

Risk as an Impediment to Privatization? The Role of Collective Fields in Patriarchal Family Farms

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Collective property rights over natural resources

The commons

1 Production on the commons is inefficient

- The last unit of effort is paid at the average productivity of labor \implies Over-provision of effort
- The resource base is overexploited
- Tragedy of the commons

2 Commons have insurance properties (Baland & François, 2005)

- If one is badly endowed in terms of skills or production factors for alternative activities, he/she can always work on the commons
- Those are persistent characteristics of farmers (their type is constant over time)
- Insurance has to be thought of in terms of **redistribution**

Collective ownership of production

The case of cooperatives

- Under collective ownership of output, **production is inefficient.**
 - The last unit of effort is only paid at a fraction of marginal productivity of labor \implies Under-provision of effort
 - The sharing rule (equal sharing) entails **free-riding.**

- Cooperatives have insurance properties** (Carter 1987, Putterman 1989)

\implies Collective farming is a costly insurance device.

\implies Tradeoff insurance / production efficiency (Carter 1987)

- BUT without allowing for side-income transfers-**

Risk-sharing under limited commitment

The literature on **risk-sharing**

- focuses on reciprocal income transfers
- highlights **limited-commitment** as a major constraint (Coate & Ravallion 1993)

⇒ □ Insurance through transfers is an alternative mechanism to common property but it is limited in scope.

Individualization of land tenure

- There is (has been) a general trend toward privatization of land.
 - Land reforms in Latin America
 - Individualization of land tenure in Sub-Saharan Africa (even without private property rights)
 - Increase in the value of land attributable to demographic pressure and market integration
- A trend that also takes place within extended families
- How privatization of land tenure is impacted by risk-coping mechanisms within the household?
- What is the role played by collective fields?

Our contribution

- Analysis of extended family farms
 - a collective field
 - private parcels
- We model extended family farms as institutions that organize **production-and-risk-sharing**
- A first attempt to merge the two insurance mechanisms
 - 1 Collective production, which is plagued by **free-riding**
 - 2 Income transfers, which are hampered by **limited - commitment** -

The land tenure regime

- The household is composed of n members $i \in N$.
- Each hh member is endowed with L units of land area.
- A fraction μ of which is privately owned.
- The size of the collective field is therefore $(1 - \mu)(nL)$.
- The size of each private parcel is μL .
- The production function is defined on labor and land $f(e, l)$ and is characterized by constant returns to scale.

The risk structure &

Uncertainty & affects the labor input &

- In each period t , Nature draws within the household a subset & of individuals $H_t \subset \mathbb{N}$. &
- The dependants $i \in H_t$, are endowed with one unit of & productive time (healthy). &
- This time has to be allocated between &
 - work on the collective field e_C , &
 - work on their private plot e_I , &
 - off-farm activities with constant marginal return w . &
- Labor allocation is not contractible. &

The risk structure &

■ At-the-individual-level, &

The time endowment is drawn from a Bernoulli distribution: &

$$P(i_t \in H_t) = (1 - P(i_t \notin H_t)) = \left(\frac{\bar{h}}{n}, \forall i_t \in N, \forall t,\right.$$

$\frac{\bar{h}}{n}$ is the **unconditionnal-probability**-to be valid. &

■ At-the-household-level, &

let $h_t \in [0 \& n]$ (denote the number of healthy hh members. &

$$P(h_t = h) = (p_h, \forall t,$$

$$\sum_{h=0}^n p_h = (1; E(h_t)) = (\bar{h} \forall t.,$$

The shocks are therefore iid over time but not necessarily in & the cross-section dimension. &

The risk structure

Covariate and idiosyncratic shocks

- The **covariate**-risk is embodied by the draw of h :
The household is more or less happy with its aggregate labor endowment.
- The conditional probability identifies the **idiosyncratic**-component of risk.

$$P(i \in H, | h) = (1 - P(i \notin H, | h)) = \left(\frac{h}{n}, \forall i \in N.\right)$$

The latter can be shared within the household.

The risk structure

Any type of correlation between individual draws is allowed

- The distribution of h , is left unspecified
 - ⇒ **Any-type-of-correlation-between-individual-draws-is-allowed.-**
 - ⇒ The idiosyncratic (vs covariate) fraction of aggregate risk can take any value.
- Two particular cases:
 - 1 Purely idiosyncratic risk: $h_i = \bar{h}$ with probability 1: Complete insurance can be physically achieved.
 - 2 Independent (iid) risks: h_i , drawn from a Binomial distribution. The covariate risk is decreasing in the h size.

Risk-sharing mechanisms&

1& Collective-production:-

The output of the collective field is shared equally among& household members.&

2& Risk-sharing through-income-transfers:-

For each state of the world at the household level&h), an& income transfer can be specified.&

The insurance budget constraint is&

$$h\tau_h^{out} \geq \square n, - h) (\tau_h^{in},$$

and is assumed to be binding (the hh cannot save).&

3& The private land of the sick members can be rented out.&

Labor allocation &

Labor allocation is unaffected by uncertainty &

⇒ Valid hh members maximize current consumption &

$$c_1 = \left(\frac{1}{n} y_C + (y_I + (w, 1 - e_C - e_I)) - \tau_h^{out}, \right.$$

$$y_C = (f, E, 1 - \mu) nL \quad (\text{where } E = \sum_{i \in H} e_{iC},$$

$$y_I = (f, e_I, \mu L) .,$$

Production on the collective field is plagued by **free-riding** &

The **arbitrage-condition** between the 3 activities gives &

$$E^*, e_I^* \text{ (are such that } \frac{1}{n} f_e^C = f_e^I = (w.$$

Labor allocation &

Lemma &

Under constant returns to scale, if (\tilde{e}, l, k) is such that $f_e(\tilde{e}, l) = (k, \tilde{e}, l)$, then the total rent is proportional to the cultivated land area, l :

$$R(l, k) = (f(\tilde{e}, l, k) - w\tilde{e} - r)l \propto l,$$

$$\iff R(l, k) = (R^C - R^*)l.$$

Let then R^* and R^C denote the rent per unit of land surface on private plots and the collective field, with $R^C > R^*$.

The consumption levels &

$$c_1 = \left(\frac{1}{n} y_C + (y_I + (w(1 - e_i^C - e_i^I))) - \frac{n-h}{h} \tau_h \right)$$

$$c_0 = \left(\frac{1}{n} y_C + (\tau_h + (\mu LR^* \dots)) \right)$$

Substituting for equilibrium labor allocation, &

$$c_1 = \left(L \left[(1 - \mu) R^C + (\mu R^*) \right] + \left(w - \frac{n-h}{h} \left(\frac{wE}{n} + (\tau_h) \right) \right) \right)$$

$$c_0 = \left(L \left[(1 - \mu) R^C + (\mu R^*) \right] + \left(\frac{wE}{n} + (\tau_h) \right) \right)$$

Privatization improves production efficiency &

Lemma &

The expected, aggregate, household, income, is, increasing, in, privatization: $\partial E_h(Y) / \partial \mu > 0.$

Proof &

$$Y, h) = (hc_1 + (n - h)c_0, hw + (nL, [\mu R^{*□} + (1 - \mu) R^C])),$$

$$\frac{\partial E_h(Y)}{\partial \mu} = \left(\sum_{h=0}^n p_h \frac{\partial Y}{\partial \mu} = (R^{*□} - R^C) nL, > 0., \right)$$



First best &

Proposition &

The **first-best-institution** $(\mu^{FB}, \tau_1^{FB}, \dots, \tau_{n-1}^{FB})$ is characterized, by,

- 1 Complete, privatization: $\mu^{FB} = 1$
- 2 Perfect, insurance, against, idiosyncratic, risk: τ_h^{FB} , are, such, that,
 $c_1 = c_0 \forall h \in \{0, \dots, n\}$ □

The first best can be achieved under &

- 1 non-cooperative labor allocation &
- 2 perfect commitment (enforceable insurance transfers) &

Timing of the game &

Under & limited & commitment &

- 1 & Nature draws a subset $H, \subset \mathbb{N}$, of size h . The h members & belonging to H , are endowed with one unit of productive time. &
- 2 & Hh members $i, \in H$, choose either to stay on the family farm & and to abide by the insurance agreement & $\tau_1 \dots \tau_{n-1}$) (or to & leave with the output of their private parcel at the end of the & growing season. &
- 3 & The dependants $i, \in H$, non-cooperatively decide on the & allocation of their work effort & (e_C, e_I) . &
- 4 & The dependants who had chosen so in stage 2 leave the & household forever with the output of their private parcel. &

Preferences

The per period expected utility is given by

$$V(\mu, \tau_1, \dots, \tau_{n-1}) = \left(\sum_{h=0}^n p_h \left[\left(1 - \frac{h}{n} \right) u(c_0, \tau_h) + \left(\frac{h}{n} \right) u(c_1, \tau_h) \right] \right)$$

with $u' > 0; u'' < 0$,

Conditional on being valid for the current period,

$$U_{i \in H} = (u(c_1, \tau_h) + (\delta V_{t+1}))$$

Limited commitment

A valid hh member who reneges on the income transfer

1 is excluded (\bar{V} , is per period expected utility outside the hh), &

2 does not receive his share of the collective output. &

The consumption level in case of deviation is &

$$c_d = (y_l + (w, (1 - e_i^l)))$$

$$c_d - c_1 = (\kappa - \beta(1 - \mu)) LR^C, .$$

The incentive compatibility constraint writes &

$$u, c_d) + \delta \bar{V} \leq \beta (c_1) + (\delta V, \forall h, \in \{0 \dots n\}),$$

Limited commitment &

Since neither c_d , nor V , depend on b ,

- The ICC simply imposes a minimum consumption level (c_1, κ) , &
- Or a maximal level of transfer κ (in cash and in labor) &

$$\kappa = \frac{n, - h,}{h} \left(\frac{wE,}{n,} + (\tilde{\tau}_h) \right) \text{ such that}$$

$$u, c_d, (-u, c_1, \kappa) (-\delta, V, -\bar{V}) = (0.,$$

- This maximal transfer is constant across states of nature h . &

The second best insurance scheme &

If b is low, &

- 1 & there are few workers (each giving a constant contribution) &
- 2 & insurance needs are important. &

⇒ The ICC will be binding. &

⇒ Perfect insurance is incentive compatible iff h , high enough: &

Risk-sharing is incomplete iff &

$$\kappa \frac{n-h}{n} w, \iff \tilde{h} = \left(n, \left(1 - \frac{\kappa}{w} \right) \right),$$

The second best insurance scheme

Proposition

The **second-best-insurance-scheme** is,

$$\begin{aligned} \min\{\tilde{\tau}_h, \tau_h^{FB}\} &= (\tilde{\tau}_h, \text{ if } h < \tilde{h} \\ &= (\tau_h^{FB}, \text{ otherwise.}, \end{aligned}$$

- Under bad conditions at the household level, insurance is incomplete.
- If the covariate shock is important, the protection against idiosyncratic shocks is weakened.
- This is compatible with the literature.

Intermediate summary

Our model has 2 desirable features

- 1 Collective production is plagued by free riding. \implies Privatization improves production efficiency.
- 2 Risk-sharing through income transfers is impeded by limited commitment, especially if covariate shocks are important.

The effects of privatization&

Proposition&

The, effects, of, privatization,:

- 1&** *Privatization, improves, production, efficiency.,*
- 2&** *For, given, levels, of, income, transfers, privatization, increases, idiosyncratic, risk.,*
- 3&** *The, impact, of, privatization, on, risk-sharing, through, transfers, is, indeterminate.,*

The optimal privatization level &

$$V = \sum_{h=0}^{\lfloor \tilde{h} \rfloor} p_h \left[\left(\left(1 - \frac{h}{n} \right) u(c_0, \kappa) + \frac{h}{n} u(c_1, \kappa) \right) \right] + \sum_{\lfloor \tilde{h} \rfloor + 1}^{n_i} p_h u\left(\frac{Y}{n}\right)$$

First order condition wrt privatization: &

$$\frac{dV}{d\mu} = \frac{\partial V}{\partial \mu} + \left(\frac{\partial V}{\partial \kappa} \frac{\partial \kappa}{\partial \mu} \right) = 0.$$

1. Privatization improves production efficiency: &

$$\frac{\partial V}{\partial \mu} = (E(u'(c)) L(R^* - R^C)) > 0.,$$

The impact of privatization on risk-sharing

- Relaxing the ICC improves risk-sharing, hence $\frac{\partial V_i}{\partial \kappa} > 0$.
- The impact of privatization on aggregate willingness to transfer is

$$\frac{\partial \kappa}{\partial \mu} = \left(L(R^* - R^C) - \frac{u'^{\square} c_d}{u'^{\square} c_1} \right) \left(L R^* - 0 \right)$$

$$\iff \frac{R^C}{R^*} > 1 - \frac{u'^{\square} c_d}{u'^{\square} c_1}$$

Privatization increases idiosyncratic risk if

- The exit option \bar{V} is high.
- The value of the future \bar{V} is low.
- The household size n is reduced.

Conclusions

- Collective ownership of production
 - 1 gives adverse incentives and generates inefficiencies in production,
 - 2 plays a mechanical insurance role.
- The literature highlights the tradeoff production efficiency / risk-sharing.
- Does risk-sharing through transfers allow to reach the first best and to fully privatize?
- Under limited commitment, the impact of privatization on risk-sharing is unclear.
- The likelihood of high privatization rates is positively related to the value of hh membership.