This chapter is incomplete but contains the relevant material you need.

22

Land

22.1. Introduction

As explained in Chapter 18, an economy can react to an unequal distribution of land in a variety of ways. The land market can open up, with plots rented out or sold from landowners to those with a relative abundance of labor or other inputs of production (including access to credit markets). Alternatively, the labor market can become active, with hired labor working on the larger plots of land. We have already discussed how different considerations dictate the relative levels of activity in these two markets. In this chapter, we concentrate on the market for land.

A proper functioning of the land market is very important for the overall development of the economy. If land is held unequally and many individuals fail to obtain access to it, they are likely to leave agriculture in search of a less precarious source of living. This can lead to a situation in which large numbers of migrants crowd the cities—a situation that can be politically, environmentally, and economically unpalatable.

Quite apart from political acceptability, there is the narrower question of *economic* efficiency in agriculture. Input markets such as the land market exist to bring the ratios of various inputs into line for efficient production. Do land markets serve this purpose or are they limited in their operation?

This chapter asks the following questions:

(1) How does the land rental market deal with substantial inequalities in the ownership of land? What are the main types of tenancy and how does the economic environment determine the form of the land rental contract?

(2) Are land rentals efficient? If not, which sorts of economic environments are more likely to create inefficiency?

(3) At a broader level, is inequality of ownership inefficient? Are small farms more productive than large farms?

(4) If the answer to question 3 is indeed yes, why don't we see frequent sales of land from rich to poor? What is the role of land reform?

22.2. Ownership and Tenancy

Table 22.1 shows how unequal the distributions of land are in the countries of Asia and Latin America. A huge percentage of the rural population is either landless or owns very small plots of land, in contrast with a small fraction of the population who own very large quantities of land. Look at the Gini coefficients of land distribution, for example. They are very high compared to corresponding estimates of the inequality in income distributions (see Chapter 10).

Although there is substantial inequality in Asia, land inequalities in Latin America are higher by an order of magnitude. It is true that average landholdings are smaller in Asia and the rural population density is very much higher, which perhaps explains, to some extent, why there are limits to inequality. After all, there is some lower bound to the smallest farm size that can be profitably used in cultivation. Latin American levels of inequality in Asia would surely drive the smallest plots to sizes that are just not feasible to cultivate. In this sense, a high population density places limits on inequality.

Using somewhat more recent data, Figure 22.1 plots Lorenz curves for land inequality in two Asian countries (India and Thailand) and two Latin American countries (Honduras and Colombia). The differences in the two sets of Lorenz curves are quite evident.

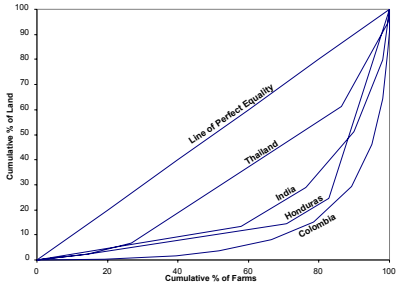

Figure 22.1. Lorenz curves for land holdings in two Asian and two Latin American countries. Source: Agricultural Censuses of Colombia (1988), Honduras (1993), India (1986), and Thailand (1988).

The low per capita holdings of land in Asia and the high inequality of landholdings in Latin America have a similar effect: a sizable fraction of the farms are owner-cultivated. In Asia this fraction is particularly high, standing at around 86% (see Otsuka, Chuma, and Hayami [1992]). The Latin American fraction is lower and also includes a significant fraction of very large farms that are cultivated with the use of hired labor. Table 22.2 shows the percentage of owner-cultivated farms in different parts of the world.

The African countries are somewhat of an outlier in this respect. Much of the land is held under forms of group or communal tenure, and individual claims on such plots are weak. Thus a small proportion of land is under owner cultivation simply because property rights are not well defined. The reported data are probably an understatement for all practical purposes, which reflects the ambiguity of property rights (*use* rights from plot to plot are better defined).

Also note that several countries provide for ownership or use rights to tenants who have worked the land for some prespecified number of years. This legal stipulation often lowers the amount of tenancy, and in the case of Asia there may be a substantial amount of informal tenancy that goes unrecorded in the data. Several countries in Latin America also uphold as a basic principle that the land belongs to those who farm it and have legalized this principle by regarding tenancy as a basis for granting use rights or ownership. This is true, for instance, in countries such as Mexico or Brazil. Such legislation has not always had a potent effect in turning land over to the

Country	Operational Size (ha.)	Percentage of Farms and Farmland < 5 hectares *Farms*	*Area*	> 50 hectares *Farms*	*Area*	*Gini*
Asia						
Bangladesh	1.6	90.6	67.6	n.a.	n.a.	0.42
India	2.3	88.7	46.7	0.1	3.7	0.62
Indonesia	1.1	97.9	68.7	0.0	13.6	0.56
Nepal	1.0	97.2	72.1	0.0	0.8	0.56
Philippines	3.6	84.4	47.8	0.2	13.9	
Thailand	3.7	72.3	39.4	0.0	0.9	0.45
Latin America						
Brazil	59.7	36.8	1.3	16.3	84.6	0.84
Costa Rica	38.1	48.9	1.9	14.5	79.7	0.82
Colombia	26.3	59.6	3.7	8.4	77.7	0.86
Peru	16.9	78.0	8.9	1.9	79.1	0.91
Uruguay	214.1	14.3	0.2	37.6	95.8	0.82
Venezuela	91.9	43.8	0.9	13.6	92.5	0.91

Table 22.1. Ownership distribution of farms and farmland in Asia and Latin America in the early 1970s. Source: Otsuka, Chuma, and Hayami (1992, Table 2).

tiller. Often, the reaction in Latin America has been in the direction of tenant eviction, followed by large-scale mechanized farming.

In India, for instance, the percentage of pure owner-cultivated land is almost certainly smaller than the data suggest. See the box on tenancy in the ICRISAT villages, where a higher prevalence of tenancy than that recorded in the national data is suggested. In the words of Jodha [1981]:

> . . . in India, prior to independence, tenancy was largely viewed as an instrument of exploitation of the weak. Regulation of tenancy, therefore, became a key feature of post-independence India . . . [Thus] efforts directed to study tenancy *per se* usually have not succeeded. Because of the great capacity of farmers to hide it, agricultural tenancy simply disappears once one starts investigating it through the usual one or two round surveys.

At the same time, the preponderance of owner–cultivators in Asian countries such as Korea and Taiwan is not surprising at all. These countries exhibit a relatively low degree of inequality in landholdings, so there is less need to bring land into alignment with labor.

Whereas tenancy exists all over the world, there are variations in the form of the tenancy arrangement. Latin American tenancy is largely of the *fixed-rent* variety: the tenant pays a fixed sum of money to the landlord in return for the right to cultivate the land. In contrast, Asian tenancy is characterized by a high incidence of *sharecropping*, in which the tenant yields to the landlord an agreed-upon share of the crop. Asian fractions of tenanted land under share tenancy range from around 30% (Thailand), through 50% (India) or 60% (Indonesia), all the way up to 90% in Bangladesh. In contrast, the corresponding percentages in Latin America are much lower (under 10%

	Asia	*Africa*	*L. Am.*	*Europe*	*N. Am.*	*World*
Countries	10	4	15	12	2	46
Farms (million)	93.3	3.5	8.6	11.9	3.1	120.4
Farm size (hectares)	2.3	0.5	46.5	7.6	161.2	10.0
Distribution (%)						
Owner cultivation	85.8	5.2	60.3	67.6	63.2	79.2
Tenancy	5.9	1.6	17.1	9.3	12.0	7.1
Owner-cum-tenancy	8.2	6.9	6.6	23.0	24.8	10.0
Other	0.0	86.3	16.0	0.1	0.0	3.7
Distribution of farmland (%)						
Owner cultivation	84.0	9.2	80.4	58.9	36.6	61.1
Tenancy	5.9	3.0	6.2	12.5	11.9	9.0
Owner-cum-tenancy	10.1	29.1	5.6	28.5	51.5	27.2
Other	0.0	58.7	7.8	0.1	0.0	2.7
Percentage of share tenancy in tenanted land	84.5	0.0	16.1	12.5	31.5	36.1

Table 22.2. Distribution of farms and farmland by land tenure status in the 1970 World Census of Agriculture. Source: Otsuka, Chuma, and Hayami (1992, Table 1).

in countries such as Costa Rica or Uruguay and negligible in Peru, although relatively high at 50% in Colombia) (see Otsuka, Chuma, and Hayami 1992).

Why is the form of the tenancy contract of any interest? The answer to this question must be postponed until we have examined these alternative tenancy forms in greater detail, but a preliminary observation or two is not out of line at this stage. Typically, richer tenants engage in fixed-rent tenancy, because the landlord is relieved of all risk: the rent is the same whether the crop does well or not. Thus in this sense, fixed-rent tenancy requires that the tenant be willing and able to bear the risks of agricultural production. This is generally so if the tenant has substantial wealth of his own. This is (admittedly indirect) evidence for the assertion that Latin American tenancies are held by large farmers, and perhaps even evidence for the conjecture that many tenancies flow *from* relatively poor farmers *to* relatively rich farmers.

This concept is consistent with our discussion in the previous chapter. In a country with large landholdings, agriculture may take on a highly mechanized and capitalistic form, using wage labor where labor is required. In such a regime, it may be better for smaller landowners to give up their land to large owners in exchange for a rent.

Contrast this with Asia, in which the bulk of tenancy is in the form of sharecropping. As we will see in the sections that follow, sharecropping is an arrangement that has particular value when the tenant is small and averse to risk: if a given *fraction* of output is paid as rent, then the tenant is, to some extent, insulated against output fluctuations, because he can share some of these fluctuations with his landlord. This suggests that Asian tenancy probably reflects, on the whole, land leases from relatively large landowners to relatively small landowners. However, be careful not to treat this as a general rule, even in Asia.

We will begin our study of land markets by describing tenancy contracts.

22.3. Land Rental Contracts

Suppose that a landowner wishes to rent out his land to a potential tenant. Several contractual forms are available. The simplest form of tenancy contract is what is called a *fixed-rent contract*, one in which the landlord charges a sum of money (per year or per season) for the rental of the land and, in turn, allows the tenant to carry out production. This sort of contract is found wherever land rentals are observed, but by no means is it the only form of contract that we observe, or even (depending on the region of observation) the dominant form. A second type of contract is commonly referred to as *sharecropping*. Sharecropping comes in many flavors, but all of them involve the sharing of the tenant's output in some preassigned proportion between the landlord and the tenant. The proportions vary from country to country and across regions within a country, although a 50–50 division is commonly observed. Variations on the sharecropping contract include different proportions of division of the output depending on whether *input* costs are also shared between the landlord and the tenant, and tied credit arrangements. The latter normally involve the advance of money by the landlord for the tenant's purchase of output (in addition to or in lieu of cost sharing): these "interlinked" contracts will be discussed in Chapter 19.

There is a simple but useful way to write down a class of rental contracts that contains fixed rent and sharecropping contracts as special cases.[351] If Y denotes agricultural output on the rented land, then write the total rent as

$$R = \sigma Y + \rho. \tag{22.1}$$

If $\sigma = 0$ and $\rho > 0$, this is a fixed-rent contract with rent ρ. If $\rho = 0$ and σ lies between 0 and 1, then this is a sharecropping contract, where the share to the landlord is σ and the share to the tenant is $1 - \sigma$. Finally, if $\sigma = 0$ and $\rho < 0$, this can be interpreted as a "pure wage contract," where the wage is simply $w = -\rho$: the tenant is not a tenant at all, but a laborer on the landlord's land. Labor contracts will be considered in Chapter 23.

Tenancy in the ICRISAT Villages

We introduced the ICRISAT study area in Chapter 17. We continue our study here by studying land tenancy in these villages.

Landholding distributions were (and continue to be) quite skewed in all the study villages, but in most of them there is a pronounced trend toward greater equality. Households with large landholdings seem to have shed some land over the decades, whereas many formerly landless families have gained some land. In the sample, 20% of the village population consists of people who were landless in 1950, but owned plots of their own in 1982. The proportion of formerly landed families who had lost all their land by 1982 is only 4%. In sum, whereas only 62% of the population owned land in 1950, that fraction grew to 82% in 1982. It appears that such (nontenancy) land transfers mostly took place through sales rather than through land reform measures that empower long-standing tenants with ownership rights. Over the three decades, the amount of land bought and sold annually, expressed as a percentage of total land endowment for the sample households, varied between 1% for Kalman to 4% for Dokur. These are not negligible figures.

[351] See Stiglitz (1974). The class that we describe can easily be extended to cover cost sharing in inputs.

We have to be very careful in the interpretation of such data. Faced with land ceiling acts that restrict the maximum amount of land a landlord can hold, it is possible (although unlikely) that land transfers through tenancy are declared to be transfers of ownership, wherein a tenant is required to report that he owns excess-of-ceiling land when he in fact does not.[a] This suspicion received some support from an earlier study of Jodha [1981], which was based on the same survey area but on older data collected over a two year period beginning May 1975. In line with his view that tenancy is largely concealed, two years of field work were used to ascertain whether land was under tenancy or not, and "the initial concealment of tenanted plots disappeared over time." In Jodha's view, land transfers were also common during this period, but the bulk of such transfers (between 77 and 97%) were due to tenancy transactions alone.

Therefore, it is likely that the following data (although certainly vastly more indicative of widespread tenancy relative to the Indian National Census of Agriculture) still underrepresent the incidence of tenancy, or at least those forms of tenancy that involve land transfers from relatively large landowners to landless or small landowners. More circumstantial evidence indirectly supports this position, as we will see subsequently.

Agricultural tenancy is common (although not predominant relative to owner cultivation) in the ICRISAT villages. About 20% of all households sharecrop, and far less (below 5%) are fixed-rent tenants. Table 22.3 provides more detailed estimates ranging over the period 1975–82.[b]

Villages	*Households*	*Owners*	*Sharecropping tenants (%)*	*Fixed-rent tenants (%)*	*Mixed tenants (%)*
Aurapalle	406	90.7	1.2	8.1	0.0
Dokur	220	82.3	15.9	0.9	0.9
Shirapur	437	69.1	30.4	0.5	0.0
Kalman	296	68.6	30.7	0.7	0.0
Kanzara	320	80.6	11.0	5.3	3.1
Kinkheda	187	85.0	14.5	0.0	0.5
Boriya	186	56.5	29.0	12.9	1.6
Rampura	216	76.4	14.8	5.6	3.2
All	2,268	76.8	18.2	4.1	1.0

Source: Shaban (1987, Table 1 (adapted)).

Table 22.3. Tenancy in ICRISAT villages by household.

The table lumps together all households who rent land. Some of them are "pure" tenants, but most tenants also own land of their own. For instance, "fixed-rent tenants" in the table refers to households who have *some* land under fixed-rent tenancy. It is interesting to note that 80% of all tenants cultivate some land that they own (Shaban [1987]).

Clearly, the land-lease market is fairly active (even if we neglect possible underreporting). It is also of interest to see that, overall, sharecropping is dominant as a mode of tenancy. This will yield a puzzle once we consider the Marshallian argument for the inefficiency of sharecropping (see the next section). Fifteen percent of all plots are sharecropped, whereas under two percent are in the form of fixed-rent tenancy. But there is variation across the villages. Fixed-rent tenancy is dominant in the village of Aurapalle, for instance.

Table 22.4 provides estimates of tenancy by area. The percentages of land that come under different forms of tenancy are quite similar to the corresponding percentages by

household. The table brings out additional features of some interest that have to do with plot *sizes* and *values*.[c] Note that plot values are higher for owner-occupied plots than for tenanted plots. It is not surprising that the best quality plots are retained for owner cultivation.

	Owned			Sharecropped			Fixed Rent		
Village	Plots %	Area acre	Value Rs./acre	Plots %	Area acre	Value Rs./acre	Plots %	Area acre	Value Rs./acre
Aurapalle	96.4	1.9	21.2	0.5	1.5	13.8	3.1	2.0	14.0
Dokur	84.1	1.6	42.2	14.9	2.2	40.2	1.0	1.9	40.0
Shirapur	64.5	1.6	29.7	35.5	2.5	24.9	0.0	0.2	21.3
Kalman	77.6	1.6	17.6	22.1	2.0	13.4	0.3	4.0	10.0
Kanzara	83.9	2.6	22.6	12.3	3.7	18.9	3.8	3.6	11.7
Kinkheda	92.2	3.5	15.1	7.7	2.9	10.6	0.1	2.0	10.0
Boriya	67.1	0.7	39.3	25.5	0.8	39.3	7.4	0.7	35.2
Rampura	80.7	1.0	62.8	16.1	1.2	60.7	3.1	1.4	56.2
All	80.9	1.8	29.20	17.5	2.2	27.08	1.6	1.8	27.45

Source: Shaban (1987, Table 2).

Table 22.4. Tenancy in ICRISAT villages by plots.

Now look at plot *area* in Table 22.4. In several cases, area is significantly higher on tenanted land than on owned land. This suggests that although tenants lease land from those who are more endowed than they are, they are certainly getting fairly sizable chunks of it. Indeed, this observation also indicates that "reverse leasing"—the leasing of land from relatively small to relatively large farmers—may be present in the data.

Reverse tenancy—the apparently perverse phenomenon of *small* landowners leasing out their land to larger ones—has been observed in many places and has attracted some (but not sufficient) research attention. It is certainly not rare in the ICRISAT data. On average, in tenancy relationships, 47% of the partners came from the same farm size group, 32% of leasings were reverse (small to large farmers), and 22% of the land was leased by large farmers to smaller ones. However, in Dokur, as many as 55% of the leases were reverse. Jodha [1981] and Shaban [1991] discussed this in more detail. In any event, we should treat the high incidence of reverse leasing with some caution: as previously discussed, leases from large to small farmers may be severely underreported.

Most leases covered in the study had a brief duration—frequently not exceeding one year. About 60% of the contracts were for one cropping season only. Landlords frequently shuffle and rotate their tenants; there has been an almost total demise of traditional long-term tenancy arrangements, such as the *rehan* system in Aurepalle. This demise can be ascribed largely to land reform legislation that makes it easy for long-standing tenants to acquire ownership of the plots. Some negative effects of this development are immediately apparent: with limited tenure, the tenant loses the incentive to apply in proper amounts such inputs as manure, which is known to have residual and lasting effects (stretching beyond a year) on crop yields.

The terms of tenancy arrangements showed some variability and flexibility across the villages. In Dokur, where the use of purchased inputs is fairly high, more than 90% of the contracts stipulate 50–50 output *as well as input cost sharing*. In contrast, in Shirapur, where use of purchased inputs is much less intensive, the tenant is responsible for supplying all inputs and receives a share of 50–75% of the output. In many cases, a landlord's failure to supply his proper input share or higher cultivation costs being borne by the tenant for within-season production adjustments led to renegotiation and

readjustment of the output shares. In those cases where the landlord shared in the cost of inputs, the landlord had a much greater say in the choice of the crop to be grown.

[a] The reason why this bias is unlikely is because land can be held in the names of various family members in an attempt to avoid the ceiling. In any case, this is somewhat different from the more commonly accepted source of bias: tenancy is underreported because of the fear of land-to-the-tiller legislation. This source typically classifies tenanted land as cultivated by the owner, whereas the possible bias that we are discussing here classifies tenanted land as land owned (and cultivated) by the tenant.

[b] The sample in each village contains households for each season in each year. Thus multiple observations (over different periods) might be accounted for by the same household.

[c] Plot values, which are supposed to reflect the potential market price of the plot (per acre), are influenced most by perceptions of soil quality on that plot and whether or not the plot is irrigated.

22.4. Incentives: the Smith-Marshall Doctrine

There is a long tradition in economics that argues that sharecropping is essentially an inferior system to that of fixed-rent tenancy. The argument is not new and can be traced all the way back to Adam Smith. In *The Wealth of Nations*, Book III (Ch. 2), Smith observes of sharecroppers that:

> "It could never, however, be the interest of this species of cultivators, to lay out, in the further improvement of the land, any part of the little stock they might save from their own share of the produce, because the lord, who laid out nothing, was to get one-half of whatever it produced."

A clear statement of the supposed superiority of fixed-rent tenancy can also be found in Alfred Marshall's *Principles of Economics*:

> [W]hen the cultivator has to give his landlord half of the returns on each dose of capital and labor that he applies to the land, it will not be to his interest to apply any doses the total return to which is less than twice enough to reward him."

It is perhaps no coincidence that the early arguments came predominantly from English economists. At the time, fixed-rent tenancy was prevalent in England, whereas sharecropping (or *metayage*, as it was called, following the customary practice of 50–50 division) was dominant among the French. A little jingoism is good for a passionate argument, though it could prove to be wrong. But let's hear the case first.

The Smith-Marshall doctrine is based fundamentally on the need for the *appropriate provision of incentives*. A fixed-rent contract has the property that the tenant pays a fixed sum to the landlord no matter how much output is produced. Another way of saying the same thing is that the tenant retains 100% of any extra output that is produced. In contrast, sharecropping effectively leaves the tenant with some *fraction* of any additional output—a percentage such as 50% or 60%, depending on the exact form of the contract. Thus, *if the effort of the tenant cannot be monitored and controlled by the landlord, the tenant has an incentive to undersupply his effort*, because, under the sharecropping contract, part of the output produced by him gets siphoned off to the landlord. It would be better, instead, to extract this rent up front by charging a *fixed* payment and then leave the tenant alone.

This argument is pretty compelling but it is not the whole argument. If you are in a contentious mood, you could reply, "But what is so sacrosanct about the tenant keeping 100% of the extra output? Why not let him keep 110%, or even 120%, and charge an even higher rent up front? In that case the tenant would surely put in even more effort. If the move from 60 to 100% enhances efficiency, what is different about the move from 100% to 120%?" That isn't a bad question at all, and forces us toward a more careful exposition of the Smith-Marshall argument.

Although the demonstration to follow is more general, it is easily described by assuming that the tenant has just one variable input of production — e, for "effort". In Figure 22.2, we plot the production function that relates output to effort applied on the rented plot of land, which is given by the curve $F(e)$. Of course, that effort is costly to the tenant: it has other uses. For instance, part of the tenant's labor may be hired out by him for a wage. Or he might have some land of his own to which he wishes to devote part of his labor endowment. Another alternative (though this is less compelling in situations of excess labor supply) is that the tenant may simply value leisure. Whatever the reason, labor supply to the rented plot has a cost, shown by the line $c(e)$ in Figure 22.2.

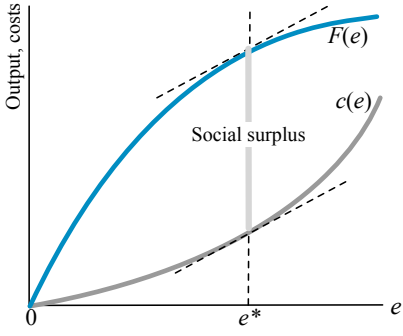

Figure 22.2. Production, cost, and social surplus

This depiction makes it very clear just how much social surplus is produced by the tenancy arrangement. The surplus is precisely the difference between the value of output and the cost of producing it; that is, the vertical gap between the curve $F(e)$ and the line $c(e)$. The surplus will vary, of course, with the amount of labor being applied. We are interested in the labor input level that yields the *maximum* possible social surplus, which is the vertical difference between the curves $F(e)$ and $c(e)$. One feature of this maximizing input level is that the value of the marginal product of labor, which is given by the tangent to the production function at this point, equals the unit opportunity cost of labor, given by the slope of the line $c(e)$. This maximum surplus lies at stake in the tenancy.

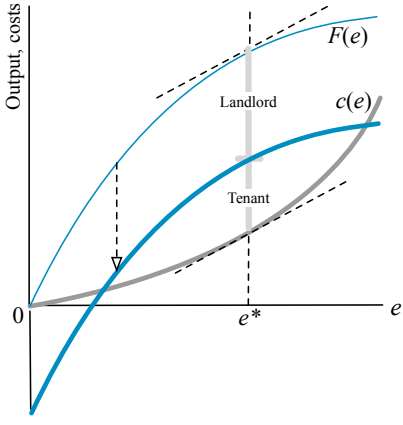

Figure 22.3. Fixed rent contract.

Of course, the tenant himself has no necessary interest in seeking to maximize this surplus (through his choice of effort) unless it happens to be in his interest to do so. Figure 22.3 shows how this incentive problem can be solved through the use of fixed rent tenancy contracts. Under a fixed rent contract, the tenant's return is diagrammatically shown by a *parallel* downward shift of the production function, obtained by subtracting the fixed rent at every point. The difference between *this* shifted-down return and the tenant's cost, $c(e)$, is what the tenant seeks to maximize.

The key observation is that this exercise is essentially identical to the maximization of social surplus. The imposition of a fixed rent gives the tenant the same incentives as those of some mythical social planner who seeks to maximize surplus, and therefore the choice of e will result in precisely the same solution e^*. Now all that's left is to observe that total surplus must be distributed between the landlord and the tenant. The tenant can be given whatever he needs to be given by adjusting the fixed rent, and the landlord gets the rest as shown in the diagram. Therefore, not only is social surplus maximized, the landlord *should* want to maximize it in order to maximize her own return. Under no other arrangement can she do better, because other arrangements cannot have a larger social surplus, and the tenant must be compensated to the same degree. Thus spake Smith and Marshall.

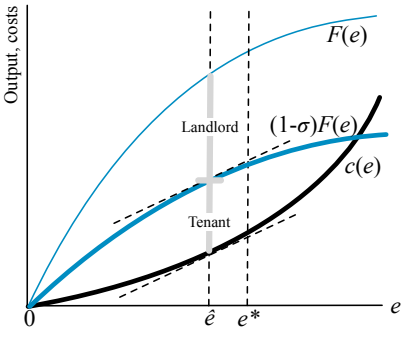

Figure 22.4. Sharecropping contract.

In contrast, consider sharecropping, depicted in Figure 22.4. Because the landlord receives some share σ of the output, the tenant receives the remaining fraction $1-\sigma$, and so the *effective return* to the tenant is the line $(1-\sigma)F(e)$; that is, the production function multiplied by the tenant's output share. This is also a shift down, but not a *parallel* shift; it's more a swivel than a shift. And now the tenant will be interested in making the difference between *this* effective return and his cost $c(e)$ as large as possible, because that's what *he* receives from the deal. Will he end up serendipitously maximizing social surplus, as he did for the case of fixed rent tenancy? The answer is no, and the reason is precisely because the effective return to the tenant is a "swiveling" or flattening of $F(e)$.

This is a one-liner using calculus. With fixed rent tenancy, the tenant maximizes $F(e) - c(e) - R$, resulting in the first-order condition $F'(e^*) = c'(e^*)$, but with sharecropping, he maximizes $(1-\sigma)F(e) - c(e)$, which results in the different first-order condition $(1-\sigma)F'(\hat{e}) = c'(\hat{e})$. He will therefore maximize his own return at an effort input that is *smaller* than e^*. Figure 22.4 contains the graphic details.

In passing, we can easily answer why granting 100% marginal return to the tenant has special significance and why it is not optimal to offer contracts that offer still higher marginal returns (such as 110 or 120%). Of course, such contracts will make the tenant work very hard indeed, and will carry his input above e^*. But the fact that *output* is higher does not mean that *surplus* is higher. All this does is goad the tenant to work even harder than the level prescribed for surplus maximization. The economic surplus is therefore reduced in this case as well. Given that the landlord gets the surplus net of tenant compensation, she is better off offering the fixed rent contract.

22.5. A Critical Look at the Smith-Marshall Doctrine

If a fixed-rent system is demonstrably superior to a sharecropping arrangement, not only from a social efficiency angle, but also from the point of view of the landlord's individual rationality, then why does sharecropping enjoy such enduring popularity in real world practice? Surely, there is more to the story than currently has been

outlined.[352] And, to get an initial reaction out of the way: this isn't merely an intellectual curiosum dealing with arcane land contracts. That reaction would be misguided for several reasons.

First, if we do observe sharecropping where our basic theory of contracts tells us there should be none, then there is something wrong with that basic theory. At any rate, the theory needs to be augmented by a fuller description of reality. This enrichment may assist us in understanding other situations where the theory of incentives is also important. Second, and at a more practical level, if sharecropping exists despite the efficiency losses that it appears to generate, it suggests that there are other compensating factors that necessitate such an arrangement. If these factors can be separately addressed and corrected by appropriate policy, the resulting inefficiencies will decline. Third, these contractual relationships may have implications for other kinds of landlord and tenant behavior, such as the provision of credit to the tenant, the tendency to evict tenants, and the incentives to make long-run improvements on the land. Finally, "land and labor" is a parable for other real-world phenomena. Replace "land" by "capital" and "labor" by "entrepreneurs," and you are in the business of explaining the form that venture capital contracts must take. Or replace "land" by "patented knowledge" and "labor" by "technology importers," and you are now seeking to explain the form that licensing agreements might take. Smith and Marshall threw out an important challenge. We can't just stop there.

By the Way, Is Sharecropping Empirically Associated with Lower Yields?

The argument for the inefficiency of sharecropping relies on the assumption that the application of inputs by the tenant, such as labor, cannot be perfectly monitored and enforced by the landlord. If perfect monitoring were possible, the form of the tenancy contract would be irrelevant for our understanding of productive efficiency, because the efficient use of labor would be dictated by the landlord, irrespective of the particular choice of contract.

Can the levels of labor and other inputs chosen by the tenant be costlessly monitored and enforced by the landlord? Empirical work can shed some light on this issue. Shaban's [1987] study, using ICRISAT data, is one of the most careful contributions in this area. It is not enough to simply check whether there are differences in yield per acre across sharecropped land and other forms of land use. We must carefully control for several other factors that systematically vary with the form of tenancy (and not just the application of labor or other nonmonitored inputs). Shaban's study goes a long way toward handling these serious difficulties.[a]

The main idea (which handles quite a lot of otherwise uncontrollable variation) is to study the productivity of the *same household* that owns some land and sharecrops other land. We have already seen that the ICRISAT data is full of such "mixed" families.

At one stroke, this insight permits the researcher to control for all sorts of family-related characteristics that vary systematically across owned and sharecropped land. For instance, families that own land may have better access to working capital than families that sharecrop, in which case the productivity on owned land may be higher; this cannot be directly attributed to Marshallian inefficiency, however. Conversely, a poor sharecropper may have few alternative uses for his labor and thus may farm the land more intensively

[352] See Singh (1989) for a survey of theories of sharecropping, which complements the observations here.

despite the disincentive effect identified by Marshall. Then productivity per acre will not be too different across owned or sharecropped land, but this does not rule out the possibility that the inefficiency is still there.

That's not all. It is possible that land quality varies systematically across tenanted and untenanted land. Indeed, we have already seen that this is true of the ICRISAT villages. Hence, a proper study must account for these systematic differences. The ideal tool in this respect is multiple regression (see Appendix 2): putting in several terms on the right-hand side allows us to control for the effects of these systematic differences. Shaban included plot values (see Table 22.4) as well as dummy variables for irrigation and other measures of soil quality. After all these variables are controlled for, the only remaining differences are expected to stem from the form of the tenancy contract.

The results are striking:

(1) Output and input intensities per acre are higher on the *owned* plots of a mixed sharecropper relative to the plots that he sharecrops: the average difference is 33% for output and between 19 and 55% for the major inputs.

(2) Quite a bit of this variation is due to irrigation, but certainly not all. With irrigation accounted for in the regression, output per acre is higher by 16% on owned versus sharecropped plots. Family male labor is higher by 21%, family female labor is higher by 47%, and bullock labor is higher by 17%. These differences also persist even if attention is restricted to sharecropper–owners who grow a single crop across the two types of plots.

(3) With irrigation and soil quality controlled for, there are no systematic differences between plots under fixed rent and plots under owner cultivation, just as predicted by the Marshallian theory.

These observations leave us with a vexing puzzle. If it is truly the case that sharecropping is inefficient, then why do we observe its existence? Indeed, sharecropping is the *dominant* form of tenancy in the ICRISAT villages: why do we see so much of it? Thus both theoretically and empirically, we are led to the same question, which we will now pursue in the main text.

[a] Also notable is the earlier study by Bell [1977], who first suggested the sort of methodology later extended by Shaban and others.

22.5.1. Risk, Fixed Rents, and Sharecropping. An individual is *risk-averse* if she prefers a certain (i.e., known or deterministic) sum of money to a lottery with the same expected value as the deterministic sum. The very fact of variation or fluctuation around the deterministic sum is intrinsically displeasing to a risk-averse person. This is not to say that she cannot be compensated for taking risk. She can, but the greater the risk aversion, the greater will have to be the compensation (over and above the expected value of the lottery).

Observe that risk attitudes imply more than the ability to compare a risky gamble with a given amount of *safe* money. Two risky gambles with a common expected value can also be compared, and the one with the "greater spread" around their common mean will be deemed "more risky." As in the theory of inequality measurement, sometimes — and especially for two-outcome lotteries — this is easy enough to describe, though sometimes it is more complicated. As an example of an easy comparison, think of two projects. The first pays off $10,000 or $2,000, each with probability 1/2. Now compare this project to another risky project with even odds — one that pays less ($8,000) in the event of success, but pays more ($4,000) in the event of failure. Both projects have

the same expected value of \$6,000, but the latter project involves a lower "spread" in the returns. A risk-averse person would therefore prefer the latter project.

We now observe that there is a close parallel between this pair of projects, and fixed-rent tenancy and sharecropping, also viewed as a pair of projects. To make this point, assume that the same quantity of inputs is being applied to the tenanted property in both cases (yes, I know I earlier argued that they won't be, but bear with this assumption for a minute). Now, just because inputs are fixed doesn't mean that *output* will be: the harvest is still heavily dependent on rainfall, pest invasions, plant disease and the like, and will vary. Say that only two levels of output are possible: h (for "high") with probability p, and ℓ (for "low") with probability $1-p$.

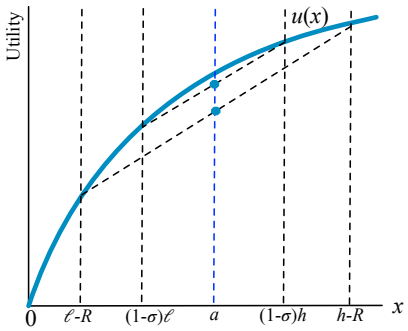

Figure 22.5. A risk-averse tenant dislikes fixed-rent tenancy.

Under a fixed-rent contract in which the tenant is required to pay a rent of R, the tenant receives a net reward of $h-R$ if things go well and $\ell-R$ otherwise. (The landlord receives a sure payment of R irrespective of the fortunes of the plot.) Now imagine replacing this contract with a sharecropping contract which yields the same expected reward to the landlord (and therefore to the tenant as well). That is, if σ is the share of the crop accruing to the landlord, then

$$p\sigma h + (1-p)\sigma\ell = R,$$

so that

$$\sigma = \frac{R}{ph + (1-p)\ell}. \tag{22.2}$$

So much for the averages, then, which are equalized. Now compare the returns to the tenant for each state. If the output is high, then the tenant gets $h - R$ under fixed rent, and $(1-\sigma)h$ under sharecropping. Using (22.2), we may conclude that

$$(1-\sigma)h - (h-R) = R - \sigma h = R - \frac{hR}{ph + (1-p)\ell} < 0,$$

by virtue of the fact that $h > \ell$. So a sharecropping contract *lowers* the return to the tenant in the high state. Because the two expected values are the same, we must also conclude that when the harvest is bad, sharecropping pays off better than fixed rent. Now the analogy with our earlier project pair should become clear: sharecropping and fixed-rent tenancy are like two projects with the same expected value, but the "spread" of returns to the tenant is narrower under sharecropping. If the tenant is risk-averse, he should prefer the sharecropping contract over the fixed-rent contract.

Figure 22.5 confirms this intuition for the usual textbook description of a "risk-averse" person. As you know from your introductory microeconomics classes, the preferences of such a person over monetary outcomes can be described by a strictly concave utility function, which captures his distaste for gambles. And indeed, as the Figure shows, the expected utility under a sharecropping contract that is calibrated to the same average monetary return as under fixed-rent tenancy is strictly higher than in the latter arrangement.

This is no mere artifact of some conveniently drawn utility function. When output is low, the burden of an unwavering rent can be enormous, especially for tenants who are relatively poor. It is true that the tenant is equally compensated on the upside, but that compensation is only paid in the high state, when the tenant least needs it. Meanwhile, the landlord is nicely insulated against such fluctuations, receiving a deterministic R in high and low states.

But who needs the insurance more, the tenant or the landlord? The relative wealth of landlord and tenant must play a significant role in the answer. If the landlord is relatively poor, leasing her land out to a rich tenant with capital, then the argument above can be turned on its head. Fixed rent tenancy then protects the relatively poor economic agent (the landlord, in this case), against unseemly fluctuations in her income. The case for fixed rent is strengthened, and Smith and Marshall gain more ammunition for their arguments. But if the landlord is wealthy and the tenant poor, then the opposite argument acquires power: sharecropping insures the tenant against fluctuations in income, whereas fixed rent might expose him to unacceptable levels of risk.

Now, it isn't that the landlord particularly cares for the tenant. But she understands that there is potential gain in compressing the fluctuations in her tenant's income. For instance, she could move from a fixed rent contract to an equivalent sharecropping contract, giving the tenant more insurance, and then cut back a bit on the tenant's share. That way the tenant would *still* prefer the sharecropping contract, while the landlord, who is relatively risk-neutral, enjoys a larger expected payoff. In this way, sharecropping might emerge as a way to share, not just the output of productive activity, but the *risk* that is associated with it as well. A tenant who pays fixed rent might happily agree to switch to sharecropping, passing on some of the uncertainty to his landlord.

We have cut some corners with this explanation, and it is now time to go back and examine the missing steps. The main counter-objection to our argument may be summarized thus: if the objective of the contract is to remove risk from the risk-averse party (tenant) to the risk-neutral party (landlord), why stop at sharecropping? It is possible to reduce tenant uncertainty even further. Consider, for instance, the payment of a fixed *wage* to the tenant equal to the expected value of the tenant's return under sharecropping. A risk-averse tenant would strictly prefer the wage to the share contract, so much so that he would give up even more income for the added insurance, which the landlord could then pocket. We now a situation where labor is effectively being hired rather than land being leased out.

However, two considerations stand in the way of an unequivocal conclusion. First, in many situations the landlord and tenant may *both* be risk-averse, though it might be reasonable to suppose that the latter is more so than the former. Fixed rent places all the uncertainty on the tenant, but a fixed wage places all the uncertainty on the landlord. If both parties are risk-averse, neither of these extreme contracts may be an acceptable solution. An intermediate outcome in which both individuals share risk may be preferred. Such intermediate contracts would closely resemble sharecropping.[353]

The second consideration that stands in the way of a wage solution is the incentive problem. Remember Marshall's argument. Just because we *presumed* that labor input is fixed (recall our temporary assumption) does not mean that it is so. The lower

[353]I say "resemble" because the theory is not sharp enough to predict that the shares accruing to each individual would be independent of the level of output.

the share to the tenant, the weaker are his incentives to supply effort. In the extreme case, the hiring of wage labor is impossible unless there is a direct supervision system to ensure that the laborer is putting in the required effort. Thus we find a tension between the need to provide incentives to the tenant and the need to insure him. *This combined problem is fundamental*. The landlord will offer an appropriate contract to balance incentives and insurance, but trading off some insurance necessarily implies that full efficiency isn't reached: such efficiency is incompatible with the landlord's own objectives.

There is another objection to the risk-sharing argument for sharecropping (see Newbery 1977). In a world where only fixed-wage and fixed-rental contracts are present, an individual agent (landlord or tenant) can control her degree of exposure to risk by merely diversifying the use of her assets and resources across fixed-rent contracts and wage contracts. Thus, landlords may lease out part of their land on a fixed-rent basis and earn secure incomes from land leased in this way. The rest can be cultivated by hired wage labor, which produces higher expected returns, but attaches the associated risk to the landlord. Similarly, a landless person may spend part of her time as employed wage labor to obtain a minimum base income and invest the rest in cultivating leased land on a fixed-rent basis, taking her chances with that venture. This kind of diversification may have the added benefit that the disincentive effects and distortions may be smaller compared to a system of full-fledged sharecropping.

There are three counterarguments to this objection. First, as already noted, fixed-wage contracts have their own incentive problems, so it is far from clear that a *combination* of fixed-rent contracts (which are good for incentives) and fixed-wage contracts (which are bad for incentives) must dominate sharecropping (which is middling for incentives). It all depends on how easy it is to get around the monitoring problem for hired labor. This may be possible in cases where large scale hiring of labor occurs, so that it pays to hire specialized supervisory labor.

The second counterargument is that the mixing of different contracts may be difficult to accomplish in practice. It all depends on the structure of the labor and tenancy markets. Some employers may demand full-time work to be carried out on their plots. This is especially of concern during the harvest season, when proper timing is of the essence. A person who finds employment during this season (and this is the season when most employment is available) may not be able to simultaneously deal with harvesting additional output on leased land.

Finally, other forms of uncertainty might make their appearance felt in the labor market and make the wage rate itself uncertain. Even if mixing is possible, it may not be possible to find a "safe asset," such as a fixed-wage contract that is lacking in all uncertainty. In such circumstances sharecropping may well dominate whatever can be achieved by mixing fixed-rent tenancy with a risky wage contract (Newbery 1977).

22.5.2. Limited Liability. If a tenant is poor and his output is uncertain, then quite apart from considerations of risk aversion, there may be states of the world in which the tenant will not be *able* to pay a fixed rent. Landlords who charge fixed rent will therefore know that such rent cannot always be paid. If the tenant is poor and the harvest fails, the rent will have to be forgiven or essentially advanced as a loan. However, there is no guarantee that the loan will be repaid in the future, so part or all of the

rent may truly have to be forgiven. This constraint, stemming from the tenant's small wealth and the small output that he might produce, is known as *limited liability*.

The problem with the "forgiveness arrangement" just described is that it creates an incentive for the tenant to overinvest in risky methods of production (Basu 1992). This is because if production fails, rent is forgiven, whereas if it succeeds, the tenant gets to retain all the excess (under fixed-rent tenancy). We shall pursue this particular incentive problem in more detail in the context of credit contracts: see Chapter 19. One way to counterbalance this tendency is for the landlord to lower the rent in bad states and raise it in good states. This gives a tenant a stake in the bad outcome as well and reduces his tendency to overinvest in risky forms of farming.

But a lower rent in bad states and a higher rent in good states is akin to sharecropping. Of course, as tenants grow richer, the limited liability constraint bites less and less and then one can return to fixed-rent tenancy. This also implies that we should observe more fixed-rent tenancy if tenant wealth is higher. This observation is related to the notion of *tenancy ladders*; see Shetty (1988) and Sengupta (1997), who study the implications of limited liability for share contracts.

22.5.3. The Double-Incentive Problem. Is leased land farmed only by the tenant and his family, and the laborers hired by them? It depends. If land is leased out by a small landowner to a large tenant or by an absentee landlord who is only interested in maintaining a secure source of rental income, the landlord usually will not be involved with the leased land in an ongoing way. Typically such leases are carried out on the basis of fixed rent, because minimal activity on the landlord's part (such as verification of tenant output) is required. In fact, the landlord would not care whether the land is even cultivated or not, as long as the rent is paid.

On the other hand, there are situations in which the landlord is deeply involved with the crop grown on the land, the methods used for cultivation, the inputs used, and the proper maintenance and care of the leased plot. The landlord may be in a position to make suggestions, to provide managerial care, and supply inputs of production. Some of these inputs may be noncontractible, just as the tenant's labor is noncontractible because it cannot be observed or verified by the landlord.

Now we're in a bind, even if both parties to the contract are risk-neutral. Recall the Smith-Marshall inefficiency argument: under an arrangement such as sharecropping, the tenant gives away some marginal output, and so has an incentive to undersupply effort. That is still a valid argument here, but the issue is one of providing incentives to *both* tenant and landlord. This is the *double incentive problem*.

If the tenant gets to keep the entire marginal output from the land, the landlord keeps none of it. (That's fixed-rent tenancy.) Of course, the tenant will then work very hard, but the landlord will have no incentive to put in effort on the leased land. Now suppose the landlord gets to keep the entire marginal output from the land, but the tenant keeps none of it. (This is the case of wage labor where the landlord is really an employer and the tenant is really an employee.) In this case, the landlord will have all the incentive to put in effort and the tenant-laborer will have none.

So we are in a double bind: the Smith-Marshall argument applies in both directions, and we can no longer say that fixed-rent tenancy does better than sharecropping.

Sharecropping may be a compromise solution in which both landlord and tenant put in some effort. Eswaran and Kotwal (1985a) study this extension.

These arguments can be succinctly expressed with the help of a little algebra. Label the landlord by 1 and the tenant by 2, with landlord supply input e_1 and tenant supplying e_2. We can then write aggregate output on the land as a production function

$$Y = F(e_1, e_2).$$

Let $c_1(e_1)$ and $c_2(e_2)$ stand for the two input cost functions for landlord and tenant respectively. As before, social surplus stands for the aggregate payoff to landlord and tenant, which must sum to

$$F(e_1, e_2) - c_1(e_1) - c_2(e_2),$$

no matter how the output is divided across the two individuals. If the production function has diminishing returns to each input, social surplus maximization is described by the following *pair* of first order conditions

$$\frac{\partial F(e_1^*, e_2^*)}{\partial e_1} = c_1'(e_1^*) \text{ and } \frac{\partial F(e_1^*, e_2^*)}{\partial e_2} = c_1'(e_2^*). \tag{22.3}$$

Let's abstract from the other considerations we've been discussing, such as risk or limited liability, and return to the world most conducive to Smith and Marshall, in which the optimality of fixed rent tenancy is easily established (Section 22.4). With double moral hazard, can the conditions in Equation (22.3) be willingly implemented by the two parties to a suitably constructed contract?

The answer is no, and can be most transparently seen in the class of contracts introduced in Equation (22.1), which writes the rent accruing to the landlord as

$$R = \sigma Y + \rho.$$

where ρ is a transfer (positive or negative) from tenant to landlord, and σ is the output share to the landlord. Under any such system, the landlord and tenant will choose effort e_1 and e_2 to independently maximize

$$\sigma F(e_1, e_2) - c_1(e_1) + \rho \text{ and } (1 - \sigma)F(e_1, e_2) - c_2(e_2) - \rho.$$

These must give rise to the first order conditions

$$\sigma \frac{\partial F(e_1, e_2^*)}{\partial e_1} = c_1'(e_1^*) \text{ and } (1 - \sigma) \frac{\partial F(e_1^*, e_2^*)}{\partial e_2} = c_1'(e_2^*), \tag{22.4}$$

and casual inspection of (22.4) will convince you that these equations cannot line up with the conditions for social surplus maximization, described in (22.4), *no matter what the values of σ and ρ are.*

There is still a "second-best" optimum though, one that acknowledges that full efficiency cannot be attained because of the double incentive problem. The important point is that that second best solution will generally not involve fixed rent tenancy. For if it did, then $\sigma = 0$, and the first equation in (22.4) then informs us that e_1 will be set equal to zero, which would lead to low production levels on the farm.

22.5.4. Cost Sharing. Sharecropping may be the preferred contract when input costs can be shared between landlord and tenant. This is a potentially tricky issue, because we are saying in the same breath that the use of inputs cannot be pre-specified by the landlord, while at the same time their use costs can be shared. But there is no deep mystery here. There is typically no court of law to which the landlord can take a case, if the tenant does not agree to her stipulated use of inputs. Moreover, she may not *want* to stipulate input use. There could be variations in, say, optimal fertilizer use or in timing that only the farmer knows deeply about, and the landlord does not want to concern herself with. In this context, the Smith-Marshall doctrine may be entirely relevant: there is a genuine moral hazard problem.

Suppose, however, that the inputs in question are observable to both parties and their cost can be shared. For the sake of argument, say that the only input in production is fertilizer. The landlord could share the tenant's cost of applying fertilizer. Now consider the effect that this has on the choice of fertilizer input by the tenant. He will equate the marginal product of fertilizer *that accrues to him* to the marginal cost of fertilizer *that he pays*. Under sharecropping, the marginal product he receives is half the true marginal product, and with cost sharing thrown in, the marginal cost faced by him is halved as well. This restores efficiency, because marginal product is then equated to marginal cost. Figure 22.6 graphically explains this simple yet powerful argument. Notice how the tenant's retained output function *and* his cost function are swiveled or flattened to the same degree, so that the net effect on his input choice is unchanged.

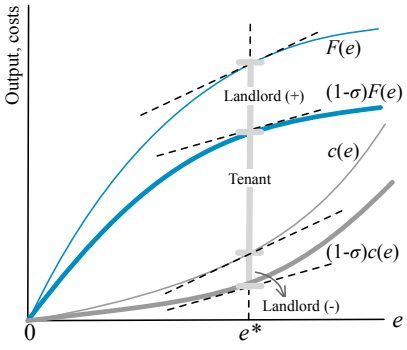

Figure 22.6. Cost-sharing combined with sharecropping.

Matters are more complicated when there are many inputs of production — some observable and some not. Then the Smith-Marshall inefficiency argument still applies to the inputs that are unobservable, whereas with judicious cost sharing it can be avoided for those inputs that are observable.[354] If the tenant is risk-neutral, it is still better (barring the other considerations raised in the previous subsections) to lease out the land on fixed-rent tenancy, but if the tenant is risk-averse or has limited liability, the insurance advantage makes a sharecropping contract potentially attractive, as already discussed. If several inputs are contractible and if cost sharing can be used, then the relative advantage of sharecropping is further heightened. Newbery and Stiglitz (1979) study some of these issues.

The following brief description of share contracts in the Sindh region of Pakistan illustrates some of the points of this subsection and is relevant for some of the observations made in the previous subsection as well.

[354] These statements are somewhat loose. Marshallian inefficiency is not really defined "input by input," but by the entire complex of reactions to a particular contract. This also means that if some inputs are not contractible, the optimal cost share on the contractible inputs are not generally equal to the output share.

Sharecropping in the Sindh, Pakistan

Share tenancy contracts in the Sindh are referred to as *batai*; literally, a division.[a] The landlord leases land in return for a share of the harvest; the tenant provides the labor. The costs of other inputs of cultivation—seeds, fertilizer, and pesticides, for instance—are borne by *both* landlord and tenant under a variety of cost-sharing rules. To be sure, the *crop* share and the *cost* share are closely linked. For example, a tenant who assumes sole responsibility for land preparation (i.e., provides all labor) and who has a one-half share in the cost of all other inputs gets a one-half share of the crop. This arrangement is viewed as the most common form of *batai*.

However, the 50-50 share is becoming less frequent, particularly in Sindh. The tenant's crop and cost shares vary between one-half and one-sixth, and intermediate crop shares of a one-third, one-fourth, or one-fifth are also observed. Mechanization is partly responsible for the fall in the tenant's share. Labor-intensive tasks such as land preparation and threshing, which were traditionally the sole responsibility of the tenant, are now accomplished wholly or partly with machines. Thus active landlord involvement in cultivation is present.

Multiple cropping has also increased the use of hired labor on tenanted area. The agricultural year typically consists of two seasons. In one season, a food crop (wheat or rice) is grown, and in the other, cash crops (cotton, sugar cane, and fruits) are grown. With the advent of multiple cropping, two or more crops (such as cotton and sugar cane) may need to be harvested simultaneously, while another crop (red chilies, for instance) is being planted. This situation has dramatically increased the use of hired labor on the share tenant's plot. These changes have raised the monetary costs of cultivation and reduced the tenant's role as provider of labor and draft animals. Tenants who get a one-fourth or smaller share, typically do not have draft animals and are not responsible for land preparation. The tenant's share of payments made to thresher operators and hired harvest labor are equal to his crop share.

Multiple cropping and the increasing focus on cash crops has made farming a more lucrative business. If alternative opportunities for tenants do not rise at the same rate (e.g., due to increased mechanization), a reduction in the tenant's crop share is a likely outcome. Sometimes the tenant's share differs by crop. They may get one-half or one-third of the food crop, but only one-fourth or one-fifth of the cash crop. In some cases, tenants work as agricultural wage labor in the season when the cash crop is grown and as share tenants in the season when the food crop is grown.

[a] I am grateful to Ghazala Mansuri for providing me with the material on which these observations are based.

22.5.5. Dynamic Incentives and Relational Contracts. The Smith-Marshall doctrine argues that the tenant cannot be compelled to supply the right levels of effort, where "right" is defined from the point of view of the landlord. He must be incentivized. Yet those incentives generate risk for the tenant, and (as we've already argued) that can also make sharecropping profitable. But so far, we've made all these arguments in a static setting. New considerations and opportunities emerge when we consider contract *renewal*.

Specifically, while a landlord cannot take a tenant to court for not putting in the efficient amount of effort, she can certainly threaten — implicitly or explicitly — to

replace the tenant.[355] For instance, she might know that the tenant has spent excessive time farming his own plot of land instead of working on the rented plot, but cannot *prove* it. Ergo, this event cannot be used in legal contracting, but it can be used in the decision to *renew* a contract. After all, if our tenant is no worse than other tenants, then it is entirely credible for the landlord to informally promise that she will renew the contract. At the same time, the tenant will be aware that it is also credible for the landlord to not renew the contract if he, the tenant, shirks. Contract (non-)renewal can be based on information in ways that an ordinary contract *cannot* mimic.

These dynamic threats or incentives go under the rubric of *relational contracts*. They're contracts all right, but their continuation is based on observations or "relationships" that cannot be verified in a court, and don't need to be.[356] That gives the landlord an additional instrument — the threat of non-renewal — through which effort incentives are provided or reinforced. I hasten to add that I am not passing a moral judgment on this system, for there are many reasons why eviction threats could be seriously problematic. (See the discussion to follow, as well as the box on Operation Barga below.) But let us be clear-eyed about what they can do.

The threat of non-renewal substitutes for current incentives and enables the landlord to offer a suitably compressed contract to the tenant. The greater the compression of rewards, the better the insurance that she offers, but the cost of that must come in the form of dynamic incentives that require her to give the tenant more than her next-best option. We have already seen these self-enforcing contracts when we studied credit markets in Chapter 19, and we will meet them again when we take up the topic of permanent labor in Chapter 23. They involve giving the tenant a premium in the here and now, relative to his outside option. The potential loss of that premium serves as the incentive to exert suitably high effort. The landlord will have to examine closely whether she is willing to pay the additional compensation required to acquire a credible instrument based on eviction.

This gap between contract and alternative is an undeniable plus for the tenant. If eviction were to be banned and there is an excess supply of potential tenants, a *new* tenant will not be given any more than his next best alternative. In particular, it is not surprising to observe that, despite the vicissitudes and uncertainties of tenancy, tenancy is still preferable to landless labor.

That said, the overall effect of potential eviction on the welfare of the tenant needs to be examined with caution. Certainly, eviction comes with the possibility of serious damage. It is one thing to say that the contract will be renewed contingent on "satisfactory performance," but there are always dangers in fully agreeing ex post upon what that satisfactory performance exactly entails. Or the tenant may fail the test for genuine reasons that are hard to foresee, such as a family illness. So the eviction threat could introduce a new form of risk for the tenant, and he will have to be compensated for this risk; otherwise he will not accept such a contract. In addition, there are other potential sources of loss. Chief among these are activities that increase the long-run earning potential of the land, which the tenant will now be less willing to carry out, for fear that he will not be around to enjoy the fruits of that investment.

[355] The literature on eviction includes Singh (1983), Bardhan (1984), Dutta, Ray, and Sengupta (1989), and Banerjee, Gertler and Ghatak (2002).

[356] A large literature on this topic includes Bull (1987), Pearce and Stacchetti (1988), MacLeod and Malcolmson (1989), Levin (2003), Kostadinov (2020), and Watson, Miller and Olsen (2020).

22.5.6. Power and Efficiency. In all the arguments above, we've taken for granted the fact that tenants have some outside option, and that the landlord seeks to maximize her payoffs subject to providing the tenant the value of that outside option. Like Smith and Marshall, we as analysts are interested in overall systemic efficiency, but our inquiry so far has been constrained by the existing allocation of power across landlord and tenant. The land is the landlord's land after all, and she holds the cards. That said, though, and in the interests of a broader exploration of these matters, there is no particular reason why we should regard the power allocation as a given.

Our discussion of eviction is relevant here. Banning eviction does not grant the tenant property rights over the land, but it does grant him *use* rights, and use rights do confer power. A ban can greatly increase the economic welfare of incumbent tenants for this reason. No longer can the landlord offer a contract to which the tenant can only respond with a meek "yes" or perhaps a slightly more dignified "no." Now the contract can be bilaterally bargained, because with the banning of eviction, the landlord is *not free to offer the plot to an alternative tenant*, even though she owns the property.[357]

This much is obvious. What is less obvious is that such a ban can increase social surplus because it transfers power to the tenant and in this way naturally improves on his incentives for effort provision. Return to the Smith-Marshall doctrine which asserted that a fixed-rent contract *both* maximized the landlord's return *and* social surplus. However, as soon as we introduced the realistic features of uncertainty and risk aversion, fixed-rent tenancy represented too much of a risk for the tenant. Those output fluctuations for the tenant can be tempered to some extent by sharecropping, but we also noted that this gives rise to an incentive problem, which lowers productivity. We concluded that there is a fundamental trade-off between the provision of incentives and the provision of insurance, and that this tension meant that maximal productivity will *not*, in general, be attained.

But now we qualify that statement a bit more: maximal productivity will not, in general, be attained *unless the landlord substantially raises the tenant's share of rent*. However, the landlord has no interest in productivity per se: what does she stand to gain if that increase in productivity (and then some) is passed on to the tenant? But this change *can* be achieved through effective legislation. If eviction is banned, the tenant can increase his share because of his better bargaining position.[358] At the same time, there is a potential loss in incentives because the eviction instrument cannot be applied. Which effect dominates is ultimately an empirical question. The box on Operation Barga, a program of tenancy legislation implemented in West Bengal, summarizes an empirical test of these ideas carried out by Banerjee, Gertler and Ghatak (2002).

Operation Barga

The Land Reforms Act of India (1955) and its subsequent amendments stated that all sharecroppers will have *permanent* use rights on land that they lease, and, moreover, that such rights will be inheritable. Such incumbency rights could be claimed as long as

[357] However that same policy may have entirely different consequences for potential tenants; say, those who are currently landless laborers. For them, fresh tenancy contracts become much harder to get, and, all other things being equal, this will reduce their welfare.

[358] This is one way to interpret the point made by Mookherjee (1997).

sharecroppers paid the legal share of the crop to their landlords or did not leave the land uncultivated, *or unless the landlord wished to take back the land for personal cultivation.*

Loopholes such as the italicized phrase in the previous sentence have tripped up land reform legislation for decades. Landlords have routinely used the personal cultivation clause to evict tenants.

There was another major barrier. A tenant would have to formally register his status (as a tenant) with the government. But few tenants registered, faced as they were with potential intimidation from their landlords, the loss of other forms of support such as consumption credit, and the prospect of a long and arduous legal battle if they truly wanted to dispute an eviction.

The Left Front came to power in West Bengal, India, in 1977 as the ruling state government. In existing tenant laws they found possibilities to advance their agenda of agrarian reform. Even though these laws conferred only use rights and not ownership, they had potential anyway. The Left Front carried out a two-pronged attack. It took the no-cultivation clause seriously and closed off this loophole. Simultaneously, it encouraged the registration of tenants through a much publicized program called Operation Barga (the term *barga* stands for sharecropping). The peasant organizations of ruling political parties worked along with village-level administration to encourage registration. They thwarted collusion between landlords and local officials and prevented intimidation. "Settlement camps," which were already being used by land reform officials to maintain and update land records, were actively used as tools of registration; registration certificates were issued on the spot. Over the period 1977–90, the fraction of registered sharecroppers rose from 23 to 65%.

We must be careful evaluating the direct effect of this registration scheme. During the same period of time in West Bengal, there was expansion in public and private irrigation and there was technological change as well, so we need to control for these variables. Banerjee, Gertler and Ghatak (2002) showed nonetheless, that Operation Barga accounted for a significant fraction of total growth in agricultural production during this period: 36% is the figure estimated.[a]

It seems, then, that in the case of Operation Barga, the possible loss in yield due to lack of eviction threat as an instrument was far outweighed by the gain in yields accruing from a greater tenant stake in output. In the sample studied by Banerjee and Ghatak [1996], only 10% of all tenants had output shares that exceeded 50% in the pre-reform period. Post-reform, about half of all registered tenants and even a quarter of all *unregistered* tenants had shares that exceeded 50%.

Alas, many years later, the distinction between use rights and property rights, which worked well enough to give tenants more power, would come back to haunt the Left Front, and irrevocably change the face of politics in West Bengal. Land began to be acquired for non-agrarian manufacturing activity all over India. West Bengal was no option. Landlords, hamstrung by their inability to evict their sharecroppers, were only to eager to sell, while there was no obvious clause to protect or compensate the farmers, who were the tillers of the land, but mot the owners. Operation Barga simply did not have a contingency plan for this one. In the years leading up to the 2011 West Bengal Legislative Assembly election, the failures of equitable land acquisition brought the Trinamool Congress increasingly into prominence. In that year, a Trinamool-led alliance took 227 seats in the 294-seat Assembly, dealing a death blow to the incumbent Left Front government after more than three decades of unchallenged power.

[a] The direct effect is probably even higher, because sharecropping accounted for somewhat less than half of West Bengal's agricultural sector.

22.5.7. Screening. A sharecropping contract offered along with other kinds of contracts may be a suitable screening device to obtain high-quality tenants. Suppose that a landlord is uncertain about the true ability and productivity of a prospective tenant, although the tenant himself knows precisely what his abilities are. In such a situation, it is sometimes possible to *separate* the two kinds of tenants by offering a menu of contracts.

The idea behind the argument is that high-ability tenants will prefer contracts in which they can retain a larger share of their (high) marginal product, whereas low-ability tenants would like to divide their (low) marginal product between the landlord and themselves. Now landlords would like to ferret out the high-ability tenants in a world where tenant abilities are largely unknown. By doing so, the landlord can use their higher productivity to extract more rent.[359] Note well that *all* the implicit extra surplus cannot be extracted as increased rent, because in that case no high-ability tenant will reveal himself through an appropriate choice of contract. This is where a cunningly chosen menu of contracts can make a difference.

Specifically, suppose that the landlord can ask the tenant to choose between two contracts: one in which a share of the output is offered and another in which fixed rent must be paid. It is possible, under some circumstances, to choose this menu so that the following conditions are met.

(1) A high-ability tenant will prefer the fixed-rent contract to the sharecropping contract, even though the implicit rent in the fixed-rent contract is higher. The reason is that he gets to keep his high marginal product entirely. In the sharecropping contract, he must give some of this away.

(2) A low-ability tenant will prefer the sharecropping contract to the fixed-rent contract. The fixed rent is too high relative to the extra marginal product that he would get to retain.

If these two conditions are met, then the two types of tenants will "separate" by choosing different contracts. Under this view, sharecropping is a sifting device to leave fixed-rent contracts in the hands of the most productive tenants. This screening theory also offers an explanation for the *coexistence* of sharecropping with other contractual forms.

Note that there are several problems with the screening view. First, abilities do not stay unknown *forever*: what happens once tenant abilities are revealed? After this happens there is no need to give the low-ability tenant a sharecropping contract (unless there are other considerations that we have already discussed, such as risk aversion). Thus the screening theory at best gives sharecropping an ephemeral role or a permanent role only when there is a perennial influx of fresh tenants.

Second, if a high-ability person knows that once he reveals himself, rents will be raised to squeeze the extra surplus that he generates, what incentive does he have to reveal himself in the first place? In an intertemporal context, separation is still achievable, but is a more costly proposition.

Third, if potential tenants can bid for contracts, and the only uncertainty lies in tenant abilities, then potential tenants are like entrepreneurs who can bid for other

[359] However, see the subsequent remark on competition.

factors, including land. Then the equilibrium form of tenancy will be fixed-rent. For screening to have a role, more than one factor of production must display uncertain quality.

Despite these limitations of the simple screening model, it does illustrate the subtle incentive problems that crop up in the choice of land contracts. For this reason we provide a more formal discussion of the screening model in Appendix 2 to this chapter.

22.6. Land ownership

22.6.1. A brief history of land inequality. Why the ownership of land is distributed as it is ultimately is a historical question. When population was sparse and land abundant, the issue was not so much one of the appropriate use of *land* as the appropriate use of *labor*. Thus the beginnings of modern history are marked not so much by battles for land, but struggles for the control (and ownership) of labor. This changed first in those parts of the world in which population density began to cross certain critical bounds and land became the critical factor in production. The notion of property rights slowly began to emerge, beginning with notions of community or tribal rights to tracts of land and culminating in the structure that we know today in many parts of the world: ownership rights by a single individual or family.

The path to specific property rights has seldom been smooth. Rights to land have historically been subject to challenge, largely backed by force. It was only natural that a class of overlords or rulers would emerge, who would exact tribute or rent from cultivators in return for patronage and protection. Such payments were subsequently enshrined in tradition, in social custom, in religious norms, and last (but not least) in the legal dictates of the state. As populations swelled the world over, these norms, regulations, and traditions were supplanted and reinforced by the power of the market. Land rents and prices rose as land became scarce relative to labor. With a cheap supply of labor, the laws that supported slavery gradually were dispensed with.

Binswanger, Deininger, and Feder [1995], in their comprehensive survey of the evolution of land relations, note that an increasing population was not the only factor that determined the skewed relationship of labor to land. Free peasants moved to the large manorial estates under measures that systematically reduced their outside options: (1) large tracts of unoccupied lands, including tracts of high quality, were assigned to members of the ruling class, thereby reducing the amount of free land available for small-scale cultivation, (2) differentially high taxes were imposed on free peasants, (3) access to markets for output was restricted by setting up marketing schemes that restricted sources of purchase, and (4) infrastructural improvements as well as various subsidies were selectively provided to farms that belonged to the ruling class. It need hardly be added that these measures necessitated a high degree of connivance between the state and the ruling class, which was not very difficult because many representatives of the state came precisely from this class.

It is not surprising, then, that the twentieth century dawned with enormous inequalities in land holdings, much of which survives unscathed as we move into the twenty-first century. This inequality gives rise to four major questions:

(1) Is such inequality compatible with productive efficiency, quite apart from the intrinsic ethical abhorrence that we may feel toward it?

(2) If there is an efficiency loss, can it be repaired through the operation of land rental markets?

(3) If land rental markets are not adequate to restore efficiency, would land sales from rich to poor spontaneously redress the balance?

(4) If neither land rental markets nor sales markets are sufficient, what is the role of land *reform*?

We have already examined the second question in detail. In the rest of this chapter, we address the remaining issues jointly.

22.6.2. Land size and productivity: Concepts. *Productivity* Do small farms have higher productivity than large farms? To address this question, it is important to clarify what we mean by the term "productivity." Consider two notions. One is *total factor productivity*: do small farms have a production *function* that lies "beyond" that of large farms? This is a hard concept to get at for two reasons. First, small and large farms do not typically use the same inputs. Thus, we need to compare the inputs in some way, presumably by multiplying by market prices, to get an overall aggregate. Second, there is the problem of valuing nonmonetized inputs such as family labor. In the following text we will have no theoretical reason to believe that small farms are more efficient in this narrow technological sense. We are after a broader notion of productivity anyway.

The second notion of productivity is "productivity in the sense of market efficiency." This is a vaguer notion, and we can roughly translate it by asking, Do small farms produce an output per acre that is closer to the "efficient market" output than large farms? However, what do we mean by market efficiency? In a world where several markets are inefficient or nonfunctional, it is unclear whether the standard rules of efficiency in *one* market promote economic efficiency overall.[360] Very tentatively, we may say that production efficiency is achieved when the values of the marginal product of all inputs equal their true marginal costs. This is the viewpoint we will use to make the subsequent theoretical arguments.[361]

This second, subtle notion is often tested very bluntly: simply ask if output per acre (perhaps correcting for land quality) on small plots exceeds those of large plots. This presumes that whenever the preceding efficiency conditions are violated, they are violated in the direction of *underapplication* of inputs. The arguments we consider in the upcoming text suggest that this may be the case, but it helps to keep the conceptual distinctions of this subsection in mind throughout.

Technology

Consider, first, the technological angle. Obviously, there are minimum sizes below which land cannot be usefully cultivated, at least for certain crops. Moreover, large plots are suitable for mechanization and cultivation with capital-intensive methods, in a way that small plots are not. Thus, from the pure technological point of view, it is

[360] The so-called theory of the second best (see Lipsey and Lancaster [1956]) states that in a world where the appropriate efficiency conditions do not hold in a number of markets, getting them to hold in any *one* market may be a bad thing. We shall see this logic applied with great vigor in the case of customs unions (see Chapter 29).

[361] All efficiency losses do not arise "at the margin." This is especially so in situations where, for instance, fixed costs of labor supervision must be incurred. In this case the *marginal* efficiency conditions may well be met, but there is nevertheless an efficiency loss arising from the supervision of labor.

reasonable to suppose that land either exhibits constant unit productivity (with all other inputs being expanded in proportion) beyond a certain minimum scale or displays increasing productivity once large-scale techniques of cultivation can be brought to bear.

What are the various sources of scale economies in production? First, there is the use of draft animals, which are economical only when a certain minimum size is reached. Draft animal *power* can come in divisible units if a rental market for animals exists, but for more than one reason, this market is very thin. Animals are capital goods and proper care is necessary to maintain their value over long periods of time. If they are rented out, they could be overworked or mistreated. Moreover, there is often correlation (within a village) in the use of animal power, so that an animal may be in use on the owner's land during the time that it is needed by a potential renter. Thus bullocks are typically individually owned, and the lack of a rental market creates the indivisibility.

Machinery—tractors, harvesters, threshers, pump sets—represents economies of scale on an order higher than those created by draft animals. The minimum size of land required for efficient ownership is high, but the scope for a rental market is somewhat better. Threshing can be done at any time of the year; the rental of harvesters or pump sets may be more problematic when time-bound cultivation is critical. On the whole, there should be advantages to ownership.

Thus from the narrow technological viewpoint, there seems to be little point in any debate. Large plots of land can always do just as well as smaller plots, if for no other reason than the fact that large plots can be subdivided into smaller plots and cultivated the same way small plots can. In addition, they can take advantage of any large-scale methods (such as cultivation with the use of tractors) that might be available.

Imperfect insurance markets and small-farm productivity

The insistence on technology alone misses a basic feature of cultivation: that labor plays a central role in agriculture. Both in this chapter and the chapter to follow, I have taken pains to emphasize the severe incentive problems that come with the employment of labor, either directly, or indirectly in the form of tenancy. As we will see in Chapter 23, there are often serious problems of monitoring labor, for which the employer must pay either in the form of direct supervision or indirectly in the form of contracts designed to create incentives. As for tenancy, the greater part of this chapter has been concerned with the incentive problems that arise there as well. These incentive problems would not arise if all labor were risk-neutral, for then fixed-rent tenancy could mimic ownership and distortion-free cultivation would be possible (as in Marshall's ideal) simply through the exclusive use of such rentals.

However, laborers and tenants are not risk-neutral and they do not have perfect access to credit or insurance markets (as we will see in Chapters 19 and 21). Therefore, landlords can make money by attempting to insure them against agricultural uncertainty. But In doing so, the landlords must offer contracts that fail to ensure efficiency in production. Even moderate experiments such as Operation Barga, which only confer use rights (and not ownership rights), have shown that a shift of power away from the landlord can lead to productivity gains, because of the shift in marginal output enjoyed by the tenant. Studies such as Shaban [1987], which we have also discussed,

estimate the magnitude of the productivity gains that are possible simply from the extra incentive effect.

The following question arises: if there is an efficiency gain to be had, why doesn't the landlord (or employer) reap that gain by changing the contract appropriately? We have asked this question before (see the section on eviction, for instance), and the answer here is the same. If there is no limited liability (or perfect credit markets) and no uncertainty (or perfect insurance markets or risk neutrality), all efficiency gains that *can* be made, *will* indeed be made by the landlord through an appropriate choice of contract, because he can always design a contract that exhibits these gains and then remove the gains by a lump-sum tax (fixed rent) on the tenant. In a world of risk-averse or credit-constrained tenants, this isn't possible any more. Actually, to be precise, it *is* possible to offer a contract that enhances efficiency, but the landlord cannot reap the benefits of that contract without exposing the tenant to a level of risk that he will not accept (or cannot absorb, if he is credit-constrained). Therefore a productivity-maximizing contract will not be offered; see Mookherjee [1997].

This means that ownership of small plots that are predominantly farmed by family labor is associated with intrinsic productivity advantages that cannot be mimicked by contractual hiring of labor (unless some special conditions are met). These gains are efficiency gains in the second sense described in the previous subsection.

Imperfect labor markets and small-farm productivity

The preceding argument relied on a lack of perfect credit and insurance markets. This is why the land contract (or the labor contract) is forced to do double duty: it must provide incentives and insurance at the same time. In trying to do both, it fails to do either of them perfectly, because there are trade-offs involved. In particular, efficient incentive provision does not occur and productivity is lower on farms that are leased out or use hired labor.

A similar outcome can occur if *labor* markets are imperfect; in particular, if they display unemployment. To understand how this works, suppose first that there is full employment. Now evaluate the opportunity cost to a landowner of applying one unit of labor on the land. If this labor is *hired*, then the opportunity cost to the landowner is just the going wage rate per unit of labor,[362] but what if this is the landowner's *own* labor (or family labor)? The answer is that it's the going wage rate as well, because this is what one unit of labor *could* earn were it not to be applied on the land. In short, there is no difference in the opportunity cost of labor whether the labor is hired or is supplied internally by the family.

But the foregoing argument falls apart in a world of unemployment. For someone who hires labor, the opportunity cost of another unit of labor is still the market wage rate he needs to pay for that unit, but for family labor, the opportunity cost is *less* because there is the possibility of unemployment.

Exactly what the opportunity cost is for family labor in a climate of unemployment depends on the way in which the labor market functions. The details are unnecessary (but are given in a footnote)[363] as long as we are agreed that it must be less than the

[362] It may be higher if there are incentive problems as in the previous subsection, but we neglect these to make our current argument as stark as possible.

[363] Here are two ways to model opportunity cost. One is that the family *knows* whether it can get a job or not. If it can, the opportunity cost is just the market wage, as in the full-employment case. If it can't, the

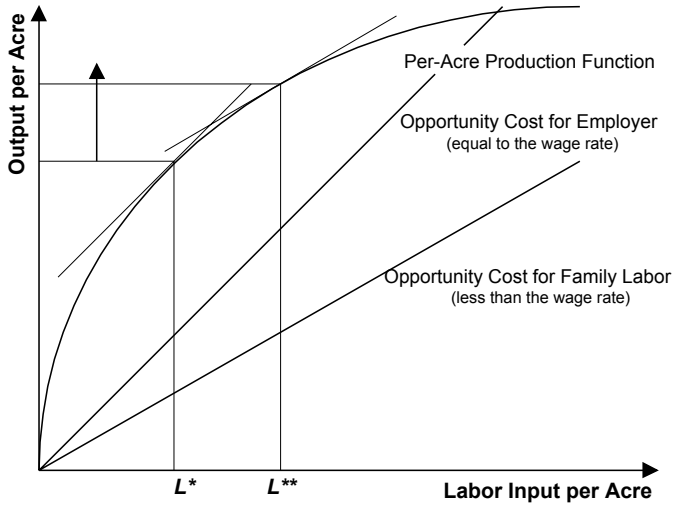

Figure 22.7. Imperfect labor markets and small-farm productivity.

market wage. Now it is easy to see that small farms will put in more labor per acre than large farms and produce higher output per acre.

Figure 22.7 puts together these observations by drawing per-acre production functions (much the same way as we did for the Solow model in Chapter 3).[364] With a lower opportunity cost of labor (induced by the possibility of unemployment), small farms that use family labor will put in L^{**} units of labor per acre (this is the point at which marginal product equals *their* marginal cost). Large farms that hire in labor will use less units per acre (they are at L^{*}). Thus output per acre on small farms will tend to be higher.

Is this argument an argument for productivity gains in the sense of enhanced *market* efficiency? Here we are on slippery ground: the answer depends on the "true" marginal cost of labor. If there is unemployment in the labor market, it isn't a bad bet that the wage is too high relative to the social opportunity cost of labor. Thus a profit calculus that hinges on the market wage is likely to lead to underapplication of labor relative to the efficient level, so it appears that family farms that factor in the probability of unemployment in their opportunity cost calculations are moving closer to the efficient allocation of resources. However, a definitive answer to this inquiry must depend on a careful analysis of the particular imperfections in the labor market.

Pooling land It is possible to try to sidestep the productivity debate by pulling the reverse of a trick that we tried a few subsections ago: small farms must *always* win

opportunity cost is effectively zero (ignoring leisure for simplicity). On average, then, some families will have very low opportunity cost and some will have the same opportunity cost as an employer of labor. A second model is that the family does not know whether its labor can be employed elsewhere. If p is the probability of employment and w is the going wage rate, then the opportunity cost for a risk-neutral family is just the expected value, which is pw.

[364]These per-acre production functions presume constant returns to scale in land and labor (see the Appendix to Chapter 3). Again, this is a simplification. We have already acknowledged the possible gains from increasing returns and will include this in our summary. For now, we ignore it.

over large farms because of the incentive argument and because small landowners, if they so wish, can *pool* their land to take advantage of technological returns to scale.

This argument is problematic, however. The pooling of land recreates the incentive problem to *some* extent, although how much of it can be avoided depends on the precise source of returns to scale. For instance, suppose that the source of increasing returns is large-scale marketing. Then it is likely that the incentive problems *can* be dealt with through reform. The land can still be farmed separately and the fixed costs of setting up a marketing group can be pooled. It is not at all surprising that cooperatives whose main incentive to form was marketing have been relatively successful (the dairy cooperatives in India are a particularly visible example).[365]

On the other hand, suppose that the source of increasing returns lies at the production level (say, through the use of tractors). Then the incentive problem returns with full force: as long as *production* is joint, individual owners will have a tendency to slack off. Indeed, the production activity *must* be joint if returns to scale are intrinsically embodied in the cultivation process.

A simple story that explains the incentive problem with joint farming has the same flavor as several disparate models that we have studied before. Joint production creates an *externality*. Additional effort by any one farmer leads to additional output, but the added output is *shared* among the whole team. That part of the marginal output that accrues to other members of the cooperative is an externality as far as our farmer is concerned, and unless he internalizes this through a complete sense of altruism, he will undersupply effort. To be sure, everybody else will do the same as well and productivity will be reduced below the efficient level. This is a *free-rider problem* characteristic of situations like the Prisoners' Dilemma.

We have used this sort of argument to explain the Marshallian inefficiency of sharecropping and in other contexts as well.[366] We leave the details of the argument here to an exercise at the end of the chapter.

Thus, even if you do see successful cooperatives that exploit increasing returns *outside* the cultivation sphere (such as mechanized processing or marketing), do not expect to see successful wheat or rice cooperatives. We have already seen in Chapter 17 how decollectivization in Chinese agriculture in the late 1970s brought about substantial gains in agricultural output. After collectivization in the early 1950s, TFP fell between 20 and 30% in the 1970s. In just a few years after the reforms (which essentially provided for use rights on plots), TFP was back to the precollectivization level and then continued to grow steadily through the 1980s (Wen [1993]).[367] Vietnam experienced similar gains from decollectivization (Pingali and Xuan [1992]).

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[365] Another example of relatively successful cooperation is the sugar cooperatives of Maharashtra, India. Here, the source of increasing returns lies in crushing the sugar—a capital-intensive process in which the scope for moral hazard is minimal. The *cultivation* of sugar cane is carried out separately. For more on the role of cooperatives in rural development, see Attwood and Baviskar [1988].

[366] See, for instance, our analysis of fertility decisions in a joint family. The common features are brought out in Appendix 1 (Game Theory) at the end of the book.

[367] Chinese communes used the work-point system, under which output shares were determined, in part, by the ratio of work points accumulated by the individual to the total number of work points registered in the commune. To some extent, this serves to mitigate the free-rider problem because output *shares* themselves can be influenced by effort (see Sen [1964]), but this presumes that effort is *fully* observable, which is unlikely.

Summary so far We can summarize the observations in this section by saying that technology is at best neutral toward land size and may even favor large land sizes because of the possibility of extensive mechanization. On the other hand, with imperfect insurance markets, incentives favor the cultivation of land by owners and family labor: hired laborers and tenants typically must be given contracts that create an efficiency loss. Imperfect labor markets with unemployment heighten this proclivity by reducing the opportunity cost for family labor relative to that of hired labor. Finally, the technological gains of large farms cannot be achieved easily by small farms simply by pooling land, because that creates a free-rider problem. Hence there genuinely are two opposing sets of forces, and which effect dominates is ultimately an empirical question.

22.6.3. Land size and productivity: Empirical evidence. Available evidence suggests that the productivity gains arising from incentives (in the background of imperfect markets) do outweigh the technological returns to scale from larger plots, at least for developing countries. (Supermechanization on the order of magnitude seen in the United States and Canada is an entirely different matter altogether.) Roughly speaking, the following trend seems to be observed: the most productive farms are those that are owner-occupied and predominantly use family labor (although the very smallest farms do not unambiguously display higher productivity).[368] These are followed by large, mechanized, owner-cultivated farms that employ wage labor. There are efficiency losses with the hiring of labor, but these appear to be (partially) compensated for by mechanization. Last of all is sharecropped land, in which, as we have seen, the incentive problems arising from risk sharing are likely to be strongest. Our theories do not appear to be far off the mark.

Empirical productivity studies must be treated with a great deal of care. There is some reason to believe that small plots could be of higher quality. Good land may be more fragmented because of inheritance pressures. It may also be the case that farmers who sell off land in distress (thus becoming small holders) sell off the relatively less fertile part of their holdings. As Binswanger, Deininger, and Feder [1995] noted, there are not many studies that examine this issue (although Walker and Ryan [1990] empirically rejected the hypothesis that there is a negative correlation for size and productivity among the ICRISAT villages).

Abhijit Sen's [1981] study of a sample from West Bengal uses the value of output per acre as a measure of productivity (see preceding text for a tentative defence of this approach). Table 22.5 summarizes his findings. There appears to be clear evidence of a negative relationship between productivity and farm size among owner-cultivated farms. Among farms that have some tenanted land (under sharecropping), there is no clear trend. The very smallest farms have the lowest productivity in this case, but among the remaining classes of farms, productivity continues to decline with size. Note, however, that in every size class, productivity per acre on sharecropped land is lower than the productivity of the *same* farms under owner cultivation. Marshallian inefficiency, as in Shaban's [1987] study, is again at work. On average, the productivity on owned land exceeds the productivity on sharecropped land by about 50%.

[368] Scale issues may really bite at very low farm sizes. Moreover, the poorest farmers may lack access to complementary inputs of production because of severe credit constraints (Binswanger, Deininger, and Feder [1995]).

		Farms with some crop sharing	
Operated area (acres)	*Pure owners (Rs/acre)*	*Overall productivity (Rs/acre)*	*Productivity or*
0–3	1313	798	867
3–5	1044	909	1099
5–8	960	842	1130
8–12	691	843[a]	959[a]
12+	624		
All	902	851	1047

Source: Sen [1981: Table 7].

[a] The last two size groups have been merged because of an insufficient number of observations.

Table 22.5. Rupees of output per acre by size group and tenure: West Bengal.

Range of farm size (acres)	Average farm size (acres)	Income per acre (rupees)
0–5	3.0	737
5–15	9.3	607
15–25	19.5	482
25+	42.6	346

Source: Berry and Cline [1979, Table A-1].

Table 22.6. Farm size and land productivity: India.

The inverse relationship appears at an aggregated level as well, even when the difference between owner-occupied and tenanted land is not explicitly taken into account. Tables 22.6 and 22.7, which present aggregated information for India (as a whole), northeast Brazil, the Punjab (Pakistan), and Muda (Malaysia), are taken from the work of Berry and Cline [1979]. The aggregated information supports the decreasing farm-size productivity relationship.[369] It seems that, regardless of the form of the operation, size per se plays a role. (As we have already noted, the decreasing productivity effect persists for tenants in the Sen study except at the very lowest farm sizes.) This situation suggests the possibility that labor market imperfections play a role in addition to the incentive effects, but verification of this point must await more careful empirical study.

The Berry–Cline studies also suggest that the larger the size differences, the larger the productivity differences. In northeast Brazil, the small farms are over *five* times as productive as their largest counterparts! The ratio narrows to 1.5 (which is still a sizable margin) for the relatively equal Muda River region. Thus, as Binswanger, Deininger, and Feder [1995] noted, there is some tentative support for the hypothesis that regions of greater inequality have proportionately more to gain, under an efficiency viewpoint alone, from land reform.

[369] These studies used income per acre rather than the value of output per acre. That is, all the studies subtract the cost of purchased inputs, so the effect of household labor (which we have focused on in the theoretical sections) is included in the net income calculations.

Farm size	*Northeast Brazil*	*Punjab, Pakistan*	*Muda, Malaysia*
Small farm (hectares)	563 (10.0–49.9)	274 (5.1–10.1)	148 (0.7–1.0)
Largest farm (hectares)	100 (500+)	100 (20+)	100 (5.7–11.3)

Notes: Largest farm productivity is normalized to 100. "Small farm" refers to second smallest size range.
Source: Berry and Cline [1979].

Table 22.7. Farm size and land productivity: Selected regions.

Rosenzweig and Binswanger [1993] emphasize another interesting aspect of the productivity–size relationship. They use the ICRISAT data set. Like the other studies, they too find that smaller farms are more productive, on average, than larger farms. However, they found that the advantages are systematically smaller in high-risk environments. The most powerful variable that measures this risk in their study is the variability in the date of arrival of the monsoon rains. The higher the variability in this indicator, the lower is the profitability of assets.[370] Small farms react more violently to this variable than large farms, so apart from a general decline in profitability for all wealth classes (except the richest groups), there is also a narrowing of the profit differential.

So access to credit and insurance clearly plays a role here. In particular, the greater the imperfections in these markets, the smaller the productivity differential is likely to be. It follows that land reform may have effects that outstrip the gains signaled by aggregate calculations of productivity differentials. If ownership of land also implies better access to credit, the productivity per acre of the beneficiaries may be further increased relative to the prereform values.[371]

22.6.4. Land sales. So far, we have seen that a more equal distribution of land might result in significant productivity gains in the economy. Although there may be some loss in the exploitation of possible increasing returns, these losses appear to be more than outweighed by the incentive gains. We also have seen that tenancy contracts do not go all the way toward reaping these gains. The reason is that fixed-rent contracts are often not optimal in a second-best world. Large-scale hiring of labor, on the other hand, involves losses that arise from supervision costs.

This brings us to the issue of land *sales*. Specifically, if small landowners can buy land from rich landowners, then productivity gains can be realized. The question is, Do land markets work adequately?

All the empirical evidence that is available suggests that they do not. Land sales from relatively rich to relatively poor, while not entirely absent, are not very common

[370] Unlike the other studies, Rosenzweig and Binswanger calculate the ratio of profits to total assets. If farming is the major occupation (which it is), this will be closely correlated with net output per acre, after subtracting production costs.

[371] The possibility that access to better credit markets might have significant effects on yields is seen in other studies as well. For instance, farm yields in Burkina Faso have been documented to be significantly affected by the availability of nonfarm income or access to credit (Reardon, Crawford and Kelley [1994] and Udry [1996]).

either. There is some evidence for land sales by the relatively rich, perhaps to finance consumption spurts such as weddings or large investments (see, for instance, the box on ICRISAT villages earlier in this chapter or Cain [1981]), but most land sales appear to be in the form of distress sales that occur from *poor* to *rich* (see, for instance, Rosenzweig and Wolpin [1985]). These include land transfers in lieu of debt repayment (again, from relatively poor to relatively rich; see Chapter 19 for a discussion of collateral transfer).

Why are land sales markets so thin? Consider the value of land. When credit markets are imperfect, land value consists of two components. The first is the discounted sum of income streams that will emanate from working the land. The second component comes from imperfect credit markets: land can be used as collateral, and this ability has value (measured by the profitability of the additional loans that can be obtained as a result of mortgaging the land). Note that this second value would be zero if competitive credit markets prevailed and one could obtain all the loans one wanted at some going rate of interest. Under normal conditions, then, a seller will therefore want to sell the land for a price that is no less than the *sum* of these two values. Now consider what a buyer is willing to pay. If he can buy the land outright from his own funds, then he reaps both these gains as well, but if he must obtain a loan to buy the land and if he must mortgage that very piece of land for the loan, then he cannot reap the collateral value until the loan is paid off. Thus the collateral advantages of a land purchase are pushed back to a distant future when the loan has been repaid, so the buyer's *present valuation* of the land must be less than that of the seller. Thus no sale will occur; see Feder et al. [1988] and Binswanger, Deininger, and Feder [1995].

But the preceding argument has a loophole. It does not take into account the productivity gain that we discussed in the previous section. If small farmers are truly more efficient than large farmers because of the incentive problem, then the discounted sum of income streams (per acre) will be higher for small farmers than for large farmers. It remains to be seen whether the difference in this income stream outweighs the collateral value. If it does, then the absence of a land market cannot be explained with this argument.

This issue was explored by Mookherjee [1997], who showed that the foregoing argument can be rescued by explicitly studying the incentive problems that are associated with the *credit contract* that must be entered into in order to buy the land. Specifically, the optimal contract that will be designed by the lender will involve repayments to him that depend partly on the output produced by the borrower. Intuitively, a creditor effectively becomes the borrower's landlord for the period of time that the loan is outstanding. Fixed interest payments on the outstanding debt are like fixed-rent tenancy, and as we have already seen, fixed-rent tenancy is not optimal for the landlord. For the very same reason, fixed repayments are not an optimal contract for the lender. Thus the loan contract will have the same features as an optimal tenancy contract and will therefore affect productivity on the borrower's newly acquired land: specifically, it will lower productivity for exactly the same reason a tenancy contract lowers productivity. This removes the productivity advantage as long as the borrower is indebted and resurrects the collateral-based argument.[372]

[372] Imperfect credit markets (and the consequent existence of a collateral value of land) are not the only factors that drive the price of land above the present discounted value of output produced from it. Speculative margins on land, especially for agricultural land that is close to an expanding city, or inflation, or government policies that discriminate in favor of large farmers all do the trick. Conversely, distress sales may be viewed

22.6.5. Land reform. Putting together all that we have discussed so far, it seems that (i) productivity is higher on smaller plots than on larger plots, (ii) that these productivity gains cannot be realized by tenancy, because the tenancy contract itself erodes the productivity gain, and (iii) that land sales markets cannot adequately substitute for land tenancy markets.

To realize these gains, we are then left with the option of land transfers from rich to poor, either without adequate compensation or with full compensation paid by the government or by foreign donors, *but not entirely by the beneficiaries*. This last phrase is important. If full compensation is paid by the beneficiaries, then this is no different from a land sale, which, as we've already seen, would not have occurred spontaneously.

Unless the government wishes to spend its budget on compensating beneficiaries, or unless some enlightened foreign donor (the World Bank, perhaps!) earmarks funds especially for this purpose, it is hard to see how a successful land reform can come about. It takes tremendous political will (resistance to powerful lobbies, in particular) to push a land reform program through. There is some possibility that large landowners will agree to *some* reform if they are faced with the credible threat of violence or forced expropriation (for a related line of reasoning, see Horowitz [1993][373]). Otherwise, major land reforms have been the product of political upheavals in society, as in Cuba, Japan, Korea, and Taiwan. Political upheaval has the advantage that large landowners are viewed as enemies, or collaborators with the previous regime, and so there is immense popular support for land reform (without the countervailing lobbies).

To be sure, there are intermediate steps that lie between government inaction and large-scale redistribution. Providing tenants with unlimited *use rights* to land is one of them. We discussed an instance of this when we studied eviction (see the box on Operation Barga). Although such reforms undoubtedly go in the right direction and can have significant effects on productivity, they fall short of reaping the full gains in an environment of imperfect credit markets. Without ownership rights, land cannot be pledged as collateral for productivity-enhancing investments. Seized land also may be redistributed as collectives, as in Mexico or Peru, but we have already remarked on the possible incentive problems associated with collective farming. Finally, land ceilings may be used to curtail ownership of large plots. Even though such ceilings are in force in many developing countries, they are easily sidestepped by holding land in several parcels under the names of friends and relatives.

We end this chapter by studying land reform movements in Korea and in Mexico. The contrasts between the two will be apparent. Our discussion leans heavily on the book by Powelson and Stock [1987].

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as a situation in which the seller's asking price is *below* the present discounted value of the land income stream: precisely the opposite scenario. In this case land sales do become a viable proposition. Unfortunately, the seller is usually the poor farmer.

[373] In the Horowitz model, land reform is viewed as a response to the possibility of destructive conflict. Landowners may agree to policies that redistribute some of their land, because the alternative is far worse for them. What is of interest is that a particular reform may generate the impetus for a further reform by altering the status quo in which agents find themselves. Thus even if there is no arrival of fresh information or any changes in the intrinsic parameters of potential conflict, land reform may appear as a continuing series of relatively small redistribution episodes, rather than one cataclysmic event. On related matters as well as for an insightful analysis of Latin American land relations, see de Janvry [1981].

Land Reforms: South Korea and Mexico

South Korea.

Large-scale land reforms were instituted in Korea in the years following World War II. Korea was a Japanese colony before the war. The defeat of Japan and the establishment of a U.S. military government not only led to a major change in Japan's international political relations, but also a radical reorientation of internal political forces that paved the way for massive redistribution of land. In contrast to many other countries, Korean land reform was not restricted to legal documents and official proclamations—it was brisk and effective.

The bedrock of the land redistribution scheme was the Land Reform Act of 1949 (amended in 1950). The Japanese, in their constant search for cheap sources of rice, had taken an active interest in Korean agriculture and acquired substantial land holdings in that country. Most of this land was transferred to former tenants at low rates: they were to pay the government 20% of their annual output for fifteen years. Thus, 240,000 hectares of Japanese-owned land were conferred upon Korean peasants. Land was also transferred from large domestic landowners to their tenants under the land-to-the-tiller scheme and the original owners were compensated. The Act stipulated that all rented land plus owned land above 3 *chongbo*[a] would be purchased by the government and sold to tenants. Landlords were compensated in government bonds worth 1.5 times the annual output on the land. Tenants, on the other hand, had to pay the government 30% of the annual yield on acquired land for five years. By 1952, 330,000 hectares were redistributed.

A major part of the transfer of land took place by direct sale from landlord to tenant. As we will now see, this does not contradict the earlier arguments in the text, because the sale price for the landlord was effectively driven below the present value of land income by the overall climate of land reform.

The government encouraged mutual arrangements in the first place, but more importantly, economic and political conditions were such as to create incentives for direct settlements and bypass official channels. By the late 1940s, tenants had acquired sufficient political clout and patronage, so much so that in many instances, that they stopped paying rent altogether, assuming *de facto* ownership. When the official reforms were initiated, the government was slow to redeem the bonds used as compensation; the market value of the bonds fell to such low levels as to make compensation worth approximately 3.5 *sok* of rice per *chongbo*. In contrast, the tenant's obligation to the government stood at around 19 *sok* per *chongbo* in the current discounted value. The substantial gap left a great deal of room for profitable private negotiation. The result was that as much as 550,000 hectares of land were transferred through direct sales. However, note that the landlord's fallback position was *not* the retention of his land: that land was going to go anyway, which is why the land market was so active.

	Share of land held (%)	
Category	*1947*	*1964*
Owner	16.5	71.6
Part owners	38.3	23.2
Tenants	42.1	5.2
Farm laborers	3.1	0

Source: Powelson and Stock [1987].

Table 22.8. Land under different occupational groups in Korea, 1947 and 1964.

Table 22.8 illustrates how the ownership pattern of land in the countryside was dramatically transformed by the reform in less than two decades. In 1945, 4% of the farm households held more than 3 *chongbo* of land and accounted for 26% of the cultivated acreage. In 1960, only 0.3% of households owned more than 3 *chongbo* and together they controlled just 1.2% of total acreage. One-half of the country's agricultural land had been redistributed to two-thirds of its rural population. Clearly, a greatly egalitarian distribution of land was created in South Korea, starting from a very skewed pattern of ownership that is typical to so many backward countries, within a remarkably short span of time.

Its great success apart, some special features of Korean land reforms demand our attention; a few of them doubtlessly provide clues to that very success.

In many countries, attempts at land reform by the government have been thwarted by the strong lobbies of large landowners, through surreptitious manipulation of the state and bureaucratic machinery. Landlords routinely take advantage of loopholes in the law or flagrantly flout the law itself. Korean landlords had few such luxuries. Most large landowners were tainted by their cooperation with the Japanese and had therefore lost all political clout and state patronage, which led to a breakdown of traditional power relations in the countryside. Reforms were easy in such an environment.

Second, in spite of the massive transfers, the *operational* size distribution remained more or less intact. Very little land was broken up and the same farmers largely cultivated the same plots. The only difference was that erstwhile tenants assumed ownership rights on a wide scale. Consequently there was little fear of a drop in productivity in the turmoil of the transition. Finally, the land redistribution scheme was not accompanied by state intervention in other spheres of agricultural activity, such as marketing, credit, or input supplies—a feature that is rare in other countries where such reforms have been attempted. The farmer's independence was left intact, and the tenant's acquisition of land was not tied to clauses that made his reliance on the state excessive.

Apart from the egalitarian aspect of the Korean land reforms, its impact on overall agricultural productivity was no less cheerful. In the eight years immediately following the reforms, value added in agriculture grew at an annual rate of 4.0%. Over a longer horizon, agricultural output increased by 3.5% per annum from 1952 to 1971, and at 3.8% from 1971 to 1982, which amounts to an annual growth rate of 2% per capita in the latter period.

Mexico.

Land reform measures in Mexico were instituted after the Revolution of 1910–17. Article 27 of the Constitution of 1917 brought all land under state ownership. However, the government reserved the right to transfer land to private citizens at its discretion. The "revolution of the south" had fought for communal farming (to form *ejidos* or communal farms), whereas the "revolution of the north" demanded small private properties. The government struck a compromise by permitting both forms, depending on local needs.

At the core of Mexico's land reform legislation, therefore, lies an essential arbitrariness, which is perhaps both a symptom and a cause of the failure of the reforms to change drastically the ownership and power structure in the countryside. Land redistribution, in practice, has proceeded at a very slow pace, spread over several decades; it occurred in short spurts during certain presidencies [notably that of Lazaro Cardenas (1934–40)], and was interspersed with long periods of inactivity. The last major expropriations took place in 1975.

Unlike South Korea, the wealthy landed class yielded substantial political clout in Mexico even in the postrevolution phase. Using their influence in government and bureaucratic circles, and taking advantage of several loopholes in the law, they were able to short-circuit the redistribution process to a considerable extent. In La Antigua, which comprises 10,000 hectares, the sugar mills and the best acreage around it were excluded from expropriation in the 1920s. Landlords often perpetrated violence on the supporters of reform: peasant leaders were murdered. In San Andrés-Tuxtla a number of commercial crops were grown, and half the acreage was devoted to cattle grazing. In the late Porfiriato, large export-oriented tobacco haciendas operated by wealthy landowners were abundant. There was intense activity of peasant leagues in these regions in the 1920s and 1930s; yet cattlemen and large owners continued to dominate, partly through the use of violence.

To the extent that redistribution actually took place, recipients were chosen not on the basis of well-defined criteria set down in the books, but on the basis of political favor mongering. In fact, land transfers (apart from the limited doses in which they were doled out) were cynically used by the ruling party as an instrument to gain a political stranglehold over the peasantry.

We may conclude that the reason behind the government's half-hearted execution of land reforms was twofold. First, reform did not yield sufficient power over the old landed aristocracy; indeed, to a large extent, the aristocracy had infiltrated the government. In addition, the government was not entirely willing to settle the land question once and for all: the issue needed to be kept alive to draw the peasants and peasant organizations into the orbit of the ruling party. Such dependence was further reinforced through the government's control over the channels of credit and input supply. These considerations were revealed in the following excerpt from an article in *The Wall Street Journal*, 14th February, 1984 (quoted in Powelson and Stock [1987]):

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"They have to come to us first if they want land," says an official with the peasant confederation. "Even if they get land, they have to come to us to get water. If they get water, they still need credits and fertilizer. The party will never lose control of the countryside."

[a] A *chongbo* is almost 1 hectare; 0.992 hectare, to be precise.

The irregular, uncertain, and unpredictable nature of land expropriation and transfers, together with the free-rider problems caused by the formation of cooperatives with ill-defined property rights, surely undermined the productivity of Mexican agriculture and caused it to stagnate over a very long period. Table 22.9 speaks for itself.

22.7. Summary

In this chapter, we studied land markets. We began with a study of land *rental* contracts. A landowner leases out his land to a tenant for cultivation and charges rent. The contract may be in the form of a *fixed-rent tenancy*, in which a constant sum is paid by the tenant to the landlord regardless of the output that he produces, or a *sharecropping tenancy*, in which a share of the output is relinquished by the tenant to the landlord as rent. To be sure, these are extreme forms, and we observed several variations, such as the provision of credit as part of the tenancy contract or the cost sharing of production inputs between the landlord and the tenant.

	Agricultural output (1975 = 100)					
	1961	*1966*	*1971*	*1975*	*1979*	*1983*
Total	66	85	96	100	116	131
Per capita	106	115	108	100	103	103

Source: United Nations FAO *Production Yearbook*, 1973 and 1983; reproduced from Powelson and Stock [1987].

Table 22.9. Index of Mexican agricultural output, overall and per capita.

Share tenancy poses a puzzle. Economists such as Adam Smith and Alfred Marshall have argued for the superiority of fixed-rent tenancy on incentive grounds. Fixed rent allows the tenant to retain the *full* marginal product of his efforts and, therefore, does not distort the tenant's choice of inputs. In contrast, sharecropping lowers the marginal product of effort, or at least that part of it that accrues to the tenant. Thus sharecropping should be associated with lower land productivity: it should display what is known in the literature as *Marshallian inefficiency*. To be sure, this argument presumes that tenant inputs are unobservable.

Marshallian inefficiency is observed empirically. This suggests that the preponderance of sharecropping in Asia is unproductive. We studied how sharecropping, despite this inefficiency, can be an equilibrium outcome. An important driving force is the existence of uncertainty, coupled with imperfect or nonexistent mechanisms for insurance. In such situations the provision of incentives creates large uncertainties for the tenant. The tenant is willing to pay a premium for the removal (or amelioration) of this uncertainty, and we showed that the landlord has an incentive to provide such partial insurance in the land contract. Essentially, this involves sharing in the tenant's output.

There are other roles for sharecropping as well. Among them are situations in which *both* landlords and tenants participate in production (the *double-incentive* problem), in which there are restrictions (physical, legal, or social) on the tenant's ability to repay (*limited liability*), or environments in which *cost sharing* of inputs is widespread.

We ended our discussion of land rental contracts by considering the phenomenon of *eviction*. We viewed eviction as another instrument that the landlord might use to provide incentives and we discussed situations in which eviction clauses may be implicit or explicit in tenancy arrangements. Of particular interest in this context are situations in which the tenant is granted *use rights* to the land (while he does not have ownership as in a full land reform, the landlord cannot evict him). We discussed how this form of partial land reform can affect land productivity.

We then moved on to the study of land ownership, land sales, and land reform. The first important question is, Do small farms have higher productivity than large farms? We described what we mean by "productivity" in this context, and then provided some theoretical arguments and empirical evidence that bear on this question. Among the theoretical issues are (i) increasing returns to scale, (ii) the incentive problems of tenancy and large-scale farming using hired labor, and (iii) differential productivity effects resulting from unemployment in the labor market. The empirical evidence supports the contention that small farms, by and large, exhibit higher productivity.

If small farms have higher productivity, why doesn't a land *sales* market spontaneously arise to transfer land from relatively large to relatively small landholders? Unfortunately, the evidence suggests that land sales are not very common, and even where they occur, they are often in the form of distress sales from small to large landowners. We considered theoretical arguments for the absence of a land sales market.

Finally, we briefly studied *land reform*: the transfer of land from large to small landowners with or without partial compensation.

Appendix 1: Principal–agent theory and applications

12.A.1. Risk, moral hazard, and the agency problem. *Hidden information and hidden action*

Over the last twenty years, it has become increasingly apparent that the incompleteness and asymmetry of information between agents have a strong influence on market structures, the nature of economic transactions, and the kind of contractual arrangements people enter into. For instance, the Marshallian attack on sharecropping assumes that tenant effort is *unobserved* by the landlord, and cannot be specified. This is an example of informational incompleteness and, indeed, such incompleteness influences the choice of contract by the landlord.

Actually, two kinds of informational problems are known to have significant effects. One is the problem of *hidden information*. For example, workers may come in various levels of skills. An individual worker may know what his own level of proficiency is, but a prospective employer can only make a rough guess. Of course, the worker could communicate his knowledge, but the act of communication is itself fraught with incentive problems. For instance, each worker would like to tell the employer that he is of high quality, but how can he credibly do so? The problem in this case is to devise a contract or scheme that will accurately reveal the information of the agent. An example of this kind of problem is the screening model, introduced in the text and described more fully in Appendix 2 of this chapter.

The second problem is that of *hidden action*, often called the problem of *moral hazard*. In the hidden action problem, the benefit of a transaction to one party depends on some action taken by the other party; however, the latter may not have any incentive to take the beneficial action after a contract has been signed between the two. This is precisely the problem with a fixed-wage contract, where the action in question has to do with the choice of effort. The key element is that the action to be taken is not publicly observable, and it is difficult or impossible, therefore, to prove in a court of law that the party concerned has neglected an assigned task. A classic example is that of fire insurance. Once a building has been completely insured against accidental damage due to fire, its owner will have no incentive to install and maintain costly fire-fighting devices. Failure to do so will significantly increase the hazard of fire in the building and will reduce the company's ability to provide insurance at an affordable premium. This situation may end up hurting both parties: clients have to pay very high premiums and may not be able to purchase sufficient insurance; insurance firms, on the other hand, suffer considerable loss of business. A large part of the literature on contract theory is concerned with such problems and examines how contracts can be devised so as to

provide built-in incentives that minimize the scope of morally hazardous behavior in an optimal way.

Risk and moral hazard: Interaction We take up the hidden action or moral hazard problem here. At first sight, it appears that the problem is easy enough to solve. Simply ask for a fixed payment from the agent whose actions are difficult to monitor. Saddled with all the residual incentives, the agent will indeed choose the correct action. This is precisely the logic that underlies the Marshallian demonstration of the efficiency of fixed-rent tenancy.

However, what makes it difficult, if not impossible, to implement this sort of solution is the fact that *the provision of incentives is intimately tied to the provision of insurance*. In particular, more of one is less of the other. Consider again the debate on sharecropping versus fixed-rent tenancy. Note that to provide insurance to the tenant, the tenant's return must become more insensitive to the output produced by him. Indeed, insensitivity to outside fluctuations is what insurance is all about. Now it should be obvious that incentives to work are diluted. The two features—risk and moral hazard—interact, and resolving this interaction in a satisfactory way is the issue studied in *principal–agent models*, to which we now turn.

Principal–agent theory There is a large class of economic models in which an economically powerful entity, called the principal, attempts to devise contractual arrangements with one or more individuals, called agents, in a way that best serves the former's interest. Examples include a firm hiring employees, a government trying to find a supplier to provide some public good like a highway, the regulation of public utilities, or a landlord–tenant relationship. The principal is supposed to have control over scarce assets or production processes that give him monopoly or quasi-monopoly power, so that he can dictate the terms of the contract or make take-it-or-leave-it offers. However, there are two constraints that must be met.

First, agents have alternative uses and opportunities for their effort and resources. To accept a contract, the agent must be compensated for the opportunity cost of his resources and time.[374] The utility a typical agent could earn by the best alternative use of his available resources is often called his "reservation utility." The principal, in devising the contract, has to take care that the agent earns at least his reservation utility from the deal (otherwise his offer will be refused). This restriction on the principal's choices is called the *participation constraint*.

Second, there is the problem of hidden action. A principal must understand that the agent will take the action most suited to his own preferences. If the action is to be altered, the terms of the contract must be suitably modified to provide the agent enough motivation to carry out the alteration. This restriction is known as the *incentive constraint*.

The optimal contract is chosen to yield the highest possible return to the principal, subject to the satisfaction of these two constraints. Let us now illustrate how this works in the context of land tenancy.

12.A.2. Tenancy contracts revisited. The landlord–tenant relationship beautifully illustrates the tension between risk sharing and incentives. Begin with a landlord who

[374] Throughout the principal–agent literature, agents are given the freedom to refuse an offer. Therefore, slave economies and bonded labor fall outside the direct purview of this kind of analysis.

owns a plot of land and wishes to devise the most profitable contract for a prospective tenant/worker. Thus the landlord here is the principal and the tenant is the agent. The tenant has a reservation utility (i.e., the utility he will obtain by making the best use of his time and resources elsewhere) $\bar{U}$, which is exogenously given. The contract that the landlord offers should provide the tenant an expected utility of at least $\bar{U}$ for it to be accepted. This condition is the *participation constraint*.

Let Q denote the output obtained after cultivation. Suppose Q can take two values: "high" (H) or "low" (L). These values are realized probabilistically. The probability of the high output depends crucially on the agent's effort input. In particular, suppose that there are two levels of effort, e, to choose from: $e = 0$ or $e = 1$. When there is zero effort, the probability of high output is q. On the other hand, when the higher level of effort is provided, there is a higher probability $p\ (> q)$ of the high output being realized. However, the higher effort level involves a cost E for the tenant; hence, he will be unwilling to put in high effort unless that effort significantly affects the payment he receives from the principal. We assume, without loss of generality, that there is no cost of providing low effort.

The tenant is risk-averse. This is captured by ascribing to him a utility function of money of the form $U = U(w)$ (w being the monetary payment he receives), where $U(\cdot)$ is a strictly increasing and concave function. The concavity of $U(\cdot)$, by definition, implies the inequality

$$\theta U(w_1) + (1-\theta)U(w_2) < U(\theta w_1 + (1-\theta)w_2), \tag{22.5}$$

where θ is any proper fraction and w_1 and w_2 are two different possible values of the agent's monetary income. Inequality (12.3) merely says that whenever the agent faces some uncertainty, that is, has the prospect of two unsure income levels, each with a given chance, his *expected utility* is lower than what his utility would have been if he received the expected *monetary* income *for sure*. (See the discussion in this chapter and in Chapter 17, and consult, especially, Figure 17.13.)

Overall utility is just the utility of money minus the effort cost (if any).

We assume that the principal is risk-neutral, so that his objective is to write an acceptable contract that maximizes his own expected monetary return.

For the problem to be interesting and nontrivial, we impose two conditions:

(1) We assume that the provision of high effort maximizes expected net surplus (and is hence Pareto efficient). Mathematically, this can be written as the condition

$$pH + (1-p)L - E > qH + (1-q)L. \tag{22.6}$$

On rearrangement, this becomes

$$(p-q)(H-L) > E. \tag{22.7}$$

(2) We assume that whatever the actual choice of effort, the expected net output generated is always enough to pay the agent a compensation that gives him at least his reservation utility. Given the previous assumption, all we need to specify is that there is enough surplus generated in the low-effort case.

Mathematically,

$$qH + (1-q)L \geqslant \bar{w}, \tag{22.8}$$

where $\bar{w}$ is the certain payment that will provide the agent exactly his reservation utility, that is,

$$U(\bar{w}) = \bar{U}. \tag{22.9}$$

The first-best contract (efforts observed)

Suppose that the landlord can costlessly observe (and a law enforcing third party costlessly verify) the effort put in by the agent. The contracted payment to the agent can then be made conditional on the provision of a stipulated level of effort and the landlord, by prior agreement, can refuse to make any payment (or even impose a fine) if the agent fails to meet the required condition regarding effort. Thus only the participation constraint matters in this situation, not the incentive constraint.

In such a case, the optimal contract for the principal is one that asks the agent to put in $e = 1$, promising a sure payment of $\bar{w}_c$ [where $U(\bar{w}_c) = \bar{U} + E$] if and only if the tenant provides this effort. For the principal, this is preferable to asking for zero effort and paying the lower compensation $\bar{w}$ because by the preceding assumption 1, higher effort generates higher *net* expected surplus, and the principal can appropriate the whole of it if he can observe and specify the agent's level of effort.

Moreover, the optimal contract necessarily involves the same payment to the agent, irrespective of outcome, because the principal (being risk-neutral) is better off bearing all the risk himself. A more precise argument runs as follows. Suppose the principal were to offer an acceptable contract that offered a wage w_1 in the case of high output and w_2 in the case of low output, with $w_1 \neq w_2$. First note that if this provided an expected utility any higher than $\bar{U}$, then the principal would be able to do better by reducing any one of the payments slightly. Hence, a maximizing principal will set

$$pU(w_1) + (1-p)U(w_2) = \bar{U}. \tag{22.10}$$

Let $\tilde{w}$ be the expected payment in the foregoing scheme, that is,

$$\tilde{w} = pw_1 + (1-p)w_2. \tag{22.11}$$

By the assumption that $U(\cdot)$ is a concave function, we have

$$U(\tilde{w}) > pU(w_1) + (1-p)U(w_2), \tag{22.12}$$

which, in conjunction with (22.10) and (22.11) implies that

$$U(\tilde{w}) > \bar{U}. \tag{22.13}$$

Thus, if instead of making the conditional payments (w_1, w_2), the principal were to offer the fixed payment $\tilde{w}$ for sure, he would provide the agent with *more* than his reservation utility. Hence, the principal can offer a sure payment of slightly less than $\tilde{w}$ (say $\tilde{w} - \delta$), while still satisfying the participation constraint. The principal, being risk-neutral, worries only about minimizing the expected *monetary* payment to be made, and hence, clearly prefers the latter arrangement (paying $\tilde{w} - \delta$ regardless of outcome) to the former (paying w_1 or w_2, contingent on the final output). Hence the optimal contract in the full information case involves a fixed payment to the agent, just enough to cover his reservation utility. This is nothing but a labor hiring contract at a predetermined wage.

The second-best contract (efforts unobserved)

Now, let us assume, as is more realistic in most situations, that the tenant's actual supply of effort is *not* observable to the principal. What are the characteristics of the best contract the principal can design in such a scenario? Such a contract is often referred to as the "second-best" contract, to distinguish it from the previous one (i.e., the best contract under full observability of effort). We now see that the principal will want to make the payment conditional on output, paying out a high amount when the output is higher.

To begin with, suppose the best second-best contract is such that it *does* induce the agent to choose high effort. Whether it is optimal to write such a contract is something we will check later. For now, we assume that the principal is trying to design a contract that will induce the agent to choose $e = 1$, and we figure out the best possible way in which the principal can achieve this goal.

Let the contract specify a payment w_H in the case of high output and w_L when output is low. The problem is to find the values of w_H and w_L that will maximize the principal's expected return, subject to the constraints that exist. The first of these is the *incentive constraint*. If the agent is to choose a high effort voluntarily, the payment scheme must be such that his expected utility from doing so is at least as much as that from choosing a low effort. This implies the inequality

$$pU(w_H) + (1-p)U(w_L) - E \geqslant qU(w_H) + (1-q)U(w_L),$$

which, on rearrangement, becomes

$$(p-q)[U(w_H) - U(w_L)] \geqslant E. \tag{22.14}$$

It is immediately obvious that because $p > q$ and $E > 0$ by assumption, we must have $w_H > w_L$ for the inequality to hold. Hence, any payment scheme that gives the agent an incentive to provide high effort must pay him more in good states (i.e., when output is high) than in bad states. The intuition is clear: the self-interested agent will care for a better outcome only if he has some personal stake in it.

The second constraint that the principal faces is the *participation constraint*. The agent's expected utility under the contract should not fall short of his reservation utility. This translates into the inequality

$$pU(w_H) + (1-p)U(w_L) - E \geqslant \bar{U}. \tag{22.15}$$

We now note the following statement.

Observation 1. *For the optimal contract, the incentive constraint* (22.14) *must be satisfied with equality.*

The reason is as follows. Consider any contract (inducing $e = 1$) so that (22.14) holds with *strict* inequality. Now allow the principal to make the following two adjustments. First, he reduces w_H and increases w_L by small amounts, so as to keep the expected value $pw_H + (1-p)w_L$ the same as before. Because the incentive constraint held with inequality in the first place, it will continue to be satisfied if the size of the adjustment is small enough.

However, this adjustment raises the agent's expected utility from the contract, because it reduces the risk in his income (see Figure 22.5 and the discussion around it), while keeping its expected value the same. Therefore, given that the participation

constraint (22.15) was originally satisfied, it must now be *strictly* satisfied, because the agent's expected utility has gone up.

The principal can now carry out a second adjustment to the terms of the contract: he can profitably reduce w_L by a small amount. This makes incentives (for high effort) even better and the participation constraint still holds if the reduction is small. Whereas the first adjustment gives the principal neither a gain nor a loss, because it keeps the expected payment the same, the second is clearly a gain. Hence, starting from a contract where the incentive constraint holds strictly, the principal always has a feasible way to redesign it so as to increase his expected net return. So Observation 1 must be true.

Now consider the following statement.

Observation 2. *In the optimal contract, if* $w_L > 0$*, then the participation constraint* (22.15) *must hold with equality as well.*

The proof is similar to the previous one. Suppose the participation constraint is strictly satisfied to begin with. Then lowering w_L by a small amount will still satisfy that constraint. Note also that the incentive constraint continues to be met, so it follows that the principal will certainly make this reduction if he can. The only possibility that will prevent him from doing so is that w_L may be zero to begin with, so that reducing it further would mean asking the agent to pay a penalty (rather than receive a payment) in the case of a poor harvest. Due to legal, institutional, or ethical reasons or reasons stemming from credit-market imperfections (a typical poor tenant/worker is unlikely to have much stored wealth of his own from which to pay a fine), a landlord is very unlikely to be able to exercise such an option.[375]

The preceding claims and the technique for solving the optimal values of w_H and w_L can be illustrated by a simple diagram. If we rewrite the incentive and participation constraints in the form of equalities rather than weak inequalities, we have the equations

$$(p - q)[U(w_H) - U(w_L)] = E \tag{22.16}$$

and

$$pU(w_H) + (1 - p)U(w_L) = \bar{U} + E. \tag{22.17}$$

By placing $U(w_H)$ and $U(w_L)$ on the Y and X axis, respectively, we can plot these two equations; see Figure 22.8. It is easy to see that equation (22.16) represents a straight line with slope 1 and intercept $E/(p - q)$ (the line AB in each panel of the figure), whereas equation (22.17) represents another straight line, negatively sloped, with slope $-(1 - p)/p$ and intercept $(\bar{U} + E)/p$ (drawn as the line CD in each panel of the figure). The landlord's task is to choose a pair $(w_H,\ w_L)$ or, equivalently, choose a point $(U(w_H), U(w_L))$ in Figure 22.8 to satisfy the two constraints. Note that all points lying above the line AB satisfy the incentive constraint, whereas those lying above CD satisfy the participation constraint. The *feasible set* of points from which the landlord can choose his contract is then given by the common region, which is marked by the shaded areas in the figure.

[375]The condition that the agent cannot be offered negative payments, that is, asked to pay a penalty, under any contingency, is known as a limited liability constraint; see main text. There is nothing, in principle, to prevent the landlord from imposing penalties in the event of adverse outcomes. However, in many contexts, it seems natural and realistic to impose limited liability constraints on the agent. It is not necessary, though, that the minimum payment in any contingency has to be zero. It can be any positive or negative number that seems suitable.

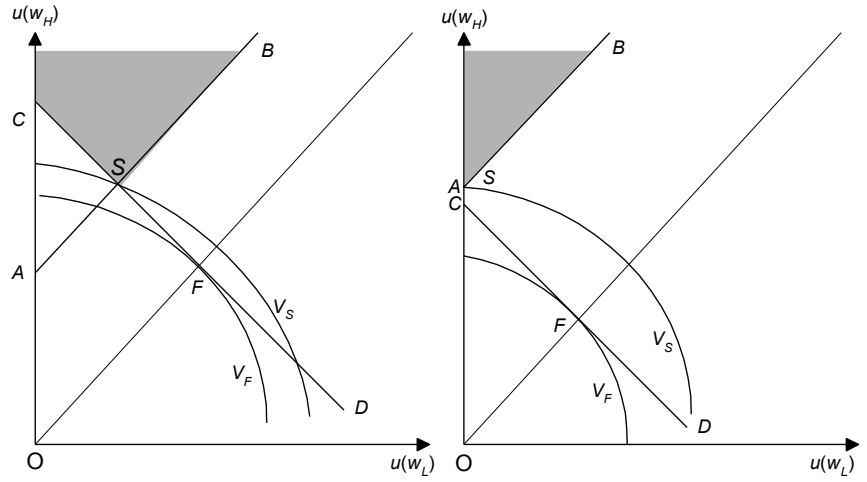

Figure 22.8. Solving for the optimal contract.

Next, we can draw the landlord's indifference curves. Any particular indifference curve is a locus of $(U(w_H), U(w_L))$ pairs that provide the same expected return to the landlord. These are downward sloping and concave, with lower indifference curves representing higher expected return for the landlord. If the landlord is to pay a higher amount in any one state, he must pay a lower amount in the other to keep his expected return the same; this explains the negative slope. If payment in one state is lowered and that in the other state is held constant, the landlord's expected return goes up because he has to make a lower expected payment; this explains why lower indifference curves signify higher expected returns. The argument for concavity is a bit more subtle and depends on the concavity of the $U(\cdot)$ function. Start at a point on an indifference curve with $U(w_H) \geqslant U(w_L)$. Now, say w_L is reduced somewhat and w_H is simultaneously increased so as to keep the expected payment the same. The agent now faces a risky income. Due to risk aversion, the loss in w_L is weighed more in utility terms than the corresponding gain in w_H. The larger is the (mean preserving) transfer from w_L to w_H, the smaller will be the increase in $U(w_H)$ relative to the fall in $U(w_L)$. Hence we have the concave shape of the landlord's indifference curves.[376]

One further characteristic of the indifference curves is worth mentioning. At its point of intersection with the 45° line (i.e., wherever $w_H = w_L$), each indifference curve has a slope of $-(1-p)/p$. This is because such points represent complete income insurance, so that the agent is almost willing to accept a *very small* mean preserving transfer of income across good and bad states.

Going back to Figure 22.8, we have separately represented two cases. In the left-hand panel of the figure, $(\bar{U} + E)/p > E/(p-q)$, so that the intercept of CD is higher than that of AB. Clearly, the landlord, in trying to attain the lowest indifference curve, will choose the corner point S of the feasible set. This point, then, represents the second-best contract. The corresponding values on the two axes $U(w_H^*)$ and $U(w_L^*)$ give us the optimal payment scheme (w_H^*, w_L^*) from the utility function. Notice that

[376] A parallel argument holds in the less relevant case where w_L initially exceeds w_H.

the line AB (on which S lies) is merely an upward shift of the 45° line. Hence, in the optimal contract, it must be true that $U(w_H^*) > U(w_L^*)$, which in turn implies $w_H^* > w_L^*$. This confirms what we previously argued verbally.

The case represented in the right-hand panel is very similar to the first, only more extreme. Here, $(\bar{U} + E)/p < E/(p - q)$, so that the intercept of CD is lower than that of AB. As a result, the participation constraint is never binding: the incentive constraint exclusively determines the feasible set. The optimum point is at the corner A, which involves a payment of $F(e)$ in the good state, but a zero payment in case of low output. This is an extreme example of incentives in a contract: the landlord refuses any payment at all (or makes the lowest possible payment) if performance is poor.

It is instructive to compare this with the contract given in the case of observable effort (i.e., the first-best contract). In that contract, the incentive constraint is irrelevant, so that the landlord merely chooses the lowest indifference curve without falling below the line CD (representing the participation constraint). Evidently, the best point to choose is that point on the line CD that is tangent to one of the landlord's indifference curves. Remember that CD has a slope of $-(1 - p)/p$, which is the slope of the in difference curves at their point of intersection with the 45° line. Hence, tangency occurs at the point F, where CD crosses the 45° line. This point then represents the first-best contract. Being on the 45° line, this point provides the same utility $U(\tilde{w}_c)$ to the agent in either state, that is, it involves the same payment $\tilde{w}_c$ in each state. This confirms the assertion that in the case of observable effort, the optimal contract should provide full income insurance to the agent.

Furthermore, note that the indifference curve V_S passing through S is above the curve passing through F (V_F). Hence, when the tenant's effort cannot be observed, the landlord's expected return is lower than in the full information case. In other words, providing incentives for high effort is costly to the landlord.

Indeed, might the landlord be better off by not providing any incentives and simply letting the tenant choose lower effort? In the latter case, it is best for the landlord to pay $\bar{w}$ in either outcome. For the best contract with high-effort incentive to be truly optimal, it is necessary that the landlord's expected return be at least as great as what he would have obtained by not providing any incentive at all. This amounts to the condition

$$p(H - w_H^*) + (1 - p)(L - w_L^*) \geqslant qH + (1 - q)L - \bar{w}, \tag{22.18}$$

which on rearrangement becomes

$$(p - q)(H - L) \geqslant pw_H^* + (1 - p)w_L^* - \bar{w}. \tag{22.19}$$

Note that if the increase in probability of high output with high effort $(p - q)$ and the difference in magnitude between high and low output $(H - L)$ is high enough relative to the cost of providing incentives [the right-hand side of inequality (12.17)], the landlord will prefer the high-effort contract.

Summary

In a world of perfect information the best contract that the principal can design is a contract that pays the agent a fixed wage irrespective of the outcome in production. This is good for the agent because he is made immune from any randomness in his income. It is also good for the principal because by implicitly offering income insurance

to the agent (which the principal can well afford because of his own risk neutrality), he also implicitly extracts a premium from him.

Problems arise when the agent's actions and inputs are hidden, that is, when there is scope for moral hazard. If the agent is given a fixed compensation by contract, then he has a strong incentive to provide as little input as possible (because effort is costly) and then blame the poor outcome on bad weather or any other damaging exogenous factor beyond his control. To ensure that the agent puts in a good, if not efficient, amount of input, the contract has to provide him some stake in the outcome. Thus, he must be paid more when the outcome is good, but has to be penalized by reduced pay in the case of bad outcomes. This, however, introduces an element of randomness in the agent's income, because even in the case of good input supply, the outcome may be bad through sheer bad luck. Because insurance is mutually profitable, it is clear that the provision of incentives in the contract entails a corresponding loss in the form of reduced insurance. The stronger the incentives the principal would like to provide, the greater is the insurance loss. This trade-off between the insurance and incentive aspects in a contract forms the most fundamental issue in the literature on principal–agent relationships. Theoretical research attempts to identify the form of contracts that strike the optimal balance between the two aspects and tries to explain real world contractual arrangements and institutions in the process.

Appendix 2: Screening and sharecropping

This simple model illustrates how sharecropping may arise when landlords are unsure about the true ability and productivity of their tenants, and may then offer a menu of different contracts, each suitable for a specific type of agent.

Suppose there are two possible types of prospective tenants—one with high ability and the other with low. Cultivating a given plot of land, a high-ability tenant can produce an output Q_H, whereas a low-ability tenant can produce Q_L, with $Q_H > Q_L$. Other than the tenant's ability, there is no other factor affecting output. Hence, we assume away natural uncertainties and the problems of shirking or low-effort supply that lay at the core of the previous model. This is only to achieve exclusive focus on a different set of issues. Assume that the landlord does not know what the true ability of a prospective tenant is, but attaches a probability p to the event that the tenant has high ability rather than low.

Let $\bar{w}$ be the agent's reservation income (the same for both types). Any contract, to be acceptable, must provide the agent at least this much. Because risk is not an issue here, there is no need to bring in a utility function as before; the tenant will only bother about the monetary income he receives from the contract (because whatever he gets, he gets for sure).

Let us first see how much the landlord can expect to earn if he offers only a fixed-rent contract. We will then contrast this with the case where he can offer the tenant two different contracts—fixed rent and sharecropping—from which the latter is free to choose one. We will show that in the latter case, the expected return of the landlord is generally higher than that in the former.

Suppose the landlord considers offering a single fixed-rent contract. What is the maximum rent he should charge? There are two possibilities. The landlord may want the contract to be accepted no matter what the agent's type is. In this case, the fixed

rent charged should be low enough to cover the reservation wage in case the tenant is *low* ability (if a low-ability tenant finds a particular contract acceptable, then so will a high ability one, because they have the same reservation wage, but the latter's productivity is higher). The landlord, to maximize his returns, will charge a rent high enough so that the agent, if his ability is low, will be indifferent between acceptance and rejection. This implies the rent to be charged is

$$R_1 = Q_L - \bar{w}. \tag{22.20}$$

There is a second possibility to consider. The landlord may want to ask for the highest rent that the high-ability tenant will be willing to pay, thereby risking rejection of his offer in case the tenant has low ability. In this case, the rent charged is

$$R_2 = Q_H - \bar{w} > R_1. \tag{22.21}$$

However, the landlord will get this rent only with probability p, because the contract will be accepted only if the tenant is of high productivity. Hence, the landlord's *expected* return from the contract is $pR_2 = p(Q_H - \bar{w})$. Clearly the landlord will choose to charge R_1 when $R_1 > pR_2$ and R_2 when $pR_2 \geqslant R_1$. Note the significance of the magnitude of p: the landlord will choose to ask for the lower rent R_1 when p is sufficiently low ($1 - p$ is sufficiently high). This is fairly intuitive, because the landlord cannot choose to ignore a possible low-ability tenant if he thinks it highly likely that the tenant he is dealing with is actually of lower productivity. We shall assume that this is the case, that is, low-ability tenants are not so rare as to be ignored in the contract designing problem of the landlord. In other words, we assume $R_1 > pR_2$. Then the rent charged by the landlord if he offered only a fixed-rent contract would be

$$\tilde{R} = Q_L - \bar{w}. \tag{22.22}$$

Next, assume that the landlord contemplates offering two contracts and lets the agent choose one. In particular, he considers offering a contract with a fixed rent R, and another — a sharecropping contract — specifying a share σ of the output to be paid to the landlord (hence, the tenant *retains* a share $1 - \sigma$ of the output for himself). How should the landlord optimally choose the values of R and σ, and what is the corresponding (maximized) expected return? The reason the landlord might want to offer these multiple contracts is to target each at a different type of tenant: if the *same* contract is more attractive to the tenant irrespective of his ability, then the other contract is really redundant and might as well not be offered at all. A moment's reflection shows that the fixed-rent contract is better targeted at the high-ability tenant: because he has higher productivity, he can afford to pay a higher stipulated amount while still earning at least his reservation wage. The discussion, then, naturally suggests a pair of *incentive constraints*, one for each agent. These merely say that each type of agent should get at least as much return from the contract designed for it as from any other. In the context of the present model, the incentive constraints for the high- and low-ability types, respectively, imply the inequalities

$$Q_H - R \geqslant (1 - \sigma)Q_H \tag{22.23}$$

and

$$(1 - \sigma)Q_L \geqslant Q_L - R. \tag{22.24}$$

In addition, there is a pair of *participation constraints*. Each type, on choosing the contract designed for it, should be able to secure at least his reservation income. This

implies

$$Q_H - R \geqslant \bar{w} \tag{22.25}$$

$$(1-\sigma)Q_L \geqslant \bar{w}. \tag{22.26}$$

What is the landlord's expected return when he offers a pair of contracts denoted by (R, σ)? It is a weighted average of the returns from a high-ability tenant and that from a low-ability tenant, and the weights are the respective probabilities that the tenant has one ability or the other. Mathematically,

$$V = pR + (1-p)\sigma Q_L, \tag{22.27}$$

where V is the landlord's expected return. The landlord's aim is, therefore, to choose (R, σ) in such a way as to maximize V, while satisfying the incentive and participation constraints mentioned previously.

We can simplify the problem by dropping two of the four constraints—the low-ability tenant's incentive constraint and the high-ability tenant's participation constraint [(22.24) and (22.25), respectively], and explicitly consider only the other two. Our reasoning is that as long as (22.23) and (22.26) are valid, (22.24) and (22.25) are automatically satisfied. If the share contract pays the low-ability tenant his reservation wage, then it pays even more to the high-ability tenant because he is more productive. The fact that the latter is induced to choose a fixed-rent contract instead means that the fixed-rent contract provides him at least as much, if not higher (by the incentive constraint). In other words, combining the inequalities in (22.23) and (22.26) with and the fact that $Q_H > Q_L$, we have

$$Q_H - R \geqslant (1-\sigma)Q_H > (1-\sigma)Q_L \geqslant \bar{w}. \tag{22.28}$$

Hence

$$Q_H - R > \bar{w}. \tag{22.29}$$

Therefore we see that (22.25) is automatically satisfied when the other constraints are and may therefore be dropped. However, it is important to note something from (22.29): under the dual contract scheme, the high-ability tenant always enjoys a "surplus," that is, some income over and above his reservation wage. This arises because of the landlord's lack of information about the tenant's true productivity and is often referred to as an "information rent." It also shows why the landlord can never naively ask the tenant about his true type and expect to get an honest answer: the tenant, even if he possesses superior ability, has an incentive to underreport his true skills so as to obtain a "softer" contract.

Why can the low-ability tenant's incentive constraint be dropped? We will argue shortly that the optimal contract has the property that the high-ability tenant is just indifferent between choosing the fixed and the share rent contract [i.e., (22.23) is valid with an equality]. If that is so, the low-ability tenant will *strictly* prefer the share contract; mathematically, you can check that when (22.23) holds with equality, (22.24) necessarily holds with strict inequality. Thus, it is enough to focus on (22.23) and (22.26) alone.

Next, we claim that when the landlord designs the contract optimally, both (22.23) and (22.26) will hold with *equality*. The reason is as follows. Suppose (22.23) holds with the "greater than" (>) sign. Then the landlord gains by increasing R by a small amount. The high-ability tenant continues to prefer the fixed-rent contract if the increment is

low enough. The low-ability tenant, who previously preferred the share contract, now prefers it with even greater reason after the rise in rent. Both incentive constraints therefore continue to be satisfied. We have already mentioned that as long as other constraints are met, the high-ability tenant earns strictly more than the reservation wage. Hence his participation constraint continues to be met even after the small increment in rent. There is no problem with the low-ability type's participation, because the share contract has not been altered. In summary, a small increase in R is possible as long as (22.23) holds with strict inequality, so under the optimal contract equality must hold in (22.23).

Second, suppose (22.26) holds with strict inequality. Then the landlord can feasibly raise his share (σ) by a little bit, while still meeting all constraints. The low-ability tenant is still induced to participate as long as the rise in σ is small. The high-ability tenant continues to find the fixed-rent contract more attractive, because the share contract now pays even less than before after the rise in the share to be paid to the landlord. Hence, both relevant constraints [(22.23) and (22.26)] continue to be satisfied, and we have already argued that as long as that is true, the other two constraints can be safely ignored.

Finding the optimal pair (R, σ) is now only one further step. Writing (22.23) and (22.26) in the form of equalities, we have the pair of equations

$$\sigma Q_H = R \tag{22.30}$$

$$(1-\sigma)Q_L = \bar{w}. \tag{22.31}$$

Solving for the pair of values of σ and R from the system of simultaneous equations (12.28) and (12.29), we get

$$\sigma = 1 - \frac{\bar{w}}{Q_L} \tag{22.32}$$

$$R = (Q_L - \bar{w})\frac{Q_H}{Q_L}. \tag{22.33}$$

Putting this in (22.27), we can calculate the landlord's expected earning from the best paired contract. This turns out to be

$$\begin{aligned} V &= p(Q_L - \bar{w})\frac{Q_H}{Q_L} + (1-p)\frac{(Q_L - \bar{w})}{Q_L}Q_L \\ &= (Q_L - \bar{w})\frac{pQ_H + (1-p)Q_L}{Q_L}. \end{aligned} \tag{22.34}$$

Given that $Q_H > Q_L$, $pQ_H + (1-p)Q_L > Q_L$. Hence

$$\frac{pQ_H + (1-p)Q_L}{Q_L} > 1. \tag{22.35}$$

Therefore,

$$V > Q_L - \bar{w} = \bar{R}. \tag{22.36}$$

Inequality (12.34) shows that the landlord's expected income from the paired contract (both fixed rent and sharecropping) is greater than that from the best single fixed-rent contract [compare with (22.20)], under the assumption that the probability of a tenant being of the low ability is not too low. In situations where landless tenants with sufficient diversity of skills interact with a monopolist landlord, therefore, both

kinds of contractual arrangements (fixed rent and sharecropping) can be expected theoretically.

Exercises

(1) A farming family owns some land. Suppose that in any year the equivalent of two people are needed to farm each acre of land that they own. The following information is given to you: (i) There are six people in the family; (ii) the going annual wage per person (which each person can earn if he or she so chooses) is \$1,000; (iii) each acre of land produces \$3,000 worth of output (if it is farmed properly by two people, as earlier stated); (iv) the family is always free to lease out land, but the labor required to farm it must be compensated at \$1,100 per person; (v) the family can always hire labor, but hired labor is useless without supervision, and to hire *one* supervisor to monitor labor (irrespective of the number of laborers that you hire), costs \$2,000 per year.

(a) Calculate the rent per acre the family can hope to obtain by leasing out land.

(b) For a six-person family, what is the minimum acreage necessary for it to be optimal to lease out land? Explain your answer.

(c) Is there a threshold acreage after which the family will no longer lease out land, but hire a supervisor and employ wage labor?

Think about why you are getting these answers. To use these observations to assess the validity of the following statements: (i) a high degree of equality in land ownership means that there is a preponderance of family farms using family labor; (ii) very high inequality means that there are only family farms, or capitalist farms hiring labor; (iii) moderate levels of land inequality are often associated with tenancy.

(2) (a) Generalize the setting in (1). There are ownership distributions for land, for labor, for bullocks, for access to working capital. Explain carefully how the *operational* distribution of land will relate to these various ownership distributions.

(b) As an illustration, suppose that there are just three inputs of production: land, labor, and bullock power. Assume that to produce one unit of output requires one unit of land, one unit of labor, and one unit of bullock power combined in *fixed* proportions (1:1:1). Now suppose that the entire economy has 100 units of each of these three inputs, but that each of these are distributed unequally among the population. How many input (rental) markets will need to function perfectly for efficient production to take place? Use this answer to show that the operational distribution of the inputs that do have markets must conform to the ownership distribution for the inputs that do not have markets.

(3) Compare and contrast the features of agrarian structure in Latin America and Asia, paying particular attention to the problem of land ownership.

(4) (a) Show that in an economy with extensive possibilities for perfect crop insurance, fixed-rent tenancy must be dominant irrespective of whether potential tenants are risk-averse or risk-neutral.

(b) Show that in an economy where risk is a major factor, where tenants are risk-averse, and where the inputs of the tenant can be costlessly monitored by the landlord (and verified in court), sharecropping will be preferred to fixed-rent tenancy.

(c) In this question, why did we add the extra qualification that inputs can be verifiable? What happens if we drop this assumption? Study Appendix 1 to this chapter to find out.

(5) Consider a production cooperative with just two farmers. Each farmer chooses independently how much labor to supply to the cooperative. Each unit of labor is supplied at an opportunity cost of w. Output is produced by means of a standard production function (exhibiting diminishing returns), with input equal to the aggregate quantity of labor put in by the two farmers. There is no other variable input of production.

(a) Draw production and total cost as a function of labor input. Find (diagrammatically) the amount of labor input that maximizes farm surplus.

(b) Now return to the problem where labor is supplied independently. Show that if total output is divided equally among the two farmers, production will fall short of the answer in part (a).

(c) Next, suppose that farmer 1 receives a share $s > 1/2$ of the total output, while farmer 2 gets $1 - s$ (everything else is the same as before). Describe what happens to production and labor efforts as s varies between 1/2 and 1.

(d) Now change the problem by supposing that each farmer has an *increasing* marginal cost of supplying labor, instead of the constant marginal cost w. (But assume that the cost function for each farmer is the same.) Now describe how you would solve for the surplus maximizing labor inputs and total output, just as you did in part (a).

(e) Suppose you were to redo part (c) with the conditions of part (d). What difference would this make to your answer?

(f) Try to intuitively relate this exercise to the problem of Marshallian inefficiency in sharecropping.

(6) It is not uncommon to observe that in sharecropping contracts with cost sharing, the cost share borne by the tenant is equal to the output share accruing to him (see, for instance, the box on sharecropping in the Sindh region of Pakistan). Explain why this might be the case.

(7) (a) Why might tenant laws that confer permanent use rights on a tenant who has farmed a plot of land for some years have counterproductive effects on the security of a tenant?

(b) Explain why the presence of limited liability can give rise to situations in which eviction threats are used by the landlord against the tenant. Discuss the various factors that will affect tenant productivity if eviction is banned by law.

(8) A widely observed feature of backward agriculture is the inverse relationship between farm size and productivity; that is, larger farms tend to produce lower output per acre than smaller ones. Brief sketches of two alternative explanations for this phenomenon are provided in (a) and (b). Elaborate on these arguments, using appropriate diagrams if necessary.

(a) It has been suggested that smaller farms chiefly use family labor for cultivation, whereas larger farms rely more heavily on hired labor. Due to significant rates of unemployment in many rural labor markets, the opportunity cost of family labor may

be much lower than the market wage. This may induce small farms to apply more labor per acre relative to large farms.

(b) The following sketch is an alternative "Malthusian" explanation. More fertile land, by providing an abundant source of food, causes families surviving off such land to grow very large. As children in such families become independent adults, the land tends to get fragmented, creating smaller farm sizes.

(c) Compare these two proposed explanations in terms of (i) direction of causality and (ii) policy implications with respect to redistribution.

(d) Suppose you want to test empirically which of these theories explains reality better. This is not a straightforward task, because both have the same observable implication—an inverse relationship between farm size and productivity. Suggest a way in which you can choose from the twao competing hypotheses by analyzing farm data. In particular, what kind of data will you seek for the exercise? (Hint: Consider data collected from a region where major land reforms have been carried out *recently*.)

(9) Consider various forms of land rights: (i) communal ownership, (ii) individual use rights without ownership, and (iii) full ownership rights. Discuss how these rights affect the productivity of cultivation.