kcal per hour for tree felling. Of course, these are activities that are not (and cannot) be performed continuously over large stretches of time, but the European reference man with his allotment of calories for physical activity might be hard pressed to carry out any of these at minimal levels. The point, then, is clear enough. The labor of the poor is often physical labor, and physical labor requires significant amounts of energy.

4. *Storage and borrowing.* It should be quite obvious by now that, over a period of time at least, we can expect to see some form of balance between item 1, energy input, and the *sum* of the components in items 2 and 3. In the short or medium run, however, excesses or deficits can be cushioned (to some extent) by the human body. An energy deficit is met by running down stores from the body. An energy surplus is partly dissipated, partly stored.

Well-fed people in developed countries worry about the second problem (especially the possibility that energy surpluses may be stored and not dissipated). For the hundreds of millions of people that suffer undernutrition, the real problem is the first: coping with the threat of an energy deficit. A sustained deficit leads to undernutrition, and—ultimately—the breakdown of the body via illness, incapacitating debility, or death.

The point that we need to be aware of—and it is a point that we shall develop in detail in Chapter 13—is that *not only* do labor markets generate income and therefore create the principal potential source of nutrition and good health, but good nutrition in turn *affects the capacity of the body to perform tasks that generate income*. There is a cycle here, and this cycle alerts us to the possibility that in developing countries, a significant fraction of the population may be caught in a poverty trap.

To fix our ideas, ignore for the moment the possibility of borrowing or storage. Figure 8.2 shows the relationship between nutrition and the capacity to perform productive work, which we refer to as the *capacity curve*.

Observe closely the labeling of the axes in Figure 8.2. In particular, the  $x$  axis, which really should be “nutrition,” has been labeled “income.” The implicit assumption here is that all income is spent on nutrition. Nothing of substance is lost by amending this to a more realistic situation where, say, 70% of income is spent on nutrition, but as you’ll see, the exposition is just easier this way. The  $y$  axis is labeled with the vague-sounding phrase “work capacity.” How can we conceptually think about this? The idea is to think of work capacity as a measure of the total number of tasks an individual can perform during the period under review, say, the number of bushels of wheat that he can harvest during a day. The capacity curve is found by

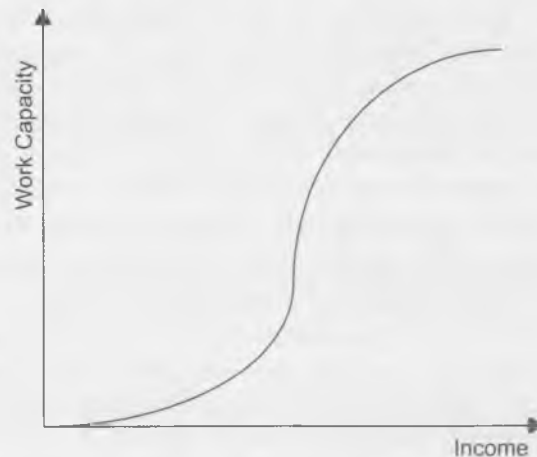


Figure 8.2. The capacity curve.

linking different nutrition (or income) points to the corresponding levels of work capacity that are generated by the individual.

To understand the shape of the capacity curve, ask yourself what happens as we move from left to right along the  $x$  axis; that is, as we increase the amount of income (nutrition) available to the individual. Initially, most of this nutrition goes into maintaining resting metabolism, and so sustaining the basic frame of the body. In this stretch very little extra energy is left over for work (remember again that for the moment, we are ruling out the depletion of body stores of energy). So work capacity in this region is low (close to zero, if you like) and does not increase too quickly as nutrition levels change. Once resting metabolism is taken care of, however, there is a marked increase in work capacity, as the lion's share of additional energy input can now be funneled to work. This phase is followed by a phase of diminishing returns, as the natural limits imposed by the body's frame restrict the conversion of increasing nutrition into ever-increasing work capacity. (The curve probably even turns *downward* after a point, reflecting the usual concerns of the developed world, but we ignore that here.)

#### *Nutrition and work capacity*

The whole point of developing the biological relationship between nutrition and work capacity is to alert us to a line of thought that we will pursue in detail in Chapter 13. Although low incomes create low nutrition, *low nutrition is capable of creating low incomes*. This is the functional aspect of undernutrition: apart from being of social and ethical concern in its own right, it has an impact on the ability to earn. Thus it is not difficult to imagine a vicious circle of poverty in many low-income countries, in which low incomes are responsible for undernutrition, which in turn perpetuates those low incomes.

In Chapter 13, we take up this theme in some detail, but at this stage, it is worth thinking about how the argument may run. Several considerations come to mind.

(1) *If a low-income–undernutrition–low-income circle is possible in poor countries, why is it not possible for some groups of people in rich countries?*

This question pushes us to think about whether the vicious circle that we've described can exist in isolation, independently of whether the economy is rich or poor. The answer is that, in general, it cannot, and the reason has to do with the overall supply of labor.

A labor market is *tight* if the alternatives to working with any particular employer are relatively plentiful and attractive. Standard supply and demand theory tells us that for a labor market to be tight, there must be either a low supply relative to demand *in that market itself* or attractive opportunities in *other* labor markets.

Now, if the labor market is tight, in the sense that we have just described, the returns to work are high even though a person may have low work capacity to start with. The circle cannot be completed. These high returns, in general, permit the individual to consume adequate nutrition and hence raise his work capacity over time. The limits to which a worker's income can be pushed depend not on biological considerations, but on the opportunities available to that worker elsewhere in the labor market. If these latter considerations are salient, then a vicious circle theory based on undernutrition ceases to be valid.

The tightness of particular labor markets in particular countries is an issue that can be settled only by detailed and careful empirical work.<sup>24</sup>

(2) *Can't people simply borrow their way out of the vicious circle?*

This is a subtle issue that we cannot address satisfactorily until we study Chapters 13 and 14, but it is possible to provide some tentative answers. First, the credit market may simply be closed to poor individuals, for reasons that we have outlined in the preceding sections. This is especially true of consumption credit. Moneylenders are often interested in funding tangible production projects or providing working capital for such projects, and consumption loans are difficult to obtain at reasonable terms.

There is a second, more delicate answer. An economy with undernutrition traps of the kind that we are envisaging here may well be Pareto optimal! That is, there may be *no* way (in the short run) to make the undernourished poor better off without some amount of redistribution from the portion of the population with greater access to income and assets.<sup>25</sup> Recall from your introductory economics analysis what Pareto optimality means. It means that there is no way to rearrange endowments, production, and consumption so that all economic agents are simultaneously better off. Pareto optimality sounds very nice, and at some level it is, but it is perfectly compatible with the idea that some people are getting very few of the economic goodies. The best way to understand this is to think of dividing a cake between two people. As long as you aren't throwing any of the cake away, *any*

<sup>24</sup> Take the case of the rural labor market in India, in which the majority of India's labor force participates. There seems to be little doubt that such markets are characterized by large and persistent levels of unemployment, at least for significant fractions of the year. The evidence comes from a number of sources. For example, Krishnamurty [1988] observed from National Sample Survey data that rural unemployment rates were high and increasing in the 1970s, although there was significant interstate variation. Visaria [1981] and Sundaram and Tendulkar [1988] observed, moreover, that for agricultural households that were primarily engaged in the rural labor market, these rates were very high indeed. Mukherjee's thesis [1991] contains a careful review of the relevant literature and, in addition, carries out a detailed study of Palanpur village, which reinforces the foregoing findings. High unemployment is such an accepted feature for researchers studying the Indian case that theoretical analysis of labor markets is often driven by the objective of explaining and understanding this one crucial feature. The excellent survey by Drèze and Mukherjee [1991] of theories of rural labor markets illustrates this point well.

<sup>25</sup> This is the argument made in Dasgupta and Ray [1986].

division is Pareto optimal, including the one in which one person eats all of it.

Pareto optimality has its implications. If an economy is functioning so that its allocation of goods and services is Pareto optimal, then introducing a credit market in which people can borrow to stock up on work capacity cannot have any effect at all! The reason is that for people to lend to such a market, they must register a gain. The people who borrow presumably gain as well. People who do not participate are unaffected.<sup>26</sup> Then the new allocation achieved by the credit market must make some people better off and nobody worse off. This contradicts the postulate that the earlier allocation was Pareto optimal.

This argument relies on the presumption that the initial outcome is Pareto optimal. We will see more of this model in Chapter 13.

(3) *If work capacity affects future work output, won't employers wish to offer long-run contracts that take advantage of this?*

It is unclear that such contracts can be enforced unless there is some *separate* reason why workers want to stay in such contracts (there may well be, as we will see later in the book). It is unlikely that an employer will make a long-run contract with his employee *just* to extract future gains from enhanced work capacity. There is no guarantee that the employee will be around tomorrow: he may work for a different employer, perhaps in a different village; he might migrate. Under these circumstances, the employer might be extremely reluctant to engage in a nutrition-enhancing investment. Second, if a person in good health can be identified by other employers, the market will bid up the wage rate for such an employee. This means essentially that the employee will reap the entire benefit of the employer-financed investment in the form of a higher wage. If this is the case, then why undertake the investment in the first place?

The problem can be overcome if the employee binds himself to a contract that forbids him from working elsewhere in the future even though the terms elsewhere are better, but this has ethical connotations that make it unenforceable by a court of law, and rightly so, from a moral point of view.

(4) *By the way, if such long-run relationships were somehow in place for other reasons, would this have an effect on nutritional status?*

It might, but in a relationship where nutrition is used positively by the employer to build up work capacity on the part of her employee, *there must*

<sup>26</sup> The cautious reader will notice that the argument is a bit slippery here. There may be effects on relative prices that do change consumption allocations for the nonparticipants, but in the simple one-commodity model that we consider in Chapter 13, these claims are true.

be a separate factor, or set of factors, that makes the relationship inflexible in the sense that the employee is costly to replace. Consider three quick examples.

**The slave economy:** Slavery is perhaps the most appropriate example. Slaves were bought, and therefore each act of replacement brought with it a large outlay, apart from the daily costs involved in keeping slaves. Indeed, in the American South, slave prices rose steeply in the decades before the Civil War (Fogel and Engerman [1974, pp. 94–102]). Thus an existing slave had great value to the employer/owner. It turns out that slave diets were plentiful and varied.<sup>27</sup> The diet actually exceeded U.S. 1964 levels of recommended daily allowances for all the chief nutrients. Perhaps more to the point, the calorific value of the average slave diet exceeded that of all “free men” in 1879 by more than 10% (Fogel and Engerman [1974, p. 113]). In addition, the maintenance of the health of slaves was repeatedly emphasized in overseer manuals as a central objective (Fogel and Engerman [1974, p. 117]).

**Industry:** The effect of adequate nutrition on the productivity of workers has been emphasized repeatedly in manuals. The monograph by Keyter [1962] on South Africa, for example, contains many such references and a closing section with fifty-four recipes. This book focuses on industrial feeding, and in so doing squarely addresses the obvious reasons for feeding in the workplace: by changing the composition of wages in this manner, it forces the worker to consume a greater proportion of his wage as food.<sup>28</sup>

**Domestic servants:** This is another good example of a labor market that is likely to be inflexible. Servants are associated with characteristics acquired on the job that make them hard to replace. Not only is the loss of a servant important, but the acquisition of a new servant with minimally acceptable characteristics often results in an arduous training process. We are interested in seeing studies of this market in the Indian context; casual empiricism tells me that such studies would prove quite supportive to our thesis.<sup>29</sup> We refer the reader, instead, to an excellent monograph on the subject by McBride [1976], which cites various housekeeping manuals written for English and French housewives in the nineteenth century. Although McBride found the diet of servants to be generally parsimonious (relative to that of master and

<sup>27</sup> Fogel and Engerman [1974, p. 111] pointed out that among the “plantation products that slaves consumed were beef, mutton, chickens, milk, turnips, peas, squashes, sweet potatoes, apples, plums, oranges, pumpkins and peaches,” in addition to corn and pork.

<sup>28</sup> In this context, see also Rodgers’ [1975] study of some Bihar villages, though in this study the reasons for on-the-job feeding are considerably more ambiguous.

<sup>29</sup> Middle- and upper-class Indian households display an extremely high degree of paternalistic concern regarding the nutrition and medical care available to their servants. Such concern seems particularly out of line with the monetary wages paid to servants. Even though this paternalistic care has been molded by social custom to appear as genuine caring, there is little doubt regarding the fundamental motives behind such behavior.

mistress), more than one manual explicitly suggests means to assure servants a high level of energy. For instance, a popular French manual of the early nineteenth century recommended that servants be made to abandon the traditional Parisian practice of café au lait in the morning and substitute a breakfast of soup made from the meat left over from the previous night, so that the servant would have enough energy to work until 5 p.m. without stopping. Booth's study of life among London laborers concluded that "the quality of food given to domestic servants... is usually very good, and in all but very rare cases greatly superior to that obtainable by members of the working-class families from which servants are drawn" (Booth [1903, Vol. 8]).

#### 8.4.3. Poverty and the household

##### *The unequal sharing of poverty*

One of the great tragedies of poverty is that the poor may not afford to share their poverty equally. Unequal sharing arises fundamentally from the fact that certain minimum amounts of nutrition, care, and economic resources have to be devoted to each person (including each child) in order for that person's life to be productive and healthy. In situations of extreme poverty, equal division of household resources might help no one, because the average amounts are far too small. The potential merit of unequal division is that it helps *some* individuals in the household to be minimally productive under extreme circumstances. This takes us right into the well-known problems of the "lifeboat ethic": a lifeboat can hold only two people and there are three individuals to save. One person must die.

The capacity curve gives us a clear idea of how the nutritional problem serves to promote unequal allocations. Figure 8.3 displays the capacity curve, marked *OAE*. The straight line *OAB* is drawn from the origin so that the line segment *OA* equals the line segment *AB*. The income level corresponding to capacity *B* is denoted by  $Y^*$ . By construction, the income level corresponding to capacity *A* must be  $Y^*/2$ .

Now consider a household of just two persons, and suppose that their capacity curves are identical and given by the curve in Figure 8.3. Suppose that *total household income* happens to be given by  $Y^*$ . Think of two options: the household shares this income equally or one person consumes the entire income.<sup>30</sup> Notice that by the construction of  $Y^*$ , these two options yield exactly the same total work capacity for the household: by similar triangles, the height of *B* must be exactly twice that of *A*.

Suppose, now, that the household has an income lower than  $Y^*$ , say  $Y$  (see diagram). Equal division means that each member gets  $Y/2$  and each

<sup>30</sup> Of course these two extreme options represent an exaggeration. Other intermediate divisions are obviously possible, but we neglect them for simplicity.

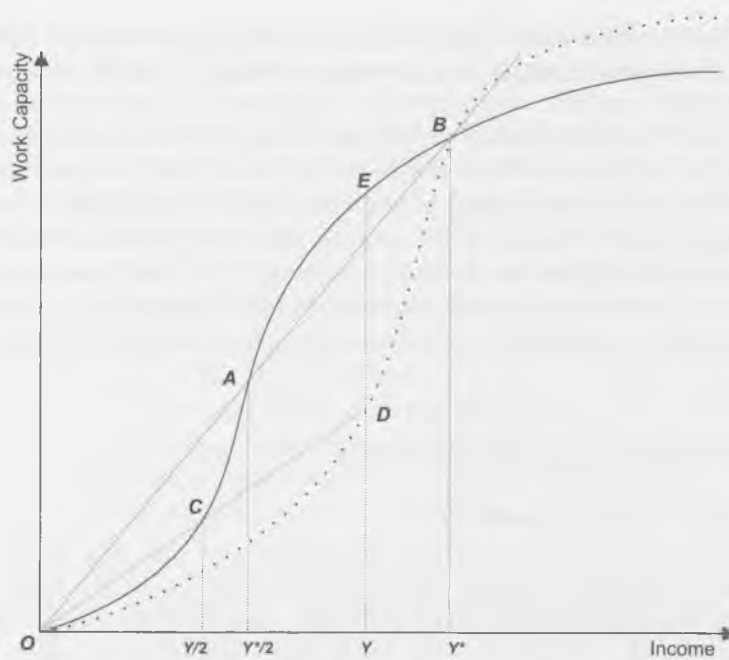


Figure 8.3. The capacity curve and unequal allocation.

person therefore has work capacity equal to the height of *C*. Total household capacity is therefore given by twice this height, which is just the height of the point *D*. Compare this to total household capacity if one person is allocated the entire income for consumption: it is the height of the point *E*, which is greater. It follows that at incomes below the critical threshold  $Y^*$ , *unequal consumption allocations create greater household work capacity than equal allocations*. To the extent that increased household capacity is good for future income-earning potential, we have a dilemma here.

In contrast, at household incomes above the threshold  $Y^*$ , equal division does better than unequal division. The dotted curve *ODB* was constructed from the capacity curve: it tells us what household capacity is when household income is divided equally. It lies *below* the individual capacity curve until the point *B* and then rises above it.

This argument suggests why poverty is correlated with unequal allocation. Note well the culprit: it is the “convex” section of the capacity curve, which captures the fact that certain minimal amounts are required as nutritional input before productivity gains kick in. Without this section, equal allocations would always be preferable.<sup>31</sup>

One reaction to this argument is that it is unrealistic: it is absurd to imagine that in the interests of maximizing household capacity, one person

<sup>31</sup> For more detailed analysis along these lines, see Mirrlees [1976] and Stiglitz [1976].



will be left to starve. This is certainly not the lesson that I want you to take away: the extremity of the result arises from the simplicity of the model. There are several reasons why the extreme unequal outcome may not come about, not the least among them being that each family member is loved and cherished. However, the situation creates a *tendency* toward unequal treatment to the extent that the income-earning potential of the household is an issue of some concern.

One common solution to the lifeboat problem is to draw lots: this has at least the virtue of being egalitarian *ex ante*. Drawing lots is not an entirely absurd proposition: providers of emergency care in a major disaster effectively do it all the time. However, we are talking here not about a sudden disaster, but about an ongoing process of nutritional development (so that drawing and redrawing lots on a daily or weekly basis has the same effect as equal consumption). Thus the targets of discrimination are established once and for all: certain individuals may be *systematically* denied nourishment and medical care, so that scarce resources can be better focused on some remaining subset of family members.

#### *The receiving end*

Who are the individuals who are so denied? They are typically females, both adults and children, and—the presumed harmonies of the extended family notwithstanding—the old and the infirm. Why the old should be so treated is perhaps relatively easy to understand, especially in the light of the preceding model: nutrition and medical care serve a functional role apart from being ends in themselves. They provide the foundation for income-earning capabilities in the future. The old are in less of a position to provide these capabilities. To the extent that income-earning objectives are internalized in the social dynamics of the family, the elderly will be discriminated against. That is, no *one* individual needs to make these hard decisions, but the discrimination will nevertheless manifest itself in the actions of every family member—perhaps even the elderly themselves.

Consider widows. Rahman, Foster, and Mencken [1992] studied mortality rates for widows in rural Bangladesh, and Chen and Drèze [1992] carried out a related study for several villages in northern India. The loss of a husband can be devastating in economic terms unless the widow owns assets such as land, although here too matters are complicated, because the possibility of land loss can in turn depend on widowhood (Cain [1981]). As Chen and Drèze [1992] observed, “the basic problem is not only that a widow often depends on other household members to survive, *but also that these other household members typically do not depend on her for anything essential*” (Italics added for emphasis).

Table 8.6. Age-specific death rates for widows in rural Bangladesh.

| Age group    | Mortality rate (deaths per 100 person-years) |             |                           |                             |   |
|--------------|--|-------------|---------------------------|-----------------------------|---|
|              | Currently married women                      | All widows  | Widows heading households | Widows in HH headed by sons | Widows not in HH headed by self or sons |
| 45-54        | 0.89   | 1.36        | 1.68                      | 1.15                        | 1.63                                    |
| 55-59        | 1.78   | 2.06        | 2.21                      | 2.13                        | 1.23                                    |
| 60-64        | 3.10   | 3.83        | 2.42                      | 3.86                        | 5.84                                    |
| 65-69        | 3.81   | 5.56        | 5.20                      | 5.15                        | 8.27                                    |
| 70-79        | 9.43   | 9.99        | 8.63                      | 9.88                        | 11.67                                   |
| 80+          | 9.38   | 17.50       | 15.04                     | 17.66                       | 18.52                                   |
| <b>Total</b> | <b>1.87</b>                                  | <b>5.29</b> | <b>3.75</b>               | <b>5.37</b>                 | <b>7.59</b>                             |

Source: Rahman, Foster and Mencken [1992] and Chen and Drèze [1992].

Table 8.6 shows how age-specific death rates vary with widowhood in rural Bangladesh. The results are striking. Overall death rates jump by a factor of close to 3 if a woman is a widow, rather than currently married. In this group, widows who are heads of households do relatively better than the average for all widows. Widows living in households that are not headed by themselves or by one of their sons do particularly badly,<sup>32</sup> and the explanation for this cannot rest on the hypothesis that such households are, for some reason, intrinsically poorer than other households: there is no evidence that households with a widow have lower per capita expenditures than households without one (Drèze [1990]).

Observations such as these are not restricted to widows alone. In the context of medical care, Kochar's [1996] study of extended families in South Asia found that medical expenditures on the elderly vary systematically (and inversely) with measures of their earnings ability, which implies that the role of the household as a *production unit* looms large when nutritional or health expenditure allocations are made. This bias is reflected not only in smaller allocations of medical expenditures to elders *relative* to the expected incidence of illness in higher age groups, *but sometimes in absolute terms as well*.<sup>33</sup>

Once we accept the argument that intrahousehold allocation has functional as well as intrinsic motives, the phenomenon of discrimination against the elderly is easy to understand. It is somewhat more difficult to appreci-

<sup>32</sup> To be sure, the fear of being without a son for support may in turn impact on fertility decisions earlier on, and this may account in part for high fertility among groups known to discriminate against widows (see Chapter 9 for more on this).

<sup>33</sup> The problem is exacerbated in the presence of women and children, who accentuate the trend in allocation away from the elderly. The analysis is complicated, however, by the puzzling observation that savings are more likely to be run down for the treatment of the elderly than for young males, after controlling for the severity of the illness. Kochar's paper contains an insightful discussion of the possible causes of this seeming anomaly.

Table 8.7. Calorie intakes and requirements by sex in rural Bangladesh (1975-76).

| Age<br>(years) | Male              |                        | Female            |                        |
|----------------|-------------------|------------------------|-------------------|------------------------|
|                | Calorie<br>intake | Calorie<br>requirement | Calorie<br>intake | Calorie<br>requirement |
| 10-12          | 1,989             | 2,600                  | 1,780             | 2,350                  |
| 13-15          | 2,239             | 2,753                  | 1,919             | 2,224                  |
| 16-19          | 3,049             | 3,040                  | 2,110             | 2,066                  |
| 20-39          | 2,962             | 3,122                  | 2,437             | 1,988                  |
| 40-49          | 2,866             | 2,831                  | 2,272             | 1,870                  |
| 50-59          | 2,702             | 2,554                  | 2,193             | 1,771                  |
| 60-69          | 2,569             | 2,270                  | 2,088             | 1,574                  |
| 70+            | 2,617             | 1,987                  | 1,463             | 1,378                  |

Source: Sen [1984, Table 15.3].

ate how a similar burden falls on females, both adults and children. Unless we believe that men are more fit than women for tasks of various sorts, we cannot make the case for discrimination against women on the basis of the lifeboat argument *alone*. Intrahousehold discrimination against females reflects the larger context of gender bias. Suppose, for instance, that women provide household tasks while men earn income. If household tasks are not properly monetized in the psychology of household resource allocation, then the lifeboat argument applies and we would expect to see discrimination in resource allocation against women. Likewise, even if women and men are both engaged in monetary employment, but wages to women for comparable work are lower, this will bias resources away from women.

The issue is made more complex by the question of how to measure nutritional deprivation. It may not be enough to simply observe that women receive less nutrition than men: the question is whether they receive less nutrition relative to their requirements. The evidence on this matter is not as clear-cut as you might expect. For instance, the Institute of Nutrition and Food Science (INFS) conducted a sample survey of nutritional intake by household in rural Bangladesh.<sup>34</sup> They also used notions of "requirement," namely, the age- and sex-specific recommendations of the FAO/WHO Expert Committee (1973). Table 8.7 summarizes some of the INFS observations on calorie intake.

The table is interesting on two counts. First, the second and fourth columns tell us that females receive systematically lower nutrition in *all* the age groups surveyed (and the age classification is pretty fine). The intake shortfall varies from a minimum of 11% (in the youngest age group) and rises to a high of 44% in the 70+ category (in line with the observations on widows made earlier).

<sup>34</sup> This discussion is drawn from Sen [1984, Chap. 15].

Second, and in contrast to the first observation, if the shortfall is measured relative to stated *requirements*, this discrepancy goes away. A deficit remains relative to requirements at the two youngest age groups, but there is a deficit for males as well. This raises the question of just what requirements are and how they are measured. Apart from considerations of body mass, do they presume different sets of tasks performed by men and women? In addition, how is it that the energy use of these tasks is accurately estimated without pinning down a set of tasks completely? As Sen [1984, p. 351] observed, "...there are good reasons to dispute the assumptions about the energy use of activities performed by women, which are not as 'sedentary' as calorie calculations tend to assume. Also the extra nutrition requirements of the pregnant women and lactating mothers require fuller acknowledgement." Measuring shortfalls relative to some arbitrary notion of "requirement" can be dangerously misleading.

Thus gender bias may or may not be directly manifested in consumption-requirement ratios, as far as nutrition is concerned. We may have to probe deeper. Very different sorts of allocation decisions may be at work, even those that do not have any direct opportunity costs. A female child may not be taken to a clinic when she is ill even if medical services are free. The cost of taking the child is *not* the cost of medical care, but possibly the implied cost of dowry if the child survives to maturity. A female child may not be given education or her education may be neglected simply because education of female children is not expected to pay off in larger incomes for *that* household (and it may not lower the cost of a dowry either). The box on sibling rivalry in Ghana is an example of research that looks for direct indicators such as these. Finally, sex-based differences in infant mortality may take care of a large amount of discrimination: the *survivors* may be treated relatively equally, but in looking for this we fail to count the dead.

These problems are magnified when we lack direct data on intrahousehold allocation and have to make do with indirect evidence. Deaton [1994] discussed one such method: to look at household consumption of certain "adult goods" (such as tobacco) and relate this to the proportion of girls in the household (controlling for total number of children). If there is consumption discrimination against girls, this should be reflected in an overall increase in adult consumption as the composition of children shifts in favor of females. Deaton [1989], Subramanian and Deaton [1991], Ahmad and Morduch [1993], and Rudd [1993], among others, took this interesting methodology to the data. No clear-cut findings were made, even in areas where other indicators of discrimination (such as sex ratios) were positive. Deaton [1994] observed that "it is certainly something of a puzzle that the analysis of expenditure patterns so consistently fails to show strong gender effects even when they are known to exist."

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*Sibling Rivalry: Evidence from Ghana*

As in many other low-income economies, parents in Ghana often invest less in the human capital of their daughters than their sons. Primary school enrollments are fairly even, but by secondary school only 28% of females between age 16 and 23 attend school, whereas 42% of boys are enrolled.

A study by Garg and Morduch [1997] explored how economic constraints exacerbate gender differences in Ghana. The starting point for this study is that even if parents desire to invest a given amount in their children's human capital, they may lack the personal resources to do so, and even if expected returns are high, parents may find it difficult to borrow for such long-term investments. Children must then compete with their siblings for the resources currently available to parents. Boys have an advantage in this competition if parents perceive higher returns to this investment. If the total number of their siblings is held constant, children with fewer brothers also may get more resources than they would otherwise.

The Garg-Morduch study supports this hypothesis in the case of Ghana. For instance, the study shows that children aged 12-23 with three siblings are over 50% more likely to attend middle or secondary school when all three of their siblings are sisters than when the three are brothers. The effects are similar for boys and girls and for other sibling groups. Similar results hold for health outcomes as well. The study is consistent with the idea of "sibling rivalry" caused by parents' difficulty in borrowing to make human capital investments in their children. The study illustrates the importance of considering issues of gender within the context of markets and institutions available to households. The results suggest that improving financial systems can have important indirect benefits for the health and education of children in Ghana.

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What we have learned so far is that there are dimensions along which females are discriminated against, but the obvious indicator of discrimination—nutrition—does not hold up well unless we have a precise notion of requirements. There is the additional problem that direct intra-household data are hard to obtain. Where they do exist—as in the Ghana study described in the box—and where data are collected on outcomes other than nutrition, such as medical care and education, there is clear evidence of discrimination against girls (see also Subramanian [1994]).

We must, therefore, seek to supplement this sort of research with indicators of differential educational attainment, direct anthropometric indicators of differential nourishment, or indicators of differential mortality and morbidity. These indicators are not without problems either,<sup>35</sup> but they serve as

<sup>35</sup> Kumar [1991], in his insightful study of Kerala, noted that the incidence of illness in that state of India far exceeds the national average. This is especially true of diseases such as tuberculosis. Does this prove that Kerala is the sickest state in India? It does not. Data on morbidity, or the incidence of illness, combine two features: the *actual* incidence of illness, which is not observed by the researcher,

another route to understanding the relationship between poverty and intra-household allocation.

Consider educational attainment. The *World Development Report* (World Bank [1996]) noted that for low-income countries as a whole, there were almost *twice* as many female illiterates as there were males in 1995 (the illiteracy rates were 45% for females and 24% for males). This disparity is echoed by enrollment figures: in low-income countries taken together, male enrollment in primary schools exceeded female enrollment by over 12%, and the difference exceeded 30% for secondary schools.<sup>36</sup> Note well that these are averages for the countries as a whole. To the extent that the relatively rich in these countries are free of the resource constraints that lead to discrimination, the corresponding figures for the poor in these countries must be more dramatic still.<sup>37</sup>

Consider sex ratios: estimates of female-to-male population in the developing world. In North America and Europe, the life expectancy of women is somewhat longer than for men. The roots of this difference are unclear: they may be biological, but there are also possible social and occupational factors at work. The average ratio of female-to-male population in these countries is around 1.05; that is, there are approximately 105 females for every 100 males. Figure 8.4 displays the corresponding sex ratios for many developing countries. The first panel shows the African data, the second shows the data for Asia, and the last panel shows the data for Latin America. It is evident that the problem of low female-to-male ratios is predominantly an Asian problem. The figure for Asia is peppered with data points in the range of the mid-90s, and there are several instances that are lower still.

These differences imply enormous *absolute* discrepancies. If the ratio of females to males is 93 (for every 100 males) in India, and India has approximately 440 million males (United Nations [1993]), then about 30 million women are unaccounted for in India *alone*.<sup>38</sup> Thus sex ratios around 95 or so represent *prima facie* evidence of substantial discrimination, which might

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and its *perception* (which includes reporting the illness). Kerala, with its higher rates of education and literacy, may do very well on the latter, thus raising observed morbidity. The same ideas can be applied to the use of morbidity as a test for discrimination between boys and girls. If girls fall ill more often but the illness goes unreported, morbidity rates might look much lower for girls.

<sup>36</sup> These figures are for 1993.

<sup>37</sup> For middle-income countries these discrepancies begin to fade, at least in the aggregate terms of measurement used by the World Bank. Nevertheless, male rates of illiteracy are consistently lower than their female counterparts.

<sup>38</sup> This is the case if we adopt the counterfactual scenario that there "should be" 440 million males as well. There are two reasons why the number 30 million is probably an *underestimate*. First, there are also males who died in infancy or childhood because of high rates of child mortality (of course, the additional female count so implied would not all be attributable to discrimination). Second, the counterfactual assumes a 1:1 parity: if the European or North American figures are taken as a benchmark, then the number of missing females would be higher still. On these and related matters, see, for example, Coale [1991], Coale and Banister [1994], Klasen [1994], and Sen [1992].

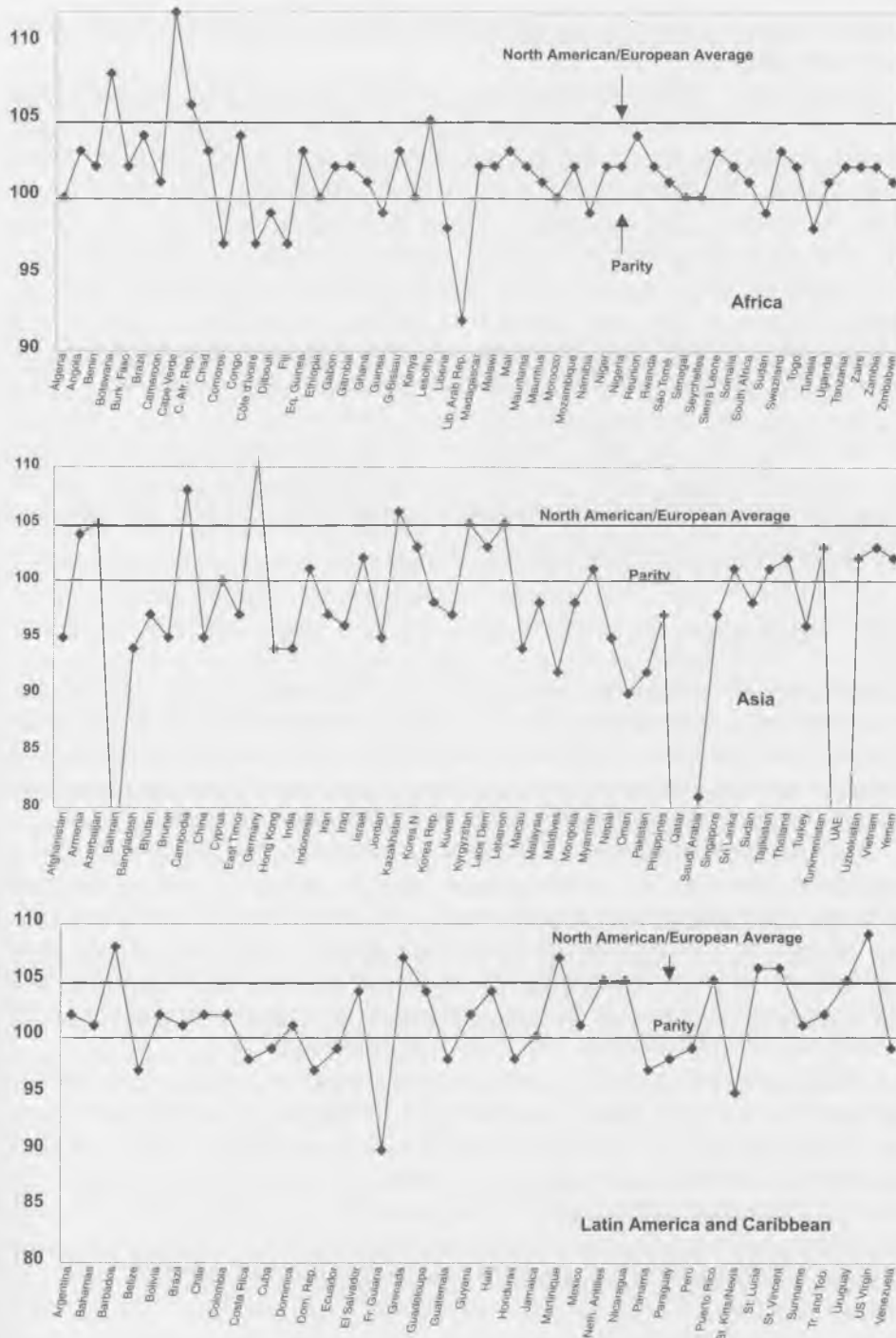


Figure 8.4. Sex ratios (females per 100 males) in the developing world. Source: United Nations Secretariat [1996].

include neglect in infancy or childhood (leading to death) or practices such as sex-selective abortion.

The relative absence of skewed sex ratios in Africa makes an interesting point. As we've noted before, poverty *alone* cannot be responsible for the gender biases that we do see in Asia, although poverty serves to reinforce these biases. The overall social context of discrimination also plays a role. Take, for instance, the institution of dowry. Families might react to dowry by resorting to sex-selective abortion, female infanticide, or discriminatory neglect during the infancy of a girl (which amounts to infanticide). Boys are preferred because they are a source of income and support; girls are not because they impose costs. Nevertheless, *once* a girl survives there may be less evidence of discrimination in matters of nutrition and medical care. After all, the costs, say, in terms of the potential for marriage, are only enhanced in the absence of this care. Testing for gender discrimination is therefore a complicated issue, and it may be unevenly manifested through various potential channels. There is no reason to expect that all ways and forms of discrimination will be equally in evidence.

### 8.5. Summary

Poverty, just like inequality, has intrinsic as well as functional aspects. We are interested in poverty in its own right, as an outcome that needs to be removed through policy, but poverty also affects other forms of economic and social functioning. It creates inefficiencies of various kinds and can exacerbate existing forms of discrimination, such as those against women.

We first studied issues of *poverty measurement*. The measurement of poverty is based on the notion of a *poverty line*, which is constructed from monetary estimates of minimum needs. We noted several problems with the concept even at this fundamental level: should income or item-by-item expenditure be used to identify the poor, are notions of the poverty line "absolute" or "relative," is poverty temporary or chronic, should we study households or individuals as the basic unit, and so on.

We then turned to well-known poverty measures: among these are the *head-count ratio*, which simply measures the fraction of the population below the poverty line. The head-count ratio is a popular measure, but it fails to adequately account for the intensity of poverty. In particular, a planner who uses the head-count ratio as a political yardstick for poverty reduction will be tempted to target the segment among the poor who are very close to the poverty line (and who are arguably not in the greatest need of help). To remedy this shortcoming, we can use measures such as the *poverty gap ratio* or the *income gap ratio*, which look at the total shortfall of poor incomes from the poverty line and express this shortfall as a fraction of national income (as in the poverty gap) or as a fraction of the total income required to bring



all the poor to the poverty line (as in the income gap ratio). These measures add to the information contained in the head count, but have their own drawbacks: in particular, they are indifferent to the *relative deprivation* of the poor (see the Appendix to this chapter for more).

We then described some of the characteristics of the poor. Even going by conservative estimates, such as India's poverty line applied to the world as a whole, we see that in 1990, over 600 million people were poor. Poor households tend to be large (though there are some qualifications attached to this statement) and they are overrepresented by female heads of households. Rural areas tend to display more poverty. Poverty is highly correlated with the absence of productive asset holdings, such as holdings of land. Poverty is correlated with lack of education, and there is an intimate connection between nutrition and poverty, although nutrition levels do not seem to rise as quickly with household income as we might suppose a priori.

The fundamental implication of poverty is that the poor lack access to markets, most notably the markets for credit, insurance, land, and labor. We discussed how the absence of collateral restricts access to credit markets and how problems of moral hazard and incomplete information restrict access to insurance. We then began a study of imperfect access to the labor market (the threads of this story will be taken up again in Chapter 13). The basic idea is that poverty and undernutrition affect *work capacity*. The relationship between nutrition and work capacity can be expressed through the use of a *capacity curve*. The capacity curve creates the possibility of a low-income undernutrition *trap*. Just as low incomes are responsible for low levels of nutrition, low levels of nutrition work through the capacity curve to diminish earnings. We argued that the existence of such a trap is far more likely in countries that have low per capita incomes overall (because of labor supply effects), that it is difficult to borrow one's way out of an undernutrition trap (lack of access to credit is again relevant here, though not necessary), and that long-run contracts may not spontaneously come into play to overcome the undernutrition trap, although examples of long-run relationships that have an effect on the trap do exist.

Finally, we turned to the relationship between poverty and resource allocation *within* the household. We argued that extreme poverty promotes unequal treatment within the household, because of a "lifeboat problem": certain minima are needed for people to lead a productive life, and equal treatment may simultaneously deny everyone those minima. We showed how inflexible minima are unnecessary to derive this result by using the capacity curve to analyze an intrahousehold allocation problem. We then asked the question, Which subgroups are on the receiving end of such unequal treatment (when it occurs)? The elderly (notably widows) are among such groups. Females are generally on the receiving end as well, although this phenomenon requires more careful exploration. In particular, observations

of actual nutritional treatment of *surviving* females do not reveal the same sorts of disparities as those implicit in skewed sex ratios, suggesting that much of the discrimination occurs through active neglect leading to death in infancy or perhaps practices such as sex-selective abortion. However, some other indicators of unequal treatment, such as access to education, certainly reveal more pronounced evidence of gender bias even among surviving children.

### *Appendix: More on poverty measures*

Poverty lines suggest that there is some sort of magic threshold to poverty: people below the line are poor, whereas people above the line are not. Quite apart from the serious conceptual difficulties associated with this, there are operational problems as well. Policy makers who have an incentive to reduce poverty as measured by the head count may not cater to the poorest, but rather only to those who are easily nudged above the line. The poverty gap measure gets around this to some extent, but problems remain. Consider a natural application of the Pigou-Dalton transfer principle to the measurement of poverty:<sup>39</sup>

*Weak Transfers Principle.* A transfer of income from any person below the poverty line to anyone less poor, while keeping the set of poor unchanged, must raise poverty.<sup>40</sup>

This sounds innocuous, but as we have seen in the text, *both* the head-count ratio and the poverty gap (or the income gap) fail to satisfy this criterion. Is this just nitpicking or are there real-world phenomena that correspond to these conceptual problems? The *World Development Report* (World Bank [1990, Box 2.2]) discussed the effect of an increase in rice prices on poverty in Java, Indonesia, in 1981. Many poor households are farmers: they are net *producers* of rice, so the price hike presumably helped them, and indeed, the head-count index of poverty fell. However, this masks another phenomenon: many of the *poorest* people are not rice producers but landless laborers or farmers with other sources of income. They are net *consumers* of rice and they are adversely hit. Measures of poverty that are "transfer sensitive" could pick up this change, whereas traditional measures register a decline in poverty.

The best known measures that address the distributional underpinnings of poverty is the class proposed by Foster, Greer, and Thorbecke [1984]. The

<sup>39</sup> This is the approach to poverty pioneered by Sen [1976]. A discussion of the poverty index developed by him can be found in Foster [1984].

<sup>40</sup> This is called the *weak transfers principle* because it restricts consideration of transfers to those occurring between poor people. For more discussion on this matter, consult Foster [1984].

idea is very simple. Look at a variant of the poverty gap ratio in equation (8.2), given by

$$(8.4) \quad \text{PGR}' = \frac{1}{n} \frac{\sum_{y_i < p} (p - y_i)}{p},$$

which is just the sum of all individual poverty gaps, expressed as a fraction of the poverty line, and then divided by the total number of people in the society. Distributional sensitivity is achieved by raising the poverty gaps to a power, much as we did in our discussion of the coefficient of variation as a measure of inequality. For any power  $\alpha$ , define a class of poverty measures, called the *Foster-Greer-Thorbecke* (FGT) class, by

$$(8.5) \quad P_\alpha = \frac{1}{n} \sum_{y_i < p} \left( \frac{p - y_i}{p} \right)^\alpha.$$

As we vary  $\alpha$  over different values, we obtain interesting implications. First note that for  $\alpha = 0$ , the measure  $P_0$  is just the head-count ratio. For  $\alpha = 1$ , the measure  $P_1$  is the poverty gap ratio in (8.4). As  $\alpha$  rises beyond 1, larger poverty gaps begin to acquire greater weight and the measure becomes increasingly sensitive to these gaps and, therefore, to questions of distribution, such as those raised by the Java price hike.

The case  $\alpha = 2$  is of separate interest. With some manipulation, we can show that

$$(8.6) \quad P_2 = \text{HCR}[\text{IGR}^2 + (1 - \text{IGR})^2 C_p^2],$$

where HCR is the head-count ratio, IGR is the income gap ratio, and  $C_p$  is just the coefficient of variation among the set of poor people (see Chapter 6 for a definition). This is a very useful way to see the FGT index for  $\alpha = 2$ . It tells us that when there is no inequality among the poor, poverty can be captured by some simple function of the head-count ratio and the income gap ratio alone, but the presence of inequality raises poverty. To see this, imagine that the Lorenz curve of incomes among the poor worsens, while both the head-count ratio and the income gap ratio are kept unchanged. Then, because the coefficient of variation is Lorenz-consistent,  $C_p$  will rise and the FGT index will rise as well.

There is another reason why the case  $\alpha = 2$  is of interest. It marks the boundary between poverty measures that not only satisfy the transfer principle, but satisfy what one might call *transfer sensitivity*:

**Principle of Transfer Sensitivity.** *A given regressive transfer between two poor people must matter more if both (starting) incomes of the persons involved are reduced equally.*

It can be checked that the transfer-sensitivity principle is satisfied if and only if  $\alpha > 2$ . At  $\alpha = 2$  the FGT index is just about insensitive to the principle.

The FGT family of poverty measures also satisfies a convenient decomposability property. Suppose we are interested in how much overall poverty in a country is contributed by various subgroups: for instance, we may be interested in looking at poverty across women and men or across various ethnic groups.<sup>41</sup> It would be useful if these "subgroup poverty measures," appropriately weighted by the numerical strengths of the groups, summed to the total poverty as measured by the same index. The FGT indices have this property (see Foster, Greer and Thorbecke [1984] for a more extended discussion).

### Exercises

■ (1) Is poverty an absolute concept or a relative concept? There are clearly some components (such as access to food, clothing, and shelter) that we would consider necessary in any society, but there are other components that are clearly society-specific.

(a) Identify some components of "minimum needs" that you feel are specific to one society but not another.

(b) Do you think these relative components are purely social (or cultural) or are they apt to change with the per capita income of a country?

(c) Because poverty has these relative components, consider the following poverty measure: anybody who has less than half (or some predetermined fraction) of the per capita income of a society is poor. Why is this a bad approach to poverty measurement?

(d) Try and identify some basic "capabilities" that you might want any human being to have: for example, every person should be capable of obtaining adequate nutrition, every person should be capable of obtaining "adequate" housing, means of transportation, and so on. Treat the right to such capabilities as absolute. Now can you reconcile the relative and absolute notions of poverty using these absolute capabilities as a starting point? On these and related matters, read Sen [1985].

■ (2) Read the 1990 *World Bank Development Report* to see how international poverty calculations are carried out. In the light of question (1), how would you evaluate such calculations? Study the *Report* for a clear account of the characteristics of the poor and for additional material on poverty not contained in this text.

<sup>41</sup> See, for example, Anand [1977].

■ (3) Evaluate the following statements by providing a brief explanation or analysis.

(a) The income gap ratio and the head count, as measures of poverty, may lead to very different uses of antipoverty resources by policy makers.

(b) World poverty shows a steadily diminishing trend all through the 1970s and 1980s.

(c) The poverty gap ratio and the income gap ratio focus attention on different aspects of the poverty problem.

(d) Both the poverty gap ratio and income gap ratio are insensitive to the inequality among the poor.

(e) The FGT indices (see Appendix) are increasingly sensitive to the income distribution among the poor, the greater is the value of  $\alpha$ .

■ (4) Suppose that you are comparing two economies, *A* and *B*. The FGT indices (with  $\alpha = 2$ ) for the two countries are the same. However, the head-count and the income gap ratio are both higher for economy *A* than for *B*. What can you say about the coefficient of variation of income distribution among the poor in these two economies? What about the inequality of the *entire* income distributions in these two economies?

■ (5) Explain why a moneylender who relies on future credit cutoffs to enforce loan repayment today will be less willing to advance loans to a poor individual for projects that guarantee future income security. Discuss the role of collateral in obtaining such loans.

■ (6) Discuss the capacity curve and explain why the curve has an initial segment in which work capacity exhibits increasing returns with respect to nutritional input. In Chapter 13, we will discuss the implications of this in more detail, but the following exercise will provide you with some advance intuition.

Suppose that you need 8,000 units of work (in capacity units) to be performed, and you can hire all the laborers that you want. Assume that all income earned by the laborers is paid to them by you, and that all income is spent on nutrition. The capacity curve for each laborer is described as follows: for all payments up to \$100, capacity is zero and then begins to rise by 2 units for every additional dollar paid. This happens until an income of \$500 is paid out. Thereafter, an additional dollar paid out increases capacity by only 1.1 units, until total income paid is \$1,000. At this point additional payments have no effect on work capacity.

(a) Assume that you would like to get your work done at minimum cost. Describe how many laborers you would hire to get your work done and how much you would pay each of them.

(b) Redo the exercise assuming that capacity is zero for all payments up to \$275, then follows exactly the same rules for additional dollars paid as in the original problem. Interpret your answer.

■ (7) Consider the same capacity curve as in problem (6a). Suppose that a family of five members each have this capacity curve. Assume that this family has access to a source of nonlabor income, valued at \$400. Assume furthermore that each unit of capacity can fetch an income of 50 cents, and that all income is spent on nutrition. We are going to examine the division of income among the family members.

(a) Show that if all nonlabor income is divided *equally* among the family members, then no one will be able to sustain any work capacity so that labor income will be zero.

(b) Find allocations of the nonlabor income that give rise to positive wage income. Compare and contrast these allocations with the equal division allocation, using various criteria (including Pareto-optimality).