

Rural Credit Market and the Choice of Tenurial Contracts: A Micro Evidence from Rural West Bengal, India

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An attempt has been made in the paper to shed some lights on the economic rationale of the coexistence of alternative tenurial contracts in agrarian institutions. To provide adequate explanations of economic rationale under alternative tenurial contracts, a theoretical conceptualisation has been made to identify the role of credit in contract choices. The theoretical model suggests that choice of a particular contract is determined by the joint influence of credit accessibility of tenants and the lending potentiality of the landlords. The propositions derived from the model have been tested empirically using firm field data from rural West Bengal under the specification of both *Simultaneous* and *Sequential Choice Models*. Empirically both the versions of the empirical model establish the instrumental role of credit in determining the choice of a particular contract among a set of possible contracts.

I. INTRODUCTION

Rural credit transaction and agrarian institution of tenancy are two widely discussed and debatable issues in development literature (Bardhan 1989). In an agricultural mode of production, tenancy can be considered as an institution in which landlord leases out his land to a tenant who cultivates the land and gives a fixed proportion of the total output (in cash or in kind) to the landlord. The most important and widely used tenurial practices are fixed rent, pure sharecropping and cost sharing tenancy. Co-existence of multiple contracts is also prevalent not only in the same region, but also within the same village (Laha 2009). In fact, Shaban (2000) in his study of eight Indian villages finds different contractual arrangements on adjoining plots of land. The predominance of one particular contract over another is undoubtedly due to complex historical, political and sociological factors

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specific to different regions. But an economist persists in believing that at least some of the variations may be explained by economic structural factors (Bardhan 1984). However, empirical evidences analyzing factors affecting the choice of contracts are relatively scanty in the literature (Laffont and Matoussi 1995, Chaudhuri and Maitra 1997). Existing studies on contract choice are exclusively dependent on simultaneous choice framework where the landlord and tenant simultaneously choose one contract out of a set of alternative possible contracts. Chaudhuri and Maitra (1997) suggested an alternative specification of tenurial choice where choice of contract is considered as a sequential decision-making process. In the first stage of the process, it determines whether a particular plot of land is cultivated by the owner or is leased out to be cultivated by a tenant. In the second stage, conditional on the plot being cultivated by a tenant, it determines whether the plot is under fixed rent, pure sharecropping or cost sharing arrangement. However, the role of credit in the choice of contract has not been explained in either of these model specifications. The availability of rural credit seems to play an important role in the choice of contract using both the Simultaneous and Sequential Choice Models. This paper attempts to explore the role of credit in the choice of tenurial contracts.

Under this backdrop, with a theoretical framework, this paper examines the problems of contract selection under alternative tenurial choices and explores broadly the role of rural credit in contract selection. The propositions of the theoretical model have been tested empirically using primary data of rural West Bengal¹ both under Simultaneous and Sequential Choice Models. For the convenience, the paper is divided into six sections. The next section explores the nature of tenancy contracts in our surveyed villages. A theoretical model has been outlined in Section III by modifying the model of Tibako (2003) to consider the role of credit availability on the various forms of tenancy.² Section IV deals with the

¹ Taking into consideration the co-existence of the incidence of tenancy and the extent of rural credit transactions, the study purposively selected a particular block, namely Raina I, from the district of Burdwan in West Bengal. The block, Raina I, is comprised of two distinct agro climatic zones—one, with canal irrigation and the other zone with rain-fed farms. A two stage sampling design was followed in order to select the households of the survey. In the first stage, the villages, namely, Saktia and Anguna from Mugura village panchayat, were chosen as a relatively well communicated and infrastructural developed villages, whereas the villages, like Dhamash and Boro, were chosen from Natu village panchayat as underdeveloped villages under the same criteria. In the second stage, 203 households were purposively chosen covering the different categories of farmer households.

² Tikabo (2003) developed a theoretical model to explore the coexistence of alternative tenurial contracts in the land rental market of Eritrea. In the absence of missing credit market

empirical estimation of theoretical propositions under Simultaneous and Sequential Choice Models. Results and discussions are presented in section V. The conclusions appear in section VI.

II. NATURE OF TENURIAL CONTRACT

Tenancy is an agrarian institution in which landlord leases out his land to a tenant who cultivates the land and gives a fixed proportion of the total output (in cash or in kind) to the landlord. The most important and widely used tenurial practices are fixed rent tenancy, sharecropping with cost sharing and without cost sharing arrangement.³ Coexistence of all three forms of contracts is prevalent in our surveyed villages. Out of 203 households surveyed, we have come across 106 households that are involved in different types of tenancy contracts. The classification of households under alternative forms of tenancy (Table I) reveals the fact that landless and marginal farmers are predominantly (87.73 per cent of cases) lease in land from large landlords. About 52.22 per cent of total surveyed households are engaged in lease in land market. Out of 106 cases, 37 cases are reported under fixed rent tenancy; and in 33 cases,⁴ sharecropping is the mode of tenurial contract. But sharecroppers are not a homogeneous group of tenants. There is wide variation in the sharing of output between landlord and tenant even under sharecropping mode of cultivation. The dominant practice (44 per cent of cases) is 1/2:1/2 crop sharing where landlord bears a part of total cost. If the tenant bears the full cost of cultivation, the output sharing ratio becomes 3/4:1/4 and 2/3:1/3. Thus, there is a negative association between cost sharing and output sharing.

in the theoretical formulation, household wealth serves as a source of liquidity. On the basis of the assumption, both the tenant and landlord choose a particular contract in response to its liquidity status defined by its wealth.

³ Under fixed rent tenancy, the landlord leases out the land to the tenant and in return asks for a fixed rental payment. The sharecropping is a form of tenurial contract under which tenant leases in land from the landlord and shares the output under predetermined contractual arrangement. The sharecropping is again of two types. The cost sharing sharecropping under which the landlord shares the cost of factor of production usually in the same proportion as the share of output. On the other hand, under the arrangements of the sharecropping without cost sharing tenants bear the full cost of production and the proportion of output share to the landlord is usually smaller than under cost-sharing arrangement. Inclusion of cost sharing arrangement in our analysis is particularly relevant in view of the widespread prevalence of the arrangement as a part of the tenancy contract, which is a striking new phenomenon in Indian agriculture (Bardhan 1984).

⁴Twenty four cases are associated with pure sharecropping (i.e. no cost sharing) and 9 cases are associated with cost sharecropping.

TABLE I
**DISTRIBUTION OF TYPES OF TENANCY UNDER DIFFERENT
 CATEGORIES OF HOUSEHOLDS**

Types of contracts	Category of households					
	AGL	MRF	SMF	MID	LF	ALL
Fixed rent tenancy	10 (28.57)	24 (41.38)	1 (11.11)	1 (33.33)	1 (100.00)	37 (34.90)
Pure sharecropping	6 (17.14)	13 (22.41)	4 (44.44)	1 (33.33)	0 (0.00)	24 (22.64)
Cost sharing	5 (14.29)	4 (6.90)	0 (0.00)	0 (0.00)	0 (0.00)	9 (8.49)
Both fixed rent and sharecropping	14 (40.00)	17 (29.31)	4 (44.44)	1 (33.33)	0 (0.00)	36 (33.96)
Total	35 (100.00)	58 (100.00)	9 (100.00)	3 (100.00)	1 (100.00)	106 (100.00)

Source: Field Survey 2006-07.

Note: AGL=Agricultural labourers, MRF=Marginal farmers, SMF=Small farmers, MDF=Medium farmers, LF=Large farmers.

It is interesting to note that the choice of tenurial contracts has an important bearing on cropping pattern in agricultural production. Fixed rent tenancy is observed to be inclined upon the production of capital intensive crop (potato and boro cultivation). This is because wealthy tenants, who generally prefer fixed rent form of tenancy, can take the whole risk associated with cultivation. On the other hand, sharecropping tenants are mostly interested in cultivating those crops (aman paddy, til and mustard cultivation) which can meet their subsistence requirements and are labour intensive in nature.

Another important factor which influences the choice of tenurial contract is the availability of credit for agricultural operation. The tenants who have access to institutional credit predominantly prefer fixed rent form of tenancy. On the contrary, tenants with the access to informal source of credit (mainly landlords) prefer sharecropping form of tenancy. The segmentation of credit market in our survey area has a natural consequence of differential interest rates in formal and informal credit markets and even within a heterogeneous informal credit market. Commercial and cooperative banks charge 7 to 12 per cent per year,⁵ whereas informal interest rates (implicit in many cases) vary from as high as an average of

⁵ Higher interest rate in cooperative bank represents an additional insurance premium over and above the lending rate of interest.

104 per cent per year (from moneylenders) to a nil interest rate (from friend and relatives).

TABLE II
CONTRACTUAL ARRANGEMENTS AND THE NATURE OF
CROPPING PATTERN

Cropping pattern	Owner cultivation	Fixed rent tenancy	Sharecropping tenancy	Cost sharecropping tenancy
Aman paddy	154 (49.20)	11 (11.23)	34 (57.64)	29 (78.38)
Boro paddy	30 (9.58)	27 (27.55)	2 (3.39)	0 (0.00)
Potato	55 (17.58)	47 (47.96)	1 (1.69)	1 (2.70)
Mustard	31 (9.90)	4 (4.08)	5 (8.47)	4 (10.81)
Til	30 (9.58)	5 (5.10)	13 (22.03)	3 (8.11)
Wheat	4 (1.28)	1 (1.02)	2 (3.39)	0 (0.00)
Others	9 (2.88)	3 (3.06)	2 (3.39)	0 (0.00)
All crops	313 (100.00)	98 (100.00)	59 (100.00)	37 (100.00)

Source: Field Survey 2006-07. Figures in parentheses refer to percentage in total.

III. TENURIAL CONTRACTS: THE MODEL

The choice of tenurial contract is a simultaneous process of interaction between the tenant and the landlord. Interestingly, the prevalence of horizontal interlinkage between formal and informal credit markets is a predominant feature of rural credit transactions. In horizontal interlinkage, formal sector banks compete directly with informal intermediaries in the provision of credit and the crucial link between the two markets is provided by the spill-over of excess demand from the formal credit market to the informal credit market. The assumption of horizontal interlinkage is plausible in the context of rural economy of developing countries where the credit market is often found to be imperfect. In such imperfect rural credit market, the collateral poor tenant households are unlikely to get access to formal financial institutions and the demand for credit of the tenant households is expected to spillover to informal markets where landlords would be an effective alternative. Accordingly, the demand for and the supply of credit plays an important role in the choice of a suitable contractual arrangement. It is assumed that there is a variation in the accessibility of credit of lessor households under various contractual arrangements. However, the return of output with respect to credit is assumed to be uniform across alternative forms of contract. Both landlords and tenant compare the alternative pay off functions under various tenurial contracts for the choice of

effective contract negotiation. The pay off functions under various contract negotiations are assumed to be a function of credit. It is further assumed that the contract partners discount the future return from farming activity at a constant rate which is simply the weighted average of formal and informal interest rates. The discount rate ρ is defined as $\rho = \frac{1}{1+i}$ where i is defined as the weighted average of formal and informal interest rates.⁶

III.1 The Tenant's Problem

Now the tenant household chooses a specific contract in response to its availability of loan (L^1) by comparing the pay-offs from the different contracts. Thus, we have the following pay-off functions for the different contracts:

$$\text{Fixedrent(F)} : \Pi(F(L^1)) = \alpha_f \rho^t (i) P_q q_F^t(A_F^t, x_F^t, L_F^t) - (r_F A_F^t + P_x x_F^t)(1+i)$$

$$\text{Sharecropping(S)} : \Pi(S(L^1)) = \alpha_s \rho^t (i) P_q q_s^t(A_s^t, x_s^t, L_s^t) - (P_x x_s^t)(1+i)$$

$$\text{Costsharing(C)} : \Pi(C(L^1)) = \alpha_c \rho^t (i) P_q q_c^t(A_c^t, x_c^t, L_c^t) - (\alpha_c P_x x_c^t)(1+i)$$

where superscript t implies tenant, q^t is a twice differentiable concave production function for the tenant, A_k^t, x_k^t ($k \in F, S, C$) are tenanted land and purchased inputs used in production for each contract respectively, r_F, P_q and P_x are exogenously given prices of rental, output and purchased inputs, α_k ($k \in F, S, C$) ($0 < \alpha_c < \alpha_s < \alpha_f = 1$) are tenant's share of output in each contract respectively.

III.2 The Landlord's Problem

The landlord also compares pay-offs from the different contracts and chooses the ones that give the highest pay-off in response of his capacity to provide the necessary credit (L^1) to his tenant. Thus, we have the following pay-off functions for the different contracts:

$$\text{Fixedrent(F)} : \Pi(F(L^1)) = r_F A_F^r + iL_F$$

$$\text{Sharecropping(S)} : \Pi(F(L^1)) = (1 - \alpha_s) \rho^1 (i) P_q q_s^1(A_s^r, x_s, L_s) + iL_s$$

$$\text{Costsharing(C)} : \Pi(F(L^1)) = (1 - \alpha_c) \rho^1 (i) P_q q_c^1(A_c^r, x_c, L_c) - (1 - \alpha_c) P_x x_c + iL_c$$

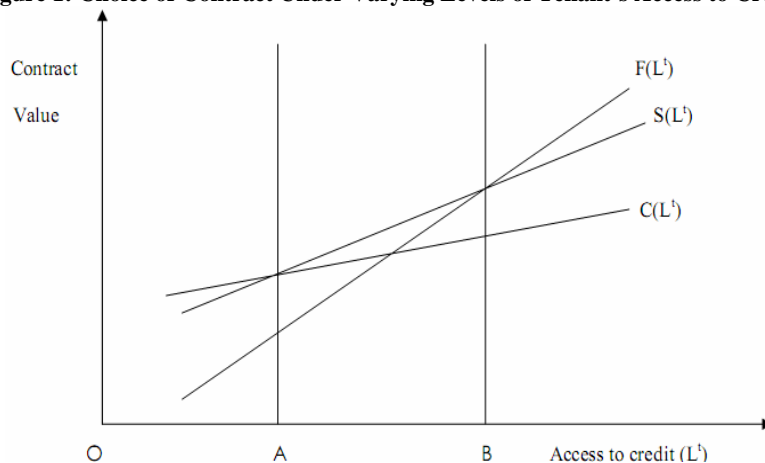
⁶ See Pender (1996) for details.

where superscript l implies landlord, L_F , L_s and L_c are the amount of credit provided by the landlord to fixed renters, pure sharecropping and cost-sharing tenants respectively. All other notations apply usually as mentioned in the tenant's problem.

III.3 Availability of Credit and Contract Choice: A Diagrammatic Presentation

Figure 1 presents the expected pay-off of tenants for each contract as a function of the tenants' access to credit. The contract value of each contract is measured along the vertical axis, while tenant's access to credit is measured in the horizontal axis. The differences in share parameters are reflected in the differences in slopes of the curve under alternative contract choices.⁷ Cost sharing is more profitable than the pure sharecropping and fixed rent contract at low level of availability of credit. At a low availability of credit ranged at OA, the demand for credit of the tenant household is spillover to informal markets where the landlord will provide necessary finance to them. This is evident as the expected pay-off of cost sharing contract is much higher than other contractual forms. The order is reversed when the credit accessibility is sufficiently high to allow the domination of fixed rent contract over the other contractual arrangements. Sufficient accessibility of credit is shown by a range of credit above point B in the diagram. At intermediate access to credit level (in the range AB in the diagram), pure sharecropping is preferable to cost sharing and fixed rent tenancy.

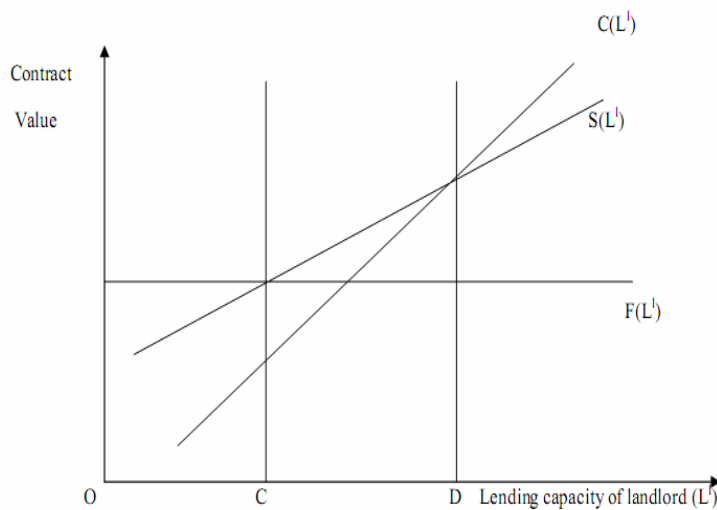
Figure 1: Choice of Contract Under Varying Levels of Tenant's Access to Credit



⁷ This is plausible in view of our earlier assumption that the return of output with respect to credit is uniform across alternative forms of contract.

Similar to tenant, Figure II presents the landlord's expected pay-off for each contract. In the vertical axis the contract value is measured, while lending capacity of the landlord is measured along the horizontal axis. At the low level of lending capacity of the landlord at the range of OC, the fixed rent contract is more profitable than pure sharecropping and cost sharing i.e. the expected pay-off of fixed rent contract lays above all other forms of contract. In other words, it is consistent with earlier our diagrammatic representation that fixed rent tenants have an access to institutional sources of credit market. So they are less dependent on landlords to meet their production as well as consumption needs. On the other hand, the order of choice of contracts is reversed at high level of lending capacity above point D, as cost sharing is more profitable to the landlord than sharecropping and fixed rent tenancy. At intermediate lending capacity (in the range of CD in the diagram), pure sharecropping dominates all fixed rent and cost sharing arrangements.

Figure 2: Choice of Contract under Varying Levels of Lending Capacity of the Landlord



The main theoretical proposition derived from the model is that choice of a particular contract is determined by the interaction of both the credit accessibility of tenants and the lending potentiality of the landlord. In particular, cost sharing contract is preferable to both of them when tenant has low availability of credit from institutional sources and high level of lending capacity of the landlord. Thus

cost sharing contract is a *choice for credit unconstrained landlord and credit constrained tenant*.⁸ This empirical evidence is particularly relevant in the context where the access to credit varies according to the landownership pattern of tenant households. On the other hand, fixed rent contract is preferable in a situation of simultaneous occurrence of both sufficient availability of institutional credit of the tenant and low level of lending capacity of the landlord. Thus fixed rent contract is a *choice for credit constrained landlord and credit unconstrained tenant*. In an intermediate access of credit to the tenant and lending capacity of the landlord, pure sharecropping is preferable to both cost sharing and fixed rent contracts.

IV. CONTRACT SELECTION: SIMULTANEOUS AND SEQUENTIAL CHOICE MODEL

IV.1 Simultaneous Choice Model: An Econometric Specification

At first, we assume that choice of contract under which each plot is cultivated is a simultaneous decision. To consider the factors determining the choice of contract, a variety of qualitative response models can be suggested (Chaudhuri and Maitra 1997). Since the observed choice of contracts represents ordered or ranked categories, a suitable version of Ordered Probit Qualitative Response Model (Zavoina and Mc Elvey 1975) is used to analyse the present problem.⁹ In the Ordered Probit Model, a variable contract (CT) is defined as

$$\begin{aligned} \text{CT} &= 0 \text{ if the plot is under cost sharing} \\ &= 1 \text{ if the plot is under pure sharecropping} \\ &= 2 \text{ if the plot is under fixed rent tenancy} \\ &= 3 \text{ if the plot is under owner cultivation} \end{aligned}$$

To examine the choice of contract for each plot, we assume that there is an underlying response variable CT^* , defined by the following latent regression specification, $\text{CT}^* = \beta^* x + u$ where the error term u is distributed normally with

⁸ In the case of tenant household, the term “credit constraint” is narrowly defined by the non-availability of credit from formal financial institution. On the other hand, in the case of landlord household, the term actually implies inability of the landlord to provide credit to the tenant households.

⁹ Similar model was used in a number of studies like Choudhuri and Maitra (1997), Laffont and Matoussi (1995) and Tikabo (2003).

zero mean and unit variance.¹⁰ Here CT^* is unobservable latent variable determined by the observed value of the contract, CT such that

$$\begin{aligned} CT &= 0 \text{ if } CT^* \leq 0 \\ &= 1 \text{ if } 0 < CT^* \leq \mu_1 \\ &= 2 \text{ if } \mu_1 < CT^* \leq \mu_2 \\ &= 3 \text{ if } CT^* > \mu_2 \end{aligned}$$

where μ s are unknown parameters to be estimated with β . Since we assume μ is normally distributed across observations, we now have the following probability that the land is under alternative forms of contracts as

$$\begin{aligned} \text{Pr ob}(CT = 0 / x, \beta, \mu) &= F(-\beta x) \\ \text{Pr ob}(CT = 1 / x, \beta, \mu) &= F(\mu_1 - \beta x) - F(-\beta x) \\ \text{Pr ob}(CT = 2 / x, \beta, \mu) &= F(\mu_2 - \beta x) - F(\mu_1 - \beta x) \\ \text{Pr ob}(CT = 3 / x, \beta, \mu) &= 1 - F(\mu_2 - \beta x) \end{aligned}$$

where F is the cumulative distribution function of u . The threshold values μ s are estimated along with the β coefficients by maximising the log likelihood function:

$$L(\beta, \mu) = \sum_{CT=0} \ln(F(-\beta x)) + \sum_{CT=1} \ln(F(\mu_1 - \beta x) - F(-\beta x)) + \sum_{CT=2} \ln(F(\mu_2 - \beta x) - F(\mu_1 - \beta x)) + \sum_{CT=3} \ln(1 - F(\mu_2 - \beta x))$$

Result of the maximum log likelihood function is obtained by using sophisticated statistical package like E-Views. The package uses analytic second derivative methods to obtain parameter and variance matrix of the estimated coefficient estimates.

IV.2 Sequential Choice Model: An Econometric Specification

Chaudhuri and Maitra (1997) suggested an alternative specification of tenurial choice where choice of contract is considered as a sequential decision-making process. A similar analytical framework of sequential choice model is followed in our study with the following modifications:

- In our study, the availability of credit is disaggregated into formal and informal sources in accordance with our theoretical framework. Loan from landlord is a

¹⁰ Logistic distribution could be used as an alternative. Normal distribution is considered purely for convenience. The logistic and normal distributions generally give similar results in practice.

particular interest to us as it is hypothesized that it has an impact on the particular production risk sharing attributes and hence popularized cost sharing contracts.

- In the second stage of sequential choice model, contract type is further disaggregated into three types, i.e. fixed rent, pure sharecropping and cost sharing. Each of the contracts has a significant representation in our sample, and hence the power of the test in the second stage is not seemed to be a suspected one.

In the first stage of sequential choice model, we define a binary variable, mode of cultivation (MC), as MC = 0 if the plot is under owner cultivation
 = 1 if the plot is under tenant cultivation

To determine the mode of cultivation for each plot, we assume, as before, an underlying response variable, MC^* , defined by the latent regression specification $MC^* = \beta x + u$ --- (i). MC^* is unobservable latent variable determined by the observed value of contract, MC. The values of β coefficients are estimated by maximising log likelihood function as follows:

$$L(\beta) = \sum_{MC=0} \ln F(-\beta x) + \sum_{MC=1} \ln F(\beta x)$$

In the second stage, we have a censored sample of tenant cultivation under alternative tenurial contracts, like fixed rent, pure sharecropping and cost sharing. To capture the determinants of choice of tenurial contracts, a binary variable, alternative tenurial arrangements (TT), is defined as

TT = 0, if the plot is under cost sharing
 = 1, if the plot is under pure sharecropping
 = 2, if the plot is under fixed rent

The underlying response variable for TT is TT^* defined by the linear regression $TT^* = \gamma x + \varepsilon$ --- (ii) where $\varepsilon \approx IN(0, \sigma_\varepsilon^2)$. In the second stage, we have a censored sample in the sense that TT is observable only when MC=1. Thus, four possible outcomes can be observed

1. MC=0
2. MC=1, TT=0
3. MC=1, TT=1
4. MC=1, TT=2

The equations (i) and (ii) together constitute a Bivariate Qualitative Dependent Variable Model that exhibits a form of partial observability.¹¹ The joint approach

¹¹ In this approach log likelihood function (following Meng and Schmidt 1985) should be maximised to estimate the parameters.

offer efficiency gains over those obtained via separate estimation of these two equations. This approach corrects the potential sample selection bias that could be incurred in separate estimation of these two equations as the approach accounts for the potential correlation between the two equations.

IV.3 The Choice of Explanatory Variables and Hypotheses

The description of explanatory variables¹² and hypothesis (as specified by expected sign) in both the Simultaneous and Sequential Choice Models are presented in Table III.

TABLE III
HYPOTHESES: EXPECTED SIGN OF THE EXPLANATORY VARIABLES

Independent Variables	Notation	Description	Model Specification		
			Simultaneous Choice Model (Dep.Var. CT)	Sequential Choice Model	
				First Stage (Dep.Var . MC)	Second Stage (Dep.Var . TT)
Age of the head of the household	HHAGE	Age in years	-	+	-
Experience of the head of the household	HHEXP	Squared of age in years ¹³	+	-	+
Sex of the head of the household	HHSEX	Dummy variable, 1 for male and 0 for female	-	+	-
Size of the family	F SIZE	Family members in unit	-	+	-
Dependency ratio	DEPEND	Dependent members as a ratio of total working members	+	-	+
Value of land	V LAND	Value of land (in Rs.)	+	-	+
Irrigated land area	IRRILAND	Irrigated land area (in bigha ¹⁴)	+	-	+
Operated land for a particular contact	OPRT	Operated land (in bigha)	+	-	+

(Table III Contd.)

¹² The summary statistics related to the explanatory variables are given in Appendix-I.

¹³ In the literature on development economics, the experience of the household is approximated by the squared of age of the household.

¹⁴ 7.2 bigha of land = 1 hectare.

Independent Variables	Notation	Description	Model Specification		
			Simultaneous Choice Model (Dep.Var. CT)	Sequential Choice Model	
				First Stage (Dep.Var . MC)	Second Stage (Dep.Var . TT)
Animal asset	BULLOCK	A pair of bullock (in number) ¹⁵	+	-	+
Formal Loan	FL	Amount of formal loan (in Rs.)	+	-	+
Informal loan other than landlord	IL	Amount of informal loan other than landlord (in Rs.)	+/-	+/-	+/-
Loan from landlord	LALAND	Amount of loan from landlord (in Rs.)	-	+	-
Village dummy variables	DU1, DU2, DU3	Three village specific dummy variable to capture the effect of four selected villages,	+/-	+/-	+/-

In empirical estimation, our particular interest is to verify whether the result confirms the expected sign of the parameter or not. The preference of a particular contract over all possible contract choices can be explained by the availability of credit from a particular credit source. This inference can be tested by examining the expected signs of different sources of credit (of tenants). The statistical computer package like E-Views estimates Ordered Probit Model in this context.

V. RESULTS AND DISCUSSION

V.1 Estimation Results of the Simultaneous Choice Model

Maximum likelihood result of the Ordered Probit Model is presented in Table IV. A positive sign of the estimated coefficient indicates enhanced probability of the land being owner cultivated, while negative sign indicates that land is more likely to be cultivated under cost sharing. Household, plot and village level characteristics are included as explanatory variables to determine the choice of alternative forms of cultivation.

¹⁵ In the study a pair of bullock (BULLOCK) is used as a proxy of the animal assets of the household, as used in the literature of Development Economics.

The negative and significant coefficient of HHAGE suggests that as the age of the household increases, the probability of the land being under owner cultivation declines and the probability of the plot being under sharecropping increases, irrespective of the mode of sharecropping contract.¹⁶ The variable of the experience of the head of the household (HHEXP) might capture the tenancy ladder effect (Spillman 1919, Reid 1977) in which the individuals with the greatest entrepreneurial ability become fixed-rent tenants, those with no such ability become wage earning workers, and the intermediate cases become share tenants. The hypothesis is getting supported with the positive and significant coefficient of HHEXP. In the determination of the impact of gender on the choice of contract offered, it is found that male tenant household heads are more likely to choose one of the sharecropping contracts as opposed to owner cultivation and fixed rent tenancy. However, the result is statistically insignificant. The coefficient of family size (FSIZE) is negative and significant. This implies that the larger the family size, larger will be the working members in the family and correspondingly higher will be the probability of lease in land by the family. If the family bears a significant number of dependent members (DEPEND), landlords will be less willing to lease out land to the family and hence it reduces the probability that the plot is under share tenancy. The positive coefficient supports the hypothesis, though the result is found to be statistically insignificant.

The positive and significant coefficient of value of land (VLAND) suggests that the probability of the owner cultivation increases with the increase in value of land. This empirical finding supports our common belief that plots of higher value of land are cultivated by the owner using hired labour on a wage basis (Ghosh 1995). The coefficient of irrigated land area (IRILAND) is negative and thus the empirical result is striking in the sense that the probability of the land being cultivated by the owner is found to be decreases with the increase in the irrigated land holding. The coefficient of operated land holding (OPRT) for the particular contract is positive and highly significant at 1 per cent level of significance. This implies that larger landholding is associated with owner cultivation or fixed rent tenancy, whereas small parcels of land is cultivated under share tenancy. Further, the household with larger animal assets has the tendency to choose fixed-rent contract or owner cultivation as opposed to cost-sharing contract, but the result is found to be statistically insignificant. Two out of three village dummy variables are found to be

¹⁶ The result provides an empirical validation of the theoretical foundation of Chaudhuri and Maitra (1997). In their study, higher age was a signal of lower discount factor and thus it was expected that younger agents are working for wage, those in the intermediate range working for rent and the older tenants working for share.

statistically significant. It implies that fixed rent tenancy and owner cultivation is commonly prevalent in more developed villages like Saktia and Anguna, whereas share tenancy is a distinguishing characteristic of backward villages like Dhamash and Boro.

TABLE IV
ORDERED PROBIT RESULTS FOR CHOICE OF CONTRACT UNDER
SIMULTANEOUS CHOICE MODEL

Contract type: CT = 0 if land is under cost sharing tenancy = 1 if land is under pure sharecropping tenancy = 2 if land is under fixed rent tenancy = 3 if land is under owner cultivation				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
HHAGE	-0.069150	0.040468	-1.708754	0.0875
HHEXP	0.000738	0.000417	1.768909	0.0769
HHSEX	-0.510309	0.455596	-1.120092	0.2627
FSIZE	-0.042718	0.021356	-2.000301	0.0455
DEPEND	0.046200	0.061253	0.754249	0.4507
VLAND	2.11E-06	1.04E-06	2.031827	0.0422
IRILAND	-0.068233	0.038673	-1.764349	0.0777
PRT	0.108757	0.026569	4.093444	0.0000
BULLOCK	0.090746	0.166079	0.546402	0.5848
FL	4.45E-05	1.57E-05	2.842888	0.0045
IL	1.26E-05	9.48E-06	1.324168	0.1854
LALAND	-7.59E-05	4.61E-05	-1.646431	0.0997
DU1	0.166426	0.226924	0.733402	0.4633
DU2	-0.450839	0.236810	-1.903797	0.0569
DU3	-1.056812	0.239425	-4.413962	0.0000

Source: Field Survey 2006-07.

Note: The statistical analysis has been made using *E-Views* statistical package.

Credit plays a crucial role to determine the choice of contract. Access to credit from both formal (FL) and informal sources other than landlord (IL) increases the probability that the land will be cultivated under owner cultivation. However, only the coefficient of formal sources of credit (FL) is found to be statistically significant and different from zero. The variable, loan from landlord (LALAND), is a particular interest to us. The availability of loan from landlord increases the probability that the plot is under cost sharing. This result is in conformity with our theoretical model which predicted that cost sharing is more profitable than other tenurial arrangements

at low level of availability of institutional credit. This proposition can also be established in landlord's model where a landlord with potential lending capacity is usually intended to share at least a part of production cost of the tenant. When the credit accessibility from institutional sources is sufficiently high, it allows the domination of fixed rent contract over the other contract types. At the intermediate level of credit accessibility, pure sharecropping is preferable to cost sharing and fixed rent tenancy.

V.2 Empirical Results of the Sequential Choice Model

In the first stage of the sequential decision making process, it is determined whether a particular plot of land is cultivated by the owner or a tenant. If the plot is found to be cultivated by the tenant, then in the second stage, the tenant determines the types of tenurial contracts viz., fixed rent, pure sharecropping or cost sharing.

V.2.1 First Stage Binary Probit Analysis

The result from the first stage Binary Probit for cultivator households is presented in Table V.

TABLE V
BINARY PROBIT RESULTS FOR THE FIRST STAGE OF SEQUENTIAL
CHOICE MODEL

Mode of cultivation: MC = 0 if the plot is under owner cultivation = 1 if the plot is under tenant cultivation				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
CONSTANT	-2.112307	1.292787	-1.633917	0.1023
HHAGE	0.066539	0.046822	1.421110	0.1553
HHEXP	-0.000721	0.000490	-1.469363	0.1417
HHSEX	0.610283	0.507326	1.202941	0.2290
FSIZE	0.043147	0.024938	1.730179	0.0836
DEPEND	-0.065223	0.071387	-0.913655	0.3609
VLAND	-2.59E-06	1.38E-06	-1.874788	0.0608
IRILAND	0.106668	0.048537	2.197664	0.0280
OPRT	-0.169178	0.034914	-4.845555	0.0000
BULLOCK	-0.052159	0.186727	-0.279332	0.7800
FL	-3.06E-05	1.55E-05	-1.972019	0.0486
IL	2.30E-06	1.20E-05	0.191435	0.8482
LALAND	0.000102	7.50E-05	1.365080	0.1722
DU1	-0.377062	0.251160	-1.501285	0.1333
DU2	0.352136	0.266669	1.320496	0.1867
DU3	0.948198	0.276271	3.432136	0.0006

Source: Field Survey 2006-07.

Note: The statistical analysis has been made using *E-Views* statistical package.

The parameter estimates from the first stage Binary Probit Model reinforce the results that we obtained earlier in the Simultaneous Choice Model in respect of sign of coefficients. However, the level of significance of the parameter estimates and power of the test, as measured by information criterion,¹⁷ of the Sequential Choice Model is not so much robust in comparison to earlier Simultaneous Choice Model. The coefficient of the age of the head of the household (HHAGE) is positive but weakly significant only at 16 per cent level of significance. So it supports our earlier hypothesis that the probability of the plot being tenant cultivated increases with the increase in the age of the head of the household. The negative coefficient of the experience of the head of the household supports “tenancy ladder” hypothesis, though the result is found to be significant at 15 per cent level of significance. Male headed household with an ability of entrepreneurship skill is willing to lease in land and thus, in turn, the probability of tenant cultivation increases. Though the sign of the variable is expected, but the result is statistically insignificant. A large family size with more working members is more willing to undertake tenant cultivation. This is evident in the positive and statistically significant coefficient of FSIZE. Since the dependent members of a family are not belonging to the category of working age group, the probability of tenant cultivation decreases with the increase in dependent members in proportion to working members in a family. The sign of DEPEND is in line of our hypothesis, but the result is not found to be significant.

In both the Simultaneous and Sequential Choice Models, the significant coefficients of value of land (VLAND) showing that increasing land quality tends to increase the probability that the land is cultivated by the owner himself using hired labour on a wage basis. Once again, negative and statistically significant coefficient of operated land holding (OPRT) implies that comparatively larger landholdings are kept for owner cultivation, whereas small parcels of landholding are leased out for tenant cultivation. Village dummy variables establish our earlier empirical evidence that tenurial arrangements are more widespread in the backward villages like Dhamash and Boro.

Like Simultaneous Choice Model, access of formal loan (FL) significantly influences the probability of cultivating the land under owner cultivation. Availability of informal loan, in particular loan from landlord (LALAND), is found to be the major impetus to tenant cultivation. Like loan from landlord, the access of informal loan other than landlord (IL) also enhances the probability of land being cultivated under tenant cultivation. However, both the results are found to be statistically insignificant.

¹⁷ E-Views routinely calculate Akaike Information criterion, Schwarz criterion and Hannan-Quinn criterion along with the result.

V.2.2 Second Stage Ordered Probit Analysis

In the second stage, we want to identify factors which affect the choice of a particular contract by the tenant households. The result to determine the choice of a particular tenurial contract, as mentioned in Table VI, suggests that none of the variables relating to household characteristics are significant in affecting the choice of a particular contract. However, variables relating to credit and village dummy variables are found to be statistically significant.

TABLE VI
RESULT FOR JOINT ESTIMATION IN THE SECOND STAGE OF SEQUENTIAL CHOICE MODEL

Tenurial arrangements: TT = 0 if the plot is under cost-sharecropping = 1 if the plot is under pure sharecropping = 2 if the plot is under fixed rent				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
HHAGE	-0.027218	0.065468	-0.415746	0.6776
HHEXP	0.000180	0.000659	0.273127	0.7848
HHSEX	-0.098902	0.768743	-0.128654	0.8976
FSSIZE	-0.026461	0.033847	-0.781782	0.4343
DEPEND	-0.132887	0.098205	-1.353159	0.1760
VLAND	2.02E-06	1.42E-06	1.424830	0.1542
IRILAND	0.085837	0.080717	1.063436	0.2876
OPRT	-0.071966	0.048582	-1.481329	0.1385
BULLOCK	0.114737	0.298957	0.383791	0.7011
FL	0.000146	4.21E-05	3.454397	0.0006
IL	0.000178	4.42E-05	4.041659	0.0001
LALAND	-0.000296	9.18E-05	-3.228933	0.0012
DU1	-0.712591	0.395615	-1.801223	0.0717
DU2	-0.865553	0.409210	-2.115182	0.0344
DU3	-1.508201	0.396958	-3.799393	0.0001

Source: Field Survey 2006-07.

Note: The statistical analysis has been made using *E-Views* statistical package.

The role of credit is systematic and statistically significant in both Simultaneous and Sequential Choice Models (first and second stage). The fixed rental contracts are characterised by payment of rent in advance and bearing the entire production risks by the tenant. To mitigate the production risks, and to overcome the problems of rent payment in advance, they prefer an institutional credit negotiation along with the provision of crop insurance. We find empirical validation of this claim that an increase in the availability of formal sources of credit (FL) leads to a shift towards

more rental contracts. Again, it can be mentioned that an increase in the availability of informal sources of loan other than landlords (IL) increases the probability that the land will be cultivated under fixed rental contract, though we cannot comment much about the probability of pure sharecropping in such an Ordered Probit Model. Non-existence of well structured institutional credit market compels a tenant to depend on landlord to share the production risk associated with the tenancy. Some studies pointed out that a preponderance of share tenancy in third world countries is due to its valuable risk sharing attributes (Newbery 1977, Newbery and Stiglitz 1979). Risk sharing attributes in share tenancy are supported by our empirical results of negative and significant coefficient of loan from landlord (LALAND). It implies that if the borrowing potentialities from landlord increases, then the tenants intend to opt for cost sharing arrangement of sharecropping contract.

VI. CONCLUSION

The choice of tenurial contract is a simultaneous process of interaction between the tenant and the landlord. In a theoretical framework, the role of credit on the choice of contracts is analysed from the perspective of both tenant and landlord by modifying the framework of Tikabo (2003). The propositions derive from the model have been tested empirically by considering both Simultaneous and Sequential Choice Models. In conformity with the theoretical framework,¹⁸ our empirical results of both the versions of choice model suggest that credit plays an instrumental role in determining the choice of contract. In fact, an increase in the availability of formal credit leads to a shift towards rental contracts, whereas in the absence of availability of institutional credit, a tenant is often compelled to depend on landlord to fulfill his/her credit requirements. In these circumstances, cost sharing is more profitable than other tenurial arrangements as the landlord is used to share at least a part of production cost of the tenant. At the intermediate level of credit accessibility, pure sharecropping is preferable to cost sharing and fixed rent tenancy.

¹⁸ One of the major limitation of the analysis is that we could not carried out our empirical analysis separately for tenant and landlords households even our theoretical analysis rests on both these perspectives. Representation of small number of landlords in our sample observations restricted us to carry out the analysis in the desired line of our theoretical conceptualisation. In the empirical survey, it was not possible to collect information on those absentee landlords who reside outside the village for most part of the year as they were usually involved in non-agricultural activities as primary occupation. It was even difficult to collect information on landlord households residing within the village. Bardhan and Rudra (1980) excluded the category of lessors households from their sample on consideration of reliability of information.

REFERENCES

- Bardhan, P. 1984. *Land, Labor, and Rural Poverty: Essays in Development Economics*. Delhi: Oxford University Press.
- Bardhan, P. and A. Rudra. 1980. "Terms and Conditions of Sharecropping Contracts: An Analysis of Village Level Survey Data in India." *Journal of Development Studies*, 16(3).
- Bardhan, P. (ed). 1989. *The Economic Theory of Agrarian Institutions*. Oxford: Clarendon Press.
- Chaudhuri, A. and P. Maitra. 1997. "Determinants of Land Tenure Contracts: Theory and Evidence from Rural India." Seminar paper presented at University of Southern California.
- Ghosh, P. 1995. "On the Coexistence of Short, Rent and Wage Contracts in a Rural Economy." IED Working Paper. Boston University.
- Laffont, J.J. and M.S. Matoussi. 1995. "Moral Hazard, Financial Constraints and Sharecropping in El Oulja." *Review of Economic Studies*, 62: 381-399.
- Laha, A. 2009. *Land Tenancy and Rural Credit Market: A Case Study in West Bengal*. PhD thesis, The University of Burdwan.
- Meng, C.L. and P. Schmidt. 1985. "On the Cost of Partial Observability in the Bivariate Probit Model." *International Economic Review*, 26(1): 71-85.
- Newbery, D.M.G. 1977. "Risk Sharing, Sharecropping and Uncertain Labour Markets." *Review of Economic Studies*, 44(3): 586-594.
- Newbery, D.M.G. and J. E. Stiglitz. 1979. "Sharecropping, Risk Sharing and the Importance of Imperfect Information." In J.A. Roumassset, J.M. Boussard and I. Singh (eds), *Risk, Uncertainty and Agricultural Development*. New York: Agricultural Development Council.
- Pender, J. L. 1996. "Discount Rates and Credit Markets: Theory and Evidence from Rural India." *Journal of Development Economics*, 50: 257-96.
- Reid, J.D. 1977. "The Theory of Share Tenancy Revisited-Again." *Journal of Political Economy*, 85(2): 403-8.
- Shaban, R.A. 2000. "Testing between Competing Models of Sharecropping." In P Bardhan, and C. Udry (eds.), *Readings in Development Economics*, vol. II, 139-169. MIT press.
- Spillman, W.J. 1919. "The Agricultural Ladder." *American Economic Review*, 9: 170-79.
- Tikabo, M. O. 2003. "*Land Tenure in the Highlands of Eritrea: Economic Theory and Empirical Evidence*." Doctor Scientiarum Thesis. Agricultural University of Norway.

Zavoina, R. and W.Mc Elvey. 1975. "A Statistical Model for the Analysis of Ordinal Level Dependent Variables." *Journal of Mathematical Sociology*, summer: 103-120.

Appendix I Summary Statistics of Independent Variables by Contract Type

Variable	Mean and Standard Deviation by Contract type							
	Owner		Fixed Rent		Sharecropping		Cost sharing	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
HHAGE	47.54839	11.92356	46.60811	11.40514	47.6383	10.91753	47.96667	12.49961
HHEXP	2402.103	1138.008	2300.635	1089.164	2386.064	1081.247	2451.833	1309.431
HHSEX	0.967742	0.177257	0.972973	0.163269	1	0	0.966667	0.182574
Fsize	6.535484	3.518555	6.824324	3.657824	6.829787	3.32526	7.633333	4.029917
DEPEND	1.902734	1.295269	1.648037	1.13644	1.80385	1.403406	1.796825	1.132736
Vland	140429	193964.6	85005.41	191419.9	77297.87	130430.2	56880	96558.6
IRRILAND	2.496645	5.089674	2.063919	5.833307	1.126596	1.853107	1.346333	2.193486
OPRT	9.123355	9.046731	9.43973	15.52943	7.501064	7.567468	8.175333	6.756808
BULLOCK	0.2	0.638586	0.148649	0.612259	0.042553	0.29173	0.066667	0.365148
FL	8378.251	21586.07	3278.095	6715.947	860.1881	2269.333	577.1063	1247.936
IL	3967.502	7817.486	1773.772	2507.72	5174.658	11866.25	1779.474	5823.253
LALAND	200.8368	737.8583	306.8127	574.8901	415.5335	1365.47	589.073	2921.2
DU1	0.393548	0.49012	0.202703	0.404757	0.319149	0.471186	0.066667	0.253708
DU2	0.23871	0.427677	0.310811	0.465985	0.170213	0.379883	0.333333	0.479463
DU3	0.141935	0.350115	0.297297	0.460188	0.382979	0.491369	0.566667	0.504007
YIELD	6.304742	4.730087	4.243569	3.148657	2.360472	1.92625	2.298534	1.717286