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Towards an Evidence Based Approach
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Land Tenure Systems, Food Security and Poverty: Evidence from Africa

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Abstract

Land and land tenure systems are central in promoting livelihoods in developing countries since access to land and security of tenure are the main means through which food security and sustainable development can be achieved. This paper is explores land tenure systems, the nature of these systems and the role they play in the defining or affecting the welfare of individuals particularly in developing countries. It aims at improve the understanding of the linkages between land tenure systems, poverty, food security and sustainable natural resource management. Land tenure systems are significant in defining agricultural productivity, food security and poverty rates in households. Land tenure systems affect access to technological inputs and to extension services as well as membership to cooperatives. Gender differences in land tenure systems exist and these in turn affect farm productivity, food security and the household welfare.

Keywords: Land, tenure systems, food security and poverty

INTRODUCTION

Land and land tenure systems are central in promoting rural livelihoods in developing countries since access to land and security of tenure are the main means through which food security and sustainable development can be achieved. Given that land plays an important role in the livelihoods of the majority of households in developing countries, food security and poverty reduction cannot be achieved unless on land tenure issues of access to land, security of tenure and the capacity to use land productively and in a sustainable manner – are fully addressed. Inappropriately addressing land issues may constitute a serious constraint on economic and social development. On the one hand, insecure land tenure and dysfunctional land institutions discourage private investment and overall economic growth. On the other hand, skewed land ownership distribution and discrimination according to gender or ethnicity limit economic opportunities for disadvantaged groups and provide fertile conditions for social conflict - which often erupt in violence. In Africa, land remains crucial for poverty reduction as most rural households rely on it for the survival of present and future generations because the livelihoods of over 70% of the population in Africa are mainly linked to land and natural resources exploitation. The coexistence of various forms of tenure in Africa - state, communal, customary, individual - suggests the need of a better understanding of the pertinent relationship between land tenure, food security and sustainable development in Africa. In order to address land issues and thus formulate appropriate food security and poverty reduction policies, it is necessary to understand the links between access to land and access to other sources of income and capital. In particular, it is crucial to have a better understanding of the structures of agrarian economies as they relate to rural poverty and hunger.

The main objectives of this paper is to explore land tenure systems, the nature of these systems and the role they play in the defining or affecting the welfare of individuals particularly in developing countries. This paper aims at improve the current understanding of the linkages between land tenure systems, poverty, food security and sustainable natural resource management.

The first part of the paper introduces land tenure systems and the Marshallian inefficiency dilemma with a specific focus on the role of risk and asymmetric information and how these affect land tenure contracts and in particular sharecropping contracts. Despite the growth of interest of both theoretical and empirical literature, little convergence has emerged on the opinions of the tenancy contracts. The main challenge that has been facing agricultural tenancy is its ability to explain not only the existence of sharecropping, but also the existence of the other forms of land tenure like fixed rental and fixed wage contracts. Some of explanations that have been offered for the existence of different types of tenure contracts: (i) the existence of a trade-off between risk sharing and transaction costs, (ii) screening of workers that possess different

qualities, and (iii) imperfections for inputs market. In particular, different works have used screening models to explain the existence of different contracts. Recent literature has highlighted technical know-how credit and family labor managerial ability as some factors that lead to highly imperfect markets. Sharecropping is viewed as a partnership arrangement in which both agents have incentives to self-monitor. Such a contract arises to mitigate morally hazardous behavior on the part of both agents.

Three forms of land tenure contracts exist; pure rental contract, contract farming and sharecropping. One of the critical assumptions in the choice of contractual form in the market for tenancies is the ability of the landlord to monitor the actions of the tenant. Under the assumption that the costs of monitoring the tenant's activities are high, theory predicts that sharecropping will result in an inefficiently low amount of variable inputs applied to the rented land by the tenant, compared to the amount of variable inputs employed on owned land or on plots leased under a fixed rent contract. If, on the contrary, the landlord is able to effectively monitor the tenant's activities, then the efficient amount of variable inputs per unit area can be stipulated in the contract, and there will be no incentive problems and neither will there be any inefficiency compared to a fixed rent contract. The choice among these contracts and the efficient allocation of resources depends on the inputs is the ability of the landlord to monitor or observe the ability and actions of the tenant (agent). The models that have been analyzed in this paper confirm the fact that in the case where the principal can fully observe the agents' actions, the first best solution is obtained. The landlord maximizes his utility function by equating the marginal costs to marginal revenue and thus pays the tenant a fixed amount, just enough to cover the agent's reservation utility. The first best solution is no longer obtainable in the context where the landlord cannot observe the tenants actions (both ex-ante and ex-post). This is mainly due to the presence of asymmetric information. Alfred Marshall in his earlier works (1920) emphasized the moral hazard problem that is associated with sharecropping and how this further leads to inefficiencies. Moreover, he claimed that any contract other than fixed rent contract distorts the tenant's input supply away from what he termed as the "efficient level". Nonetheless, empirical evidence continues to show the existence and persistence of sharecropping as a mechanism of land tenure and this is particularly true in the developing world where most individuals are farmers or do practice farming activities. Why then does sharecropping continue to persist?

The second part of the paper empirically examines the land tenure systems that exist in Tanzania. Using the 2012-13 Tanzanian National Panel Survey (NPS) provided by the Living Standards Measurement Study – World Bank, we look at the land tenure systems in Tanzania and how these affect agricultural productivity, food security and poverty at a household level. Acknowledging the pivotal role women are playing in agriculture and the use of land and natural resources we also explore gender issues in land tenure systems and their role on households' welfare.

Focusing the evidence of land tenure systems in the developing countries this paper tries to answer a very controversial question by making some concluding remarks. The first one is the definition of efficiency. In his model, Marshall's main assumption is that the landlord is "rational" and so he will always maximize the earnings and thus prefer a fixed rent contract compared to the sharecropping alternative. This leads to posing the question whether agents are always utility maximizes. In particular, whether or not landlords and pay exclusive attention to the amount of effort or actions of the agents. Is the effort of the agent the only factor that influences his output levels or are there other factors are also taken into consideration like, the risk attitudes of both the principal (landlord) and the agent (tenant) and how the risks are shared among these agents in their decision making process. The second issue relates to monitoring costs. Marshall in his work identifies the high costs of supervision of tenants by the landlord as the central cause of inefficiency in sharecropping. Agricultural and farming activities in developing countries are often practiced in a context where strong social and cultural norms exist. Small scale farmers do not migrate often and thus create some sort of reputation based on trust with the landlord. Social and cultural norms are strongly perceived and abided to in these contexts. Moreover, peer monitoring is also practiced in these contexts due to family ties and the above mentioned strong social norms. These factors render the costs of monitoring for the landlord reasonably lower than in other contexts. The third issue is that there is no single model can be used to identify or explain the presence of one land tenure contract or another. In order to explain the existence and persistence of sharecropping, other factors like the risk attitudes of the agents, factors that affect monitoring costs and the ability of the landlord to screen the tenants need to be taken into consideration. Sharecropping may emerge inefficient from a purely Marshaling view. It however allows agents to mitigate other issues such as risk at the cost of efficiency.

Fourthly, land tenure systems are significant in defining agricultural productivity, food security and poverty rates in Tanzanian households. We find that land tenure systems affect access to technological inputs and to extension services as well as membership to cooperatives, which often distribute government subsidized inputs and vital market information to small farmers. In addition, they also drive access to cash income needed to purchase inputs even when these are subsidized. Finally, we also find gender differences in land tenure systems in Tanzania and these in turn affect farm productivity, food security and the household welfare.

I. LAND TENURE AND MARSHALLIAN INEFFICIENCY

Land Tenure and Contracts

There are three main forms of land tenure contracts:

- *Pure rental contract*: the tenant pays the landlord a fixed rent (either in cash or in kind) and the tenant gets to keep all of the output produced. This contract can be represented as follows: $\tilde{\tilde{X}} = R$ where *R* is a fixed rental and $\tilde{\tilde{X}}$ what the landlord finally receives;
- *Contract farming*: the landlord pays the tenant a wage and he in return, gets to keep all of the output produced by the tenant. In this case, the farmer receives a fixed payment ("wage") *W*. This contract can be represented as follows: $\tilde{\tilde{X}} = \tilde{\tilde{Y}} - W$;
- *Sharecropping*: This is a tenure system in which a landowner leases land to a tenant and in return, he gets a percentage of the output yield produced by the tenant. Variations on the share cropping contract include different proportions of division of the output depending on whether the input costs are also shared between the landlord and the tenant, and/or are tied to some form of credit arrangements. The tenant gives a fixed percentage β (usually it is approximately 50% of the output *Y*) to the landlord and so the landlord receives: $\tilde{\tilde{X}} = \beta\tilde{\tilde{Y}}$

A more general context can be represented as $\tilde{\tilde{X}} = \alpha + \beta\tilde{\tilde{Y}}$. In this case, the pure rental contract is the extreme case where $\beta = 0$ and $\alpha = R$. While contract farming represents the case in which with $\beta = 1$ and $\alpha = -W$.

One of the critical assumptions in the choice of contractual form in the market for tenancies is the ability of the landlord to monitor the actions of the tenant. Under the assumption that the costs of monitoring the tenant's activities are high, theory predicts that sharecropping will result in an inefficiently low amount of variable inputs applied to the rented land by the tenant, compared to the amount of variable inputs employed on owned land or on plots leased under a fixed rent contract. If, on the contrary, the landlord is able to effectively monitor the tenant's activities, then the efficient amount of variable inputs per unit area can be stipulated in the contract, and there will be no incentive problems and neither will there be any inefficiency compared to a fixed rent contract.

Given the above assumptions, three possible solutions can be derived:

- A fixed wage (contract farming): this is the case where the land lord is in a position to manage and supervise and thus he decides to hire wage laborers. In the figure1, this option can be identified as the extreme left of the horizontal axis where the efficiency of the land lord to manage is at maximum (i.e., close to 1);
- Fixed rental: this is the case where the tenant is able to manage and supervise production and thus he pays the landlord a fixed rental payment. This position is represented in Figure1 below by the highest point on the vertical axis where the efficiency of the tenant to supervise inputs and production is at maximum (i.e., close to 1);
- Sharecropping: this is the "intermediate" position where the landlord is able to manage and the tenant supervises, and thus the output produced is divided by the two parties. This position gives the best outcome if the landlord cannot efficiently supervise inputs and the tenant cannot make efficient management decisions (i.e., close to 0.5 on both axis);

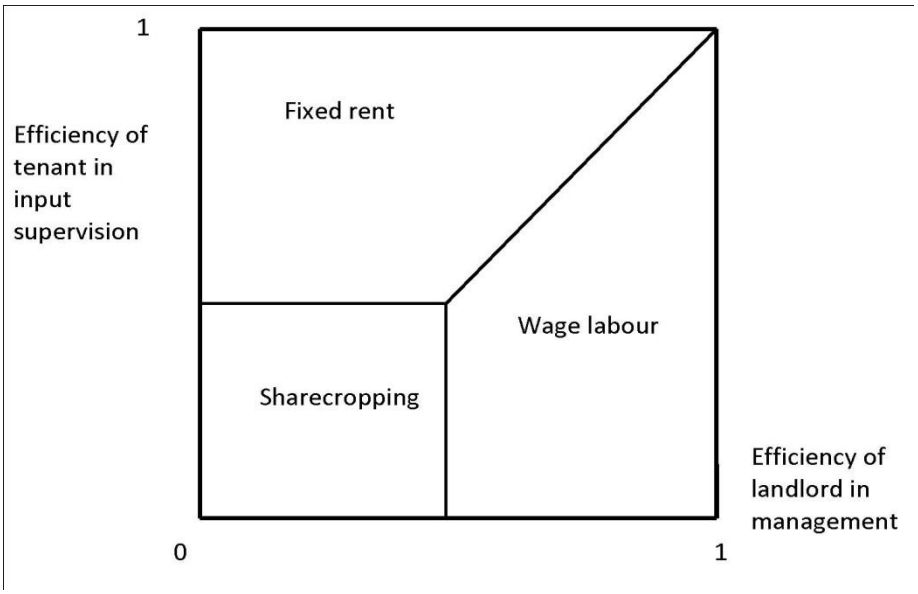

Figure 1: Efficiency of tenants and landlords

Figure 1 represents the three possible solutions. The extreme values represent the maximum efficiency of the landlord (1 on the horizontal axis) and tenant (1 on the vertical axis) to manage and supervise respectively.

Share cropping and Marshallian inefficiency

Sharecropping can be analyzed by considering a single tenant cultivating a given plot of land on the commitment that he must give the landlord a fraction of the total output he produces. Output therefore depends on the tenant's labor input (L), and it is assumed that there is no uncertainty. The tenant's income is therefore $y = \alpha f(L)$, while the landlords gets $(1-\alpha)f(L)$. The utility of the tenant (U) and the landlord (V) depend on income (y) and the tenant's labor input (L)

$$U = U\underset{+}{(}\, y, \underset{-}{L}\,) \;;$$

$$V = V\underset{+}{(}\, y, \underset{-}{L}\,) \qquad (1)$$

The traditional Marshallian model assumes that the tenant determines the level of labor input to be provided on the sharecropped land. For a given α, the tenant will therefore maximize his utility function $U(y,L)$ with respect to L, implying the first-order condition:

$$U_1 \alpha f'(L) + U_2 = 0 \qquad (2)$$

The solution obtained from solving the condition implies that this resource allocation is not efficient since the marginal product of labor is not equal to the marginal rate of substitution between labor input and income ($-U_2/U_1$). This is so because the tenant only receives a fraction of his marginal product of labor and this implies that his labor input will also be low.

More recent tenancy models in the Marshallian setting modify the assumption used in deriving equation (1) and under the new assumption, α is decided by the landlord, taking into account the effect of change in α on L:

$$\max_{\alpha} V(y,l) \text{ s.t. } U_1 \alpha f'(L) + U_2 = 0$$

Sharecropping contract and inefficiency

Most theories of sharecropping are centered on the criticism made by Alfred Marshall (1920). The essence of his critique is that sharecropping is an inefficient system. Alfred Marshall was the first to apply an analytical framework to the study of sharecropping, and this enabled him to identify the moral hazard problem associated with share cropping tenancy. The basis of his theory is that the costs of supervision of the tenant by the landlord are high. The tenant will therefore provide labor only up to the point where the value of his marginal product of labor equals the opportunity cost of choosing the sharecropping contract. Given that the tenant receives only a fraction of the value of the marginal product of labor, and that the marginal product of labor is assumed to be decreasing, the tenant will tend to provide less labor with respect to a fixed rent contract. In the fixed rental contract case, the tenant has the incentive to maximize the surplus

where he keeps the entire output and pays an agreed amount of rent to the landlord. The landlord, who usually has the bargaining power, can then extract the entire additional surplus by appropriately determining the rent.

The moral hazard problem associated with sharecropping—that is, the lack of supervision of labor by the landlord which leads to under provision of labor by the tenant and this is what is referred to as "Marshallian inefficiency." Apart from being inefficient, sharecropping is also apparently suboptimal for the landlord.

Figure 2 describes the effect of sharecropping on the tenants' incentives given the production function. Consider sharecropping in which the tenant retains share (1-β) of the production. The tenant equates the marginal product of his efforts in farming to that of other activities, for instance, working as hired labor or working on their own land. L^* is the efficient labor input but under share-cropping this falls to L^{**}. Not only does the effective return of the tenant incur a downward shift from the production function, but it also gets flatter. Thus under sharecropping, the tenant maximizes his effective return (net of costs) at a labor input level of L^{**} which is less than L^* (the level that maximizes overall economic surplus). Since the tenant receives only a fraction of output, his marginal return is less than the actual value of marginal product. Thus the tenant will apply less amount of labor compared to the previous case.

According to this view, the use of contracts other than fixed-rent contract distorts the tenant's input supply away from the efficient level. In particular, sharecropping leads to undersupply of the tenant's inputs a rational land owner trying to maximize the earnings from land lease will always prefer a suitable fixed rent contract to any share contract. According to this view, sharecropping results in poor incentives to the farmer (tenant).

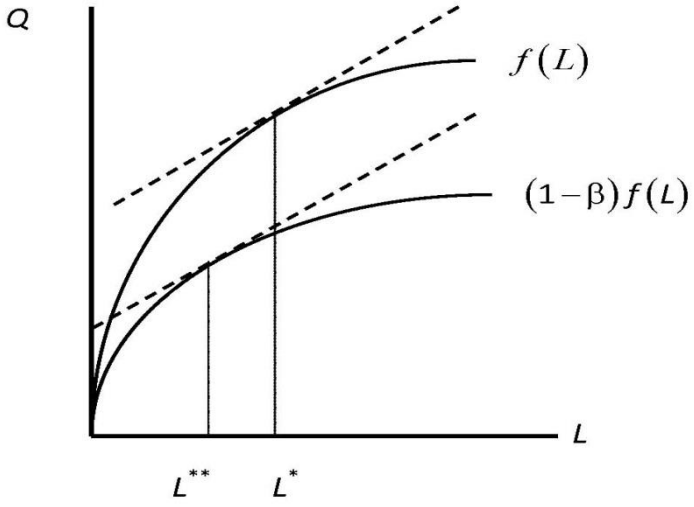

Figure 2: Inefficiency in sharecropping

The above described case gives rise to the Marshallian "dilemma" of sharecropping. If fixed rent system is superior to sharecropping arrangement, both from a social efficiency perspective and from the landlord's individual rationality, why then do we still observe the sharecropping behavior in the real world?

Different authors have tried to give an explanation of this phenomenon. In particular, some authors have argued that sharecropping can be justified by the trade-off between risk-sharing and incentive provision (Stiglitz, 1974; Newbery, 1977; Newbery and Stiglitz, 1979), informational asymmetry between agents (Hallagan, 1978; Allen, 1982; Muthoo, 1998), the presence of moral hazard (Reid, 1976; Eswaran and Kotwal, 1985); or the existence of limited liability (Shetty, 1988; Basu, 1992; Sengupta, 1997; Ray and Singh, 2001).

II. RISK AND THE ROLE OF INFORMATION

Contract theory is centered on the principal-agent model. This model analyzes the strategic interactions between two economic agents and it assumes that some asymmetry in terms of information exists between them. The principal is assumed to move first and by maximizing his expected utility, decides the type of contract to offer to the agent. In order to achieve his goal, the principal anticipates the reaction of the agent and thus chooses the contract accordingly, taking into consideration the incentives of the agent that are necessary for the acceptance of the contract.

The presence of incomplete and asymmetric information among agents remains a crucial issue since it not only influences how markets are structured, but it affects the nature of economic transactions and the contractual arrangements among individuals. The two main types of informational problems can be identified and these are:

- *Hidden action (moral hazard)*: where the payoff of a transaction to one party depends on some action taken by the other party. This action is not observable and it is difficult or impossible to prove that the party did or did not exert the effort required. The *Marshallian* attack to sharecropping assumes that tenant effort is *unobserved* by the landlord, and thus cannot be specified;
- *Hidden information*: One of the two parties (for example an employee - agent) has some knowledge which the other party (for example an employer – principle) does not know. The principal thus tries to devise a contract or scheme that will reveal the information of the agent. An example of this kind of problem is captured in the screening model. Screening explains the coexistence of sharecropping with fixed-rent and wage contracts; and it fits with the observation that share tenancy is often associated with lower productivity than fixed rent contracts since screening predicts that the more

able (and more productive) tenants will choose fixed-rent contracts and the less able will choose sharecropping.

Hidden Action and Tenancy Contracts

The landlord-tenant relationship is one of the evident cases that highlight the tension that could exist between risk sharing and incentives. The landlord (the principal) who owns the land tries to formulate the contract for a prospective tenant/worker (the agent). The tenant has a reservation utility (i.e., the utility he will obtain by making the best use of his time and resources elsewhere), which is assumed to be exogenously given. The contract that the landlord offers should provide the tenant an expected utility of at least $\overline{U}$ for it to be accepted. This condition is known as the *participation constraint*.

Let *Q* denote the output obtained after the land has been cultivated and this output can either be "high" *(H)* or low *(L)*. These values are realized with a certain probability which in turn depends on the amount of effort (*e*) that the agent's exerts. In particular, suppose that there are two levels of effort: $e = 0$ or $e = 1$. When there is zero effort, the probability of high output is *q*. On the other hand, when the higher level of effort is provided, there is a higher probability *p* (where $p > q$) of the high output being realized. However, the high effort level involves a cost *E* for the tenant. Hence the tenant will be willing to exert high effort only if it will significantly affect the payments he receives from the principal.

In this framework, the tenant is risk averse and this fact is captured by attributing him a strictly increasing and concave utility function which implies the following inequality:

$$\theta U(w_1) + (1-\theta)U(w_2) < U\big(\theta(w_1) + (1-\theta)U(w_2)\big) \qquad (1.1)$$

Where w_1 and w_2 are two possible values of the agent's monetary income. Two conditions are imposed:

- The provision of high effort maximizes expected net surplus (and is hence Pareto efficient):

  $$pH + (1-p)L - E > qH + (1-q)L \qquad (1.2)$$

  Rearranging the terms this becomes:

  $$(p-q)(H-L) > E \qquad (1.3)$$

- Whatever the actual choice of effort, the expected net output generated is always enough to pay the agent compensation that gives him at least his reservation utility. Given the previous condition, there has to be enough surplus generated in the low-effort case:

  $$qH + (1-q)L \geq \overline{w} \qquad (1.4)$$

  Where $\overline{w}$ is the certain payment that will provide the agent exactly his reservation utility i.e., $U(\overline{w}) = \overline{U}$

***Full information principal-agent model**: The First-Best Contract*

The full information model supposes that the principal (landlord) can observe the actions of the agent (tenant). In particular, the principal is fully informed on; the action of the agent intends to take (the amount of effort exerted), the agents' preferences $c(b)$ and reservation utility ($\bar{u}$). The contracted payment to the agent can thus be conditioned on the provision of a stipulated level of effort and the landlord, by prior agreement, can refuse to make any payment if the agent fails to meet the required conditions of effort. The maximization problem can be written as follows:

$$max_{b.s\,(\cdot)} x(b) - s(x(b)) \qquad (1.5)$$

Subject to:

- *Incentive compatibility constraint:* $s\big(x(b)\big) - c(b) \geq s\big(x(z)\big) - c(z), \ \ \forall z$ This constraint ensures that, the action promoted by the principal (*b)* is also the action that yields the highest payoff for the agent.
- *Participation constraint:* $s(x(b)) - c(b) \geq \bar{u}$. The participation constraint requires that the agent should receive at least as much as what he would have received had he rejected the principal's offer.

Where:

z is an arbitrary action by the agent;

b is the action that the principal tries to encourage (i.e., high effort);

$s\,(\cdot)$ is the contract/incentive schemes that the principal proposes to the agent;

$x(z)$ is the output of action *z*;

$c(z)$ is the cost of taking action *z* for the agent;

$\bar{u}$ is the reservation utility of the agent, that is, the utility that the agent could obtain without accepting the offer of the principal.

The principal's utility is given by the difference between the output produced $x(b)$ and the amount that he pays to the agent, $s(x(b))$. On the other hand, the agent's utility is given by what he receives from the $s(x(b))$ minus the cost of taking the action $c(b)$.

The principal chooses an entire function $s\,(\cdot)$ and thus the contract $s\,(\cdot)$ is a function of the agent's action. This is only possible if and only if the principal can fully observe the agent's actions. The value of $s(b)$ is fixed by the participation constraint. Since there is no reason for the principal to give more to the agent than is strictly necessary, the participation constraint is binding exactly and $s\big(x(b)\big) = \bar{u} + c(b)$.

This implies that the principal will maximize:

$$max_b x(b) - c(b) - \bar{u} \qquad (1.6)$$

The solution (the optimal contract) is the first best outcome since$x'(b^*) = c'(b^*)$, i.e., marginal costs equals marginal revenue, and b^* denotes the first best level of output. In this context, the principal pays a fixed amount to the agent and this payment is just enough to cover his reservation utility.

Moral hazard: *- The Second-Best Contract (unobserved actions)*

The imperfect information model considers the case where output is stochastic and the agent's (tenant) actions (the amount of effort he exerts) cannot be fully observed by the principal (landlord). The principal's payment to the agent is however conditional on whether or not output is high. Assume that there are *n* possible output levels $(x_1, \dots, x_n)$ and that these levels of output each occur with a certain level of probability depending on the action the agent decides to take. Assuming that the agent can only take two actions, *a* or *b* and let *s* denote the probability of output *i* if action *j* is given by p_{ij}.

Writing $s(x_i)$ as s_i and supposing that action *b* is taken, the principal-agent problem now is:

$$\max \sum_{i=1}^{n} (x_i - s_i) p_{ib} \tag{1.7}$$

Subject to:

- *Incentive compatibility constraint:* $\sum_{i=1}^{n} u(s_i)p_{ib} - c_b \geq \sum_{i=1}^{n} u(s_i)p_{ia} - c_a$ If the agent is to choose a high effort, the payment scheme must be such that his expected utility from doing so is at least as that from choosing a low effort. Any payment scheme that gives the agent an incentive to provide high effort must pay him more in good states (i.e., when the output is high) then in the bad states;
- *Participation constraint*: $\sum_{i=1}^{n} u(s_i)p_{ib} - c_b \geq \bar{u}$ The agent's expected utility under the contract should not fall short of his reservation utility

Incentive problems arise due to the fact that the agent is unwilling or is not in a position to take up all the risk generated by his actions. The unwillingness of the agent, in this case the tenant to take up all of the risk can be explained by the fact that the agent is risk averse.

In order to obtain a result, it is necessary to make additional assumptions either regarding the form of the contract itself (i.e., restricting one's attention to specific functional forms such as fixed share of output to agent, with or without side payment), the probabilities attributed (p_{ij}), and/or the preferences $u(s_i)$ of the agents.

Contract restrictions and Marshallian inefficiency

In the model, above no restrictions are imposed on the contract function. Imposing some restrictions, for instance if $s(x) = \alpha x$ then the maximization problem becomes:

$$max_{b,\alpha}(1-\alpha)x(b) \tag{1.8}$$

Subject to:

- *Incentive compatible constraint:* $b = \text{argmax}\, \alpha x(b) - c(b)$
- *Participation constraint:* $\alpha x(b) - c(b) \geq \bar{u}$

The first order condition for the agent is given by:

$$\alpha x'(b^{**}) = c'(b^{**}) \tag{1.9}$$

$b^{**} < b^{*}$ if α < 1. The amount of effort exerted in this context is lower than that of the full information contract and this is what is referred to as the Marshallian inefficiency.

A particular functional form to the payment schedule s_i such that $s_i = \alpha x_i + \beta$. In other words, compensation of the agent is limited to contracts that stipulate a fixed payment β (positive or negative) and a payment $(1-\alpha)x_i$ proportional to output. It is possible to show that sharecropping is optimal when the landlord (principal) is risk neutral and the tenant (agent) is risk averse. A special case exists where the tenant's share α decreases as his aversion to risk increases (a monotonicity result). On the contrary, when the tenant is risk neutral, fixed rental is the optimal solution.

Singh (1989) in his work *"Theories of Sharecropping"* proposes a summary of a moral hazard sharecropping model. The landlord's maximization problem is written:

$$\max_{\alpha,\beta,L} E_\theta[(1-\alpha)\theta Q(L) - \beta] \tag{1.10}$$

Subject to:

- *Incentive compatibility constraint*: $E_\theta[U'(\alpha\theta Q(L) + \alpha\theta Q'(L)\beta)] - 1 \geq 0$
- *Participation constraint:* $E_\theta[U\alpha\theta Q(L) + \beta] - L \geq K$

Where:

θ is a random output shock with $E[\theta] = 0$

L is labor,

$Q(L)$ is output,

α is the share of output going to the tenant,

β is a fixed payment (which can be positive or negative)

K is the tenant's reservation utility. i.e., the utility the tenant could achieve if he were to refuse the contract offered by the landlord.

If it is assumed that the landlord is risk neutral and that the tenant's utility is additively separable in both labor and consumption. The problem can be solved from the landlord's perspective (principal) in two stages. Given that utility is increasing in consumption, the landlord will always be in a position to push the tenant down to his reservation utility by setting β high enough.

The two constraints can thus be solved for values of L and β as a function of α and K and writing the relationships $L(\alpha, K)$ and $\beta(\alpha, K)$. Substituting into the landlord's objective function, one can obtain a first order condition for α:

$$-Q + (1-\alpha)Q'L_\alpha - \beta_\alpha = 0$$

$$\alpha = 1 - \frac{Q + \beta_\alpha}{Q'L_\alpha} \tag{1.11}$$

By totally differentiating the participation constraint, one can obtain:

$$\beta_\alpha = \frac{d\beta}{d\alpha} = -Q\frac{E[U'\theta]}{E[U']} \tag{1.12}$$

This will be negative and less than Q in magnitude if the tenant is risk averse. Hence $Q + \beta_\alpha > 0$. Whether α is less than 1 depends on the sign of L_α. One would indeed expect that effort is positively related to incentive to work α (and also with the amount of labour, L_α). However, it is difficult to establish $L_\alpha > 0$ since α also affects income and higher income could reduce the incentive to work, as the tenant substitute leisure for consumption. Singh claims that, if $U''' < 0$, then $L_\alpha > 0$.

As mentioned in the general case, one of the main limits of this approach is the assumption that the agent must be in a position to bear the risk associated with possible fluctuations in output. This is not always the case and if the agent cannot, a lower share of α and a lower payment F may be required to insure the agent against bad states of nature.

Hidden Information - Screening in Land Tenure

Hidden information arises when the landlord cannot observe the true ability and productivity of potential tenants and he therefore tries to distinguish high-ability tenants from those with low ability.

The landlord could, for instance, ask the tenant to choose between two contracts: one in which a share of the output is offered and another in which fixed rent must be paid. By offering a menu of contracts including share contracts, the landlord can get prospective tenants of different ability to select different contracts.

This allows the landlord to obtain the "hidden information" from his prospective tenants and this allows him to therefore identify their types. These potential tenants are thus in a way "screened" based on their ability.

It is possible, under given circumstances, to choose from this menu of contracts in order to satisfy the following conditions:

- A high-ability tenant will prefer the fixed rent contract to the sharecropping contract even though the implicit rent in the fixed rent contract is higher. The reason is that he can retain a large share of his high marginal product while if he were to choose the sharecropping contract he would have to give away some of this;
- A low-ability tenant will prefer the sharecropping contract to the fixed rent contract. In this case, the low-ability tenant divides his low product with the landlord. The fixed rent is too high compared to the extra marginal product that he would get in return.

Basic Model

This model assumes that there is a single landlord with two identical plots of land. Suppose that there are two types of prospective tenants – one with high ability and the other with low ability. Given a plot of land to cultivate, the high ability tenant can produce an output Q_H where as a low-ability tenant can produce Q_L, and $Q_H > Q_L$.

It is assumed that only the tenant's ability affects his output level. Moreover, it is also assumed that the landlord is neither in a position to identify nor to observe the true ability of a potential tenant. He however attaches a probability p to the event that the tenant is a high rather than low ability type. Each potential tenant has a reservation expected income of $\overline{w}$ and this is the same for both high and low ability tenants. The actual outputs are $\tilde{Q}_H$, $\tilde{Q}_L$ respectively for the high and low ability tenant and because of uncertainty ability cannot be deduced from actual output. In order to be accepted by the tenant, any contract must offer the potential tenants at least equivalent to his or her reservation income. If the landlord considers offering a single fixed rent contract to the tenants, there are two possibilities in determining the maximum rent he could charge the prospective tenant:

Firstly, the landlord may decide to render the contract acceptable independent of the agents' type. In this case, the fixed rent charged should be low enough to cover the reservation wage for the low ability tenant. In order to maximize his returns, the landlord will charge a rent high enough to render the low ability agent indifferent between accepting and rejecting the offer.

This implies that the rent charged will be:

$$R_1 = Q_L - \bar{w} \tag{2.1}$$

Secondly, the landlord may decide to distinguish between the two types of tenants based on their ability. He could thus ask for the highest rent that the high-ability tenant is willing to pay, and this could however lead to a possible risk of rejection of the offer by the low ability tenant.

In this case the rent charged will be:

$$R_2 = Q_H - \bar{w} > R_1 \tag{2.2}$$

The landlord will receive this rent only in the case where the contract is accepted with a given probability *p* and only if the tenant is of high ability type.

The landlord's expected return from this type of contract is therefore $pR_2 = p(Q_H - \bar{w})$.

The landlord will therefore choose to charge R_1 when $R_1 > pR_2$ and R_2 when$pR_2 > R_1$. In addition, the landlord will opt to ask for the lower rent R_1 when *p* is sufficiently low (*1-p* is sufficiently high). This is because the landlord cannot ignore a possible low-ability tenant if he thinks he is likely to meet one. If the landlord offers only a fixed rent contract, and $R_1 > pR_2$, the rent charged by the landlord would be:

$$\bar{R} = Q_L - \bar{w} \tag{2.3}$$

Supposing the landlord can observe the ability of the tenants and would like to target each type of tenant and so he will offer two different contracts and let the prospective tenants to choose. He offers a contract with a fixed rent *R* and another – a sharecropping contract – specifying the criterion of distribution. $(1 - \alpha)$ of the output is to be paid to the landlord while the tenant retains a share of α of the output. This leads to the following pair of *self-selection or incentive compatibility constraints*, for the high and low-ability types respectively:

$$Q_H - R \geq \alpha Q_H \quad \text{and}$$
$$\alpha Q_L \geq Q_L - R \tag{2.4}$$

The two inequalities are compatible since $Q_L < Q_H$.

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

$$Q_H - R \geq \bar{w} \quad \text{and}$$
$$\alpha Q_L \geq \bar{w} \tag{2.5}$$

The landlord's expected return (V), is a weighted average of the returns of both the high and low-ability tenant. These weights are the respective probabilities assigned to the tenant's ability

$$V = pR + (1-p)(1-\alpha)Q_L \tag{2.6}$$

The landlord's objective is to choose (R, α) in order to maximize his expected return (V), while satisfying both the incentive and participation constraints.

Thus we have that:

$$Q_H - R \geq \alpha Q_H > \alpha Q_L \geq \overline{w} \qquad \text{hence}$$
$$Q_H - R > \overline{w} \tag{2.7}$$

Under the dual contract proposal, the high-ability tenant always enjoys a "surplus" i.e., income that is above his reservation wage known as the "information rent". This arises due to the landlord's lack of information about the tenant's level and productivity.

The optimal pair (R, α) can be obtained as follows:

$$(1-\alpha)Q_H = R \qquad \text{and}$$
$$\alpha Q_L = \overline{w} \tag{2.8}$$

Solving for the pair of values of α and R from the system of simultaneous equations one can obtain:

$$\alpha = \frac{\overline{w}}{Q_L}$$

and

$$R = (Q_L - \overline{w})\frac{Q_H}{Q_L} \tag{2.9}$$

The landlord's expected earnings from the best paired contracts is thus given by:

$$V = p(Q_L - \overline{w})\frac{Q_H}{Q_L} + (1-p)\frac{(Q_L - \overline{w})}{Q_L}Q_L$$
$$= (Q_L - \overline{w})\frac{pQ_H + (1-p)(Q_L - \overline{w})}{Q_L}Q_L \tag{2.10}$$

In the second case, the landlord cannot observe the tenants ability. He is no longer in a position to discriminate the tenants given their ability. If the landlord decided to charge $R_1 > R_2$ to the more able tenant would always claim to be of lower ability and ask for a lower rent. On the other hand, charging R_1 will attract only the more able tenant.

Screening and Land Variability in Sharecropping (Newbery and Stiglitz, 1979)

This model introduces the possibility that the land size is variable and thus this creates some competition among the landlords. It is assumed that the ability multiplies labor effort in the production function. Further assumptions are that the form of the production function and the amount of land is structured in a way that each landlord will have an incentive to have more than one tenant and that there are more landlords than high-ability potential tenants.

The higher-ability tenant's average production function is $Q_H(T)$ where T is the amount of land he or she cultivated. The lower-ability person's average production function is given by $Q_L(T)$.

Let r_i be the rental rate for a tenant of type i, and T_i be the amount of land he is given. Thus the landlord under perfect information, offers two differential rental contracts r_H, T_H and r_L, T_L. He seeks to maximise $r_H T_H + r_L T_L$ subject to the total amount of available land $T_H + T_L = \bar{T}$ and to the contract acceptance constraints of the tenants, and these are given by:

$$Q_H(T_H) + r_H T_H \geq \bar{w} \qquad \text{and}$$
$$Q_L(T_L) + r_L T_L \geq \bar{w} \tag{2.11}$$

The optimal solution requires that the landlord equates the marginal products on the two plots and setting rental rates so that each tenant will obtain just $\bar{w}$.

Suppose the typical landlord offers contract rT_H and αT_L the self-selection constraints are:

$$Q_H(T_H) + rT_H \geq \alpha Q_H(T_L) \qquad \text{and}$$
$$\alpha Q_L(T_L) \geq Q_L(T_L) - r_L T_H \tag{2.12}$$

Competitive behaviour by the landlord requires that:

$$r = (1-\alpha) Q_L(T_L)/T_L \tag{2.13}$$

So that the return per acre from each contract is equalized. This is equivalent to:

$$rT_L = (1-\alpha) Q_L(T_L)$$

Hence

$$rT_L < (1-\alpha) Q_H(T_L)$$

So that

$$\alpha Q_H(T_L) < Q_H(T_L) - rT_L \tag{2.14}$$

If the self-selection constraint for the higher ability tenant is binding in equilibrium, it follows that:

$$\alpha Q_H(T_H) - rT_H < Q_H(T_L) - rT_L \quad (2.15)$$

While screening could be accomplished by offering a choice of two rental contracts, it can be done more effectively from the landlord's perspective by offering a choice between fixed-rent and a share contract. Screening is possible even in the presence of competition as long as the landlord is in a position to control for the size of land to be rented. This allows the landlord to choose contract parameters subject to contract acceptance and the equalization effect of competition among landlords for high ability tenants.

CONCLUDING REMARKS

Land and land tenure systems are central in promoting rural livelihoods in developing countries since access to land and security of tenure are the main means through which food security and sustainable development can be achieved. Given that land plays an important role in the livelihoods of the majority of households in developing countries, food security and poverty reduction cannot be achieved unless on land tenure issues of access to land, security of tenure and the capacity to use land productively and in a sustainable manner – are fully addressed. Inappropriately addressing land issues may constitute a serious constraint on economic and social development. On the one hand, insecure land tenure and dysfunctional land institutions discourage private investment and overall economic growth. On the other hand, skewed land ownership distribution and discrimination according to gender or ethnicity limit economic opportunities for disadvantaged groups and provide fertile conditions for social conflict - which often erupt in violence. In Africa, land remains crucial for poverty reduction as most rural households rely on it for the survival of present and future generations because the livelihoods of over 70% of the population in Africa are mainly linked to land and natural resources exploitation. The coexistence of various forms of tenure in Africa - state, communal, customary, individual - suggests the need of a better understanding of the pertinent relationship between land tenure, food security and sustainable development in Africa. In order to address land issues and thus formulate appropriate food security and poverty reduction policies, it is necessary to understand the links between access to land and access to other sources of income and capital. In particular, it is crucial to have a better understanding of the structures of agrarian economies as they relate to rural poverty and hunger.

This paper explores land tenure systems, the nature of these systems and the role they play in the defining or affecting the welfare of individuals particularly in developing countries. This paper aims at improve the current understanding of the linkages between land tenure systems, poverty, food security and sustainable natural resource management.

The first part of the paper introduces land tenure systems and the Marshallian inefficiency dilemma with a specific focus on the role of risk and asymmetric information and how these affect land tenure contracts

and in particular sharecropping contracts. Despite the growth of interest of both theoretical and empirical literature, little convergence has emerged on the opinions of the tenancy contracts. The main challenge that has been facing agricultural tenancy is its ability to explain not only the existence of sharecropping, but also the existence of the other forms of land tenure like fixed rental and fixed wage contracts. Some of explanations that have been offered for the existence of different types of tenure contracts: (i) the existence of a trade-off between risk sharing and transaction costs, (ii) screening of workers that possess different qualities, and (iii) imperfections for inputs market. In particular, different works have used screening models to explain the existence of different contracts. Recent literature has highlighted technical know-how credit and family labor managerial ability as some factors that lead to highly imperfect markets. Sharecropping is viewed as a partnership arrangement in which both agents have incentives to self-monitor. Such a contract arises to mitigate morally hazardous behavior on the part of both agents.

Three forms of land tenure contracts exist; pure rental contract, contract farming and sharecropping. One of the critical assumptions in the choice of contractual form in the market for tenancies is the ability of the landlord to monitor the actions of the tenant. Under the assumption that the costs of monitoring the tenant's activities are high, theory predicts that sharecropping will result in an inefficiently low amount of variable inputs applied to the rented land by the tenant, compared to the amount of variable inputs employed on owned land or on plots leased under a fixed rent contract. If, on the contrary, the landlord is able to effectively monitor the tenant's activities, then the efficient amount of variable inputs per unit area can be stipulated in the contract, and there will be no incentive problems and neither will there be any inefficiency compared to a fixed rent contract. The choice among these contracts and the efficient allocation of resources depends on the inputs is the ability of the landlord to monitor or observe the ability and actions of the tenant (agent). The models that have been analyzed in this paper confirm the fact that in the case where the principal can fully observe the agents' actions, the first best solution is obtained. The landlord maximizes his utility function by equating the marginal costs to marginal revenue and thus pays the tenant a fixed amount, just enough to cover the agent's reservation utility. The first best solution is no longer obtainable in the context where the landlord cannot observe the tenants actions (both ex-ante and ex-post). This is mainly due to the presence of asymmetric information. Alfred Marshall in his earlier works (1920) emphasized the moral hazard problem that is associated with sharecropping and how this further leads to inefficiencies. Moreover, he claimed that any contract other than fixed rent contract distorts the tenant's input supply away from what he termed as the "efficient level". Nonetheless, empirical evidence continues to show the existence and persistence of sharecropping as a mechanism of land tenure and this is particularly true in the developing world where most individuals are farmers or do practice farming activities. Why then does sharecropping continue to persist?

The second part of the paper empirically examines the land tenure systems that exist in Tanzania. Using the 2012-13 Tanzanian National Panel Survey (NPS) provided by the Living Standards Measurement Study – World Bank, we look at the land tenure systems in Tanzania and how these affect agricultural productivity, food security and poverty at a household level. Acknowledging the pivotal role women are playing in agriculture and the use of land and natural resources we also explore gender issues in land tenure systems and their role on households' welfare.

Focusing the evidence of land tenure systems in the developing countries this paper tries to answer a very controversial question by making some concluding remarks. The first one is the definition of efficiency. In his model, Marshall's main assumption is that the landlord is "rational" and so he will always maximize the earnings and thus prefer a fixed rent contract compared to the sharecropping alternative. This leads to posing the question whether agents are always utility maximizes. In particular, whether or not landlords and pay exclusive attention to the amount of effort or actions of the agents. Is the effort of the agent the only factor that influences his output levels or are there other factors are also taken into consideration like, the risk attitudes of both the principal (landlord) and the agent (tenant) and how the risks are shared among these agents in their decision making process. The second issue relates to monitoring costs. Marshall in his work identifies the high costs of supervision of tenants by the landlord as the central cause of inefficiency in sharecropping. Agricultural and farming activities in developing countries are often practiced in a context where strong social and cultural norms exist. Small scale farmers do not migrate often and thus create some sort of reputation based on trust with the landlord. Social and cultural norms are strongly perceived and abided to in these contexts. Moreover, peer monitoring is also practiced in these contexts due to family ties and the above mentioned strong social norms. These factors render the costs of monitoring for the landlord reasonably lower than in other contexts. The third issue is that there is no single model can be used to identify or explain the presence of one land tenure contract or another. In order to explain the existence and persistence of sharecropping, other factors like the risk attitudes of the agents, factors that affect monitoring costs and the ability of the landlord to screen the tenants need to be taken into consideration. Sharecropping may emerge inefficient from a purely Marshaling view. It however allows agents to mitigate other issues such as risk at the cost of efficiency.

Fourthly, land tenure systems are significant in defining agricultural productivity, food security and poverty rates in Tanzanian households. We find that land tenure systems affect access to technological inputs and to extension services as well as membership to cooperatives, which often distribute government subsidized inputs and vital market information to small farmers. In addition, they also drive access to cash income needed to purchase inputs even when these are subsidized. Finally, we also find gender differences in land tenure systems in Tanzania and these in turn affect farm productivity, food security and the household welfare.

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