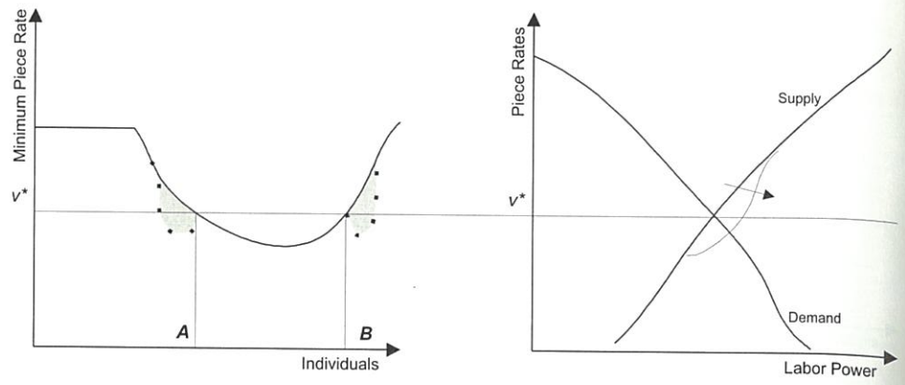

Figure 13.11. Market equilibrium.

the individuals to the left of A, who are unemployed not because they are unwilling to work, but because they are *unable* to work at the going piece rate (their resulting incomes are not high enough to reproduce the needed work capacity). We can call them *involuntarily unemployed*.[8] Of course, you should not take this type of unemployment completely literally. Perhaps such individuals can work in the short run. The point is that the going wage rate does not allow them to carry out sustained work over time without seriously impairing their health and physical strength. For more on these matters, see the next section.

We can use this model to analyze the effects of changes in the distribution of wealth holdings. In the case considered here, this is tantamount to looking at land reforms, in which land is taken away from those who have a lot of it and given to those who have none or little of it. Certainly, such land reforms hurt those who lose land and benefit those who gain it; that is only to be expected. However, we can say something about what happens to *total* output as a result. To see this, refer to Figure 13.11 once again. Suppose that land holdings are transferred from the landed gentry just to the right of B to the involuntarily unemployed just to the left of A.

There are two immediate effects of this transfer. First, the beneficiaries of the reform become "more able" to work at the going market rates of remuneration. That is, their minimum piece rates come down, because their nonlabor income has increased. Second, the losers of land become more willing to work, because their nonlabor income has decreased, so their minimum piece rates decline as well! Thus land reform has the effect of bringing down

[8] We need to motivate this term with some more care. Involuntary unemployment usually refers to the nonidentical treatment of *identical* individuals in the labor market. If we want to split hairs, we can argue that people to the left of A are not identical to people *at* A (their nonlabor incomes are different). That's true, but they are ever so slightly different, whereas the consequent impact on their labor market performance is large. The classical notion of involuntary unemployment can be extended to encompass this discontinuity (see Dasgupta and Ray [1986]).

the minimum piece rate for all who are directly affected by the reform. This is shown in Figure 13.11 by the dotted bulges that appear to the left of A and to the right of B.

What is the effect on labor supply? Well, at the going piece rate depicted in the diagram, labor supply must *increase*, because there are some more people who are able to work and there are more people who are willing to work. This is shown by the dotted shift of the labor supply curve in the right-hand panel of the diagram.[9] It follows that equilibrium labor use must go *up*. This, in turn, implies that total output in the economy must increase.

So a judicious land reform has the power to increase overall output in the economy. Such reforms have three effects. First, the unemployed become more attractive to employers as their nonwage income rises. Second, those among the poor who are employed are more productive to the extent that they, too, receive land. Finally, by taking away land from the landed gentry, their reservation wages are lowered, and if this effect is strong enough, this could induce them to forsake their state of voluntary unemployment and enter the labor market. For all these reasons, the number of employed labor units in the economy rises and pushes the economy to a higher output equilibrium.

I reiterate: in the presence of widespread undernutrition, land reforms may be judged desirable for their own sake. However, there is a separate, functional implication as well, and this is what I have chosen to emphasize here. There is no necessary conflict between equality-seeking moves and aggregate output in a resource-poor economy.[10]

13.4.2. Nutrition, time, and casual labor markets

Writing in 1943, Paul Rosenstein-Rodan observed that one of the fundamental features of labor markets that lack contractual structure is its neglect of possibly beneficial externalities. The example that he stressed was on-the-job training. Firms that impart on-the-job training to their workers not only contribute to their own profits, but raise the level of skills and proficiency throughout the economy.

The problem is that more often than not, firms fail to capture the *entire* benefit of their training activities. After all, workers might change jobs. This leads to an externality. On-the-job training requires substantial upfront investments in the worker, with no guarantee that the worker will be around

[9] The supply curve may not shift out at *every* piece rate because for some other rates the land reform may have no effect on the set of people in the labor market.

[10] It is worth noting, however, that total employment of *people* may *not* rise with a land reform, even though the total number of units of labor power employed must increase. There is a "displacement effect" at work, whereby newly productive workers are capable of displacing previously employed, less productive workers. However, as shown in Dasgupta and Ray [1987], a comprehensive land reform, involving the equalization of asset holdings, must increase output *and* employment.

to give back any of the fruits of such investments to the firm. The point is that if the *firm* has to incur such expenses, it would like to reap the gains.

Although Rosenstein-Rodan focused on training, his perceptive comments apply just as strongly to the nutritional status of workers that supply labor in a casual market, with no regulations or safeguards. Well-nourished workers are of great long-term advantage to their employers, provided that there is some way to guarantee that such workers remain in the employer's keep. In the absence of such guarantees, the collapse of nutritional status in a poor rural labor market can be comprehensive.

Nutrition is only a parable for all sorts of long-run investments that a firm could make in a worker. We have already discussed on-the-job training. Other investments that have a beneficial impact include firm-provided health insurance, as well as financing for technical training and higher education.

This is the curse of a casual labor market, and the curse is especially harsh in poor countries. To make sure that firms recoup their investments, there must be restrictions on labor movements, and these restrictions have their own costs (slavery being the extreme example). What one does about it is unclear.

13.4.3. A model of nutritional status

We use the nutrition parable to develop a model of person-specific investments that have effects *over time*.[11] We will extend our ideas in one important aspect: a worker's current nutritional status, and therefore his ability to carry out sustained work, depends not only on his *current* consumption of nutrients, but also on the *history* of that consumption.

Figure 13.12 tries to capture this observation by means of a single diagram. The curves marked A and B are capacity curves corresponding to distinct nutritional histories. Observe that work capacity varies with current nutrition (this is captured by the upward slope of the curve for any *given* history), but it is also affected by past nutrition (leading to distinct curves of the form A and B). At the moment we will leave unanswered the question of which history is the "better" nutritional history, or indeed why the curves might cross as they do.

Let's begin by recalling some concepts from Chapter 8 to better interpret these curves. Here is a quick summary.

The nutritional intake (assumed to be a scalar variable such as calories for simplicity) of an individual is divided between maintenance of the body and physical activity of various types. Let x_t denote the energy intake of the individual at time t, r_t denote *resting metabolic rate*, q_t denote the energy expended on physical activity, and b_t denote the energy released from (or

[11] This section uses and extends ideas in Ray [1993], Ray and Streufert [1993], and Bose [1997].

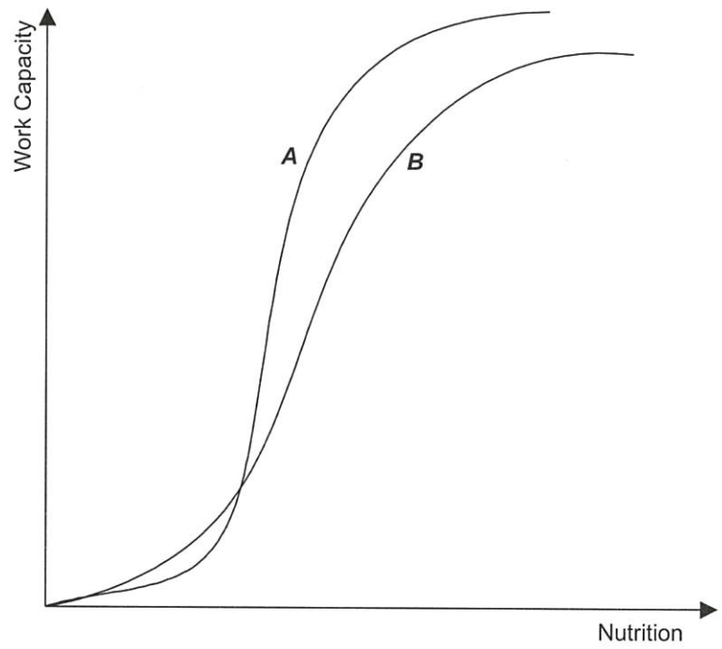

Figure 13.12. Nutritional history and the capacity curve.

stored in) the body. Then, neglecting losses due to the inefficiency of energy metabolism, we write the fundamental energy balance equation as

$$x_t = r_t + q_t - b_t \tag{13.1}$$

for all dates t. The terms used were all introduced in Chapter 8.

There are interconnections between these variables that we now need to develop. To do this, let us introduce the notion of *nutritional status*, which is, broadly speaking, the state of an individual's physical health at any date and varies from date to date depending on the stresses he is subjected to, as well as his access to nutritional inputs. There is no need to exactly measure or quantify this concept, but for the sake of concreteness we will equate it to *body mass*, which we denote by m.[12]

The first thing to note about m is that borrowing from the body tends to lower it, whereas storage tends to increase it. We can represent this schematically as

$$\text{given } m_t \to \text{higher } b_t \to \text{lower } m_{t+1}. \tag{13.2}$$

[12] Be careful to remember that we are discussing nutritional status in poor economies, so that body mass is not an inappropriate concept. For individuals in developed countries, body mass may be *inversely* related to nutritional status!

Indeed, (13.1) and (13.2) precisely represent the trade-off to an employer who hires this individual. The employer pays a wage, which the individual uses to buy nutrition x, but the employer also dictates the pace of work, which then affects q. However, the employer cannot get something for nothing. For a fixed wage, the higher he pushes the requirements of work, the greater will be the amount of borrowing from the body [inspect (13.1)] and the lower will be the next period's nutritional status [inspect (13.2)].

To go any further, we have to understand next how nutritional status (as captured by body mass) feeds back on the variables of interest such as the ability to carry out productive activity. For a given genotype, resting metabolism is related positively to body mass. Therefore, a lowering of body mass brings down resting metabolism. Is this kind of adaptation a blessing in disguise? It might be. If you look at equation (13.1) again, you will see that a lowering of r creates some extra elbow space in the energy-balance equation: the body eats up less for resting metabolism and can use this extra energy more "efficiently" for work. Call this the *resting metabolism effect*.

We must be very careful, however, to distinguish between this form of protective adaptation and the statement that such adaptation is, consequently, a *good* thing. The attendant dangers of lower nutritional status (in terms of increased susceptibility to illness, physical breakdown, disease, and death) cannot be ignored from a social point of view, no matter how efficient adaptation appears from an economic point of view.

In addition, even from an economic point of view a reduction in body mass might affect the way in which work input q is actually translated into work output. Greater physical health and strength may enable the individual to carry out tasks that an undernourished person finds difficult or impossible to do. In other words, better nutritional status may increase work capacity: call this the *capacity effect*.

Putting together the preceding two effects gives us an interesting net outcome. For a *given* amount of borrowing, the capacity curve of a person with lower nutritional status has a tendency to shift upward. This is because of the resting metabolism effect: more energy can be channeled into work. At the same time, the increased energy available for work can be used better by a better-nourished person, especially at high ranges of work output: this is the capacity effect. Thus it seems reasonable to postulate that at low work levels, the former effect dominates, so that the capacity curve shifts down with better nutritional status, whereas at higher work levels the opposite occurs. This is exactly the sort of situation depicted in Figure 13.12. We can now interpret curve B as corresponding to a better nutritional status.

Now think of things this way. If an employer can choose between creating the nutritional status given by A and that given by B, which one would he choose? One answer is that the resting metabolism effect dominates anyway, so that the employer actually *benefits* from hiring undernourished people to do his tasks for him. This is possible, but it is unlikely if the tasks involve severe manual labor. In that case the capacity effect will dominate. It is more likely that the employer would prefer to sacrifice some current output from his employee, and/or pay a higher wage (thus increasing x_t), *provided that the employee will be around tomorrow to allow him, the employer, to reap the benefits of this investment.*

The emphasized sentence in the last paragraph is precisely the problem that arises in casual labor markets. There are actually two aspects to the problem. First, because employment is casual, the employee may not physically be present for the next period. He may work for a different employer, perhaps in a different village. He might migrate. Under these circumstances, the employer would be extremely reluctant to engage in an investment when the asset might wander off at a later data. 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 must 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?

Observe that this problem can be overcome if both employer and employee were to sign a contract that requires the employee to work for the current employer in the future. This means, in particular, that the employee must forgo his right to accept alternative employment in the future. However, such contracts are often impossible to enforce at the legal level.

Thus, faced with the difficulty of appropriating the rewards of his investment, the employer may have no incentive to increase the nutritional status of his workers. He will have no incentive to pay a higher wage nor to reduce working hours. This will be especially true if the labor market is slack, a point to which we will return later.

Now comes the punch line. If our employer has the incentive to behave in this way, so has every other employer. The implication is that the casual labor market generally fails to improve the nutritional status of workers. What is of additional interest, however, is that this process generally makes employers worse off *as well*, because they have to hire workers of inferior nutritional status. This raises their labor costs even in the short run (provided that the capacity effect dominates the resting metabolism effect).

This is a classic case of a Prisoners' Dilemma. Because casual markets do not look ahead, they create nutritional externalities that everybody ends up paying for: employees through their bad nutritional status and employers through their hiring of inefficient labor.

The observation that nutritional status is degraded in the presence of casual labor markets is actually strengthened if the ability to adapt (by a decrease in resting metabolism) is heightened. The greater the resting metabolism effect, the less is the need for employers to raise wages today

or to reduce work effort. When there is a surplus of labor, the casual market is likely to react to adaptive possibilities by further depressing the wage rate.

Let us summarize the discussion of this subsection. We explored the interaction between a plausible energy balance equation, fundamental to the human body, and the labor market for physical activity. This interaction is expected to be particularly pronounced in economies where labor is in surplus and wages are low. In such economies, it is a simple but basic truth that the labor market and its workings are the keys to understanding nutritional status.

Whereas the observation that the labor market is a basic determinant of nutritional status is fairly self-evident, the casual chains that lead to the final outcome require careful analysis. We show that, in a fundamental sense, a casual labor market creates a deterioration in the nutritional status of the workforce, where this status is measured by body mass (for a *fixed* genotype). In addition, this deterioration may have a negative impact on employers, who now face a pool of workers with low "baseline" nutritional status. Paradoxically enough, this low nutrition level is of the employers' own making. The situation is akin to that of a Prisoners' Dilemma.

13.5. Permanent labor markets

13.5.1. Types of permanent labor

We will use the terms "permanent laborer," "tied laborer," and "attached laborer" interchangeably to identify any laborer who commits his labor to an employer for an extended period. The period is in contrast to that for casual laborers, who are frequently hired by the day and sometimes to complete an operation lasting for a few days at best.

Think of two broad categories of attached laborers. There are those who perform special tasks that require some judgment and precision—tasks that might be difficult to monitor. Plowing, regulating the flow of irrigation water from pump sets, driving and maintaining tractors, supervision and recruitment of casual labor, and operating threshers are examples of agricultural tasks that pose monitoring problems, simply because they have an effect on the final output (or on the upkeep of machinery) that may be inseparable from a host of other effects, such as bad weather or the failure of some other complementary activity. In contrast, an activity such as weeding, harvesting, or basket weaving lends itself to natural observation, and often such tasks can be paid for on a piece-rate basis.

There are essentially three ways in which an employer can carry out nonmonitorable tasks. First, he might entrust them to *family* members, who have a spontaneous interest in the welfare of the farm. This is a good idea for