# Tenure Insecurity, Transaction Costs in the Land Lease Market and their Implications for Gendered Productivity Differentials

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# Tenure Insecurity, Transaction Costs in the Land Lease Market and their Implications for Gendered Productivity Differentials

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## Abstract

This study sets out to assess the link between land leasing behavior and productivity differentials between male and female-headed households. A double-moral hazard model allows us to show that landlord's tenure insecurity leads to sub-optimal level of effort on tenant's part, via its impact on the likelihood of contract renewal. The landlord's enforcement ability is also shown to increase the optimal level of effort. The empirical findings support the hypothesis that female heads of households have higher tenant turnover and lower enforcement ability. The results, however, show that contract renewal is not strongly linked to productivity.

JEL classification: D2, Q12, Q15, C21, C7.

Key words: productivity; female headed households; contract length; enforcement ability

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## 1. Introduction

As much as economic growth is crucial to the development process, it is less obvious whether economic growth essentially contributes to reduction of poverty by reaching the vulnerable sects of the population. Contrary to the "trickle-down" hypothesis which asserts that overall growth in the economy will eventually sink to the poor, many contend that the "growth processes" typically "trickle up" to the very rich (Todaro, 1997). Even when growth entails a positive cascade, increasing the well being of the vulnerable calls for increasing the quality of growth by ensuring that they appropriate a reasonable proportion of its proceeds (North, 2002). Empowering vulnerable groups could also further enhance growth as it would warrant their better and effective participation in the development process. Thus, identifying the constraints they face would steer policy actions intended to empower the poor and the vulnerable.

This study focuses on female heads[1] that comprise a significant proportion of vulnerable household classes in poor rural communities of the developing world. A number of studies have noted systematic downward bias in the productivity of female owned plots (e.g. Holden et al., 2001; Hagos, 2003; Tikabo and Holden, 2003). Such results persist irrespective of attempts to control for differences in labor endowment and heterogeneities in land quality. Even within the same household, empirical evidence from Burkina Faso (Udry, 1996) shows that plots controlled by women are farmed much less intensively than similar plots within the household controlled by men.

[1] In Ethiopia, where the data employed in the empirical analysis of the paper is collected from, female household heads comprise the poorest part of the population. Many of them are widows, separated or women who live on their own making a living out of selling liquor. They are characterized as the most resource poor, having a small amount of land, no pair of oxen, no full farm equipment, insufficent adult labour and little working capital. Table 1 presents a comparision of socioeconomic and asset characteristics of male and female households.

Lack of assets (including draught power) as well as labour shortage [2], characterize female-headed households.

Under conditions where factor markets are working perfectly, female households would be able to hire in labor, oxen or rent out land until factor ratios are equalized across all households and potential productivity differentials are dissipated. However, markets for the complementary non-land factors are characterized by notorious imperfections (Bliss and Stern, 1982; Holden et al. 2003) which makes female households heavily reliant on renting out land for production.

On the other hand, the extent to which land markets contribute to equalization of factor ratios across households depends on the transactions costs households face in the land market itself. The main objective of the paper is to seek explanation to productivity differentials between male and female households in terms of differences in land leasing behavior. Particularly, we plan to test the impacts of differences in tenure insecurity, contract length and enforcement ability on productivity.

In societies where the main agricultural activities are undertaken only by men, there are tendencies to disregard the role of women as farmers (Mutimba and Bekele, 2000). This might lead to an undermining of women's position as landlords inducing systematically higher tenure insecurity on their part. In giving out the land for lease, female heads might opt for shorter term rental contracts and might also be reluctant to rent out their land. This is because female heads would fear that tenants might establish claims towards their land if the same tenant continues to stay on the land for long. In line with this, Bellemare and Barrett (2003) argue that when choosing the terms of contract, the landlord considers the impact of her choice on the probability that she will retain future rights to the rented land. On the tenant's part,

[2] This is true for Ethiopia where there is a taboo against women doing certain farming operations like ploughing with oxen.

expectations of being evicted from the (rented) land would curb the incentive towards exerting otherwise higher level of effort.

In addition, female landlords might need to exert extra monitoring and supervision to ensure that optimal level of tenant effort is exerted. This is because during peak labour and oxen seasons (days), the tenant will be labour constrained and meeting the labour requirements of both his and the landlord's land will be straining. Thus, bargaining power becomes very critical in ensuring optimal level of effort. As a result, they might resort to other suboptimal labor arrangements that would lead to lower land productivity.

In sum, the study hypothesizes the following: heterogeneities with respect to tenure security would lead to shorter duration of contracts and lower productivity on land rented in from female landlords than from the male landlords. On the other hand insecurity of tenure of female headed households and their inability to enforce the terms of the contract may lead them to suboptimal owner cultivation due to their hesitation to rent out their land, leading to lower land productivity on owner operated plots of female headed households than on owner operated plots of male headed households.

The paper is organized as follows. In the next section we give the theoretical background of the paper. Section 3 details the data employed in the empirical analysis. Estimation methodology along with some considerations in the estimation procedure is provided in section 4. Section 5 presents the empirical findings. Section 6 concludes.

## 2. The Model

Our main premise is that female landlords are tenure insecure and face higher transaction costs in the land lease market. Their tenure insecurity and high level of transaction cost could lead them to behave differently from their male counter parts in

terms of contract renewal. This will have differential effect on the tenant's effort, who would tailor his effort according to his expectation of contract renewal. Differential tenant effort that is caused by differential contract renewal would lead to observed productivity differential between plots that are owned by male and female headed households.

Given this, the essence of the model is to assess the link between landlord's tenure insecurity and transaction costs faced in the land lease market to contract renewal and tenant's optimal level of effort. As any other transaction, land transactions could be effected for shorter or longer durations [3]. When search processes are costless and the landlord is fully secure about his (her) landownership, shorter duration contracts are as good as the longer duration ones in terms of search cost. With positive search costs and full tenure security, however, longer term contracting would be more attractive as it reduces search costs for both parties. Thus the landlord would be expected to offer longer duration contract and the tenant to work harder not to be evicted from the land. On the other hand, if the landlord is less than fully tenure-secure, longer term contracting could induce the risk of losing land to the tenant. Thus, to the landlord, deciding on the duration of the contract involves weighing the benefit of reduced search cost against the risk of losing the land to the tenant. The tenant who enters into a contract with a tenure insecure landlord also considers the chance of being evicted from the (rented) land in exerting effort.

We consider a contract by a landlord and a tenant that stipulates output sharing conditions from rented out land. Contracts are also typically entered for one production year. However, the tenant's effort, which is not observable to the landlord will not be stipulated in the contract. Similarly, contracts are entered for one year with a possibility of renewal. However, whether a contract will be renewed or not will not

[3] In this context, short duration contracts refer to one-year (one production season) agreements, while longer duration contracts involve arrangements longer than one year.

be specified in the contract. The situation leads to a double moral hazard problem where the landlord's decision to renew the contract is not observed by the tenant and the tenant's choice of optimal level of effort is not observed by the landlord.

**Landlord's problem:**

We consider the landlord's standard expected utility function from production profit with positive search cost and augmented to allow for the risk of losing the land due to longer term rentals[4]. The landlord's profit function is composed of the total revenue from agricultural production and the cost of search for a tenant. The revenue is represented by the function, $q\ f$, where $q$ is a positive random variable with an expected value of unity, intended to embody the effects of uncertainty in the agricultural production (Eswaran and Kotwal, 1985), and $f$ is an increasing function of effort. The cost of time and resources the landlord spends searching for the tenant is given by $c$. $a$ represents the share of the total output that goes to the tenant[5].

Given this, at each period, the landlord will have the option of: 1) incurring a search cost and getting a new tenant without running into the risk of losing land, and 2) renewing the contract to the same tenant. Therefore, the landlord incurs no cost but carries the risk of losing the land to the tenant. At each period, the profit from the option of searching for a tenant and getting production is given by:

$$p_R = (1-a)(q\ f(e) - k(e)) - c \qquad (1)$$

On the other hand, the profit from the option of renewing the contract with the same tenant is given by:

$$p_A = G(1-a)(q\ f(e) - k(e)) \qquad (2)$$

[4] We have assumed that a fixed amount of land is to be rented out and the risk of losing land is associated exclusively to contract renewals.
[5] Fixed rentals are very few in the data, thus we have assumed away linear contracting.

Under this condition, the landlord would not incur any search cost. However, the landlord faces the risk that the tenant attempts to expropriate land and may stop paying the share to the landlord. The expected probability that he expropriates the land is (1-G). Therefore, the probability of retaining rented out land is G. It should be noted that G is not a constant probability over time but rather a survival rate whose value reduces over time. The intuitive reason for its fall over time is because the longer the duration of the contract, the more likely expropriation is to be successful.

Let W be discounted present value of expected utility for a landlord who is deciding to renew a contract or not at every given period[6]. The utility function is given by:

$$W = \begin{cases} w_0 = EU\left[(1-a)(q\ f(e)-k(e))-c\right] & if\ h=0 \\ w_1 = EU\left[G((1-a)(q\ f(e)-k(e))\right] & if\ h=1 \end{cases} \quad (3)$$

Where the maximization is over two actions: terminate the current contract and engage in searching for a new tenant. We assume there exists a switch point where the two expressions are equal to each other. Since the landlord only observes output, but not effort, we solve for the threshold level of expected output that makes the landlord renew the contract.

$$EU\left[(1-a)(q\ f(e)-k(e))-c\right] = EU\left[G(1-a)(q\ f(e)-k(e))\right] \quad (4)$$

Since the landlord only observes output and not effort, we set $q\ f(e(h)) = Q$. In addition, since the utility functions are the same, equation (4) could be solved for by equating the arguments inside the utility functions, which are the same[7].

$$(1-a)Q - c = G(1-a)Q \quad (5)$$

The solution to the above equation becomes

[7] For a risk averse land owner, we can take a logarithmic utility function (following Bellemare and Barrett (2004), for instance). The expression transforms into:
$\ln\left[(1-a)(q\ f(e)-k(e))-c\right] = \ln\left[G(1-a)(q\ f(e)-k(e))\right]$, exponentiating this will transform it into $(1-a)(q\ f(e)-k(e))-c = G(1-a)(q\ f(e)-k(e))$.

$$Q^* = \frac{c}{(1-a)(1-G)}, \text{ where } \begin{matrix} h = 1 if\ Q \geq Q^*, \quad and \\ h = 0 if\ Q \prec Q^* \end{matrix} \qquad (6)$$

Thus the landlord would renew the contract if the realized output is at least $Q^*$. Otherwise, the landlord would terminate the contract.

The relationship between the probability of retaining the land is given by the following equation where $G$ corresponds to the landlord's probability of retaining the land which also corresponds to the level of tenure security.

$$\frac{\partial Q^*}{\partial G} = \frac{c}{(1-G)^2(1-a)} > 0 \qquad (7)$$

Thus, from the landlord's problem we can see that higher $G$ increases the threshold $Q^*$.

With the relationship between $\begin{matrix} h = 1 \text{ if } Q \geq Q^*, \\ h = 0 \text{ if } Q < Q^* \end{matrix}$, a higher $Q^*$ (due to lower $G$), increases the likelihood of h being zero.

**TESTABLE IMPLICATION 1:** *lower tenure security leads to lower probability of contract renewal.*

Categorizing households based on the gender of the head, we can have the following relationship between gender and $G$, the probability that the landlord still keeps the ownership of the land after renting out[8]. $G=G(g)$, where g stands for gender ($g=1$ for female and $g=0$ for male headed households). Given our premise that female headed households are tenure insecure, $G(g=1)$ will be lower than $G(g=0)$.

Based on (6), we get the following expressions for $Q^*$.

$$Q^*_{g=1} = \frac{c}{(1-a)(1-G(g=1))}, \text{ for female headed households} \qquad (8)$$

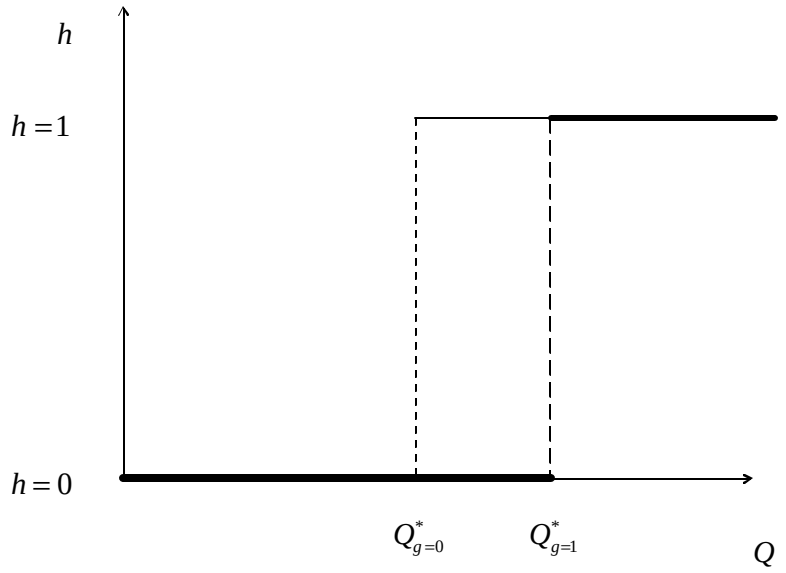
And

[8] G=G(gender, contract duration)

$$Q^*_{g=0} = \frac{c}{(1-a)(1-G(g=0))} \text{ for male headed households} \qquad (9)$$

Given that $G\ (g=1) < G(g=0)$, the expression in (8) will be greater than the expression in (9).

Since $Q^*_{g=1} > Q^*_{g=0}$ and $\begin{matrix} h=1 if\ Q \geq Q^*, \\ h=0 if\ Q \prec Q^* \end{matrix}$, this implies that $h=0$ for higher range of $Q^*$ for female headed households. Graphically,




This implies that female headed households, who are supposed to be less tenure secure are less likely to renew contracts with the same tenant. In other words, female (tenure insecure) households would require higher compensation to renew the contract.

**TESTABLE IMPLICATION 2:** *Female headed households, who are supposedly tenure insecure are less likely to renew contracts with the same tenant than their male counterparts.*

The relationship between the threshold $Q^*$ and the cost of search is given by:

$$\frac{\partial Q^*}{\partial c} = \frac{-1}{(1-a)(G-1)} > 0$$

**TESTABLE IMPLICATION 3:** *higher search cost leads to higher probability of contract renewal.*

**Tenant's problem:**

Although the landlord observes his /her decision to renew the contract, *h*, to the tenant, *h* is observed only as a probability *P*. Thus, at every period, the tenant could get a renewal with a probability *P* and a termination a probability (1-*P*). Upon termination, the tenant would have to incur a search cost $c^T$ to find another land with the same quality, thus identical production function.

Upon renewal, the tenant has two options: to cultivate the land when the land is in the landlord's hand, with probability *G* and to expropriate the land from the landlord with probability 1-*G*.

If the tenant expropriates the land, he will get an income of $\bar{S}$. However, the act of expropriation is not costless and thus the tenant will incur $C_E$ as the cost of expropriation.

With this, the tenant's problem is given by:

$$v = \max_e EV\left[ P(e)\left\{ G\left\langle aq\, f(e) - k(e)\right\rangle + (1-G)(\bar{S} - C_E)\right\} + (1-P(e))\left\langle aq\, f\,(e - k(e) - c^T\right\rangle\right]$$

(10)

The condition for optimality is given by:

$$\frac{\partial v}{\partial e} = \begin{bmatrix} \left\{ P_e\left[ G\left\langle aq\, f(e) - k(e)\right\rangle + (1-G)(\bar{S} - C_E)\right] + P(e)\left[ G\left\langle aq\, f_e - k_e\right\rangle\right]\right\} \\ -\left\{ P_e\left\langle aq\, f(e - k(e) - c^T\right\rangle\right\} + aq\, f_e - k_e \end{bmatrix} = 0 \qquad (11)$$

Which, with rearrangement will be :

$$\frac{\partial v}{\partial e}=\frac{\partial EV}{\partial p}\left\{(G-1)\left[P_e\left\langle aq\,f(e)-k(e)\right\rangle+aq\,f_e-k_e\right]+P_e\left[(1-G)(\bar{S}-C_E)-C^T\right]+aq\,f_e-k_e\right\}=0$$

$$where\,p=\left\{G\left\langle aq\,f(e)-k(e)\right\rangle+(1-G)(\bar{S}-C_E)\right\}+(1-P(e))\left\langle aq\,f(e-k(e)-c^T\right\rangle$$

(12)

Which is equivalent to[9]:

$$\frac{\partial v}{\partial e}=\frac{\partial EV}{\partial p}\left\{\begin{array}{l}(G-1)\left[P_e\left\langle aq\,f(e)-k(e)\right\rangle+aq\,f_e-k_e\right]\\+P_e\left[(1-G)(\bar{S}-C_E)-C^T\right]+aq\,f_e-k_e\end{array}\right\}=0$$

$$\frac{\partial v}{\partial e}=\left\{\begin{array}{l}(G-1)\left[P_e\left\langle aq\,f(e)-k(e)\right\rangle+aq\,f_e-k_e\right]\\+P_e\left[(1-G)(\bar{S}-C_E)-C^T\right]+aq\,f_e-k_e\end{array}\right\}=0 \qquad (14)$$

Interpretation:

1. The last two terms in the expression, $aq(f_e-k_e)$ give the standard conditions for determining the optimal level of effort under linear contracting (sharecropping).
2. The middle term, $P_e\left[(1-G)(\bar{S}-C_E)-C^T\right]$, gives the extra effort term due to contract renewal.
3. The first term $(G-1)\left[P_e\left\langle aq\,f(e)-k(e)\right\rangle+aq\,f_e-k_e\right]$ is what stands for the tenure insecurity effect and is non-positive because the maximum value G can attain is one. The term captures the disincentive to the tenant's effort from the landlord's tenure insecurity. The lower the G value (more tenure insecurity), the more negative the first term becomes. When G is one, the term disappears showing that there will not be a disincentive effect to the tenant once the landlord is fully tenure secure.

[9] Note that $\frac{\partial EV}{\partial p}$ disappears from the expression.

**TESTABLE IMPLICATION 4:** *the likelihood of contract renewal has a positive impact on productivity.*

**TESTABLE IMPLICATION 5:** *the landlord's tenure insecurity (and its interaction with the likelihood of contract renewal) has negative impact on productivity.* The results are in line with the model and empirical findings of Kassie and Holden (2005) in Western Gojjam, Ethiopia.

Like the landlord's case, we compare the optimal levels of effort where *G (g=1)* will be lower than *G(g=0).* Based on equation (14), the condition for optimal effort for *G (g=1) becomes,*

$$\frac{\partial v}{\partial e}(g=1)=\begin{Bmatrix}(G_{g=1}-1)\left[P_e\left\langle aq\,f(e)-k(e)\right\rangle+aq\,f_e-k_e\right]\\+P_e\left[(1-G_{g=1})(\bar{S}-C_E)-C^T\right]+aq\,f_e-k_e\end{Bmatrix}=0 \qquad (15)$$

Similarly, the condition for optimal effort for *G (g= 0) becomes,*

$$\frac{\partial v}{\partial e}(g=0)=\begin{Bmatrix}(G_{g=0}-1)\left[P_e\left\langle aq\,f(e)-k(e)\right\rangle+aq\,f_e-k_e\right]\\+P_e\left[(1-G_{g=0})(\bar{S}-C_E)-C^T\right]+aq\,f_e-k_e\end{Bmatrix}=0 \qquad (16)$$

In order to compare optimal levels of tenant's effort for land owned by male and female landlords, we set the following relationship:

$$\frac{\partial v}{\partial e}(g=1)\frac{\prec}{\succ}\frac{\partial v}{\partial e}(g=0) \qquad (17)$$

We take the difference between (15) and (16) , in order to determine the relationship in (17):

$$\frac{\partial v}{\partial e}(g=1)-\frac{\partial v}{\partial e}(g=0)=(G_{g=1}-G_{g=0})\left[P_e\left\langle aq\,f(e)-k(e)\right\rangle+aq\,f_e-k_e-(\bar{S}-C_E)\right] \qquad (18)$$

Since expression (18) is always negative, this implies that the optimal level of tenant's effort is lower on female owned plots than male owned plots.

**TESTABLE IMPLICATION 6:** *Due to tenure insecurity (and its interaction with the likelihood of contract renewal), female plots have lower productivity than male plots.*

## 4. The data

The data we use are taken from a survey of approximately 2000 households in two districts of the Amhara National Regional State, a region which encompasses part of the Northern and Central Highlands of Ethiopia. One of the Zones (Districts), East Gojjam is a fertile plateau receiving good average rainfall while the South Wollo zone is characterized by degraded hill side plots receiving lower and highly erratic rainfall.

This study employs information from about 230 landlord households among the 2000 households included in the survey. Almost all sample landlords engaged in the land rental market are included in this study. An overall sample of 130 male and 100 female landlords is included as a result.

As has been noted in the previous section, landlords may or may not engage in the land lease market, by virtue of which they are categorized as ' autarkic' , 'landlords' or 'tenants'. For those who engage in the land lease market, they might do so partially or fully i.e. by renting out all/part of the plots which belong to them. Table 1 presents nature and extent of participation in the land lease market by gender category.

The participation of female headed households in the land market is restricted to the leasing-out side of the market. Thus, for our purpose, landlord households (both male and female) are the relevant groups and our analysis is

restricted to male and female landlords who engage in the land lease market as landlords. While there are some households who lease out their land fully, a considerable proportion of them are owner-cum landlords who have some of their plots under their management. This would also give us the possibility to control for the leasing effect and analyse the impact of tenure insecurity on the decision to lease.

Table 2 presents the summary statistics and definition of the variables used in the regressions.

## 4. Empirical Methodology and Estimation Considerations

The aim of this section is to set up a framework for analyzing the relationship between land leasing behavior and its impact on the productivity of male and female owned plots. We intend to establish econometric relationships that would enable us empirically investigate the existence of significant productivity differences among male and female household heads. We also attempt to investigate if a significant proportion of the differences are attributable to differences in the working of the land market. To this effect, we study the relationships between three sets of factors. We start with specifying the relationships between gender of the household head and productivity. We then set the econometric relationships between contract duration and its determinants. Finally, we add contract renewal in the productivity regression.

### *4.1. The existence of gender-based productivity differentials*

As per the standard productivity analysis, plot-level productivity is determined by plot characteristics and household level characteristics. In addition, because some plots are traded, trade status is included as an additional determinant of productivity. Accordingly, the econometric relationship is specified as:

$$y_{ip} = a + wS_i + p X_{ip} + z T_{ip} + u_{ip} \quad (19)$$

Where for household i and plot p,

$y_{ip}$ is the value of output per ha

$S_i$ represents socio-economic characteristics including gender

$X_{ip}$ is physical farm characteristics of the plot

$T_{ip}$ is the plot's trade status

$a$, $w$ $p$ and $z$ are the respective coefficients to be estimated; and

$u_{ip}$ is an error term

Up to this point, we have ruled out the possibility that heterogeneities exist with respect to land leasing behaviour. In other words, equation (1) implicitly assumes that the choice to lease is a decision set by exogenous set of factors with no bearing on productivity. As argued in Section 2, however, differences in underlying tenure insecurity would lead to differences in the renewal of contracts. Sections 4.2 and 4.3 introduce heterogeneous tenure securities between households and assess the subsequent impact on productivity.

### *4.2. Contract Renewal*

The degree of insecurity a potential landlord has towards his/her land could affect land leasing behaviour. A tenure insecure landlord might have fear of losing the land to the tenant if the tenant stays on the same land for long. This could lead to reluctance to renew contracts. Thus, if as we argue, female landlords are less tenure secure, being a female will be a negative determinant of contract renewal. The econometric problem is represented by a bivariate probit model with sample selection. The estimation procedure involves two stages where in the first stage, a possible sample selection is addressed by estimating a selection equation for traded versus non-traded plots. In the second stage, a survival equation is estimated where the

dependent variable is contract renewal or not for the second stage. Plot characteristics are used in the first stage for determination of traded plots while these variables are excluded in the second stage where contract renewal is the decision. Accordingly, the selection equation is given by:

For the $i^{th}$ plot , the plot trade status equation is given by:

$$P_i = \begin{cases} 1 \; if \; b^P S_{ip} + g^P X_{ip} + u_{ip} > 0, \\ 0 \quad otherwise \end{cases} \tag{20}$$

Where $P_i$ is an indicator variable equal to 1 if plot is traded, $S_i$ is a vector of socio-economic characteristics, $X_i$ is a vector of physical farm characteristics and $u_i$ is an error term.

The survival equation is given by

$$R_{ip} = f + y X_{ip} + p S_i + h E_{ip} + mCl_{i_p} + mCl * G_{ip} + v_i \tag{21}$$

Where $S_i$ represents socio-economic characteristics including gender

$X_{ip}$ is physical farm characteristics of the plot

$Cl_{ip}$ is the number of years the tenant has managed plot p of household i ;

$E_{ip}$ is a set of variables measuring the enforcement ability of the landlord;

$T_i$ is the underlying tenure security variables

$Cl * G_{ip}$ is the interaction between gender and contract renewal

$R_{ip}$ is a dichotomous variable indicating whether contract will be renewed or not for the next production year.

### *4.3. Land leasing behaviour and productivity*

Considering heterogeneous land leasing behaviour implies taking contract renewal as an additional determinant of productivity.

Accordingly the productivity equation with contract renewal as an additional variable is given by : for the non-leased plots is given by:

$$y_{ip} = a + wS_i + p X_{ip} + z T_{ip} + R_{ip} + v_{ip} \quad (22)$$

Since contract renewal is endogenous in the above equation, OLS estimation would lead to biased and inconsistent estimates. Thus, we use an instrumental variable estimation where a predicted value of the contract renewal is used in estimating equation (22).

In order to construct the instrument for contract renewal, we formed groups of households by Kebele. With 12 kebeles in our sample, we ended up with 12 groups of households. The average contract renewal of all households within a group other than that of the household itself is calculated for each household to form the instrument for contract renewal.

Inorder to obtain the predicted value of contract renewal, we use the instrument and other determinants of contract renewal in the bivariate probit with selection framework.

## 5. Results

This section presents the empirical results from estimation of the productivity, contract renewal and extended_ productivity equations, respectively.

### *5.1. The effect of gender on productivity*

Table 4 presents the treatment-effects model estimation results for the pooled traded and non traded plots. The treatment variable is the trade status of a given plot while the effect variable is productivity. The coefficient for trade on the productivity equation is positive and significant indicating that there is a positive gain from trade,

holding other factors constant. On the other hand, female plots which are more likely to be traded than male owned plots, remain far less productive (see the shares of traded plots by gender on Table 1). This points to the possibility that female and male households do not benefit from land leasing equally.

In addition, farm size is a negative determinant of productivity indicating that our results support the inverse farm size-productivity relationship and its land market imperfection implication. Plot slope and plot fertility are negative and positive determinants of productivity respectively. The level of education and trainings attended exhibit no significant contributions. Fertilizer significantly and positively contributes to productivity.

As would be expected, households with more oxen are less likely to rent out land. Because of labour constraints, plots owned by female household heads are more likely to be rented out. However, bigger land area decreases the probability of renting out land.

### *5.2. Tenure insecurity and contract renewal*

Table 5 presents the estimation results from the survival analysis. The determinants of contract renewal considered include the landlord's & the tenant's characteristics, tenure insecurity variables and enforcement ability indicators. Female heads are significantly less likely to continue contracts with the same tenant than male heads. This is in line with our hypothesis that, because of their systematically lower tenure security, female heads would be reluctant to renew contracts with the same tenant. The other socio economic characteristics of the landlord i.e., the landlord's age, level of education and the number of adult family members are not significant. Of the tenant characteristics included, the number of oxen the tenant has is not a significant determinant of contract renewal which implies that because of oxen market

imperfections, tenants with many oxen might take contracts with too many landlords which might in turn impact on their productivity. Older tenants are less likely to get their contracts renewed.

Of the tenure security variables, the landlord's experience of land gain or loss and expectations of future changes in the land size are significant and negative determinants of contract renewal. However, expectation of future land redistribution is insignificant.

Contracts are less likely to be continued between male heads and blood related tenants. The effect is insignificant for female headed households. On the other hand, female landlords are likely to renew contracts with tenants who have blood relationship with the spouse (dead husband for instance). Under this particular case, coercion might be involved where female households are forcefully entering into and extending contracts to blood and spousal relations[10]. In addition, inability to monitor the tenant and satisfaction with the overall performance of the tenant are not significant. However, for female landlords the inability to monitor the tenant and satisfaction with the overall performance of the tenant are positive and significant indicating that coercion might be involved in some arrangements.

### *5.3. The determinants of productivity -extended*

Table 7 presents the ordinary least squares estimation for the determinants of productivity. Owing to possible heterogeneity in land leasing behaviour and its impact on productivity, we include contract renewal as an additional determinant. Since contract renewal is likely to be endogenous, we used the predicted contract renewal in

[10] This was revealed to us upon our discussion with some of the female respondents who mentioned that they enter into contracts with the relatives to the husband who believe that the land belongs to their brother (the woman's husband).

the regression[11]. The predicted value of contract renewal is obtained using estimates presented in table 6.

Compared to the productivity regression results in Table 4, many of the coefficients in this regression regime are insignificant. Particularly, the gender dummy and predicted contract renewal is insignificant.

Tenure insecurity, particularly, experience of change in landholdings is significant. Among the physical plot characteristics, steep-slope and infertile plots are significant negative determinants of productivity. Other socio-economic characteristics like age of the household are insignificant. However education of the household head is negative and significant. This could be the effect of landlords who go to school having less time to tend farming activities and particularly to monitor tenants.

**Conclusion**

Does gender discrimination have an impact on earnings and economic performances? This question has been widely examined in labor market studies where possibilities for differential wage payment exist. The paper assesses the possibility of discrimination against women and its impact on their productivity in a poor small farm setting where women are factor owners and employers.

Because the main agricultural activities are undertaken by men, in such settings, there are tendencies to disregard the role of women as farmers. This might lead to undermining their landlordship and weakening their bargaining positions in the land lease market.

The double moral hazard model of a landlord and a tenant allowed us to show the importance of landlord's tenure (in)security in determination of the optimal

[11] Contract renewal is for the coming production year while productivity is for the current production year.

current level of tenant's effort. Through probability of contract renewal as a factor linking landlord's expected search cost and tenant's effort, the underlying tenure security term is found to be positively related to tenant's effort. The finding is in line with our hypothesis that female heads that feel more tenure insecure are able to command less effort from the tenant. The model also showed that landlord's ability to enforce the terms of the contract as depicted by the tenant's reputational considerations has a positive impact on the optimal level of effort.

The empirical analysis started out by establishing that female owned plots exhibit significantly lower productivity. This is in line with the findings by other studies. Contract renewal, one link via which tenure insecurity leads to suboptimal level of effort, is found to be lower for female owned plots. Moreover, tenure insecurity is shown to have a lowering impact on contract renewal.

However, the relationship between productivity and contract renewal, was found not to be strong.

Given the long history of women's lack of property rights over their land, an important policy progress has been made by formally entitling them to land rights. One important implication of our result is that a full step forward with respect to empowering rural women in land rights requires their proper recognition as farmers which would enable them feel more tenure secure and have better bargaining power in the land lease market. At a more general level, this indicates that ensuring that informal grounds are levelled is important for obtaining expected results from a policy change.

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Table 1: Socioeconomic and endowment characteristics by the gender of the household head.

| | Socioeconomic characteristics | | | | | | |
|---|---|---|---|---|---|---|---|
| | age | education | Family size | Adult family members | Oxen | Livestock (tlu) | |
| Female | 52.71 (16.48) | 1.21 (0.61) | 4.05 (2.11) | 2.64 (1.28) | 0.34 (1.05) | 1.13 (1.86) | |
| Male | 55.67 (18.48) | 1.85 (0.95) | 6.00 (2.27) | 3.88 (1.69) | 0.80 (1.23) | 2.71 (3.01) | |
| | Tenure security indicators | | | | | | |
| | conflict | certificate | security | addition | loss | belong | |
| Female | 0.20 (0.41) | 1.19 (0.57) | 2.5 (0.88) | 0.072 (0.26) | 0.04 (0.19) | 1.78 (0.96) | |
| Male | 0.19 (3.97) | 1.17 (0.56) | 2.56 (0.94) | 0.063 (1.03) | 0.045 (0.21) | 2.06 (0.99) | |
| | Land market participation | | | | | | |
| | Area | Avge plot | Non-traded | Shared in | Shared out | Rented in | Rented out |
| Female | 1.04 (0.61) | 0.25 (0.19) | 0.32 (0.46) | 0 | 0.62 (0.48) | 0 | 0.07 (0.08) |
| Male | 1.79 (1.03) | 0.24 (0.08) | 0.45 (0.49) | 0.02 (0.14) | 0.47 (0.49) | 0.004 (0.64) | 0.015 (0.12) |

Table 2: DESCRIPTION OF VARIABLES Used in the regressions

| Variables | Description |
|---|---|
| **LANDLORD CHARACTERISTICS** | |
| EDUC1 | Head's formal education (1=read and write; 2= read only; 3=none) |
| HAGE1/age | Age of household head? |
| ADULTFS | The number of working-age family member of the landlord |
| FEMALE | Gender of the household head |
| ZONE | Zone the household belongs in |
| AREA | Total farm area (ha) |
| FERTILIZER | Amount of fertilizer applied (kg) |
| MANURE | Amount of manure applied (kg) |
| SLOPE1 | steep slope of the plot |
| SLOPE2 | medium slope of the plot |
| FERTILITY1 | fertile plot |
| FERTILITY2 | medium fertile plot |
| SOIL TYPE1 | merere (good soil water holding capacity) plot |
| **TENANT CHARACTERISTICS** | |
| AGECD | Tenant's age |
| TOXCD | The number of oxen owned by the tenant |
| **ENFORCEMENT** | |
| BTENANT | A dummy variable standing for whether the tenant is a blood relation or not (1=blood relation, 0=no) |
| STENANT | A dummy variable standing for whether the tenant is an in-law or not |
| FBTENANT | Whether the tenant is a blood relation given that the landlord is female |
| FSTENANT | Whether the tenant is an in-law given that the landlord is female |
| SATISFIED | Whether the landlord is satisfied with the performance of the tenant (1=satisfied, 0=otherwise) |
| FSATISFIED | Whether the landlord is satisfied with the performance of the tenant given that the landlord is female |
| | Whether the landlord is unable to monitor the activities of the tenant (1=unable to monitor, 0=otherwise) |
| INABILITY | Whether the landlord is unable to monitor the activities of the tenant and the landlord is female |
| | The number of years the particular plot has been managed by the current tenant |
| FINABILITY | The number of years the particular plot has been managed by the current tenant given that the landlord is |

| | |
|---|---|
| | female |
| Contract length | |
| Contract length*female | **VARIABLES** |
| | Whether the landlord expects increase, no change or decrease in the land size in the coming five years (1=decrease 2=no change 3=increase) |
| **TENURE SECURITY** | Whether the landlord has experienced change in the landlordship in the last |
| Security | Five years (1=change, 0=no change) |
| | Whether the landlord has experienced any conflict regarding the land |
| Changeland | |
| Conflict | The value of production per ha. |
| | The trade status of the plot (1= traded, 0=owner-operated?) |
| **DEPENDENT /ENDOGENEOUS** | The type of rental arrangement the land is under: fixed rent, sharecropping with premium, sharecropping and cost sharing (codes used??) |
| productivity | |
| Contract renewal | |
| Trade | |
| Contract Choice | |

Table 3: Summary statistics of variables used in the regressions

| Dependent Variable | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|
| 0utput Val./ha | 1629.588 | 2627.678 | 91.58787 | 41729.07 |
| Renewal | .7118476 | .2882522 | 0 | 1 |
| trade | .5998623 | .4000948 | 0 | 1 |
| **Landlord's socio economic characteristics** | | | | |
| female | .3700348 | .482982 | 0 | 1 |
| hage1 | 57.10732 | 17.27825 | 13 | 95 |
| heduc1 | 1.533101 | .8520947 | 1 | 3 |
| adultfs | 3.525436 | 1.69498 | 1 | 9 |
| **Landlord's physical farm characteristics and plot level input application** | | | | |
| slope1 | .0224079 | .1480341 | 0 | 1 |
| slope2 | .3653627 | .4816232 | 0 | 1 |
| fertility1 | .3159894 | .464997 | 0 | 1 |
| fertility2 | .4379035 | .4962233 | 0 | 1 |
| soiltype1 | .2650968 | .4414686 | 0 | 1 |
| area | 1.476343 | .9648846 | 0 | 4.52025 |
| manure | 31.58342 | 114.4419 | 0 | 1140 |
| fertilizer | 13.68792 | 156.4746 | 0 | 5000 |
| **Tenant's socio economic characteristics** | | | | |
| oxcd | 1.894108 | 1.107422 | 0 | 8 |
| agecd | 24.60692 | 27.32757 | 10 | 91 |
| **Tenure security variables** | | | | |
| changeland | .1725125 | .3779606 | 0 | 1 |
| security | 2.508232 | .9587313 | 1 | 4 |
| conflict | .198282 | .3988485 | 0 | 1 |
| **Enforcement and contract Variables** | | | | |
| clength | 4.467254 | 3.537878 | 1 | 20 |
| female*clength | 2.367704 | 4.054094 | 0 | 20 |
| instrument | .73782 | .2277116 | .1473684 | .9767442 |
| better | .5895465 | .8470845 | 0 | 2 |
| hardwork | .4347202 | .6566024 | 0 | 3 |
| tenantb | .3902611 | .487981 | 0 | 1 |
| stenant | .0769231 | .2665634 | 0 | 1 |
| kinf | .8678414 | .7790105 | 0 | 2 |

Table 4: Treatment-Effect estimates of Pooled Plot-level determinants of productivity

| Productivity Equation | | Plot's trade status selection equation | |
|---|---|---|---|
| female | -639.995 | female | -0.033 |
| | (143.513)*** | | (0.114) |
| hage1 | 1.684 | hage1 | 0.005 |
| | (3.914) | | (0.003)* |
| heduc1 | -73.616 | heduc1 | -0.106 |
| | (80.269) | | (0.056)* |
| adultfs | 103.235 | adultfs | -0.182 |
| | (45.345)** | | (0.042)*** |
| Fertility1 | 133.378 | Fertility1 | -0.127 |
| | (85.293) | | (0.161) |
| Fertility2 | 471. 041 | Fertility2 | -0.104 |
| | 596.211 | | (0.146) |
| Slope1 | -181.480 | Slope1 | 0.046 |
| | (107.699)* | | (0.078) |
| Slope2 | 119.598 | Slope2 | -0.144 |
| | (103.060) | | (0.059)** |
| Soiltype1 | 262.432 | Soiltype1 | 7.523 |
| | 213.048 | | (12.024) |
| area | -270.905 | area | -0.226 |
| | (86.234)*** | | (0.054)*** |
| manure | 0.330 | security | -0.125 |
| | (0.616) | | (0.045)*** |
| fertilizer | 13.231 | confilct | 0.160 |
| | (3.336)*** | | (0.107) |
| trade | 211.516 | changeland | 0.014 |
| | (458.287) | | (0.120) |
| Constant | 1,545.407 | Constant | 1.566 |
| | (591.686)*** | | (0.330)*** |

**Table 5: Bivariate Probit Model with Selection Estimation Results for the Likelihood of Contract Renenwal on Rented Plots.**

| | Survival Equation<br>**Contract renewal** | Plot Rent Equation<br>**Rented out plot** |
|---|---|---|
| security | 0.070 | |
| | (0.077) | |
| experience of change in land size | -1.124 | |
| | (0.223)*** | |
| female | -0.888 | 0.215 |
| | (0.324)*** | (0.095)** |
| age | 0.005 | 0.005 |
| | (0.005) | (0.003)* |
| education | 0.155 | 0.102 |
| | (0.112) | (0.054)* |
| adult family size | -0.048 | -0.152 |
| | (0.065) | (0.026)*** |
| conflict | 0.098 | |
| | (0.196) | |
| btenant | -0.536 | |
| | (0.215)** | |
| bftenant | 0.661 | |
| | (0.351)* | |
| stenant | -0.112 | |
| | (0.419) | |
| sftenant | 0.402 | |
| | (0.546) | |
| tagecd | -0.332 | |
| | (0.094)*** | |
| toxcd | 0.073 | |
| | (0.067) | |
| inability | 0.118 | |
| | (0.336) | |
| finability | -1.508 | |
| | (0.545)*** | |
| satisfied | 1.127 | |
| | (0.234)*** | |
| Fsatisfied | 0.366 | |
| | (0.319) | |
| hl | 0.042 | |
| | (0.049) | |
| clength | 0.023 | |
| | (0.034) | |
| slope1 | | 0.431 |
| | | (0.212)** |
| slope2 | | -0.271 |
| | | (0.101)*** |
| fertility1 | | 0.138 |
| | | (0.127) |
| fertility2 | | 0.089 |
| | | (0.090) |
| soiltype1 | | 0.587 |
| | | (0.282)** |
| Constant | 1.108 | 0.154 |

| | |
|---|---|
| (0.549)** | (0.240) |

Standard errors in parentheses
** significant at 5%; *** significant at 1%

**Table 6: Bivariate Probit Model with Selection Estimation Results for the Likelihood of Contract Renenwal on Rented Plots.**

| | Survival Equation | Plot Rent Equation |
|---|---|---|
| | **Contract renewal** | **Rented out plot** |
| instrumen | 1.453 | |
| | (0.447)*** | |
| security | 0.057 | |
| | (0.079) | |
| changeland | -1.090 | |
| | (0.218)*** | |
| hsex | -0.693 | 0.214 |
| | (0.341)** | (0.095)** |
| hage1 | 0.007 | 0.005 |
| | (0.005) | (0.003)* |
| heduc1 | 0.188 | 0.104 |
| | (0.116) | (0.054)* |
| adultfs | -0.054 | -0.152 |
| | (0.065) | (0.026)*** |
| confilct | 0.078 | |
| | (0.203) | |
| btenant | -0.537 | |
| | (0.217)** | |
| fbtenant | 0.510 | |
| | (0.354) | |
| stenant | -0.087 | |
| | (0.448) | |
| sftenant | 0.235 | |
| | (0.576) | |
| tage | -0.353 | |
| | (0.097)*** | |
| toxcd | 0.067 | |
| | (0.067) | |
| inability | 0.212 | |
| | (0.359) | |
| finability | -1.543 | |
| | (0.554)*** | |
| satisfied | 1.184 | |
| | (0.232)*** | |
| fsatisfied | 0.248 | |
| | (0.331) | |
| hl | 0.042 | |
| | (0.050) | |
| clength1 | 0.023 | |
| | (0.035) | |
| slope1 | | 0.431 |
| | | (0.213)** |
| slope2 | | -0.271 |
| | | (0.101)*** |
| fertilit1 | | 0.147 |
| | | (0.126) |
| fertilit2 | | 0.090 |
| | | (0.090) |
| soiltype1 | | 0.580 |
| | | (0.283)** |
| Constant | -0.150 | 0.146 |
| | (0.718) | (0.240) |

Standard errors in parentheses
** significant at 5%; *** significant at 1%

Table 7: **Ordinary Least Squares Estimates of Household Level Determinants of Productivity**

| | **Value of output per hectare** |
|---|---|
| Contract | -48.107 |
| Renewal | (84.647) |
| (predicted) | |
| security | -34.050 |
| | (43.624) |
| experience | |
| of change in | |
| land size | -718.158 |
| | (85.798)*** |
| female | -104.808 |
| | (96.595) |
| age | -1.309 |
| | (2.273) |
| education | -123.720 |
| | (43.127)*** |
| adult | |
| family size | 42.171 |
| | (26.231) |
| slope1 | 162.231 |
| | (183.983) |
| slope2 | 358.656 |
| | (101.833)*** |
| fertility1 | 126.419 |
| | (124.087) |
| fertility2 | -189.266 |
| | (71.797)*** |
| soiltype1 | -392.578 |
| | (259.905) |
| conflict | 187.318 |
| | (109.364)* |
| Constant | 1,668.330 |
| | (258.016)*** |
| Observations | 1687 |
| R-squared | 0.10 |

Standard errors in parentheses
** significant at 5%; *** significant at 1%