Labour Market Imperfections
1. Introduction

- Following distinctive institutional characteristics of the labour market of informal economy of the developing countries are well documented.

  - Fragmented labor markets: Large variations in wages within a narrow geographic region, despite the presence of competition.
  
  - Involuntary unemployment: Persistent lack of market clearing despite absence of any regulations that prevent wages from adjusting flexibly.
  
  - Pervasiveness of long-term contracts between employers and employees.
  
  - Unequal treatment of observationally similar workers.
    
    - Dual labor markets where some workers enter into long-term contracts while others carry out similar tasks on a casual basis at substantially lower wages.
  
  - Importance of asset ownership: Limited access of the poor to employment owing to malnutrition and absence of human capital.
• We will focus on imperfections in the labour market such as *involuntary unemployment* and *dual labour markets*.

• For a background and for discussion of other issues in the labour market of developing countries refer to the following:


2. Malnutrition and Efficiency Wages

- Following Dasgupta and Ray (1986, 1987) we consider the phenomenon of *nutrition-based efficiency wages*, and its resulting implications for the labour market.

  - This topic goes back to earlier works by Leibenstein (1957), Prasad (1970), Mirrless (1976), Stiglitz (1976) and Bliss and Stern (1978).

- The phenomenon of involuntary unemployment poses a challenge for conventional economic theory.

  - If wages are flexible in the downward direction, any excess supply ought to be eliminated by corresponding wage cuts.

    - Unemployed workers could undercut the going wage by offering to do the same work for less pay,

      - an offer that should be accepted by profit-maximizing employers.
What prevents such arbitrage?

The *efficiency wage theory* provides one answer to this conundrum:

– if the productive efficiency of the worker depends on the wage, a wage cut will be accompanied by a drop in the worker’s efficiency,
  
  ○ thus rendering the arbitrage worthless to the employer.

Dasgupta and Ray (1986, 1987) embed this story into a general equilibrium setting,

– permitting analysis of the effects of land endowment patterns on unemployment and productivity.

– The theory provides a link between persistent involuntary unemployment and the incidence of undernourishment,
  
  ○ relates them in turn to the production and distribution of income and thus ultimately to the distribution of assets.
2.1 Dasgupta and Ray (1986)

- The theory is founded on the much-discussed observation that
  - at low levels of nutrition-intake there is a positive relation between a person’s nutrition status and his ability to function;
    - a person’s consumption-intake affects his productivity.

- The central idea is that unless an economy in the aggregate is richly endowed with physical assets, it is the assetless who are vulnerable in the labour market.
  - Potential employers find attractive those who enjoy non-wage income, for in effect they are cheaper workers.
  - Those who enjoy non-wage income can undercut those who do not, and
    - if the distribution of assets is highly unequal even competitive markets are incapable of absorbing the entire labour force:
      - the assetless are too expensive to employ in their entirety, as there are too many of them.
A simple example:

– Suppose each person requires precisely 2000 calories per day to be able to function;
  o anything less and his productivity is nil; anything more and his productivity is unaffected.

– Consider two persons; one has no non-wage income while the other enjoys 1500 calories per day of such income.

⇒ The first person needs a full 2000 calories of wages per day in order to be employable; the latter only 500 calories per day.

– It is for this reason the assetless is disadvantaged in the labour market.
2.1.1 The Model

- Consider a timeless construct and abstain from uncertainty.

- Distinguish labour-\textit{time} from labour-\textit{power};
  - it is the latter which is an input in production.

- Denote by $\lambda$ the labour-\textit{power} a worker supplies over a fixed number of ‘hours’.
  - Assume that $\lambda$ is functionally related to the worker’s consumption, $I$, as shown in Figure 1(a).

- The key features of the functional relationship are:
  - it is increasing in the region of interest;
  - at low consumption levels it increases at an \textit{increasing} rate, followed eventually by diminishing returns to further consumption.
• The reason for this work capacity - consumption relationship can be explained as follows.

– Initially, most of the nutrition (consumption) goes to maintaining *resting metabolism*, and so sustaining the basic frame of the body.
  - In this stretch very little extra energy is left over for productive work.
  - Work capacity in this region is very low, and does not increase too quickly as nutrition levels change.

– Once resting metabolism is taken care of, there is a marked increase in work capacity,
  - the lion’s share of additional nutrition input can now be funneled to work.

– This phase is followed by a phase of diminishing returns,
  - the natural limits imposed by the body’s frame restrict the conversion of increasing nutrition into ever-increasing work capacity.
• An alternative specification of the work capacity - consumption relationship (used, for example, by Bliss and Stern (1978)) is drawn in Figure 1(b).

– Work capacity or labour power, \( \lambda \), is nil until a threshold level of consumption, \( I^* \), the resting metabolic rate (RMR).

– \( \lambda (I) \) is an increasing function beyond \( I^* \);

  o but it increases at a diminishing rate.
Fig. 1
The aggregate production function is $F(E, T)$.

- $E$ denotes the aggregate labour-power employed in production;
  - It is the sum of individual labour powers employed.
- $T$ denotes the quantity of land.

- Land is homogeneous; workers are not.

$F(E, T)$ is assumed to be concave, twice differentiable, constant returns to scale, increasing in $E$ and $T$, and displaying diminishing marginal products.

Total land in the economy is fixed at $\hat{T}$.

Aggregate labour power in the economy is endogenous.

Total population, assumed to be equal to the potential labour force, is $N$; $N$ is large.

- Approximate and suppose that people can be numbered along the interval $[0, 1]$. 
• Each person has a label, $n$, where $n$ is a real number between 0 and 1.

• Population density is constant and equal to $N$.
  – Normalize $N = 1$, so as not to have to refer to the population size.

• The proportion of land an $n$-person owns is $t(n)$;
  ⇒ total amount of land he owns is $\hat{T}t(n)$.
  – We label people such that $t(n)$ is non-decreasing in $n$.
    ○ So $t(n)$ is the land distribution and is assumed to be continuous.

• In Figure 2 a typical land distribution is drawn.
  – All persons labelled 0 to $n$ are landless.
  – From $n$ the $t(n)$ function is increasing.
• Assume one either does not work in production sector or works for one unit of time.

• There are competitive markets for both land and labour power; let \( r \) denote the competitive land rental rate. \( \Rightarrow \) The \( n \)-person’s non-wage income is \( r \hat{T}t(n) \).

• Each person has a reservation wage which must as a minimum be offered if he is to accept a job in the competitive labour market.

• For high \( n \)-persons this reservation wage is high as they receive a high rental income.
  – Their utility from leisure is high.

• For low \( n \)-persons (say the landless), reservation wage is low, but possibly not nil.
  – We are concerned with malnutrition, not starvation.
    - The landless do not starve if they fail to find jobs in the labour market.
      - They beg, do odd jobs outside the economy under review, which keep them undernourished; but they do not die.
Thus the reservation wage of even the landless exceeds their RMR.

- All we assume is that at this reservation wage a person is malnourished.

- Denote by \( \bar{w}(R) \) the reservation wage function; \( R \) denotes non-wage income.

- Assume the \( \bar{w}(R) \) function is exogenously given (continuous and non-decreasing).
  - Of course, non-wage income is endogenous to the model.

- This reservation wage function is depicted in Figure 3.
  - For a given \( r > 0 \), \( \bar{w}(r \hat{T}t(n)) \) is constant for all \( n \in [0, \underline{n}] \) since all these \( n \)-persons are identical.
  - After that \( \bar{w}(r \hat{T}t(n)) \) increases in \( n \).
• Malnutrition:

For concreteness choose the consumption level $\hat{I}$ in Figure 1 as the cut-off consumption level below which a person is said to be undernourished.

– At $\hat{I}$ marginal labour power equals average labour power.

– $\hat{I}$ is then the food-adequacy standard.

– Nothing of analytical consequence depends on this choice.

  ○ All that is needed is the assumption that the reservation wage of a landless person is one at which he is undernourished, and thus less than $\hat{I}$.

• Involuntary Unemployment:

A person is involuntarily unemployed if he cannot find employment in a market which does employ a person very similar to him and if the latter person, by virtue of his employment in this market, is distinctly better off than him.

– Involuntary unemployment has to do with differential treatment meted out to similar people.
To keep the exposition simple rest of the paper specializes somewhat and assume that $\lambda(I)$ is of the form given in Figure 1(b).

The **efficiency-wage**, $w^*(n, r)$, of $n$-person is defined as

$$w^*(n, r) \equiv \arg \min_{w \geq \bar{w}(rTt(n))} \frac{w}{\lambda \left( w + r\hat{T}t(n) \right)}.$$  \hspace{1cm} (1)

- $w^*(n, r)$ is the wage per unit of labour-time which, at the rental rate $r$, minimizes the wage per unit of labour power of $n$-person, conditional on his being willing to work at this wage rate.

  - Since the $n$-person’s reservation wage $ar{w}(r\hat{T}t(n))$ depends on the rental rate, his efficiency-wage depends, in general, on $r$. 

• The minimization problem in (1) is equivalent to:

\[
\max_{w \geq \bar{w}(r\hat{T}t(n))} \frac{\lambda \left( w + r\hat{T}t(n) \right)}{w}.
\]

Form the Lagrangian \( \mathcal{L} = \frac{\lambda \left( w + r\hat{T}t(n) \right)}{w} + \xi \cdot \left[ w - \bar{w} \left( r\hat{T}t(n) \right) \right] \), so that the F.O.C. are given by

\[
\frac{w \cdot \lambda' \left( w + r\hat{T}t(n) \right) - \lambda \left( w + r\hat{T}t(n) \right)}{w^2} + \xi = 0,
\]

(a)

and

\[
\xi \cdot \left[ w - \bar{w} \left( r\hat{T}t(n) \right) \right] = 0, \ \xi \geq 0, \ \text{and} \ w \geq \bar{w} \left( r\hat{T}t(n) \right).
\]

(b)
• When the reservation wage constraint is not binding \((w^* (n, r) > \bar{w} (r \hat{T} t (n)))\),
  – Then \(\xi = 0\), so that (a) implies
  \[
  \lambda' \left( w^* (n, r) + r \hat{T} t (n) \right) = \frac{\lambda \left( w^* (n, r) + r \hat{T} t (n) \right)}{w^* (n, r)} \tag{c}
  \]

• For the landless, that is, for \(n \in [0, n]\), \(t (n) = 0\), implying \(I = w^* (n, r) + r \hat{T} t (n) = w^* (n, r)\), so that (c) implies
  \[
  \lambda' (I) = \frac{\lambda (I)}{I} \Rightarrow I = \hat{I} \Rightarrow w^* (n, r) = \hat{I}.
  \]
  – Recall that, by hypothesis, \(\hat{I}\) exceeds the reservation wage of the landless.
    - This confirms that for the landless we are under the case when the reservation wage constraint is not binding.
• For one who owns a tiny amount of land, that is, \( n \) is just above \( \underline{n} \) and \( t(n) \) is positive but small enough so that the reservation wage constraint continues not to bind, (c) implies

\[
\chi'(I) = \lambda \left( w^*(n, r) + r \hat{T} t(n) \right) > \frac{\lambda(I)}{I} \text{ since } I = w^*(n, r) + r \hat{T} t(n) > w^*(n, r),
\]

\[\Rightarrow I < \hat{I},\]

\[\Rightarrow \bar{w} \left( r \hat{T} t(n) \right) < w^*(n, r) < \hat{I}.\]

– That is, for one who owns a tiny amount of land, \( w^*(n, r) < \hat{I} \), and, at the same time, \( I < \hat{I} \).

• What happens to \( w^*(n, r) \) and \( I \) as \( n \) increases further, that is, for those who owns larger amounts of landholding?

• Note that as long as the reservation wage constraint is not binding, (c) continues to hold.
Total differentiating (c) we derive the following:

\[ \frac{dw^*}{dn} = r^T t'(n) \left[ \frac{\lambda'(I)}{\lambda''(I)} - 1 \right] < 0, \text{ and } \frac{dI}{dn} = \frac{dw^*}{dn} + r^T t'(n) = r^T t'(n) \left[ \frac{\lambda'(I)}{\lambda''(I)} \right] < 0. \]

That is, the efficiency wage decreases with increase in landholding and, as a result, income of these small landowners decline.

\[ \Rightarrow \text{ For these small landowners also we continue to have } I < \hat{I}, \text{ and } \bar{w}\left(r^T t(n)\right) < w^*(n, r) < \hat{I}. \]

But how long will it continue?

Note we started with the landless for whom \( w^*(n, r) = \hat{I} > \) their reservation wage.

- Then as \( n \uparrow, \bar{w}\left(r^T t(n)\right) \uparrow, \text{ but } w^*(n, r) \downarrow. \)

\[ \Rightarrow \text{ Continuing this way we can identify an } n_0 \text{ such that } w^*(n_0, r) = \bar{w}\left(r^T t(n_0)\right). \]
• So we conclude one with considerable amount of land, \( n > n_0 \),

\[
    w^* (n, r) = \bar{w} \left( r\hat{T}t (n) \right).
\]

• Finally, for one who owns a great deal of land we would expect,

\[
    w^* (n, r) = \bar{w} \left( r\hat{T}t (n) \right) > \hat{I}.
\]
• Define \( \mu^*(n, r) \) as

\[
\mu^*(n, r) \equiv \frac{w^*(n, r)}{\lambda \left( w^*(n, r) + r \hat{T} t(n) \right)}.
\]

(2)

– Given \( r \), \( \mu^*(n, r) \) is the minimum wage per unit of labour power for \( n \)-person, subject to the constraint that he is willing to work.

• Bliss and Stern (1978) interpreted \( \lambda(I) \) as the (maximum) number of tasks a person can perform by consuming \( I \).

– In this interpretation we may regard \( \mu^*(n, r) \) as the efficiency-piece-rate of \( n \)-person.

○ In what follows we will so regard it.
• In Figure 4(a) a typical $\mu^* (n, r)$ curve has been drawn.

- $\mu^* (n, r)$ is ‘high’ for the landless because they have no non-wage income.
  
  o For the landless, $\mu^* (n, r) = \frac{\hat{I}}{\lambda (\hat{I})}$.

- It is relatively ‘low’ for ‘smallish’ landowners because they do have some non-wage income and because their reservation wage is not too high.

- It is ‘high’ for the big land-owners because their reservation wages are very high.
• While a ‘typical’ shape of $\mu^* (n, r)$, as in Figure 4(a) is used to illustrate the arguments in the main body of the paper,
  - the assumptions do not, in general, generate this ‘U-shaped’ curve.
  - For a given $r$, the common features of $\mu^* (n, r)$ are:

(a) $\mu^* (n, r)$ is constant for all landless $n$-persons and falls immediately thereafter.
(b) $\mu^* (n, r)$ continues to decrease in $n$ as long as the reservation wage constraint is not binding.

$\Rightarrow$ Whenever $\mu^* (n, r)$ increases with $n$, the reservation wage constraint is binding.

$$\frac{d\mu^* (n, r)}{dn} = \frac{\frac{d w^*(n, r)}{dn} \left[ \lambda (\cdot) - w^* (n, r) \lambda' (\cdot) \right] - w^* (n, r) \lambda' (\cdot) r T t' (n)}{[\lambda (\cdot)]^2}.$$  
- When the reservation wage constraint is not binding, $\lambda (\cdot) = w^* (n, r) \lambda' (\cdot)$, implying that $\frac{d\mu^* (n, r)}{dn} < 0$. 
(c) Once the reservation wage constraint binds for some \( n \)-person, it continues to bind for all \( n \)-person with more land.

- We have argued that the reservation wage constraint start binding at \( n_0 \) defined by

\[
w^* (n_0, r) = \bar{w} \left( r \hat{T} t(n_0) \right),
\]

where \( w^*(n, r) \) satisfies equation (c) so that, as argued earlier, \( \frac{d}{dn} w^*(n, r) < 0 \).

- Since both \( \bar{w}'(\cdot) > 0 \) and \( t'(n) > 0 \), it follows that the constraint continues to bind for all \( n \geq n_0 \).

(d) \( \mu^*(n, r) \) finally rises as the effect of increasing reservation wage ultimately outweighs the diminishing increments to labour power associated with greater land-ownership.
2.1.3 Market Equilibrium

- Markets are competitive, and there are two factors – land and labour power.

\[ \Rightarrow \] Two competitive prices to reckon with: rental rate on land, \( r \), and price of a unit of labour power, that is, the *piece rate*, \( \mu \).

- \( D(n) \): the market demand for the labour *time* of \( n \)-person;
- \( S(n) \): the \( n \)-person’s labour (time) supply.

- By assumption \( S(n) \) is either zero or unity.

- \( w(n) \): the wage rate for \( n \)-person; \( G \): the set of \( n \)-persons who find employment.

- Production enterprises are profit maximizing.

- Each \( n \)-person aims to maximize his income given the opportunities he faces.

- A rental rate \( \tilde{r} \), a piece rate \( \tilde{\mu} \), a subset \( \tilde{G} \) of \([0, 1]\) and a real-valued function \( \tilde{w} \) on \( \tilde{G} \) sustain a competitive equilibrium if and only if:
(i) for all $n$-persons for whom $\tilde{\mu} > \mu^* (n, \tilde{r})$, we have $S (n) = D (n) = 1$;

(ii) for all $n$-persons for whom $\tilde{\mu} < \mu^* (n, \tilde{r})$, we have $S (n) = D (n) = 0$;

(iii) for all $n$-persons for whom $\tilde{\mu} = \mu^* (n, \tilde{r})$, we have $S (n) \geq D (n)$, where

- $D (n)$ is either 0 or 1 and

$$S (n) = \begin{cases} 1 & \text{if } \tilde{w} (n) > \tilde{w} \left( \tilde{r} \tilde{T} t (n) \right), \\ \text{either 0 or 1} & \text{if } \tilde{w} (n) = \tilde{w} \left( \tilde{r} \tilde{T} t (n) \right); \end{cases}$$

(iv) $\tilde{G} = \{ n : D (n) = 1 \}$ and $\tilde{w} (n)$ is the larger of the (possibly) two solutions of

$$\frac{w}{\lambda \left( w + \tilde{r} \tilde{T} t (n) \right)} = \tilde{\mu}, \text{ for all } n \text{ with } D (n) = 1;$$

(v) $\tilde{\mu} = \partial F \left( \tilde{E}, \tilde{T} \right) / \partial E$, where $\tilde{E}$ is the aggregate labour power supplied by all who are employed; and

(vi) $\tilde{r} = \partial F \left( \tilde{E}, \tilde{T} \right) / \partial T$. 
• Conditions (v) and (vi):

Since producers are competitive, \( \tilde{r} \) in equilibrium must be equal to the marginal product of land and \( \tilde{\mu} \) the marginal product of aggregate labour power.

• Condition (ii):

We conclude from (v) that the market demand for the labour time of an \( n \)-person whose efficiency-piece-rate exceeds \( \tilde{\mu} \) must be nil.

Equally, such a person cannot, or, given his reservation wage, will not, supply the labour quality the market bears at the going piece rate \( \tilde{\mu} \).

– Suppose he were employed at wage \( w \geq \bar{w} \left( \tilde{r} \hat{T}t \left( n \right) \right) \).

○ He can earn this wage only if he is physically capable of delivering the job, that is, \( \tilde{\mu} \cdot \lambda \left( w + \tilde{r} \hat{T}t \left( n \right) \right) \geq w \).

\[ \Rightarrow \frac{w}{\lambda \left( w + \tilde{r} \hat{T}t \left( n \right) \right)} \leq \tilde{\mu} < \mu^* \left( n, \tilde{r} \right) , \text{ contradicting the definition of } \mu^* \left( n, \tilde{r} \right) . \]
Conditions (i) and (iv):

Every enterprise wants an $n$-person whose efficiency-piece-rate is less than $\tilde{\mu}$.

- His wage rate is bid up by competition to the point where his piece rate is $\tilde{\mu}$.

- Demand for his labour time is positive.

\[
\frac{\tilde{w}(n)}{\lambda \left( \tilde{w}(n) + \tilde{r}\tilde{T}t(n) \right)} = \tilde{\mu} > \mu^*(n, \tilde{r}) = \frac{w^*(n, \tilde{r})}{\lambda \left( w^*(n, \tilde{r}) + r\tilde{T}t(n) \right)}
\]

\[\Rightarrow \tilde{w}(n) > w^*(n, \tilde{r}), \text{ since } \frac{d\mu}{dw} = \frac{\lambda(\cdot) - w \cdot \lambda'(\cdot)}{[\lambda(\cdot)]^2} \geq 0;\]

\[\Rightarrow \tilde{w}(n) > w^*(n, \tilde{r}) \geq \bar{w} \left( \tilde{r}\tilde{T}t(n) \right),\]

that is, the wage he is paid exceeds his reservation wage.

\[\Rightarrow \text{He most willingly supplies his unit of labour time which, in equilibrium, is what is demanded.}\]
• Condition (iii):

What of an $n$-person whose efficiency-piece-rate equals $\tilde{\mu}$?

– Enterprises are indifferent between employing and not employing such a worker.

– He is willing to supply his unit of labour time:

  o with eagerness if the wage he receives in equilibrium exceeds his reservation wage, and as a matter of indifference if it equals it.
• **Theorem 1.** *Under the conditions postulated, a competitive equilibrium exists.*

• A competitive equilibrium is not necessarily Walrasian.
  
  – It is not Walrasian when, for a positive fraction of the population, condition (iii) holds; otherwise it is.
  
  – If in equilibrium, condition (iii) holds for a positive fraction of the population, the labour market does not clear, and
    
    o we take it that the market sustains ‘equilibrium’ by *rationing*:
      
      - of this group a fraction is employed while the rest are kept out.
2.1.4 Simple Characteristics of Market Equilibrium

- We will characterize the equilibrium diagrammatically.
  - There are three different regimes depending on the size of $\hat{T}$.

- **Theorem 2.** A competitive equilibrium is in one of three possible regimes, depending on the total size of land, $\hat{T}$, and the distribution of land. Given the latter:

1. If $\hat{T}$ is sufficiently small, $\bar{\mu} < \hat{I}/\lambda \left( \hat{I} \right)$, and the economy is characterized by malnourishment among all the landless and some of the near-landless;

2. There are ranges of moderate values of $\hat{T}$ in which $\bar{\mu} = \hat{I}/\lambda \left( \hat{I} \right)$, and the economy is characterized by malnourishment and involuntary unemployment among a fraction of the landless;

3. If $\hat{T}$ is sufficiently large, $\bar{\mu} > \hat{I}/\lambda \left( \hat{I} \right)$, and the economy is characterized by full employment and an absence of malnourishment.
• Before discussing the equilibrium regimes we note that
  – among those in employment, persons owning more land are doubly blessed:
    ○ the not only enjoy more rental income, their wages are also higher.

• **Theorem 3.** Let \( n_1, n_2 \in \tilde{G} \) with \( t(n_1) < t(n_2) \). Then \( \tilde{w}(n_1) < \tilde{w}(n_2) \).

• A strong implication of this result is that competition, in some sense, widens the initial disparities in asset ownership by offering larger (employed) land-owners a higher wage income.
2.1.4.1 Regime 1: Malnourishment among the Landless and Near-landless

- Figure 5(a) depicts a typical equilibrium under regime 1.

- Condition (i) \( \Rightarrow \) all \( n \)-persons between \( n_1 \) and \( n_2 \) are employed in production.
  - Typically for the borderline \( n_1 \)-person \( \tilde{w}(n_1) > \bar{w}(\tilde{r}Tt(n_1)) \).

- Condition (ii) \( \Rightarrow \) all \( n \)-persons below \( n_1 \) and above \( n_2 \) are out of the market:
  - the former because their labour power is too expensive,
  - the latter because their reservation wages are too high – they are too rich.

- In this regime all the landless are malnourished.
  - They enjoy their reservation wage which is less than \( \hat{I} \).
• All persons between \( n \) and \( n_1 \) are also *malnourished*;
  – their rental income is too meagre.

• Some of the employed are also *malnourished*;
  – the employed persons slightly to the right of \( n_1 \) consume less than \( \hat{I} \).

• Although there are no job queues in the labour market; nevertheless, there is *involuntary unemployment*.
  – \( \bar{w} (n_1) > \bar{w} (\tilde{r} \hat{T} t (n_1)) \) \( \Rightarrow \) We also have \( \bar{w} (n) > \bar{w} (\tilde{r} \hat{T} t (n)) \) for all \( n \) in a neighbourhood to the right of \( n_1 \).
  – Since such people are employed, they are distinctly better off than the \( n \)-persons in a neighbourhood to the left of \( n_1 \),
    ○ who suffer at their reservation wage.
• Finally, the $n$-persons above $n_2$ are *voluntarily* unemployed.

  – Call them the pure rentiers, or the landed gentry.

    ○ They are capable of supplying labour at the piece-rate $\tilde{\mu}$ called for by the market, but *choose* not to;

      - their reservation wages are too high.

  – They are to be contrasted with the unemployed people below $n_1$ who are *incapable* of supplying labour at $\tilde{\mu}$. 
2.1.4.2 Regime 2: Malnourishment and Involuntary Unemployment among the Landless

- The relevant curves are drawn in Figure 5(b).

- Here $\tilde{\mu} = \hat{I}/\lambda \left( \hat{I} \right)$. 
  
  - It is not a zero-measure event: it pertains to certain intermediate ranges of $\hat{T}$.

- The economy equilibrates by rationing landless people in the labour market.

- Condition (i) $\Rightarrow$ all $n$-persons between $\underline{n}$ and $n_2$ are employed.

- Condition (ii) $\Rightarrow$ all $n$-persons above $n_2$ are out of the labour market because their reservation wages are too high.
\( \mu^*(n, \tilde{r}) \)

\( \bar{\mu} = \hat{I}/\lambda(\hat{I}) \)

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variables:

- \( n \): horizontal axis
- \( \tilde{r} \): vertical axis
- \( \mu^* \): function plotted
- \( \bar{\mu} = \hat{I}/\lambda(\hat{I}) \): another function plotted
• A fraction of the landless, \( \frac{n_1}{n} \), is *involuntarily unemployed*;

  – the remaining fraction, \( 1 - \frac{n_1}{n} \), is employed.

  – The size of this fraction depends on \( \hat{T} \).

• The *employed* among the landless are paid \( \hat{I} \Rightarrow not \) malnourished.

• The *unemployed* among the landless suffer their reservation wage.

  \( \Rightarrow \) They are *malnourished*.

• Under this regime, the group of unemployed and malnourished coincide

  – This is to be contrasted with Regime 1.
2.1.4.2 Regime 3: The Full Employment Equilibrium

- Figure 5(c) presents the third regime pertinent for large values of $\hat{T}$.

- Here $\bar{\mu} > \hat{I}/\lambda(\hat{I})$.

- Condition (i) $\Rightarrow$ all $n$-persons from 0 to $n_2$ are employed.

- Condition (ii) $\Rightarrow$ all $n$-persons above $n_2$ are out of the labour market.
  - They are the landed gentry, *not* involuntarily unemployed.

- This regime is characterized by full employment and no malnourishment.

- This corresponds to a standard Arrow-Debreu equilibrium.
2.2 Dasgupta and Ray (1987)

- The analysis in Dasgupta and Ray (1986) shows the precise way in which asset advantages translate themselves into employment advantages.
  
  - This suggests strongly that certain patterns of egalitarian asset redistributions may result in greater employment and aggregate output.

- Dasgupta and Ray (1987) confirm such possibilities and
  
  - explores public policy measures which ought to be considered in the face of massive market-failure of the kind identified in Dasgupta and Ray (1986).

- Dasgupta and Ray (1986) study the implications of aggregate asset accumulation in the economy in question.
  
  - The distribution of assets was held fixed.

- Dasgupta and Ray (1987) study the implication of asset redistribution.
• Dasgupta and Ray (1987) hold the aggregate quantity of land fixed and alter the land distribution.

• They first check that redistributive policies are the only ones that are available.
  – This is confirmed by the following theorem.

• **Theorem 1.** *Under the conditions postulated, a competitive equilibrium is Pareto-efficient.*

  ⇒ There is no scope for external interventions to improve the welfare of the poor and malnourished, without making the non-poor worse off.
2.2.1 Partial Land Reforms

- Consider land transfers from the landed gentry (those who do not enter the labour market because their reservation wage is too high) to those who are involuntarily unemployed.

- In Figure 2, a partial land reform is depicted;
  - land is transferred to some of the unemployed as well as those ‘on the margin’ of being unemployed.
  - People between $n_a$ and $n_b$ gain land;
    - for them, the $\mu^* (\cdot, \tilde{r})$ function shifts downward; that is, their efficiency-piece-rate is lowered.
  - The losers, between $n_c$ and $n_d$, also experience a downward shift in $\mu^* (\cdot, \tilde{r})$,
    - but for entirely different reasons – their reservation wages have been lowered.
Fig. 2. Partial land reform: $n$-persons between $n_a$ and $n_b$ gain land, and rentiers between $n_c$ and $n_d$ lose land.
• Can the equilibrium before the partial land reform be compared with the one after land reform?

• Theorem 2. Suppose that for each parametric specification, the competitive equilibrium is unique. Then a partial land reform of the kind just described necessarily leads to at least as much output in the economy (strictly more, if $\mu^*(n, \tilde{r})$ is of the form in Figure 2).

• The result implies there is no necessary conflict between equality-seeking moves and aggregate output in a resource-poor economy.

• Such redistributions have three effects.
  – The unemployed become more attractive to employers as their non-wage income rises.
  – The employed among the poor become more productive to the extent that they too receive land.
– By taking land away from the landed gentry, their reservation wages are lowered;
  - if this effect is strong enough, this could induce them to forsake their state of voluntary unemployment and enter the labour market.

• For all these reasons, the number of employed efficiency units in the economy rises, pushing it to a higher-output equilibrium.

• Theorem 2 is silent on how the set of employed persons changes.
  – There is a natural tendency for employment to rise because of the features mentioned above.
  – However, there is a ‘displacement effect’ at work: newly productive workers are capable of displacing previously employed, less productive workers in the labour market.
2.2.2 Full Land Reforms

- This displacement effect cannot exist in the case of full land reforms.

- Recall that total land of the economy is fixed at the level $\hat{T}$.
  - Let $\hat{T}_1$ be smallest value of $\hat{T}$ such that at $\hat{T}_1$ the economy is productive enough (just about) to feed all adequately,
    - that is, at the level of food adequacy standard $\hat{I}$.

- **Theorem 4.** There exists an interval $(\hat{T}_1, \hat{T}_2)$ such that if $\hat{T}$ is in this interval, full redistributions yield competitive equilibria with full employment and no malnourishment. Moreover for each such $\hat{T}$, there are unequal land distributions which give rise to involuntary unemployment and malnourishment.
Theorem 4 has identified a class of cases, namely, a range of moderate land endowments, where

- inequality of asset ownership can be pin-pointed as the basic cause of involuntary unemployment and malnourishment.

- In such circumstances judicious land reforms can increase output and reduce both unemployment and undernourishment.

- If land were equally distributed, the market mechanism would sustain this economy in regime 3 in which
  - undernourishment and unemployment are things of the past.

- Eswaran and Kotwal (1985) analyzes an alternative source of efficiency wages, stemming from the problem of eliciting trustworthy behaviour from employees.

- Certain tasks in agriculture require application of effort which is difficult to monitor:
  - water resource management, application of fertilizers, maintenance of draft animals and machines.

- Certain other tasks are routine and menial and less subject to worker moral hazard as the product of the worker’s effort is easily monitored:
  - weeding, harvesting, threshing.

- Piece rates may suffice for the second type of tasks, but not for the first type.
  - Performance of the worker on these tasks can be ascertained only much later:
    - at the end of the year or in future years; whereas wages have to be paid upfront.
Moreover workers’ performance may not be verifiable by third-party contract enforcers.

For either of these reasons, wages for the first category of tasks will be independent of performance levels;

- accordingly trust plays a significant role.

⇒ The employer will seek to employ family members or other kins for these tasks.

- If hired hands are employed for these tasks, they have to be induced to behave in a trustworthy fashion.

  - This is made possible by an implicit long-term contract, which is renewed in future years only upon verification of the employee’s satisfactory performance.

- To give the employee a stake in the continuation of the employment relationship,

  - long-term workers have to be treated better than short-term workers hired for harvesting tasks.
This implies in turn that the market for long-term contracts will be characterized by *involuntary unemployment*:

– all workers will queue up for long-term contracts;

– but employers will typically be willing to employ a fraction of the entire labour force in long-term contracts,
  
  ○ the remaining workers being forced into the residual short-term sector.

The unemployment will not be eliminated despite wage flexibility,

– since wage cuts will reduce the stake of long-term workers in the subsequent continuation of the relationship,
  
  ○ inducing them to abuse their employers’ trust.
• This explanation for long-term contracts is similar to earlier theories advanced by

• What is of particular interest in Eswaran and Kotwal (1985) is the explanation of coexistence of long-term and short-term workers, and
  – how the composition of the work force shifts in response to demand and technology changes.
3.1 The Model

- A single crop is produced each year;
  - the crop takes two periods to produce, each period lasting for one-half year.
    - The first period requires such activities as soil preparation, tiling, sowing, etc.,
    - the second requires activities such as harvesting, threshing, etc.
  - Demand for labour and capital is considerably higher in the second period.
- Production process entails the use of three inputs: land ($h$), labour, and capital ($K$).
- Disaggregate labour into two categories according to the nature of the tasks:
  - Type 1 tasks involve considerable care and judgement such as
    - water resource management, application of fertilizers, plowing, maintenance of draft animals and machines, etc.
    - Such tasks do not lend themselves to easy on-the-job supervision.
- Type 2 tasks are those that are routine and menial such as
  - weeding, harvesting, threshing, etc.
  - These tasks are by their very nature easy to monitor.

- All workers are assumed to have identical abilities;
  - but the tasks to which they are assigned are not necessarily the same

- Distinguish between length of employment ($l$) and the intensity of effort ($e$).

- Efficient performance of any task requires an effort level $\bar{e} > 0$.

- An efficiency unit of labour is taken to be one worker hired for a whole period ($l = 1$) at an effort level $\bar{e}$.
• Type 1 tasks are performed by workers on long-term contracts, while casual workers are entrusted with only Type 2 tasks.

• Assume that no casual workers are hired in period 1.
  – The tasks to be performed in period 1 are mainly of Type 1 variety.
  – Empirically, casual workers are hired mainly in the peak season (period 2).

• $L_p$: number of efficiency units of *permanent labour* employed per period on a farm.
  – A permanent worker’s contract is over the infinite horizon unless he is found to shirk.

• $L_c$: number of efficiency units of *casual labour* employed on the farm in period 2.
  – A casual worker’s contract lasts for the whole or part of period 2.
• Production function for period 1 output, $q_1$, is:

$$q_1 = a \cdot \min \{ g_1(K_1, L_p), b \cdot h \};$$

(1)

– $K_1$: amount of capital used in period 1;

– $g_1(K_1, L_p)$ is a twice continuously differentiable, linearly homogeneous function that is increasing and strictly quasi-concave in its arguments.

• (1) implies that there is no substitutability between land and the other two factors.

– Potential output is determined entirely by the amount of land.

• $g_1(K_1, L_p)$ is an aggregate of the capital and labour inputs in period 1.

– Assume labour is an essential input in period 1, $g_1(K_1, 0) = 0$, for all $K_1$.

• $a, b > 0$ are technology parameters;

– $b$ is introduced to capture land-augmenting technical change;

– $a$ is introduced to simulate Hicks-neutral technical change.
• Production function for period 2 output, $q_2$, is:

$$q_2 = \min \{ g_2 (K_2, L_p + L_c), \ q_1 \};$$

(2)

– $K_2$: amount of capital used in period 2;

– $g_2 (\cdot)$ is a twice continuously differentiable, linearly homogeneous function that is increasing and strictly quasi-concave in its arguments.

• In period 2, tasks performed by labour are mostly Type 2 variety.

– Casual and permanent labour are perfect substitutes and both will be employed to do Type 2 tasks.

• Period 2 output depends crucially on period 1 output.

– Interpret $q_1$ as the quantity of unharvested crop and $q_2$ as the quantity of the final product, that is, the harvested and threshed crop.

  ○ $q_1$ is thus a natural upper bound on $q_2$. 
• Output price is exogenously fixed and is normalized to unity.

• All farmers are price takers in the labour and capital markets.

• Assume, for convenience, that all farms are identical.
  
  – Then, by linear homogeneity of (1) and (2), we can aggregate all farmers into a single price-taking farmer.
    
    ○ $h$ now represents the total arable land in the economy, assumed to be fixed.
    
    ○ $L_p, L_c, K_1, K_2, q_1$ and $q_2$ can similarly be interpreted as aggregates.

• $w_p$: wage rate of a permanent worker per period;

• $w_c$: wage rate of a casual worker per period;

• $r_i$: per period (exogenous) rental rate on capital equipment, $i = 1, 2$. 
3.2 Demand Side

- We now turn to the optimal choices of \( L_p, L_c, K_1, K_2, q_1 \) and \( q_2 \).
- We adopt the convention that all expenses are incurred at the end of the period.
- Note that the optimal choices of factor inputs in period 2 depends on \( L_p \) and the decisions of the first period.
  - Farmer’s decision making must be foresighted and made with full awareness of how \( L_p \) and his period 1 decisions will impinge on period 2’s choices.
- Given the nature of the production functions, it follows that it is profitable to cultivate all the arable land.
  \[ q_1 = q_2 = abh. \]  
  (3)
- Without loss of generality we set \( h = 1 \).
• The factor inputs will thus be determined so as to minimize the total present value
cost of producing the outputs $q_1 = q_2 = ab$.

• Since the choice of capital and casual labour are dependent on the amount of per-
manent labour hired,

– we first determine the demands of $K_1$, $K_2$ and $L_c$ conditional on the choice of $L_p$.

• Define the cost functions

$$C_2(q_2, r_2, w_c) \equiv \min_{K_2, L_a} \{r_2K_2 + w_c(L_a - L_p) \mid g_2(K_2, L_a) \geq q_2\},$$

where $L_a \equiv L_p + L_c$, the aggregate amount of labour used in period 2, and

$$C_1(L_p, q_1/a, r_1) \equiv \min_{K_1} \{r_1K_1 \mid g_1(K_1, L_p) \geq q_1/a\}.$$
• At the profit-maximizing outputs \( q_1 = q_2 = ab \), Shephard’s Lemma yields the following factor demands:

\[
K_1^d (L_p, b, r_1) = \frac{\partial C_1 (L_p, b, r_1)}{\partial r_1},
\]

(6a)

\[
K_2^d (ab, r_2, w_c) = \frac{\partial C_2 (ab, r_2, w_c)}{\partial r_2},
\]

(6b)

\[
L_a^d (ab, r_2, w_c) = \frac{\partial C_2 (ab, r_2, w_c)}{\partial w_c}.
\]

(6c)

• The casual labour demand is thus given by

\[
L_c^d (ab, L_p, r_2, w_c) = \max \{ L_a^d (ab, r_2, w_c) - L_p, 0 \}.
\]

(6d)

• The optimal choice of \( L_p \) is now determined as the solution to

\[
\min_{L_p} r_1 K_1^d (L_p, b, r_1) + \beta r_2 K_2^d (ab, r_2, w_c) + (1 + \beta) w_p L_p + \beta w_c \left[ L_a^d (ab, r_2, w_c) - L_p \right].
\]

(7)
• The first-order condition associated with (7) is

\[-r_1 \cdot \frac{\partial K_1^d(L_p, b, r_1)}{\partial L_p} = (1 + \beta) w_p - \beta w_c \equiv z.\]  

(8)

• The demand for permanent labour, \( L_p^d(b, r_1, z) \), is implicitly determined as the solution to (8).

– Twice continuous differentiability and strict quasi concavity of \( g_1(K_1, L_p) \) implies that the left-hand side of (8) is declining in \( L_p \). *(Explain why)*

  ▪ Thus \( L_p^d \) is decreasing in \( z \) (see Figure 1).

• Together, \( L_p^d(b, r_1, z) \) and the expressions (6a) – (6d) constitute the demand side of the model.
- \( r_1 \frac{\partial K^d}{\partial L_p} (L_p, r_1, b) \)

**Figure 1. Determination of the Demand for Permanent Labor**
3.3 Supply Side

- The utility function of an agricultural worker is
  \[ U(y, e, l) = (y - el)\gamma; \quad 0 < \gamma < 1, \]  
  \[ \text{where} \]
  - \( y \): income received for the period;
  - \( e \): intensity of effort;
  - \( l \): fraction of the period for which he is employed.

- For an arbitrarily given \( e \) and wage rate \( w \), the supply response, \( l^*(w, e) \), of a worker is the solution to
  \[ \max_{l \leq 1} U(wl, e, l) = l\gamma(w - e)\gamma. \]  
  \[ \text{where} \]
  \[ l^*(w, e) \begin{cases} 
  = 0 & \text{for } w < e \\
  \in (0, 1) & \text{for } w = e \\
  = 1 & \text{for } w > e,
\]
and an indirect utility function

\[ V(w, e) = \{ (w - e) l^* (w, e) \}^\gamma. \]  

(12)

- Since \( V(w, e) \) is a decreasing function of \( e \), there is an obvious moral hazard problem under a fixed wage contract.

\[ \Rightarrow \] the monitoring of effort is absolutely necessary.

- Since Type 2 tasks are easy to monitor, workers performing these tasks can be costlessly supervised.

\[ \Rightarrow \] No reason to hire them on long-term contracts, and hiring them on the spot markets serves adequately.

- Since Type 1 tasks involve some discretions and judgement and are difficult to monitor,

  - the landlord needs to provide a self-enforcing (incentive) contract to workers performing Type 1 tasks.
The landlord offers Type 1 workers a *permanent contract* (over the infinite horizon):

- the worker receives a wage $w_p$ per period in exchange for the worker’s services for the fraction $l^*(w_p, \bar{e})$ of each period at an effort level $\bar{e}$.

- The worker’s effort in period 1 is assumed to be accurately imputable at the end of the year.
  - If he is found to have shirked, he is fired at the end of the year.
    - He is, however, paid his wage, $w_p$, for each of the two periods.

- Once a Type 1 worker is fired, he cannot be rehired except as a casual worker.
  - If $w_p$ is high enough that a worker’s increase in utility from shirking is more than offset by the discounted loss in his utility in having to join the casual labour force,
    - he would never shirk.

- We will determine this $w_p$ in terms of $w_c$ as follows.
• Assume workers discount utility at the same rate $\beta$ as the landlord discounts profits.

• The present value utility of a permanent worker who never shirks is

$$J^h_p (w_p, \beta) = \frac{V (w_p, \bar{e})}{1 - \beta}.$$  \hspace{1cm} (13)

– The opportunity utility of a permanent worker is the discounted lifetime utility of a casual worker:

$$J_c (w_c, \beta) = \left( \frac{\beta}{1 - \beta^2} \right) V (w_c, \bar{e}).$$  \hspace{1cm} (14)

• Now turn to the possibility of shirking on the part of a permanent worker.

– Since any shirking is guaranteed to termination at the end of period 2,
  
  o a permanent worker who chooses to shirk, will optimally set $e = 0$ in period 1.
  
  o Shirking is not possible in period 2 since menial tasks are monitored costlessly.

$\Rightarrow$ His discounted utility over this crop year is: $V (w_p, 0) + \beta V (w_p, \bar{e})$. 


The discounted lifetime utility of a permanent worker who shirks is

\[ J^s_p (w_p, w_c, \beta) = V (w_p, 0) + \beta V (w_p, \bar{e}) + \beta^2 J_c (w_c, \beta). \]  

(15)

- To ensure that a permanent worker never shirks, we require

\[ J^h_p (w_p, \beta) \geq J^s_p (w_p, w_c, \beta). \]  

(16)

- For given \( w_c \) and \( \beta \), (16) puts a lower bound on the permanent worker’s wage which will elicit the required level of effort;
  
  - we refer to this wage as \( \bar{w}_p (w_c, \beta) \), that is, \( w_p \geq \bar{w}_p (w_c, \beta) \).

- At any \( w_p \) that satisfies (16) a worker obtains a strictly higher utility in a permanent contract than in a series of spot contracts:

\[ J^h_p (w_p, \beta) > J_c (w_c, \beta). \]  

(17)

- Verify this.
• It follows that the number of permanent workers hired will be demand determined.
  
  – Since a worker strictly prefers being a permanent worker to being a casual worker,
    o there will generally be an excess supply of workers seeking permanent contracts.
  
  – This will not result in a downward pressure on permanent workers’ wage since any
    \( w_p < \bar{w}_p(w_c, \beta) \) is not credible:
    o it leaves an incentive for the permanent worker to shirk.
  
  – A casual worker who seeks to obtain a permanent contract by offering to work for
    a wage marginally less than \( \bar{w}_p(w_c, \beta) \)
    o will find that the landlord will not entertain the offer.

• We shall find later that the behaviour of \( \bar{w}_p(w_c, \beta) \) as a function of \( w_c \) is of crucial
  importance for the response of the economy to various exogenous changes.
  
  – This behaviour is recorded in the following proposition.
• Proposition 1. For \( w_c \geq \bar{c} \), an increase in \( w_c \) warrants a change in \( \bar{w}_p \) that is

(a) positive, and

(b) if \( \bar{w}_p(w_c, \beta) < w_c \), then \( \frac{d\bar{w}_p}{dw_c} < \frac{\beta}{1 + \beta} \).

• Part (a) is very reasonable since \( w_c \uparrow \) amounts to an increase in the permanent worker’s opportunity income (and utility).

• According to part (b), when the permanent worker’s per period wage rate \( \bar{w}_p(w_c, \beta) \) is less than that of a casual worker, \( w_c \),

- the increase \( (\Delta \bar{w}_p) \) that is required to compensate a permanent worker for an exogenous increase \( (\Delta w_c) \) in a casual worker’s wage satisfies

\[
(1 + \beta) \Delta \bar{w}_p < \beta \Delta w_c. \tag{19}
\]

o That is, the increase in present value cost of engaging a permanent worker is less than that of a casual worker.
3.4 Equilibrium

- We now turn to the determination of the equilibrium.
- Equilibrium levels of capital in the two periods are demand determined.
- Since permanent workers are held above their opportunity utilities, their number, \( L^*_p \), is also demand determined:
  \[
  L^*_p (b, r_1, z) = L^d_p (b, r_1, z). \quad (20a)
  \]
- Demand for casual workers is given by
  \[
  L^d_c (ab, L_p, r_2, w_c) = L^d_a (ab, r_2, w_c) - L^*_p (b, r_1, z). \quad (20b)
  \]
- Condition (16) translates into
  \[
  \frac{V (w_p, \bar{e})}{1 - \beta} \geq V (w_p, 0) + \beta V (w_p, \bar{e}) + \frac{\beta}{1 - \beta^2} V (w_c, \bar{e}). \quad (20c)
  \]
  - For any \( w_c \), (20c) determines the minimum \( w_p \) that will prevent a permanent worker from shirking, that is, \( w_p \geq \bar{w}_p (w_c, \beta) \).
• (11) ⇒ in equilibrium we must have $w_c \geq \bar{e}$ and $w_p \geq \bar{e}$.

• Note also that $w_p = \bar{e}$ is never a solution to (20c) when $w_c \geq \bar{e}$:
  – Follows from the fact that (20c) implies
    
    $$V(w_p, \bar{e}) > \frac{\beta}{1 + \beta} V(w_c, \bar{e}) \Rightarrow (w_p - \bar{e}) l^*(w_p, \bar{e}) > \left(\frac{\beta}{1 + \beta}\right)^{\frac{1}{\gamma}} (w_c - \bar{e}) l^*(w_c, \bar{e}).$$

• Thus we must have $w_p > \bar{e}$; ⇒ $l^*(w_p, \bar{e}) = 1$ for a permanent worker;
⇒ each permanent worker provides one efficiency unit of labour per period.

• Assuming $N$ to be the (exogenously given) total number of workers, the aggregate supply of casual labor in the second period is:

$$L_s^c(w, e) \begin{cases} 
= 0 & \text{for } w_c < \bar{e} \\
\in (0, N - L_p^*) & \text{for } w_c = \bar{e} \\
= N - L_p^* & \text{for } w_c > \bar{e}.
\end{cases}$$  \hspace{1cm} (20d)
• This completes the specification of the model.

• Exogenous to the model are:
  – the production and utility functions,
  – the discount factor, \( \beta \),
  – the rental rates on capital, \( r_1 \) and \( r_2 \), and
  – the total labour force, \( N \).

• The general equilibrium system defined by (20a) – (20d) determine the following endogenous variables:
  – \( w_p, w_c, L_p \) and \( L_c \).

• The two remaining endogenous variables, \( K_1 \) and \( K_2 \), are demand determined, and hence determined by (6a) and (6b).

• Figure 2 illustrates an equilibrium of the system of equations (20a) – (20d).
Figure 2. *An Equilibrium with Unemployment in Period 1 and Full Employment in Period 2*
• For an arbitrarily chosen $L_p$, the casual labour supply is given by the kinked curve $L^s_c$ in the first quadrant of Figure 2.

– Demand for casual labour, $L^d_c$, is also shown in the first quadrant, obtained from
(20b).

⇒ The casual labour market clears at the wage rate $w^*_c$.

• The second quadrant displays the relationship $w_p = \bar{w}_p(w_c, \beta)$, obtained from (20c).

⇒ Associated with a casual labour wage rate $w^*_c$ is a permanent labour wage rate $w^*_p$.

• The fourth quadrant displays the demand for permanent labour as a function of $w_p$ when the casual labour wage rate is $w^*_c$.

– This demand for permanent labour is measured from $O'$ along the horizontal axis.

• If we have indeed located an equilibrium, the demand for permanent labour at $w^*_p$ will be exactly equal to the $L_p$ with which we began our construction.
3.5 Results

- We now turn to the comparative static results of the model.
- These results depend crucially on whether $w_c^* \leq w_p^*$.
  - These are endogenous and the model allows for both possibilities.
- Since the purpose is to confront the predictions with empirical evidence, we pursue the empirically relevant case:
  \[ w_c^* > w_p^*. \] (21)
- Defining $z^* = (1 + \beta) w_p^* - \beta w_c^*$, we see from (18) that
  \[ \frac{dz^*}{dw_c^*} = (1 + \beta) \left[ \frac{dw_p^*}{dw_c^*} - \frac{\beta}{1 + \beta} \right] < 0. \] (22)
  - The difference in the present value cost of hiring a permanent worker over that of hiring a casual worker declines with $dw_c^*$. 

• Proposition 2. *In an equilibrium,*

(a) *an increase in* $N$ *decreases the proportion of permanent contracts,*

(b) *an increase in* $a$ *(or* $b$ *or both)* *increases the number of permanent contracts,*

(c) *an increase in* $a$, *with* $ab$ *held constant,* *decreases the number of permanent contracts,*

(d) *an increase in* $r_1$ *or* $r_2$ *increases the number of permanent contracts.*
• (a) says the proportion of permanent workers is higher the tighter the labour market.

\[ N \downarrow \Rightarrow w_c^* \uparrow \Rightarrow w_p^* \uparrow. \]

– However, the increases satisfy inequality 
\[ (1 + \beta) \Delta \bar{w}_p < \beta \Delta w_c, \]

⇒ the marginal permanent worker is becoming cheaper to hire relative to a casual worker in period 2,

⇒ induces a substitution of permanent for casual workers.

• (a) explains the dramatic increase in the percentage of permanent contracts in East Prussian agriculture in the first half of the 19th century.

– Between 1815-49 there was an increase in the cultivated area by almost 90%, and a simultaneous agrarian reform resulting in peasants losing land to large landlords.

○ The loss of land forced the peasants into the labour market.

– Richards (1979) estimates a 3% total net loss of land by peasants, ⇒ an overall decrease in the labour-to-land ratio, ⇒ a higher proportion of permanent workers.
• (b) says a yield-increasing technological improvement increases the proportion of permanent workers.

– Technological improvement $\Rightarrow L_c^d \uparrow \Rightarrow w^*_c \uparrow \Rightarrow w^*_p \uparrow$.

– However, inequality $(1 + \beta) \Delta \bar{w}_p < \beta \Delta w_c \Rightarrow$ permanent worker becomes cheaper relative to casual worker, inducing a substitution of permanent for casual workers.

• Bardhan (1983) provides empirical evidence that the percentage of permanent labour in India is positively correlated with the index of land productivity.

• An increase in output price will induce an increase in output.

  – This effect can be simulated by an increase in $a$ in this model.

    o That is, output price $\uparrow$ induces a substitution of permanent for casual workers.

• Part (b) then explains the impact of the opening up of export markets on the labour composition in 19th century Chile.
– In the 1860’s, Chile began to export grain to European markets, and this lasted until 1890.

– Bauer (1971) estimated that the percentage of casual workers in the rural labour force of central Chile fell from 72% in 1865 to 39% in 1895.

○ This observation is consistent with part (b) of Proposition 2.
• In part (c) the final output is held fixed and the burden of activity is shifted across the two periods.

  – An increase in $a$ (with $ab$ held constant) implying a decrease in $b$,
    
    ○ makes cultivation less land-intensive in the first period while increasing the activity in the peak season.

  – Since in the second period casual and permanent labour are substitutable, we observe a shift from permanent to casual labour.

• Jan Breman (1974) observes that a change in crops
  
  – from rice which had relatively even distribution of tasks over the two periods

  – to mangoes which has a very heavy labour demand in period 2

    ○ resulted in the replacement of permanent contracts by casual labour contracts in Gujarat.
Part (d) implies $r_1 \downarrow$ would displace permanent workers,

- consequently increase the use of casual labour in the second period.

In India, because of the notoriously imperfect capital markets,

- farms with tractors are those for which the owners face lower capital costs.
- If tractors were employed on such farms only during period 1 (for operations such as ploughing and sowing),
  - the result would be a displacement of permanent workers by casual workers.
- While the existing empirical literature – Rudra (1982), Agarwal (1981) – bears out prediction regarding permanent workers,
  - there is conflicting evidence on the effect on casual workers employment.
- Eswaran and Kotwal (1985) conjectures that this conflict arises because tractors are used on some farms for period 1 operations only, while on others they are also used in period 2.
This note is based on


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