

1 **Agriculture: The efficiency of land use**

- Share of agriculture in employment is close to 50% for the world as a whole (50% in China, 57% in India).
- Is land used efficiently?

1.0.1 **Farm size and productivity: observed relationship**

- Farm size productivity differences: see table.
- Profit-Wealth ration and weather variability (monsoon outset is a measure of the risk faced by the farmer): see figure

- The Profit-Wealth ratio is always greater for small farmers
- Small farmers' profits are hurt much more by uncertainty than large farmers'

1.0.2 Why is this surprising?

- Arguments for increasing returns (the opposite relationship)
 - Technology with fixed costs (tractors, etc..)
 - Larger farmers have better access to capital
 - Larger farmers have better access to politically allocated inputs (evidence from Africa in a book by Bates “Market and states in tropical Africa”).
 - The best farmer will have more land...
- Mitigating factors:
 - Rental markets in farm machinery
 - Technological change in not very rapid. Savings not that important.

1.0.3 What could be going on: Arguments for decreasing returns

- – Agency problems: large farms are cultivated by hired labor, which has fewer incentive to work hard. Small farms are owner cultivated.
⇒ Redistributing land will create more owner cultivated land which will be more productive.
- But why cannot the owner of the land not give the right incentive to the farmers?

1.0.4 Different potential explanations for the observed inverse productivity relationship:

- Differences in land quality
- Differences in farmer characteristics
- Incentive Problems

Problem with the observed relationship: all of this could be going on... How can we separate these different effects.

1.0.5 Evidence: Study by Biswanger and Rosenzweig

- Using ICRISAT data: very detailed panel (repeated observation for every household) data from India.
- Some individuals cultivate both an owner-operated plot and a rented plot.
- Biswanger and Rosenzweig compare the inputs they apply on their own plot and the rented plots, and the overall productivity of both plots.

$$\Pi_{ij} = \alpha + \beta R_{ij} + \eta_i + v_{ij},$$

- where Π_{ij} is farmer's i outcome (profit, investment) on plot j , and R_{ij} indicate whether the plot is rented. η_i is the unobserved (but fixed)

characteristics of the farmers (risk aversion, quality, etc...). We think that η_i and R_{ij} may be correlated, but, for a minute, not v_{ij} and R_{ij} . What can we do?

- Control for the individual fixed effect to compare plots within individual's. So for example, for all the farmers that cultivate two plots of land, we can run the regression:

$$\Pi_{i2} - \Pi_{i1} = \beta(R_{i2} - R_{i1}) + v_{i2} - v_{i1},$$

- The individual fixed effect is gone!

Biswanger and Rosenzweig find a strong negative β . What does this suggest? What could be the remaining problem?

1.0.6 More evidence: Shaban (1987)

- Uses the same data, but controls in addition for plot quality.
- He finds that individual work 40% more on their own land (controlling for land size) and that the productivity is 15% to 30% higher on own land than on rented land (with or without controlling for land quality).
- On balance, the evidence suggests that the inefficiency comes from incentive problems.

A MODEL OF SHARE-CROPPING

A MODEL OF SHARE-CROPPING

1. Suppose there is a landlord who owns a plot of land which he himself cannot crop. In each period he employs exactly one tenant to crop the land. The tenant's outside option is m .

A MODEL OF SHARE-CROPPING

1. Suppose there is a landlord who owns a plot of land which he himself cannot crop. In each period he employs exactly one tenant to crop the land. The tenant's outside option is m .
2. Suppose in each period output can take on two values, $Y_H = 1$ ('high' or 'success') and $Y_L = 0$ ('low' or 'failure') with probability e and $1 - e$ respectively. The tenant chooses e , ('effort'), which costs him $c\frac{e^2}{2}$. The realizations of output are independent over time.

A MODEL OF SHARE-CROPPING

1. Suppose there is a landlord who owns a plot of land which he himself cannot crop. In each period he employs exactly one tenant to crop the land. The tenant's outside option is m .
2. Suppose in each period output can take on two values, $Y_H = 1$ ('high' or 'success') and $Y_L = 0$ ('low' or 'failure') with probability e and $1 - e$ respectively. The tenant chooses e , ('effort'), which costs him $c\frac{e^2}{2}$. The realizations of output are independent over time.
3. First best maximizes: $e - ce^2/2 \rightarrow e = 1/c$



The key assumptions of this model are:

The key assumptions of this model are:

- The tenant has no wealth and cannot save. He does however have an outside income of w , so that the least he can get paid in any period is $-w$. In other words, the landlord faces a limited liability constraint.

The key assumptions of this model are:

- The tenant has no wealth and cannot save. He does however have an outside income of w , so that the least he can get paid in any period is $-w$. In other words, the landlord faces a limited liability constraint.
- The tenant's effort choice e is non-contractible.

The key assumptions of this model are:

- The tenant has no wealth and cannot save. He does however have an outside income of w , so that the least he can get paid in any period is $-w$. In other words, the landlord faces a limited liability constraint.
- The tenant's effort choice e is non-contractible.
- At first assume that the contract is one-period contract: (h, l) .

The key assumptions of this model are:

- The tenant has no wealth and cannot save. He does however have an outside income of w , so that the least he can get paid in any period is $-w$. In other words, the landlord faces a limited liability constraint.
- The tenant's effort choice e is non-contractible.
- At first assume that the contract is one-period contract: (h, l) .
- What are possible contracts?

ANALYSIS OF THE MODEL

ANALYSIS OF THE MODEL

→ The tenant maximizes: $he + (1 - e)l - \frac{ce^2}{2}$

ANALYSIS OF THE MODEL

- The tenant maximizes: $he + (1 - e)l - \frac{ce^2}{2}$
- F.O.C: $e = (h - l)/c = r/c$

ANALYSIS OF THE MODEL

- The tenant maximizes: $he + (1 - e)l - \frac{ce^2}{2}$
- F.O.C: $e = (h - l)/c = r/c$
- The landlord maximizes:

ANALYSIS OF THE MODEL

- The tenant maximizes: $he + (1 - e)l - \frac{ce^2}{2}$
- F.O.C: $e = (h - l)/c = r/c$
- The landlord maximizes:

$$e - e(h - l) - l = [1 - r]r/c - l$$

$$\text{subject to LL: } l \geq -w, \text{ and}$$

$$\text{P: } l + r^2/c - r^2/2c \geq m$$

ANALYSIS OF THE MODEL

- The tenant maximizes: $he + (1 - e)l - \frac{ce^2}{2}$
- F.O.C: $e = (h - l)/c = r/c$
- The landlord maximizes:

$$e - e(h - l) - l = [1 - r]r/c - l$$

$$\text{subject to LL: } l \geq -w, \text{ and}$$

$$\text{P: } l + r^2/c - r^2/2c \geq m$$

- Case 1: P does not bind: Then $l = -w, r = 1/2, e = 1/2c$. This happens when $1/8c \geq m + w$

ANALYSIS OF THE MODEL

- The tenant maximizes: $he + (1 - e)l - \frac{ce^2}{2}$
- F.O.C: $e = (h - l)/c = r/c$
- The landlord maximizes:

$$e - e(h - l) - l = [1 - r]r/c - l$$

$$\text{subject to LL: } l \geq -w, \text{ and}$$

$$\text{P: } l + r^2/c - r^2/2c \geq m$$

- Case 1: P does not bind: Then $l = -w, r = 1/2, e = 1/2c$. This happens when $1/8c \geq m + w$
- Case 2: LL and P both bind: Then $r = \sqrt{2c(m + w)}$ and $e = \sqrt{2(m + w)/c}$. Holds as long as $\sqrt{2(m + w)/c} \leq 1/c$, i.e. $m + w \leq 1/2c$.

ANALYSIS OF THE MODEL

- The tenant maximizes: $he + (1 - e)l - \frac{ce^2}{2}$
- F.O.C: $e = (h - l)/c = r/c$
- The landlord maximizes:

$$e - e(h - l) - l = [1 - r]r/c - l$$

$$\text{subject to LL: } l \geq -w, \text{ and}$$

$$\text{P: } l + r^2/c - r^2/2c \geq m$$

- Case 1: P does not bind: Then $l = -w, r = 1/2, e = 1/2c$. This happens when $1/8c \geq m + w$
- Case 2: LL and P both bind: Then $r = \sqrt{2c(m + w)}$ and $e = \sqrt{2(m + w)/c}$. Holds as long as $\sqrt{2(m + w)/c} \leq 1/c$, i.e. $m + w \leq 1/2c$.
- Case 3: Only P binds: $m + w \geq 1/2c. e = 1/c$.

OBSERVATIONS

OBSERVATIONS

- Does the tenant earn the marginal product of his effort? Does he work as hard he would in the first best?

OBSERVATIONS

- Does the tenant earn the marginal product of his effort? Does he work as hard he would in the first best?
- Is he paid his outside option?

OBSERVATIONS

- Does the tenant earn the marginal product of his effort? Does he work as hard he would in the first best?
- Is he paid his outside option?
- What happens to effort when w goes up? What does this tell us? Tenancy ladder...

OBSERVATIONS

- Does the tenant earn the marginal product of his effort? Does he work as hard he would in the first best?
- Is he paid his outside option?
- What happens to effort when w goes up? What does this tell us? Tenancy ladder...
- What happens to effort when m goes up? What does this tell us? Empowerment...

OBSERVATIONS

- Does the tenant earn the marginal product of his effort? Does he work as hard he would in the first best?
- Is he paid his outside option?
- What happens to effort when w goes up? What does this tell us? Tenancy ladder...
- What happens to effort when m goes up? What does this tell us? Empowerment...
- What happens to contract when c goes up? What does this tell us?

OBSERVATIONS

- Does the tenant earn the marginal product of his effort? Does he work as hard he would in the first best?
- Is he paid his outside option?
- What happens to effort when w goes up? What does this tell us? Tenancy ladder...
- What happens to effort when m goes up? What does this tell us? Empowerment...
- What happens to contract when c goes up? What does this tell us?
- Suppose that some people own 1 plot of land and some own 5. People can work 1 plot each. The rest are tenanted. What is the size productivity relationship?

OTHER VIEWS OF SHARE-CROPPING:

OTHER VIEWS OF SHARE-CROPPING:

→ Risk versus moral hazard (Stiglitz):

OTHER VIEWS OF SHARE-CROPPING:

- Risk versus moral hazard (Stiglitz):
 - Who becomes a tenant?

OTHER VIEWS OF SHARE-CROPPING:

- Risk versus moral hazard (Stiglitz):
 - Who becomes a tenant?
 - Version A: The more risk-averse by instinct.
 - Version B: The poor, who are more risk-averse by virtue of being poor.

OTHER VIEWS OF SHARE-CROPPING:

- Risk versus moral hazard (Stiglitz):
 - Who becomes a tenant?
 - Version A: The more risk-averse by instinct.
 - Version B: The poor, who are more risk-averse by virtue of being poor.
 - Can it explain S-P relation?

OTHER VIEWS OF SHARE-CROPPING:

- Risk versus moral hazard (Stiglitz):
 - Who becomes a tenant?
 - Version A: The more risk-averse by instinct.
 - Version B: The poor, who are more risk-averse by virtue of being poor.
 - Can it explain S-P relation?
- Two-sided moral-hazard (Eswaran-Kotwal)

OTHER VIEWS OF SHARE-CROPPING:

- Risk versus moral hazard (Stiglitz):
 - Who becomes a tenant?
 - Version A: The more risk-averse by instinct.
 - Version B: The poor, who are more risk-averse by virtue of being poor.
 - Can it explain S-P relation?
- Two-sided moral-hazard (Eswaran-Kotwal)
 - Relative skills determine who becomes a tenant.
 - it explain S-P relation?

OTHER VIEWS OF SHARE-CROPPING:

- Risk versus moral hazard (Stiglitz):
 - Who becomes a tenant?
 - Version A: The more risk-averse by instinct.
 - Version B: The poor, who are more risk-averse by virtue of being poor.
 - Can it explain S-P relation?
- Two-sided moral-hazard (Eswaran-Kotwal)
 - Relative skills determine who becomes a tenant.
 - it explain S-P relation?
- Irrelevance of contractual form (Cheung)

LAND REFORMS

LAND REFORMS

- Suppose we took land from the landlord and made over the ownership to the tenant. What will be the effect on productivity under:

LAND REFORMS

- Suppose we took land from the landlord and made over the ownership to the tenant. What will be the effect on productivity under:
 - ① Limited liability moral hazard

LAND REFORMS

- Suppose we took land from the landlord and made over the ownership to the tenant. What will be the effect on productivity under:
- ① Limited liability moral hazard
 - ② Risk aversion moral hazard, version A

LAND REFORMS

- Suppose we took land from the landlord and made over the ownership to the tenant. What will be the effect on productivity under:
- ① Limited liability moral hazard
 - ② Risk aversion moral hazard, version A
 - ③ Risk aversion moral hazard, version B

LAND REFORMS

- Suppose we took land from the landlord and made over the ownership to the tenant. What will be the effect on productivity under:
- ① Limited liability moral hazard
 - ② Risk aversion moral hazard, version A
 - ③ Risk aversion moral hazard, version B
 - ④ Two sided moral hazard

LAND REFORMS

- Suppose we took land from the landlord and made over the ownership to the tenant. What will be the effect on productivity under:
- ① Limited liability moral hazard
 - ② Risk aversion moral hazard, version A
 - ③ Risk aversion moral hazard, version B
 - ④ Two sided moral hazard
 - ⑤ Cheung