Rural Land Markets

1. Introduction

- In poor countries land plays a special role in the daily livelihood and the general social structure of the vast majority of people.
- But, compared with the massive influence of land distribution on economic and social activities, the extent of actual transactions in the land market is relatively low.
  - The market *flow* is a trickle compared with the weighty *stock*.
    - The market is more active in land-lease than in the buying and selling of land.
- The history of land rights is complex and context-specific in most parts of the world.
  - But there may be some general pattern decipherable in the evolution of land rights.
- With demographic changes (say, rising population pressure on arable land) or technological and commercial advances increasing the productivity and value of land,
  - there is a tendency to move from the earlier communal patterns of landholding to more well-defined private property rights on land.

- Even when land belonged to the community, individuals often had heritable use rights (giving them incentives to take care of the land),
  - but not the right to sell it or transfer the use right to outsiders.
- Over time, as inequalities in labour and other productive assets among households increased along with outside opportunity and mobility, and
  - as community cohesion eroded and land disputes multiplied,
    - transferable property rights on land evolved.
- The individualization of tenure and transferability rights enforced on the basis of public records and cadastral surveys
  - can reduce uncertainties and thus encourage investment and allow for a more efficient reallocation of land.
- Investment may be encouraged by easier convertibility of land into liquid assets, and
  - the emergence of a credit market may be helped by land becoming collateralizable.

- In reality, the process is fraught with problems that may harm both equity and efficiency.

- Public records and court systems are woefully inadequate in most poor countries, and the process is easily manipulated by the powerful and the well connected.

$\Rightarrow$ The evolution of private property rights in land had often been associated with the dispossession of the traditional use rights of the poor farmers,

  - with heightened social tensions and the creation of new uncertainties, and with a proliferation of litigation and other transaction costs.

- Marketability of land, particularly to outsiders, may undermine long-term implicit contracts among the traditional producers on the land, and

  – discourage relation-specific investments in land preservation and cultivation.

- An important puzzle is why the land market does not function in reallocating land in favour of more efficient cultivators.
- In many poor countries the empirical evidence suggests that economies of scale in farm production is insignificant and
  - the small family farm is often the most efficient unit of production.
- The puzzle is then why the large landlords do not voluntarily sell their land to small family farmers and
  - exercise their power by grabbing much of the surplus arising from this efficient reallocation.
- Land as an asset serves some special functions for the rich which the poor are less capable of using and hence not reflected in the prices offered by the poor.
  - Holding land may offer some tax advantages, or speculative opportunities, or be a generally safe investment vehicle for the rich which are not particularly relevant for the small farmer.

- Large landholdings may give their owner special social status or political power in a lumpy way:
  - the status effect derived from owning 100 acres is larger than the combined status effect accruing to 50 new buyers owning 2 hectares each.

- Binswanger *et al*. (1995) point out that land is often used as a preferred collateral in the credit market and thus serves more than just as a productive asset;

$\Rightarrow$ the asking price for land may be above the capitalized value of the agricultural income stream for even the more productive small farmer.

- With low household savings and severely imperfect credit markets, the more efficient small farmers may be incapable of affording the going market price of land.

- Mookherjee (2001), in a complete contracting model with the presence of incentive-based informational rents, provides additional reasons why there will be no scope for mutually profitable land sales from large landlords to small farmers.

- The small farmers will be unable to borrow enough to finance the purchase.

- For all these reasons, land ownership does not pass from the large to small farmers, and, accordingly the land market is very thin.

- More often, in poor countries land sales go in the opposite way to what is suggested by the evidence of the more efficient small farmer:
  - land passes from distressed small farmers to landlords and money-lenders.
  - This increases as the traditional reciprocity-based risk-coping mechanisms get weaker and farmers may have to depend more on land sales in times of crisis.

- Thus, in general, imperfections of the insurance or credit market may prevent the land market from bringing about Pareto-improving trades.

2. Land Rental Contracts

- The land-lease market is usually more active than that of buying and selling land.
- There is a large literature on tenancy, particularly on *sharecropping*, which is an ancient and yet current institution in most parts of the world.
  - We will focus on two well accepted rationales of sharecropping:
    - trade-off between risk-sharing and incentive provision, and
    - limited liability.
- For a background and for discussion of other issues in the land market of developing countries refer to the following:

1. Ray, Debraj (1998), *Development Economics*, Princeton University Press, Ch. 12.
2. Bardhan, Pranab and Christopher Udry (1999), *Development Microeconomics*, Oxford University Press, Chapter 6.

- Tenancy involves two transactions: labour and land are exchanged with each other.
  - **Fixed rent tenancy contract:** a labourer rents in land in exchange for a *fixed* fee to the land-owner.
  - **Fixed wage contract:** the landlord hires in the labour in exchange for a fixed fee.
  - **Sharecropping tenancy contract:** a labourer rents in the land in exchange for paying the landlord a fee which is linear in output.
- Consider the production function $Q = F(L, T)$:
  - Q: output; L: labour; T: land.
- Tenant's income under these alternative contractual forms is: $y_T = s \cdot Q - R$.
- Correspondingly, landlord's income is: $y_L = Q - y_T = (1 - s) \cdot Q + R$.
- **Fixed rent tenancy contract:** $s = 1$ and $R > 0$.
- **Fixed wage contract:** $s = 0$ and $R < 0$.
- **Sharecropping tenancy contract:** $0 < s < 1$, and $R \gtreqless 0$.

- We discuss what determines the choice of land rental contracts in agriculture:
  - how the landlord chooses between a *fixed-rent* contract, a *sharecropping* contract, or a *wage* contract.

- **Sharecropping**, one of the ancient and yet current institutional arrangements in world agriculture,
  - provided the context of the application of one of the first principal-agent models in economics;
  - began the process of a whole group of development economists probing the micro-economic rationale of informal agrarian institutional arrangements
    - in poor countries in an environment of pervasive risks and information asymmetry.

- We discuss alternative theories of sharecropping with special emphasis on the roles of *risk-sharing*, *incentive provision, limited liability,* and *eviction* and *use rights*.

- The widespread prevalence of sharecropping tenancy in virtually all countries and all times has troubled economists since Adam Smith.
  - The fact that the tenant gets less than the marginal product of his inputs indicates that this agrarian institution is likely to be inefficient.

- Subsequent research based on the economics of information has shown that sharecropping tenancy is an optimal contractual response to *incomplete markets*.

- We present variants of a *principal-agent model* to capture the essence of different theories of tenancy.
  - We take as *given* the following aspects of the economic environment:
    - the production function; the preferences and endowments of landlords and tenants; market wages and rental rates.
  - Then we *derive* endogenously the *optimal contract*.

2.1 The Economic Environment

- **Production Function:**

$$Q = e + \theta. \tag{1}$$

  - Q: output;
  - e: effort put in by the cultivator;
  - θ: a random shock; distributed normally with zero mean and variance σ^2.

- The production function is linear in the tenant's effort, for simplicity.

- Output is stochastic reflecting uncertainties in agricultural production like weather fluctuations, pest attack, and so on.
  - Uncertain production is the reason for potential risk sharing and moral hazard.

- The tenant controls only the mean and not the variance of the production function.

- **Preferences:**

  All agents are *risk-averse*, and their utility as a function of income, y,takes the form:

$$u(y) = -e^{-\beta y},\ \beta > 0. \tag{2}$$

  – $\beta = -\dfrac{u''(y)}{u'(y)}$, the Arrow-Pratt measure of absolute risk aversion;

    ◦ so the utility function takes the constant absolute risk aversion (CARA) form.

- Since, under the tenancy contract, both the landlord and the tenant's incomes are linear in output, Q, consider, in general, $y = a + bQ = (a + be) + b\theta$.

- $\theta \sim N\left(0, \sigma^2\right), \Rightarrow y \sim N\left((a+be), b^2\sigma^2\right) \Rightarrow -\beta y \sim N\left(-\beta(a+be), b^2\beta^2\sigma^2\right)$.

- Recall that if $X \sim N\left(\mu, \sigma^2\right)$, then $Y = e^X$ is log-normally distributed with $E(Y) = e^{\mu+\frac{1}{2}\sigma^2}$.

  – It follows that $E\left(e^{-\beta y}\right) = e^{\left[-\beta(a+be)+\frac{1}{2}b^2\beta^2\sigma^2\right]}$.

$\Rightarrow$ Expected utility of an agent with an income y is

$$E\left(u\left(y\right)\right)=E\left(-e^{-\beta y}\right)=-e^{-\beta\left[\left(a+be\right)-\frac{1}{2}b^{2}\beta\sigma^{2}\right]}=-e^{-\beta\left[E(y)-\frac{\beta}{2}Var(y)\right]}.$$

since $E\left(y\right)=a+be$ and $Var\left(y\right)=b^{2}\sigma^{2}$.

- Since utility is ordinal (positive monotonic transformation of the utility function does not change the preference), let us abuse the notation a bit and consider the expected utility of an agent with an income y as

$$U\left(y\right)=E\left(y\right)-\frac{\beta(W)}{2}Var\left(y\right). \tag{3}$$

  - W: monetary wealth owned by the agent.
  - Assume that the coefficient of absolute risk-aversion, $\beta\left(W\right)$, is a *declining* function of W,
    - that is, the wealthier the agent the less risk-averse he is.

- **Endowments:**
  - The landlord owns a piece of land, monetary wealth W_L, and no labour.
  - The tenant owns no land, monetary wealth W_T, and 1 unit of labour.
- **Markets:**
  - The insurance markets are missing.
  - Land, labour and goods markets are perfectly competitive.

$\Rightarrow$ Landowner could buy the tenant's labour services at the market wage rate w, and the labour-owner could lease in the landlord's land at the market rental rate ρ.

$\Rightarrow$ The reservation (expected) utility of the landlord is ρ, that is, $U_L \geq \underline{U}_L = \rho$, and the reservation (expected) utility of the tenant is w, that is, $U_T \geq \underline{U}_T = w$.

- **Cost of Effort:**
  - Distinguish between labour and effort: the former is the potential to work, and the latter is the actual intensity of work.
  - It is costly to exert effort:

$$c(e) = \tfrac{1}{2}ce^2,\ c > 0. \tag{4}$$

- **Contracting:**
  - Effort, e, is neither observable nor monitorable.

  $\Rightarrow$ The tenant would need incentives to put in effort.

  - We restrict ourselves to *linear contracts*, that is, the tenant's income, y_T, is a linear function of output:

$$y_T = s \cdot Q - R, \text{ where } 0 \leq s \leq 1.$$

    - Let us summarize this contract as (s, R), where
      - s is referred to as the 'share' component and R as the 'fixed-rent' component.

2.2 The First Best

- Under the contract, (s, R), the expected utilities of the tenant and the landlord are:

$$U_T(e, s, R) = E(s \cdot Q - R) - \frac{\beta(W_T)}{2} Var(s \cdot Q - R) - \frac{1}{2} ce^2$$

$$= s \cdot e - R - \frac{\beta(W_T)}{2} s^2 \sigma^2 - \frac{1}{2} ce^2.$$

$$U_L(e, s, R) = E((1 - s) \cdot Q + R) - \frac{\beta(W_L)}{2} Var((1 - s) \cdot Q + R)$$

$$= (1 - s) \cdot e + R - \frac{\beta(W_L)}{2} (1 - s)^2 \sigma^2.$$

- Hence the **social surplus** is

$$S(e, s, R) = U_T(e, s, R) + U_L(e, s, R) = e - \frac{\beta(W_T)}{2} s^2 \sigma^2 - \frac{\beta(W_L)}{2} (1 - s)^2 \sigma^2 - \frac{1}{2} ce^2.$$

- The first best is defined by the optimal effort level, e^*, and contract structure, (s^*, R^*), that maximizes the social surplus.

- The optimal effort level and the share are the solutions of the F.O.C.'s:

$$\frac{\partial S}{\partial e} = 1 - ce = 0, \text{ and}$$

$$\frac{\partial S}{\partial s} = -\beta\left(W_T\right) s\sigma^2 + \beta\left(W_L\right)\left(1-s\right)\sigma^2 = 0,$$

which yields

$$\tilde{e} = \frac{1}{c}, \text{ and} \tag{5}$$

$$\tilde{s} = \frac{\beta\left(W_L\right)}{\beta\left(W_L\right) + \beta\left(W_T\right)}. \tag{6}$$

- The maximized value of social surplus is

$$\tilde{S} = \frac{1}{2c} - \left[\frac{\beta\left(W_T\right)\beta\left(W_L\right)}{\beta\left(W_L\right) + \beta\left(W_T\right)}\right]\frac{\sigma^2}{2}. \tag{7}$$

- As long as $\tilde{S} > w + \rho$, there are gains to be made from trade between the landowning and labour-owning agents.
  - Recall that the reservation (expected) utilities of the tenant and the landlord are w and ρ, respectively.
- The precise division of the gains would depend on the bargaining regime.
  - We adopt the bargaining protocol that is usually adopted in the contract theory literature:
    - the principal can make 'take it or leave it' offers to the agent subject to providing the agent with his reservation (expected) utility.
      - We adopt this bargaining protocol in the form of adding the **participation constraint** of the tenant: $U_T \geq w$.

2.3 Risk Sharing versus Incentive Provision

- Stiglitz (1974) was the first to formalize sharecropping as a compromise between risk-sharing and incentive provision.
  - Stiglitz introduced the first principal-agent model in economics literature to study the *moral hazard* problem with respect to *unobservable* (and therefore *non-contractible*) work effort.

- When effort is unobservable, the tenant would need incentives to put in effort.
  - Then fixed-rental contracts ($s = 1$) will be optimal from the point of view of *incentives*, but that would put too much *risk* on the tenant.
    - A *sharecropping* contract will achieve the right balance between risk-sharing and incentive provision.
      - This is essentially the story of Stiglitz (1974).

- **Incentive Compatibility Constraint:**
  - Since the landlord cannot observe e (and hence cannot specify e in the contract), he has to try to influence it through the choice of s and R.
  - This adds the *incentive compatibility constraint* into the contracting problem:

$$e = \arg\max_{\{e\}} U_T(e, s, R) = \arg\max_{\{e\}} \left[s \cdot e - R - \frac{\beta(W_T)}{2} s^2 \sigma^2 - \frac{1}{2} c e^2 \right] = \frac{s}{c}.$$

- **The Optimal Contracting Problem:**

$$\begin{cases} \max\limits_{\{s,R\}} U_L(e, s, R) \\ \text{subject to} \\ U_T(e, s, R) \geq w \text{: tenant's participation constraint (PC), and} \\ e = \arg\max\limits_{\{e\}} U_T(e, s, R) \text{: tenant's incentive compatibility constraint (ICC).} \end{cases}$$

- Substituting the expressions for expected utilities, the contracting problem becomes

$$\begin{cases} \max\limits_{\{s,R\}} \quad (1-s)\cdot e + R - \frac{\beta(W_L)}{2}(1-s)^2\sigma^2 \\ \text{subject to} \\ s\cdot e - R - \frac{\beta(W_T)}{2}s^2\sigma^2 - \frac{1}{2}ce^2 \geq w : \text{(PC), and} \\ e = \dfrac{s}{c} : \text{(ICC).} \end{cases}$$

- Since the objective function increases with R, (PC) must hold with equality.

$$\Rightarrow R = s\cdot e - \frac{\beta(W_T)}{2}s^2\sigma^2 - \frac{1}{2}ce^2 - w.$$

- Substituting this expression for R into the objective function the problem becomes

$$\begin{cases} \max\limits_{\{s\}} \quad e - \frac{\beta(W_T)}{2}s^2\sigma^2 - \frac{\beta(W_L)}{2}(1-s)^2\sigma^2 - \frac{1}{2}ce^2 - w \\ \text{subject to} \quad e = \dfrac{s}{c}. \end{cases}$$

– That is,

$$\max_{\{s\}} \quad \frac{s}{c} - \frac{\beta(W_T)}{2} s^2 \sigma^2 - \frac{\beta(W_L)}{2} (1-s)^2 \sigma^2 - \frac{s^2}{2c} - w.$$

– F.O.C.:

$$\frac{1}{c} - s\beta(W_T)\sigma^2 + (1-s)\beta(W_L)\sigma^2 - \frac{s}{c} = 0,$$

which yields

$$s^* = \frac{1 + c\beta(W_L)\sigma^2}{1 + c[\beta(W_L) + \beta(W_T)]\sigma^2}, \tag{8}$$

and consequently,

$$e^* = \frac{s^*}{c}, \tag{9}$$

$$R^* = \frac{(s^*)^2}{2c}\left[1 - c\beta(W_T)\sigma^2\right] - w. \tag{10}$$

- Observation 1:
  - As long as $\sigma^2 \neq 0$ (that is, there is some uncertainty and variation in production) and/or $\beta(W_T) \neq 0$ (that is, the tenant is not risk-neutral), $0 < s^* < 1$,
    - that is, *sharecropping* is the optimal form of contract.
  - Share contracts and fixed-rent contracts could coexist depending on the riskiness of production of different crops and on the attitudes towards risk of different tenants.
  - For fixed wage contracts to be seen the tenant has to be infinitely risk-averse.
  - The contractual form depends on
    - the attitudes towards risk of the parties ($\beta(W_L)$ and $\beta(W_T)$),
    - the variance of output (σ^2), and
    - the marginal cost of effort (c).
  - In contrast, in the first-best, the tenant's share depended only on the attitudes towards risk of the contracting parties.

- Observation 2:
  - Compare the effort level e^* (equation (9)) under this contract with the efficient (first-best) effort level $\tilde{e}$ (equation (5)):

$$e^* = \frac{s^*}{c} < \frac{1}{c} = \tilde{e}$$

    as long as $0 < s^* < 1$, that is, under sharecropping.

    - Thus sharecropping is an *inefficient* institutional arrangement compared to fixed-rent tenancy.

  - The difference in effort levels, $\tilde{e} - e^* = \frac{1 - s^*}{c}$, is called the 'agency costs' associated with sharecropping tenancy.

- Observation 3:
  - As uncertainty goes up ($\sigma^2 \uparrow$), the share of the tenant, the effort level and the fixed-rent component goes down.
    - Thus reduction in exogenous uncertainty would imply a movement towards fixed-rent tenancy.
- Observation 4:
  - An increase in the productivity of labour ($c \downarrow$) will increase the share of the tenant, the effort level and the fixed-rent component.
- Observation 5:
  - As the market wage rate (w) goes up, the fixed component of the rent goes down, but nothing else is affected.
    - This is a consequence of the fact that we take mean-variance utility function and effort does not affect the variance of output.

- Observation 6:
  - The more risk-averse a tenant is ($\beta(W_T) \uparrow$), $s^* \downarrow$, $e^* \downarrow$, and $R^* \downarrow$.
  - The more risk-averse a landlord is ($\beta(W_L) \uparrow$), $s^* \uparrow$, $e^* \uparrow$, and $R^* \uparrow$.
  - If we assume that the landlord is very rich so that he is risk-neutral ($\beta(W_L) = 0$), then the share of the tenant is

$$s^* = \frac{1}{1 + c\beta(W_T)\sigma^2} > 0 = \tilde{s}.$$

    That is, the optimal contract is sharecropping than the wage contract.
  - If instead the tenant is risk-neutral ($\beta(W_T) = 0$) while the landlord is risk-averse (($\beta(W_L) > 0$)), we get $s^* = 1$, and
    - only in this case we get full efficiency ($e^* = \frac{1}{c} = \tilde{e}$).

2.4 Tenancy Contracts under Limited Liability

- We now consider a somewhat modified version of the principal-agent model which emphasizes, along with moral hazard, a **limited liability constraint**:
  - *the tenant is liable upto his own wealth level* W_T.
    - This reflects a credit market imperfection.
- The first theoretical model with the limited liability constraint is that of Shetty (1988).
  - Main contribution is the recognition of the *ex post* limited liability constraint:
    - in bad states of nature, the rent cannot be paid completely.
- Laffont and Matoussi (1995) postulates an *ex ante* limited liability constraint:
  - the fixed component of the rent has to be paid in advance;
  - the amount of money that could be taken away (in advance) from the tenant as a fixed-rent is bounded above by his wealth W_T.

- We follow Laffont and Matoussi (1995) to illustrate how the *ex ante* limited liability constraint explains
  - the emergence of *sharecropping* contracts, and
  - the associated *tenancy ladder* where landlord prefers wealthier tenants.

- Consider the same economic environment developed in section 2.1 with the following two modifications:
  - both the landlord and the tenant are risk-neutral (in order to highlight the role of limited liability we downplay the role of risk sharing):

$$\beta\left(W_L\right) = 0 = \beta\left(W_T\right),$$

  - we add the ex ante limited liability constraint that the fixed component of the rent has to be paid in advance and this amount is bounded above by his wealth W_T:

$$R \leq W_T.$$

- **The Optimal Contracting Problem:**

$$\begin{cases} \max\limits_{\{s,R\}} U_L(e,s,R) \\ \text{subject to} \\ U_T(e,s,R) \geq w\text{: tenant's participation constraint (PC), and} \\ e = \arg\max\limits_{\{e\}} U_T(e,s,R)\text{: tenant's incentive compatibility constraint (ICC), and} \\ R \leq W_T\text{: tenant's limited liability constraint (LLC).} \end{cases}$$

- As before, the incentive compatibility constraint requires: $e = \dfrac{s}{c}$.
- Using $\beta(W_L) = 0 = \beta(W_T)$ and $e = \dfrac{s}{c}$, we have

$$U_L(e,s,R) = (1-s)\cdot e + R = \frac{s(1-s)}{c} + R,$$

$$U_T(e,s,R) = s\cdot e - R - \tfrac{1}{2}ce^2 = \frac{s^2}{2c} - R.$$

- Then the contracting problem becomes

$$\begin{cases} \max\limits_{\{s,R\}} \quad \dfrac{s\left(1-s\right)}{c}+R \\ \text{subject to} \\ \dfrac{s^2}{2c}-R\geq w : \text{(PC), and} \\ -R\geq -W_T : \text{(LLC).} \end{cases}$$

- Form the Lagrangian

$$\mathcal{L} = \frac{s\,(1-s)}{c} + R + \lambda\left[\frac{s^2}{2c} - R - w\right] + \mu\left[-R + W_T\right],$$

so that the first-order necessary and sufficient conditions are

$$s\text{:} \qquad \frac{1-2s}{c} + \lambda \cdot \frac{s}{c} = 0, \tag{i}$$

$$R\text{:} \qquad 1 - \lambda - \mu = 0, \tag{ii}$$

$$\lambda\text{:} \qquad \lambda\left[\frac{s^2}{2c} - R - w\right] = 0,\ \lambda \geq 0,\ \frac{s^2}{2c} - R - w \geq 0, \tag{iii}$$

$$\mu\text{:} \qquad \mu\left[-R + W_T\right] = 0,\ \mu \geq 0,\ -R + W_T \geq 0. \tag{iv}$$

- **Case I: Neither constraint binds:**
  - Then $\lambda = 0$, and $\mu = 0$; but this contradicts (ii).

  $\Rightarrow$ This case cannot arise in a solution to the contracting problem.

- **Case II: PC binds, LLC does not bind:**
  - Then $\mu = 0$, so that (ii) $\Rightarrow \lambda = 1$, and hence (i) $\Rightarrow s = 1$.
  - PC binds $\Rightarrow R = \dfrac{1}{2c} - w$.
  - LLC does not bind $\Rightarrow W_T > R$, $\Rightarrow W_T > \dfrac{1}{2c} - w$.
  - **Conclusion:** When $W_T > \dfrac{1}{2c} - w$, $\left(s^* = 1, \text{ and } R^* = \dfrac{1}{2c} - w \right)$ solves the contracting problem.

- **Case III: LLC binds, PC does not bind:**
  - Then $\lambda = 0$, so that (ii) $\Rightarrow \mu = 1$, and (i) $\Rightarrow s = \frac{1}{2}$.
  - LLC binds $\Rightarrow R = W_T$.
  - PC does not bind $\Rightarrow W_T < \frac{1}{8c} - w$.
  - **Conclusion:** When $W_T < \frac{1}{8c} - w$, $\left(s^* = \frac{1}{2}, \text{ and } R^* = W_T \right)$ solves the contracting problem.

- **Case IV: Both PC and LLC bind:**
  - LLC binds $\Rightarrow R = W_T$.
  - Then PC binds $\Rightarrow s = \sqrt{2c\,(w + W_T)}$.
  - (i) $\Rightarrow \lambda = 2 - \dfrac{1}{s}$.
    - Then $\lambda \geq 0 \Rightarrow s \geq \dfrac{1}{2}$

$$\Rightarrow \sqrt{2c\,(w + W_T)} \geq \frac{1}{2} \Rightarrow W_T \geq \frac{1}{8c} - w.$$

  - Since $\mu \geq 0$, (ii) $\Rightarrow \lambda \leq 1, \Rightarrow s \leq 1$

$$\Rightarrow \sqrt{2c\,(w + W_T)} \leq 1 \Rightarrow W_T \leq \frac{1}{2c} - w.$$

- **Conclusion:** When $\dfrac{1}{8c} - w \leq W_T \leq \dfrac{1}{2c} - w$, $\left(\dfrac{1}{2} \leq s^* = \sqrt{2c\,(w + W_T)} \leq 1, \text{ and } R^* = W_T\right)$ solves the contracting problem.

- When the tenant is wealthy enough ($W_T > \frac{1}{2c} - w$) that the LLC does not bind, then from the 'risk sharing versus incentive provision' model we know that
  - $s^* = 1$ and, from the binding PC, $R^* = \frac{1}{2c} - w$.

- When W_T is just below $\frac{1}{2c} - w$, then the landlord would want to maintain $s = 1$ and keep R equal to $\frac{1}{2c} - w$,
  - but this is not feasible any more, the LLC starts binding.
    - One option is to keep $s = 1$ (so that effort remains at the efficient level), and allow the PC not to bind.
    - The other option is to reduce s and secure some of the rents the tenant is earning (if PC does not bind, the tenant earns rents by definition) at the cost of reducing effort.
    - It turns out that the second option is more profitable to the landlord.

- Thus we see a *sharecropping* contract even when both parties are risk-neutral.
  - It arises from the fact that because of limited liability the maximum amount that the tenant will be able to pay to the landlord as a fixed fee is just W_T
    - which may be small so that it might not be possible for the principal to squeeze as much as possible out of the tenant.

- Can this process continue as W_T becomes smaller and smaller?
  - The answer is no.
    - If $W_T < \frac{1}{8c} - w$, then the landlord sets $s^* = \frac{1}{2}$ and would not bother reducing the tenant's payoff down to the reservation level as the cost in terms of incentives would be too much.

- We can summarize the solution to the contracting problem as follows:

W_T	s^*	R^*	U_L
$W_T < \frac{1}{8c} - w$	$\frac{1}{2}$	W_T	$U_L < \frac{3}{8c} - w$
$W_T = \frac{1}{8c} - w$	$\frac{1}{2}$	W_T	$\frac{3}{8c} - w$
$\frac{1}{8c} - w < W_T < \frac{1}{2c} - w$	$\frac{1}{2} \leq \sqrt{2c\left(w + W_T\right)} \leq 1$	W_T	$\frac{3}{8c} - w < U_L < \frac{1}{2c} - w$
$W_T \geq \frac{1}{2c} - w$	1	$\frac{1}{2c} - w$	$\frac{1}{2c} - w$

- As the tenant's wealth increases ($W_T \uparrow$),
  - tenant's cropshare increases ($s^* \uparrow$), & landlord's expected utility increases ($U_L \uparrow$).
- This implies a **tenancy ladder**: richer tenants are preferred by the landlord and are given higher crop shares.

- Observation 1:
  - Share contracts and fixed-rent contracts could coexist, but not pure wage contracts.
    - The contractual form would depend on the tenant's reservation payoff (w), his wealth level (W_T), and the marginal cost of effort (c).
- Observation 2:
  - The effort level e^* would, in general, be different from the surplus maximizing level, $\frac{1}{c}$.
    - The difference, which can be called 'agency costs' associated with sharecropping tenancy, is $(1 - s^*)\frac{1}{c}$.
  - Sharecropping is less efficient than fixed-rental tenancy which is the optimal contract only when the tenant's wealth exceeds $\frac{1}{2c} - w$.

- Observation 3:
  - As uncertainty goes up ($\sigma^2 \uparrow$), nothing changes as, by assumption, both parties are risk-neutral.
- Observation 4:
  - An increase in the productivity of labour ($c \downarrow$) will, in general, decrease the tenant's cropshare and increase his effort level.
    - The fixed-rent component would go up for the richest tenants for whom the LLC was not binding.
- Observation 5:
  - As the wage rate w goes up, the cropshare and effort goes up and the fixed-rent remains unchanged if the LLC is binding.
    - Otherwise it affects nothing.

3. Land Markets (Mookherjee, 2001)

- The institution of sharecropping tenancy and its inefficiency has long fascinated development economists.

- The tendency for a landlord to appropriate a fraction of the crop tilled by a tenant, and to interlink the tenancy contract with monopoly provision of credit,
  - appears to many people to be ‘semi-feudal’ in character, inducing low levels of agricultural productivity.

- This orthodoxy has been challenged in the last three or four decades on a number of conceptual grounds.
  - Sharecropping is viewed as providing a reasonable compromise between the need for a wealthy landlord to share risks with a poor tenant, and to provide incentives to the latter to apply effort.
    - Stiglitz (1974), Newbery (1977), Bell (1989), Singh (1989).

- Interlinking of tenancy and credit contracts is viewed as an efficient response to the problem of moral hazard on the part of the tenant, to avoid externalities between landlords and creditors.
  - Braverman and Stiglitz (1982), Bell (1989).

- Nevertheless, the empirical evidence (Shaban, 1987; Laffont and Matoussi, 1995) suggests that
  - sharecropping tenancy is characterized by significantly lower productivity compared to owner-cultivated farms based largely on family labour.
    - This appears to be linked to greater application of labour input by owner-cultivators rather than variations in soil quality or irrigation.
    - Similar results pertain to the comparison of small owner-cultivated farms relying primarily on family labour, with large ones relying primarily on hired labour.
  - These outcomes are related to significant imperfections in labour markets such as
    - the divergence of marginal products from wage rates, particularly for small owner-cultivated farms (Bardhan, 1973; Sen, 1981).

- Compounding these are further imperfections in land markets which prevent the sale of land by landlords to their tenants or hired workers
  - that might be intended to appropriate the productivity benefits of small-scale owner cultivation.
- These imperfections have motivated arguments for public intervention in land redistribution.
  - These arguments, however, have not been based on a precise articulation of the nature of the market failure that creates a potential role for government.
- Mookherjee (2001) poses a set of questions that need to be answered for a better understanding of these issues.
- **The First Question:**

  Why are tenant farms characterized by lower application of labour effort than owner-cultivated farms, when both are based on family labour?

- The typical argument for lower effort under tenancy is the Marshallian effect:
  - tenants appropriate a fraction of the marginal product, whereas owner-cultivators are presumed to receive the entire marginal product.

- This argument overlooks the fundamental symmetry between the two ownership modes with respect to feasible contractual structures.
  - What prevents the landlord from designing a tenurial contract that mimics the incentive system for an owner-cultivator?
  - Indeed, a fixed rent contract would also provide tenants with their entire marginal product.
  - Such contracts are believed to be not so widespread owing to the need for landlords to share risks with their tenants, and
    - the limited wealth of the tenants which causes them to default on fixed rent obligations in times of distress.

- However, owner-cultivators are subject to similar risks and wealth constraints as well;
  - they will seek to alleviate them by entering into formal and informal credit and insurance relationships.
    - Townsend (1994) presents evidence for the substantial degree of consumption smoothing in three Indian villages achieved by such arrangements.
  - These arrangements will also be subject to moral hazard arising from the need to induce appropriate incentives for the cultivator to apply effort and thereby reduce the likelihood of default.
- Why should the incentive problem for owner-cultivators be any less severe than for tenant farmers?
  - The usual Marshallian argument simply presumes that owner-cultivators obtain a greater share of their marginal product than do comparable tenant farmers,
    - without explaining the underlying reasons.

- Similar issues arise in attempting to explain why family labour is cheaper than hired labour.
  - The conventional explanation runs in terms of the incentive problems with respect to hired labour, necessitating costly supervision.
  - It is implicitly presumed that family labour is not subject to any incentive problems.
    - This overlooks, once again, the moral hazard inherent in the credit and insurance arrangements that owner-cultivators are involved in.
- The answer to either of these questions could be sought in terms of owner-cultivators having less access to credit than tenants or hired workers.
  - But, if anything, the collateral value of the land owned should permit owner-cultivators *greater* access to credit;
    - so this hypothesis seems to be implausible.

- **The Second Question:**

  The fact that tenant farms are characterized by lower levels of effort does not imply anything about the relative *welfare* properties of *self-ownership* and *tenancy*.

  - Tenants may be better protected against weather uncertainties than are owner-cultivators,
    - in which case the benefits of such risk-sharing should be weighed against the cost of reduced incentives.
  - An argument for government intervention to promote a transfer of ownership of land to cultivators should be based on
    - an explicit articulation of the nature of market failure inherent in tenancy or hired labour.

- **The Third Question:**

  What prevents landlords from selling their land to tenants or hired workers, if small owner-cultivated farms are significantly more productive?

- The empirical evidence suggests that land markets are thin, and that the institution of tenancy or wage labour tends to persist.

- A number of possible reasons may be advanced for the thinness of land markets:

  – taxes; collateral value of land; risk diversification motives; legal difficulties.

- Nevertheless, the persistence of tenancy remains a bit of a puzzle, if one believes it to be a genuinely inefficient institution.

  – This question forms part of a wider question concerning the evolution of economic institutions:

    ○ what are the impediments to institutional changes that would appear to promote both efficiency and equity?

- One explanation for the higher productivity of owner-cultivated farms could be based on the hypothesis that tenancy contracts are incomplete, and
  - cultivators must invest in farm specific assets – such as soil improvement or irrigation – to improve productivity.
    - In line with the theory of firm developed by Grossman and Hart (1986), Hart and Moore (1990), Klien, Crawford and Alchian (1978) or Williamson (1975, 1985).
- In this theory, ownership can be identified with the possession of *ex post* bargaining power: for instance, when contracts are renegotiated.
  - Anticipating that the landlord would opportunistically revise contractual terms at later dates to expropriate the rents from past investments,
    - tenant farmers would have lower incentives to make such investments.
- In such contexts, a transfer of ownership to the cultivator would enhance farm productivity, as well as total surplus.
- But, in such a setting, it would be mutually advantageous for the landlord and the tenant to enter into a land sale; that is, it fails to address the third question.

- Mookherjee (2001) develops an alternative theory of ownership based on a complete contracting framework.
  - It argues that ownership rights affect the allocation of *ex ante* bargaining power,
    - at the stage where tenancy or credit contracts are initially negotiated.
  - Any given ownership pattern thus generates an *ex ante* Pareto-efficient outcome, implying that different ownership patterns cannot be Pareto ranked.

  $\Rightarrow$ There cannot be any scope for a mutually advantageous land sale from landlord to tenant.

- This gives rise to the question:

  Why may the allocation of bargaining power have an impact on effort incentives and farm productivity?

- The answer of Mookherjee (2001) is based on the presence of *informational rents* which need to be paid to the farmer in order to induce effort incentives.

- These rents arise from wealth constraints which limit the downside risk to which the farmer can be exposed.
- The wealth constraints cannot be circumvented by borrowing, since loan contracts are also subject to higher default risk owing to the limited ability for farmers to put up collateral.

- The informational rents that must accompany the provision of high effort incentives represent a payment from the landlord or moneylender to the farmer.
  - These are pure transfers, with no accompanying deadweight losses.

- Under self-ownership the farmer earns higher bargaining power,
  - thereby serving to better internalize the pecuniary externality arising from the informational rents.

3.1 The Model

- Focus on a single plot of land, and the relationship between two agents:
  - a cultivator or farmer (denoted by F), and
  - a noncultivator (landlord or moneylender, denoted by L).
- The plot can be owned either by F or by L.
  - When F owns the land, the relationship between the two parties involves the supply of credit by the lender to the farmer.
  - When L owns the land, their relationship involves a combination of tenancy (or wage labour) and credit.
- There is a single period which is divided into two points of time:
  - $t = 0$ (beginning) and $t = 1$ (end).
- Only the farmer (F) can till the land.

- A fraction x of the overall plot can be farmed, where $0 \leq x \leq 1$.
- At $t = 0$, a material input worth Ix is needed to farm proportion x of the plot.
- At $t = 1$, the output of the farm is realized.
- Between $t = 0$ and 1, nature intervenes, so the crop output is uncertain.
  - Two possible values of the output:
    - a normal value nx, or a disaster value dx, where $d < n$.
  - The probability of a normal crop depends on the level of effort $e \geq 0$ selected by the farmer at $t = 0$, and is denoted by $p(e)$,
    - $p(\cdot)$ is a strictly increasing, continuously differentiable and concave function with $0 < p(e) < 1$ for all e.
  - Value of the crop per unit area cropped, net of the material input requirement is
    - $s \equiv (n - I)$ in the normal state, and $f \equiv (d - I)$ in the disaster state.

- Agents consume at the end of the period and there is no discounting.
- To survive, the farmer's consumption must be at least above a *minimum subsistence level*, denoted by $\underline{s}$.
- Both agents are *risk-neutral*.
  - Utility of lender (L) is the expected income from lending money or leasing out land.
  - Farmer's (F) utility depends on his consumption c and effort e, given by $c - D(e)$,
    - $D(e)$ is the disutility of effort.
      - $D(\cdot)$ is strictly increasing, continuously differentiable and strictly convex.
      - Assume $D(0) = 0 = D'(0)$.

- The farmer (F) has an exogenous amount of wealth w in the form of liquid assets;
  - this can be used to purchase inputs (I) at $t = 0$,
  - the remainder can either be used to repay loans or be consumed at $t = 1$.
- The non-farm wealth of the lender (L) is large enough that she is *not* subject to any limited liability constraint.
- The information structure:
  - The non-farm wealth of the farmer, w, as well as the crop output of the farm, are costlessly verifiable by the landlord or lender.
  - But the farmer's effort, e, cannot be monitored.
  - All the other variables are contractable, such as
    - the respective contributions of the two parties at $t = 0$,
    - the scale of production x, and
    - the returns to both parties at $t = 1$.
  - Hence there is *no incompleteness* in the contracts that can be feasibly enforced.

- A **contract** specifies the following:
  - the scale of cultivation, x;
  - the contributions of the farmer, I_F, and the lender, I_L, to cover the inputs required at $t = 0$, and
  - their receipts, F_i and L_i, from the crop output ix at $t = 1$, where i is either s or f.
- In order to be feasible, the contract must satisfy

$$I_L + I_F = Ix, \text{ and}$$

$$L_i + F_i = (i + I)\, x, \text{ for } i = s, f.$$

- In addition, the farmer should be able to survive:

$$c_i \equiv F_i + w - I_F \geq \underline{s}, \text{ for } i = s, f,$$

where c_i denotes farmer's consumption at $t = 1$ when the crop return is i.

The Incentive Compatibility Constraint:

- A contract will induce an effort from the farmer, which maximizes his expected utility:

$$p(e) \cdot c_s + [1 - p(e)] \cdot c_f - D(e).$$

- Farmer's optimal effort choice can be described as follows:
  - if $c_s \leq c_f$, then zero effort is selected;
  - otherwise, it is given by $e > 0$ that solves

$$p'(e) \cdot [c_s - c_f] = D'(e).$$

- Conversely, given any desired level of effort e, the spread between consumption in the two states necessary to sustain this in an incentive compatible fashion, is

$$c_s - c_f = \alpha(e), \tag{1}$$

where $\alpha(e) \equiv \dfrac{D'(e)}{p'(e)}$, a continuous and strictly increasing function, with $\alpha(0) = 0$.

- The incentive constraint will apply identically in either ownership mode, though the specific interpretations may differ.
- When the farmer owns the land, and acquires credit from the lender,
  - his downward risk will be limited by virtue of the limited liability constraint $c_f \geq \underline{s}$.
  - If the farmer cannot *feasibly* pay the repayment obligation in the disaster state, this will be interpreted as a *default* on the loan.
    - The possibility of defaulting on loan limits the liability of the borrower, thereby limits his ex ante incentive to apply effort.
    - The extent of loan default depends on the farmer's residual wealth $w - I_F$, which can be interpreted as the loan collateral.
      - Wealthier borrowers are less likely to default; so likely to apply more effort, and hence will have greater access to credit.
- When the lender/landlord owns the land so that we are in a tenancy setting,
  - the contract will take the interpretation of a cropsharing formula affecting the tenant's incentive to apply effort.

Participation Constraints:

- The nature of participation constraints depend partly on the nature of the market for credit or tenancy, and partly on the pattern of ownership.

- There are some lower bounds to the outside opportunities of either party which are independent of ownership or market structure.
  - The lender/landlord cannot obtain a negative return from a contract.
  - The farmer can decide to withdraw altogether from the activity of farming;
    - he obtains an exogenous net utility of $\overline{U}$ from his next best occupation.

- Given the incentive constraint (1), we can redefine a contract as a triple (x, c_f, e):
  - x: the scale of cultivation;
  - c_f: consumption of the farmer in the disaster state;
  - e: the level of effort induced.

$\Rightarrow$ Farmer's consumption level in the good state is given by: $c_s = c_f + \alpha(e)$.

$\Rightarrow$ The net return to the lender/landlord in state i, R_i, is given by

$$R_i = L_i - I_L = (i + I)x - F_i - I_L = ix - (F_i - I_F) = ix - c_i + w.$$

- The expected net return (profit) of the lender/landlord is:

$$\begin{aligned} E(R_i) &= x \cdot [p(e) \cdot s + [1 - p(e)] \cdot f] - [p(e) \cdot c_s + [1 - p(e)] \cdot c_f] + w \\ &= xR(e) + w - c_f - p(e)\alpha(e), \end{aligned}$$

where $R(e) \equiv p(e) \cdot s + [1 - p(e)] \cdot f$.

- Notation: $c = (x, c_f, e)$ denotes a contract.

- The expected utility of the lender/landlord is:

$$U_L(c) = xR(e) + w - c_f - p(e)\alpha(e).$$

- The expected utility of the farmer is:

$$U_F(c) = c_f + p(e)\alpha(e) - D(e).$$

- For the two parties to enter into such a contract, it must be the case that each obtains at least the (lower bound on their) utility from not participating.

$\Rightarrow$ The set of *feasible contracts*, C, is defined as comprising contracts $c = (x, c_f, e)$ satisfying the conditions

$$c_f \geq \underline{s}, \qquad U_L(c) \geq 0, \qquad U_F(c) \geq \overline{U} + w. \tag{2}$$

- Assumption 1:

  $R(e) > 0$ at all effort levels.

$\Rightarrow$ Efficient contracts necessarily involve cultivation at the maximal scale $x = 1$.

- The first-best then involves the effort level e^* which maximizes the sum of utilities of the farmer and the lender/landlord:

$$U_F(c) + U_L(c) = R(e) - D(e) + w.$$

- For the model to remain interesting, it is assumed that it is always jointly profitable to farm the land in a first-best setting,

  – that is, the sum of utilities with effort e^* is larger than the sum of reservation utilities: $\left(\overline{U} + w\right) + 0$.

- Assumption 2:

$$R(e^*) - D(e^*) \geq \overline{U}. \tag{3}$$

3.2 Bilateral Monopoly

- Consider the simple case where there is exactly one farmer and one lender/landlord.

$\Rightarrow$ If the two parties fail to agree, then neither can enter into any trade at all, as there are no alternative trading partners.

  - Nevertheless disagreement payoffs may depend on the pattern of ownership and wealth levels.

- Figure 1 shows the set of expected utility combinations $(U_F(c), U_L(c))$ corresponding to the feasible contracts $c \in C$.

- The chosen contract must be Pareto efficient within the class of feasible contracts.

  – So we restrict attention to the set of efficient points in Figure 1.

- Since ownership affects the allocation of bargaining power, the precise point chosen depends on the nature of ownership.

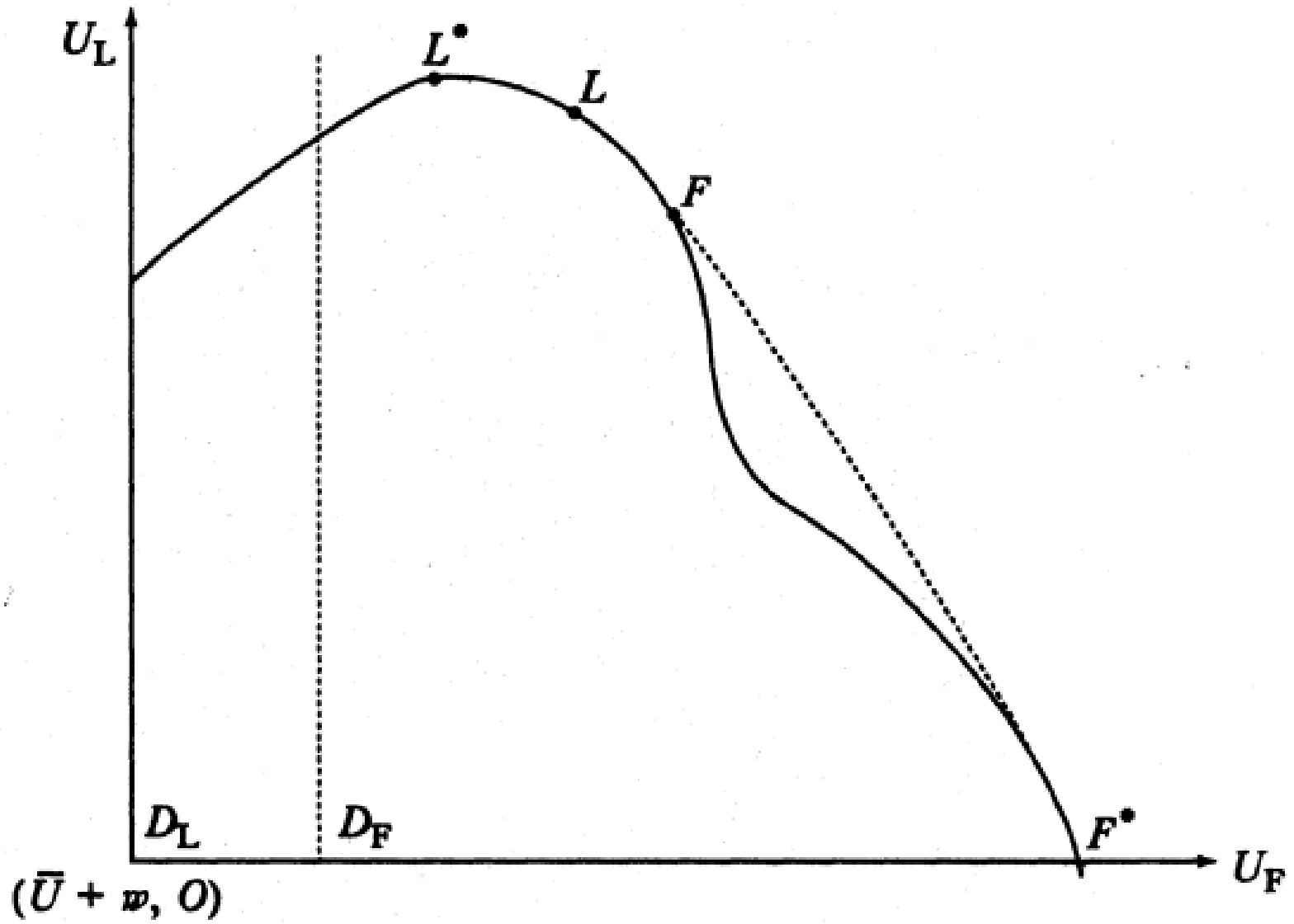

Figure 1 [Figure 1.1] Feasible pay-off sets

- Since, by assumption, $R(e) > 0$ at all effort levels, all efficient contracts involve $x = 1$,
  - that is, the entire plot of land ought to be tilled.

$\Rightarrow$ The outcome of either ownership mode will be maximal scale of cultivation.

- Scale of cultivation may be nonmaximal in the event of the two agents failing to agree on a contract;
  - for example, when the farmer owns the land and does not have access to credit.
- We now discuss the precise outcomes of disagreement under either ownership mode.
- When the farmer does not own the land,
  - absence of a contract implies there is no farming nor supply of credit:
    - $x = I_L = I_F = F_i = L_i = 0$, for $i = s, f$.

$\Rightarrow$ The disagreement payoffs are 0 and $\overline{U} + w$ respectively for lenders and farmers.

$\Rightarrow$ The set of feasible contracts coincides with the set of individually rational contracts.

- When the farmer owns the land,
  - absence of a contract means there is no credit available: $I_L = 0 = L_i$, for $i = s, f$;
  - but the farmer can farm the land on the basis of their own resources, that is, at any scale satisfying $Ix \leq w$, and
    - subsequently have available in the disaster state a consumption level of $fx + w$.
- It is in the farmer's interest to operate on as large a scale as possible, at $x = \frac{w}{I}$.

$\Rightarrow$ The farmer can feasibly farm the land as long as $\left[1 + \frac{f}{I}\right] w \geq \underline{s}$.

$\Rightarrow$ Farming without any credit is feasible only for farmers with a wealth level

$$w \geq \underline{w} \equiv \frac{\underline{s}}{1 + \frac{f}{I}}.$$

- For poorer farmers, the disagreement payoffs are identical to those of farmers that do not own the land.

- For landowning farmers with $w \geq \underline{w}$, the payoff consequent on absence of credit depends on
  - whether it is in their own interests to farm the land rather than abandon it for an alternative occupation.
- Define $x(w) \equiv \min\left\{1, \frac{w}{I}\right\}$, the maximal scale at which such farmers can cultivate.
- The highest utility they can obtain from cultivation is

$$\Pi(w) \equiv \max_{e} \quad x(w) R(e) - D(e) + w.$$

  - For w sufficiently low, $\Pi(w) < \overline{U} + w$, while for $w \geq I$, $\Pi(w) > \overline{U} + w$.

$\Rightarrow$ There exists $0 < \tilde{w} < I$ such that for all landowning farmers with wealth above $\tilde{w}$, it pays to cultivate even in the absence of any credit.

  - ◦ For all poorer farmers, the credit constraint forces them to abandon cultivation.

- Disagreement payoffs under farmer ownership and bilateral monopoly are as follows:
  - The lender's disagreement payoff is always zero.
  - The farmer's disagreement payoff depends on his wealth.
    - If $w \leq \tilde{w}$, then it is $\overline{U} + w$, just the same as when the lender owned the land.
    - If $w > \tilde{w}$, then they can profitably cultivate with their own resources in the absence of any credit,
      - leading to a higher disagreement payoff $\Pi(w)$.

  $\Rightarrow$ The set of individually rational payoffs is smaller than the set of feasible payoffs.

- This is illustrated in Figure 1:
  - With $w > \tilde{w}$, the disagreement payoff under farm ownership, D_F, lies to the right of the disagreement payoff under lender ownership, D_L.
  - If $w > I$, the farmer has no need for credit at all, and the disagreement payoff coincides with F^* where farmers have all the bargaining power.

- A transfer of ownership of land to farmers will, under most reasonable bargaining solutions, allow them to appropriate a larger fraction of the surplus from trade.
  - The extent of increase in the farmer's share is increasing in their wealth,
    - zero until $\tilde{w}$, and positive thereafter.
  - The contract actually resulting under farmer ownership (F in Figure 1) will thus differ from that under lender ownership (L in Figure 1).
- The question then arises:
  - Do different contracts on the Pareto frontier differ in terms of farmer effort?
  - Or do they merely reflect different distributions of income?
- To address this question, it helps first to compare the two polar contracts L^* and F^*
  - where the lender and the farmer respectively have all the bargaining power.
- The comparison between contracts L and F actually resulting under the two ownership modes will turn out to be qualitatively similar.

- The contract F^* where the farmer has all the bargaining power is obtained as the solution to the following problem:

$$\begin{cases} \max\limits_{\{e,c_s,c_f\}} \; c_f + p\left(e\right)\alpha\left(e\right) - D\left(e\right) \\ \text{subject to} \\ c_f \geq \underline{s}, \\ R\left(e\right) + w - c_f - p\left(e\right)\alpha\left(e\right) \geq 0. \end{cases} \tag{4}$$

- The resulting effort level is described as follows.

  – **Proposition 1.** *The effort level in the contract where the farmer has all the bargaining power is given by the solution to*:

$$\begin{cases} \max\limits_{e} \; R\left(e\right) - D\left(e\right) \\ \text{subject to} \\ R\left(e\right) + w \geq \underline{s} + p\left(e\right)\alpha\left(e\right). \end{cases} \tag{5}$$

- Proof of Proposition 1:
  - Given the lender's break-even constraint, $R(e) + w - c_f - p(e)\alpha(e) \geq 0$, and an effort level e, we get

$$c_f + p(e)\alpha(e) \leq R(e) + w,$$

$$\Rightarrow c_f + p(e)\alpha(e) - D(e) \leq R(e) + w - D(e),$$

    that is, an upper bound to the expected utility of the farmer is: $R(e) + w - D(e)$.

    - This upper bound can be achieved by setting

$$c_f = R(e) + w - p(e)\alpha(e), \quad \text{and} \quad c_s = c_f + \alpha(e).$$

    - Since $c_f \geq \underline{s}$, feasibility requires

$$R(e) + w - p(e)\alpha(e) \geq \underline{s}, \quad \Rightarrow R(e) + w \geq \underline{s} + p(e)\alpha(e).$$

  - It now follows that e is given by the solution to (5). ■

- The contract L^* where the lender has all the bargaining power is obtained as the solution to the following problem:

$$\begin{cases} \max\limits_{\{e,c_s,c_f\}} R(e) + w - c_f - p(e)\,\alpha(e) \\ \text{subject to} \\ c_f \geq \underline{s}, \\ c_f + p(e)\,\alpha(e) - D(e) \geq \overline{U} + w. \end{cases} \tag{6}$$

- The effort level chosen by the farmer under this contract is described in Proposition 2.

- **Proposition 2.**

1. *Given effort* e*, the contract under landlord monopoly which implements* e *awards consumption to the tenant as follows*:

$$c_f = \underline{s} + q(e),$$

$$c_s = \underline{s} + q(e) + \alpha(e),$$

where

$$q(e) \equiv \max\left\{0,\ \overline{U} + w - \underline{s} - p(e)\,\alpha(e) + D(e)\right\}.$$

2. The effort level under landlord monopoly, e_L, is determined by solving:

$$\max_{e} \quad R(e) - p(e)\,\alpha(e) - q(e).$$

- Proof of Proposition 2:
  - LLC requires $c_f \geq \underline{s}$;
  - Farmer's PC requires $c_f \geq \overline{U} + w - p(e)\,\alpha(e) + D(e)$.
  - Combining the above two we get

$$\begin{aligned} c_f &\geq \max\left\{\underline{s},\ \overline{U} + w - p(e)\,\alpha(e) + D(e)\right\} \\ &= \underline{s} + \max\left\{0,\ \overline{U} + w - \underline{s} - p(e)\,\alpha(e) + D(e)\right\} \\ &= \underline{s} + q(e). \end{aligned}$$

  - Given e, since the objective in (6) is to minimize c_f, it follows that $c_f = \underline{s} + q(e)$.
  - Then it follows from (1) that $c_s = c_f + \alpha(e) = \underline{s} + q(e) + \alpha(e)$.
  - Finally, substituting $c_f = \underline{s} + q(e)$ in the objective function of (6), part 2 of Proposition 2 follows. ■

- Suppose $q(e) = 0$.
  - Then $c_f = \underline{s} + q(e)$ implies $c_f = \underline{s}$.
  - At the same time $q(e) \equiv \max\left\{0,\ \overline{U} + w - \underline{s} - p(e)\alpha(e) + D(e)\right\}$ implies $\overline{U} + w - \underline{s} - p(e)\alpha(e) + D(e) < 0$.
    - Combining the two it follows that $c_f + p(e)\alpha(e) - D(e) > \overline{U} + w$, that is, the farmer's participation constraint does *not* bind.
- That is, $q(e) = 0$ implies that the farmer earns an **informational rent**,
  - the result of a minimum limit on consumption in every state,
    - combined with the need to provide the farmer with the requisite incentive to apply effort.
- With multiple potential tenants, this corresponds to the case of *involuntary unemployment* and tenancy 'queues'.
- This arises when the effort e sought to be induced is 'high'.

- This is the situation depicted in Figure 2 where
  - the participation constraint of the farmer is not binding at the tenancy solution where the landlord has all the bargaining power.
- The effective *cost of labour effort* as perceived by the landlord is given by the upper envelope of the two functions

$$\overline{U} + w - \underline{s} + D(e) \qquad \text{and} \qquad p(e)\,\alpha(e).$$

- For small values of effort, the first function dominates, and

$$q(e) = \overline{U} + w - \underline{s} + D(e) - p(e)\,\alpha(e) > 0,$$

so that the tenant obtains no informational rents.

- Since $q(e) + p(e)\,\alpha(e) = \overline{U} + w - \underline{s} + D(e)$, it follows from Proposition 2.2 that e_L is determined by solving

$$\max_{e} \quad R(e) - p(e)\,\alpha(e) - q(e) = R(e) - \left[\overline{U} + w - \underline{s} + D(e)\right],$$

that is, the marginal cost of effort from the point of view of the landlord coincides with the tenant's marginal disutility of effort $D'(e)$.

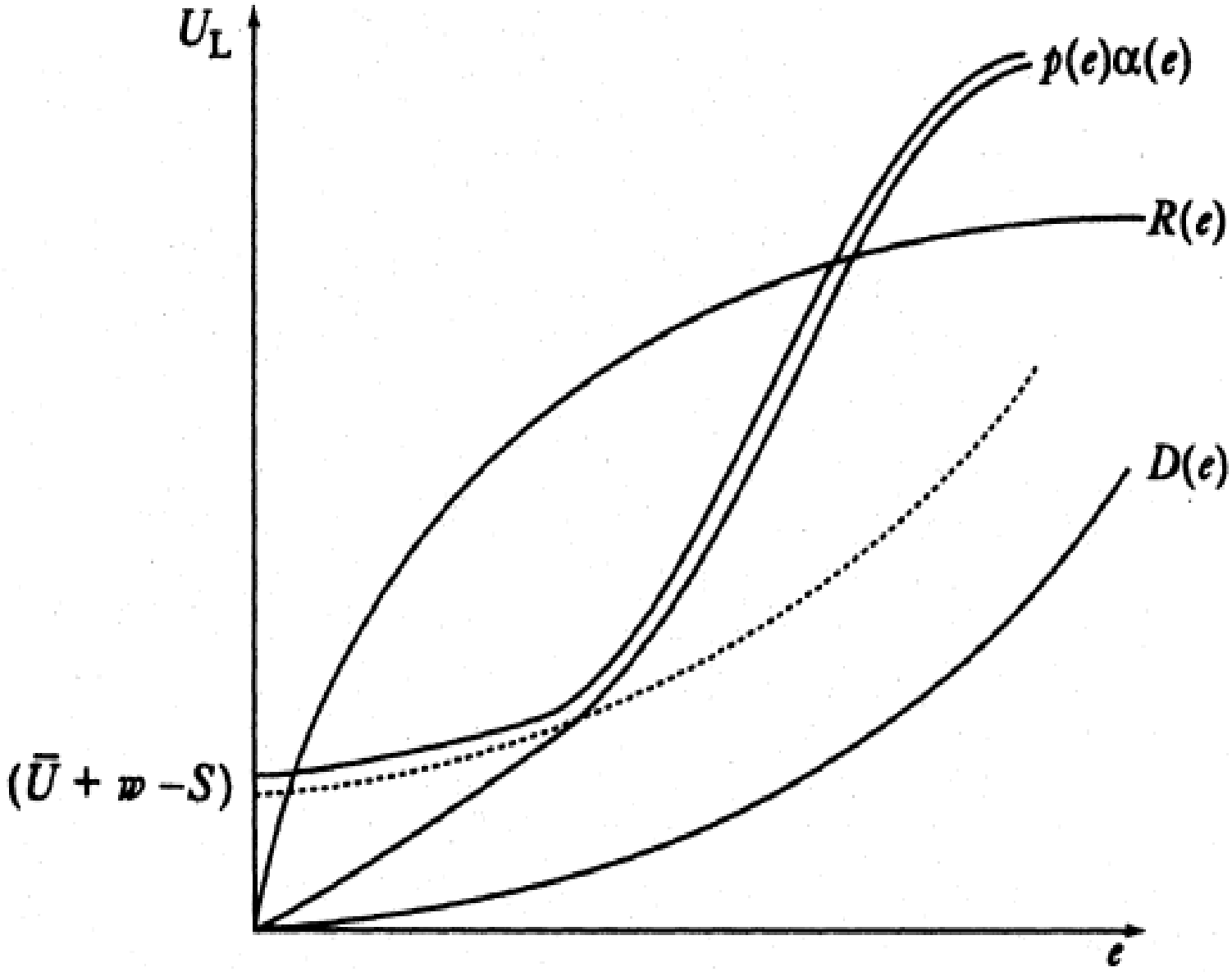

Figure 2 [Figure 1.2] Effort cost under tenancy

- For larger effort levels, the second function dominates, and $q(e) = 0$;

$\Rightarrow$ the tenant earns informational rents as the required incentive bonus grows sufficiently.

  - Since $q(e) + p(e)\alpha(e) = p(e)\alpha(e)$, over this range the marginal cost of effort as perceived by the landlord is

$$\frac{\partial}{\partial e}\left[p(e)\alpha(e)\right] = p'(e)\alpha(e) + p(e)\alpha'(e) = D'(e) + p(e)\alpha'(e) > D'(e).$$

    - The marginal cost of effort as perceived by the landlord is higher,

      - as it must additionally include the marginal informational rents paid to the tenant.

- It is therefore plausible that the effort level selected under landlord monopoly is less than that under farmer monopoly.

  - Theorem 1 confirms this result.

- **Theorem 1.**

1. *For any effort level optimal under landlord monopoly*, *there exists a* (*weakly*) *higher effort level which is optimal under farmer monopoly*.

   Moreover, *the effort level under landlord monopoly is strictly lower as long as it provides a positive surplus to both parties.*

2. *The sum of expected utilities of the lender and the farmer under landlord monopoly is smaller than under farmer monopoly*, *and*

   strictly smaller as long as landlord monopoly generates a positive surplus for the farmer.

- **Proof of Theorem 1.1:**

- Let e_L and e_F denote effort levels optimal under landlord monopoly and farmer monopoly respectively.

  – That is, suppose $\left(e_F, c_s^F, c_f^F\right)$ solves problem (4) and $\left(e_L, c_s^L, c_f^L\right)$ solves problem (6).

  – It is easy to see that $\left(e_F, c_s^F, c_f^F\right)$ belongs to the constraint set of of problem (6) and $\left(e_L, c_s^L, c_f^L\right)$ belongs to the constraint set of of problem (4).

$$\Rightarrow R\left(e_L\right) - p\left(e_L\right)\alpha\left(e_L\right) - q\left(e_L\right) \geq R\left(e_F\right) - p\left(e_F\right)\alpha\left(e_F\right) - q\left(e_F\right). \tag{a}$$

- Since $q\left(e\right) \equiv \max\left\{0,\ \overline{U} + w - \underline{s} - p\left(e\right)\alpha\left(e\right) + D\left(e\right)\right\}$, we have

$$p\left(e\right)\alpha\left(e\right) + q\left(e\right) = \max\left\{p\left(e\right)\alpha\left(e\right),\ \overline{U} + w - \underline{s} + D\left(e\right)\right\},$$

  implying

$$p\left(e_L\right)\alpha\left(e_L\right) + q\left(e_L\right) \geq \overline{U} + w - \underline{s} + D\left(e_L\right), \text{ and}$$

$$p\left(e_F\right)\alpha\left(e_F\right) + q\left(e_F\right) \geq \overline{U} + w - \underline{s} + D\left(e_F\right).$$

– It follows that

$$[p(e_L)\alpha(e_L)+q(e_L)]-[p(e_F)\alpha(e_F)+q(e_F)]\geq D(e_L)-D(e_F). \qquad \text{(b)}$$

• Together, (a) and (b) imply

$$R(e_L)-D(e_L)\geq R(e_F)-D(e_F).$$

– Since e_L is contained in the constraint set of problem (5), it follows that e_L must be optimal as well for the owner-cultivator.

• If the farmer earns positive surplus under landlord monopoly, $q(e_L)=0$, and

$$\underline{s}+p(e_L)\alpha(e_L)-D(e_L)>\overline{U}+w.$$

$\Rightarrow$ For a neighbourhood of e_L, $q(e)=0$.

$\Rightarrow$ e_L must locally maximize $R(e)-p(e)\alpha(e)$, implying the F.O.C.:

$$R'(e_L)=D'(e_L)+p(e_L)\alpha'(e_L).$$

$\Rightarrow$ $R'(e_L)>D'(e_L)$, and so $R'(e)>D'(e)$ for all $e\leq e_L$ as $R''(e)<0$ and $D''(e)>0$.

- Since for the monopoly farmer e_F is chosen to solve problem (5), it follows that no effort less than e_L can be optimal for the monopoly farmer.

- Since the landlord earns a positive surplus at e_L, a small increase in effort beyond e_L is feasible and, at the same time, profitable under farmer monopoly. ■

- **Proof of Theorem 1.2:**

- Under farmer monopoly, the lender earns zero income, while the farmer's expected utility is $R(e_F) - D(e_F) + w$.

$\Rightarrow$ Sum of expected utilities under farmer monopoly is $R(e_F) - D(e_F) + w$.

- Under landlord monopoly, the sum of expected utilities is $R(e_L) - D(e_L) + w$.

- Since e_F solves problem (5), Theorem 1.2 follows. ■

- The effect of a partial shift of bargaining power in favour of the farmer is qualitatively similar.

- Since the set of feasible utilities is convex, any point on its efficiency frontier can be described as

  – a solution to the maximization of a welfare-weighted sum of utilities over this set:

$$\begin{cases} \max\limits_{\{e,c_f\}} \left[R(e) + w - c_f - p(e)\,\alpha(e)\right] + \beta\left[c_f + p(e)\,\alpha(e) - D(e)\right] \\ \text{subject to} \quad c_f \geq \underline{s}, \end{cases}$$

  where β denotes the welfare weight of the farmer relative to the lender.

  – Clearly in this maximization problem effort level is chosen to maximize

$$R(e) - D(e) + (\beta - 1)\left[p(e)\,\alpha(e) - D(e)\right].$$

  ◦ Verify that $\dfrac{d\hat{e}}{d\beta} > 0$ where $\hat{e}$ is a solution to this problem.

- The outcome of farmer ownership (F in Figure 1) awards a greater share of the surplus to the farmer than the outcome of lender ownership (L in Figure 1).

$\Rightarrow$ The implicit welfare weight of the farmer (β) will be higher under self-ownership than under tenancy.

  - Then from $\frac{d\hat{e}}{d\beta} > 0$ it follows that the effort level under farmer ownership will be higher.

- The explanation for the greater application of labour effort under farmer ownership is based on

  – the externality arising from the *informational rents* accruing to the farmer.

  – To the landlord these rents represent a cost, while to the farmer they constitute a benefit.

  $\Rightarrow$ The farmer desires a higher effort level than the landlord.

- A shift of bargaining power towards the farmer as a result of transfer of ownership causes a higher effort level to be applied.

- The real cause of the inefficiency of tenancy is a pecuniary externality:
  - the landlord disregards the benefit of higher efforts accruing to the farmer in the form of higher informational rents.
    - Increasing farmer's bargaining power allows greater internalization of these rents.

- A land sale from landlord to tenant cannot be mutually advantageous to both parties.
  - Since contracts are complete, the outcome under either ownership structure cannot be Pareto dominated by the other.

- Otherwise, if there was a scope for a mutually advantageous sale, then both landlord and tenant would be better off following the sale.
  - The same allocation could, however, be achieved by the landlord under tenancy with the design of a tenancy contract that would mimic the effect of the sale.
    - The landlord could select a composite contract which combined
      - a fixed rent exactly equal to the price of land, with a supplemental contract which exactly replicated the credit contract arising after the land sale.
  - Since the land sale resulted in a Pareto improvement, this combined contract would also yield a Pareto improvement over the original tenancy contract.
    - But this contradict the premise that the original contract was Pareto optimal.

- **Theorem 2.** *Starting with a situation where the land is owned by the landlord, a voluntary sale of land to the tenant will never occur.*

- Proof:

  Suppose that a mutually advantageous sale were to occur at price P, with the post-sale contract denoted by $(\tilde{c}_f, \tilde{e})$ and pre-sale contract by $\left(c_f^L, e_L\right)$.

  – Since the farmer must be better off:

$$\tilde{c}_f + p\left(\tilde{e}\right)\alpha\left(\tilde{e}\right) - D\left(\tilde{e}\right) > c_f^L + p\left(e_L\right)\alpha\left(e_L\right) - D\left(e_L\right).$$

  – Moreover, the landlord must also benefit:

$$P > R\left(e_L\right) + w - c_f^L - p\left(e_L\right)\alpha\left(e_L\right). \tag{7}$$

– But the pre-sale contract was Pareto efficient, so the landlord must have preferred the pre-sale contract to the post-sale contract:

$$R(\tilde{e}) + w - \tilde{c}_f - p(\tilde{e})\,\alpha(\tilde{e}) \leq R(e_L) + w - c_f^L - p(e_L)\,\alpha(e_L),$$

$$\Rightarrow R(\tilde{e}) + (w - P) - \tilde{c}_f - p(\tilde{e})\,\alpha(\tilde{e}) \leq R(e_L) + (w - P) - c_f^L - p(e_L)\,\alpha(e_L) < 0,$$

the last inequality following from condition (7).

◦ But $R(\tilde{e}) + (w - P) - \tilde{c}_f - p(\tilde{e})\,\alpha(\tilde{e}) < 0$ implies that the lender fails to break even in the post-sale situation.

◦ So the farmer will be unable to obtain the credit necessary for the purchase. ■

- One way of understanding the result is that the land sale exerts a wealth effect:

  the farmer's debts grow as a result of the land purchase loan, which exacerbates the moral hazard associated with repayment of the loan.

  - Farmer's 'limited liability' $\Rightarrow$ he must be guaranteed at least $\underline{s}$ in the disaster state,
    - while in the good state he must repay a larger amount.
  - This debt 'overhang' reduces the farmer's incentive to exert effort on the farm after purchasing it.
  - Anticipating this, lenders assess a default likelihood high enough that they are unwilling to advance the loan.

- Alternatively, if the farmer finances the purchase from his own assets, the purchase lowers his wealth subsequent to the purchase.

  - This reduces the collateral available to the lenders, with the consequence that
    - he will not be able to obtain the credit necessary to sustain the intended productivity advantages of owner cultivation.

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- This note is based on

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