A Model of Share-Cropping with Interlinked Markets in a Dual Agrarian Economy

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ABSTRACT

Two common features of poor agrarian economies widely discussed in the literature on peasant economies are the sharecropping tenurial system and the interlinkage between land, labour and credit markets. This paper constructs a general model of sharecropping along with interlinkage between the three markets. Contrary to existing models of pure tenants, the present model incorporate a realistic feature of an agrarian economy with landed tenants who cultivate not only their own piece of land but also leased-in land. Under some structural and institutional conditions, results confirm that efficiency is achievable, which benefits both the landlord and the tenant; the landlord could even gain more under other conditions.

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A MODEL OF SHARE-CROPPING WITH INTERLINKED MARKETS IN A DUAL AGRARIAN ECONOMY

1. Introduction

Two common features of poor agrarian economies widely discussed in the literature on peasant economies are the sharecropping tenurial system and the interlinkage between land, labour and credit markets. Landlords (also financiers of credit) and tenants are the major parties involved in such phenomena. The existing models usually assume that tenants are landless labourers - pure tenants. Some recent studies\(^1\) show that only an insignificant percentage of landless tenants manage to obtain a tenancy contract. In fact, tenants themselves are usually small landowners. Hence, the poor agrarian economies have dualistic labour markets in the sense that informal and formal labour markets coexist side by side. In informal markets, individual family members may work in their own and/or leased in land, while they work as wage labourers in the formal market governed exclusively on demand and supply forces.

Over the past two decades, the existing literature on sharecropping can be divided into two schools. One is in the 'Marshallian tradition' that includes authors like Bardhan and Srinivasan (1971, 1974), Bardhan (1979), Lucas (1979), Caballero (1983), etc. According to them, sharecropping leads to Pareto-inefficient allocation of labour because only a fraction of its marginal product is equated with the market wage rate. In fact, labour input remains under-supplied since the tenants receive only a fraction of output produced in the leased in land. The other school known as the 'efficiency school' includes writers like Cheung (1968, 1969), Newbery (1975), Reid (1976), Bell and Braverman (1980), Ali (1983), Bell (1986), etc. They argue that the sharecropping could be Pareto-efficient once land and other non-labour inputs are taken into account with some appropriate contractual arrangement.

\(^1\) Our recently undertaken survey of 130 tenant households in three districts of rural Bangladesh indicates that only 1% of the respondents are pure tenants. This also supports some official statistics of 2% and less than 7% in Bangladesh (Agricultural Census, 1977) and India (National Sample Survey, 1971-72) respectively as quoted in Taslim (1992, p. 44).
The writers on the issue of interlinkage between land, labour and credit markets in poor agrarian economies can also be divided into two groups. Bhaduri (1973, 1977), Ghatak (1976), Scandizzo (1979), etc, believe that the interlinkage phenomenon, which allows the landlords to extract maximum surplus (rental and usurious), leads to the perpetual indebtedness of the tenants—an exploitative source for landlords. The other group of writers such as Bardhan and Rudra (1978), Ghose and Sainth (1976), Braverman and Srinivasan (1981), Braverman and Stigliz (1982), Misra (1983), Pant (1980), Braverman and Guiseck (1984), Gangopadhyay and Sengupta (1986), etc. refute the involuntary and exploitative nature of the interlinkage phenomenon. The main basis of the difference between these two groups lies in their perception of the nature of the credit market (for production and for consumption loans) in a poor agrarian economy. The first group believes that the lender has absolute power in setting both the amount of loan and the interest rate. The second group, on the other hand, believes that these are set on the basis of mutually agreed decision-making mechanisms.

The present paper constructs a general model of sharecropping along with interlinkage between the three markets. Contrary to existing models of pure tenants, the present model incorporates a realistic feature of an agrarian economy with landed tenants who cultivate not only their own piece of land but also leased in land. Results confirm that the efficiency is achievable, which benefits both the landlord and the tenant; the landlord could even gain more under other conditions.

2. Model

We assume that the tenant has ‘h’ units of own land and ‘H’ units of leased in land to cultivate with his family labour. It is further assumed that the tenant receives his share of output produced in the leased in land at an exogenously given rate, r, which is less than unity. The tenant is guaranteed a renewal of the leased in land if he can assure a minimum average yield, q, that is acceptable to the landlord. At the beginning of a season, the tenant may borrow a constant fraction (β) of his rental share in advance from the landlord at the given interest rate, i. This advance loan is expected to be used mainly for consumption purposes, and paid off, if possible, with interest at the end of the season. It is assumed that the amount borrowed (βF) must not exceed the rental share (rF), where F = F(H,L) is production function of cropshare land (H) and labour input (L) applied to it.

Because the tenant in our model is not a pure or landless one, he himself makes a decision on the level of cropshare land (H). As a result, the landlord may end up cultivating leased land by hiring wage labour at an institutionally fixed wage rate, w.

Let us first focus on the tenant’s decision making process in terms of a constrained optimizing problem. The tenant maximizes his income (Y) from his own and cropshare land net of input cost and consumption loan with interest subject to the constraint that the average yield from the cropshare land is no less than q, i.e., \( \bar{q}H \geq F \). To make our model simple and comparable to other studies, we assume further that the tenant supplies only one input, labour. The production functions of tenant’s own land and cropshare land also depend on labour inputs used, and are assumed to be strictly concave. Thus the maximization problem of the tenant is:

\[ M(w) = f(h, l) + rF(H, L) - w(l + L) - (1 + i)qF(H, L) + \lambda(\bar{q}H - F) \]

i.e. \[ M(w) = f(h, l) + (1 - (1 + i)\beta)qF(H, L) - w(l + L) + \lambda(\bar{q}H - F) \] (1)

where \( l = \) labor input on own land,
\( L = \) labor input on cropshare land,
\( f(h, l) = \) production function of tenant’s own land, and
\( \lambda = \) Lagrange multiplier.

The first order conditions for interior maximum are

\[ f_L = w \] (2)

\[ [(1 - (1 + i)\beta)q - \lambda]F_L = w \] (3)

\[ (1 - (1 + i)\beta)qF_H + \lambda\bar{q} - \lambda F_H = 0 \] (4)

\[ \bar{q}H - F = 0 \] (5)

From (4) we get

\[ \lambda = \frac{\bar{q}H[(1 - (1 + i)\beta)q]}{1 - \bar{q}H} \]

where \( \bar{q}_H \) is the output elasticity of cropshare land.

Putting this value of \( \lambda \) in equation (3) and (4) we get,

\[ \frac{r}{1 - \bar{q}H} \left\{ \frac{1 - (1 + i)\beta}{F_L} \right\} = w \quad \text{and} \]

\[ F_H = \bar{q}\bar{q} \] (7)

2 Only exception, to the knowledge of the present authors, is Quibria and Rashid (1986), and Tazalim (1992) who incorporate landed tenants in their model of sharecropping without interlinkage.
3 This constraint imposed on tenant by the landlord plays a role of additional condition of a tenural contract. This is a proxy for supervision cost which may be required in some situation. This implies that the landlord does not require any such cost to be incurred for maximum possible output to be produced by the tenant.
4 This assumption rules out the possibility of tenant’s perpetual indebtedness as under semi-feudal conditions a la Bhaduri (1973, 1977).

A similar assumption has been made in Bardhan and Srinivasan (1971, p. 49).
Let us now turn our attention to the landlord's constraint optimising problem. The income of the landlord is the sum of the income from cultivating own land, cropshare rental income and interest income from consumption loan. He maximizes his income \( f^L(h^t, l^t) \) subject to the constraint that the sum of the amount of land retained for self-cultivation and amount leased out must not exceed his endowment of land, i.e., \( h^t + H \leq h^t \).

\[
\max_{h^t, l^t} f^L(h^t, l^t) + (1 - r)(h^t - h^t)\bar{q} - w l^t + rP(h^t - h^t)\bar{q}
\]

(8)

where

\( h^t = \) land cultivated by landlord,

\( l^t = \) hired labour,

\( h^t = \) total land of landlord, and

\( f^L = \) production function of landlord's cultivating land.

The first order conditions for an interior maximum are:

\[
f^L_{h^t} = w
\]

(9)

\[
f^L_{l^t} = (1 - r(1 - i\beta))\bar{q}
\]

(10)

3. Results

When land and credit markets are interlinked, cropshare efficiency/inefficiency with short term leasing is characterised by the following two results:

Result I: \( F_L \leq w \) as \( r(1 + (1 + i\beta)) \leq (1 - \epsilon_H) \), [from (6)].

This result implies that if the value of \( r(1 + (1 + i\beta)) \) as determined by various institutional conditions of the poor agrarian society is lower (lower) than its structurally determined value of \( (1 - \epsilon_H) \), cropshare land will be cultivated over- (under-) intensively in terms of labour input than the tenant's own land.

Result II: \( F_H \geq f^L_{h^t} \) as \( r(1 - i\beta) \geq (1 - \epsilon_H) \) [from (7) & (10)].

This result implies that if the institutionally determined value of \( r(1 - i\beta) \) is greater (lower) than the structurally determined value of \( (1 - \epsilon_H) \), the landlord will be left with too much (little) of its own land for self-cultivation.

The two results imply that the landlord will be left with more unleased land regardless of whether the tenant is allocating labour to the leased-in or own land efficiently or inefficiently. Three special cases that can be derived from the two results are:

Case (A):

\[
F_L = f_L = w \quad \text{and} \quad F_H > f^L_{h^t}
\]

(11)

hold for \( r(1 - i\beta) > r(1 - (1 + i\beta)) = (1 - \epsilon_H) \).

(11) implies that the tenant allocates labour efficiently between leased-in and own land, while the landlord is forced to retain too much of his land for self-cultivation. This supports Cheung's (1968, 1969) assertion that tenants allocate labour efficiently between leased-in and own land, and also supports Gangopadhyay and Sengupta's (1986) view that interlinkage is in the interest of both parties—landlord and tenant.

Case (B):

\[
F_L < f_L \quad \text{and} \quad F_H > f^L_{h^t}
\]

(12)

hold for \( r(1 - i\beta) > r(1 - (1 + i\beta)) = (1 - \epsilon_H) \).

(12) states that the landlord retains relatively more land for self-cultivation in spite of the fact that the tenant cultivates cropshare land more intensively. This supports Braverman and Stiglitz's (1982) proposition that interlinkage will increase the effort of tenants under certain reasonable condition.

Case (C):

\[
F_L > f_L \quad \text{and} \quad F_H < f^L_{h^t}
\]

(13)

hold for \( r(1 - (1 + i\beta)) < (1 - \epsilon_H) \leq r(1 - i\beta) \).

(13) implies that when the tenant is not cultivating cropshare land intensively in terms of labour effort (as in the Marshalian view), the landlord fails to act decisively in distributing land between self-cultivation and cropsharing. The role of landlord in this case has some analogous reference to Pani's (1980, p. 250) result that 'the landowner may not always prefer interlinked transaction, even though he is the sole supplier of credit.'

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6 If \( \beta = 0 \) i.e., no interlinkage with credit market, efficiency or inefficiency conditions in labour and land markets will be applicable only for the simple cropsharing model.
4. Conclusion

Any tenurial contract between the landlords and the tenants in a poor agrarian economic system usually depends on its various structural and institutional conditions. In our model of sharecropping with interlinked markets the tenurial contract depends specifically on an exogenously fixed wage rate, rate of rental share, interest rate, and structurally given output elasticity of leased-in land. Also the landlord imposes an additional constraint of minimum average yield to be produced on leased-in land without incurring any supervision cost. Essentially, efficiency and inefficiency results in our model are determined by these conditions and constraints. The main result [with the exception of the Case (C)] of the model is that the landed tenant tries to allocate labour between his own land and leased-in land efficiently [Case (A)] or uses labour more intensively on leased-in land [Case (B)]. Both the landlord and the tenant gain in either of the two Cases (A) and (B), but the landlord gains more in the latter case.

Bibliography


146 W.P. Hogan
147 J. Yates
148 G. Butler
149 B. Rao
150 D.J. Wright
151 C. Karfakis
152 D. Hutchinson & S. Nicholas
153 B. Rao
154 J.B. Towe
155 E. Jones
156 I.J. Irvine & W.A. Sims
157 B. Rao
158 W.P. Hogan
159 P.D. Groenewegen
160 C. Karfakis
161 B. Rao
162 Y. Varoufakis
163 Y. Varoufakis
164 D.J. Wright
165 C. Karfakis & A.J. Phipps
166 W. Jack
167 C. Karfakis & A. Parikh
168 W. Jack
169 I.J. Irvine & W.A. Sims
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4  W.B. Hall & C.A. Hall  New Zealand Economic Papers, 10, 1976
5  A.J. Philips  Economic Record, 53(143), September 1977
7  I.G. Sharpe & W.P. Hogan  Australian Journal of Management, April 1976
8  W.P. Hogan  Economic Papers, 55, The Economic Society of Australia and New Zealand, October 1977
9  I.G. Sharpe & P.A. Volker  Economics Letters, 2, 1979
10  I.G. Sharpe & P.A. Volker  Kredit und Kapital, 12(1), 1979
12  F. Gill  Australian Economic Papers, 19(35), December 1980
13  I.G. Sharpe & L.R. Brown  Journal of Banking and Finance, 3(1), April 1979
14  R.L. Brown  Australian Journal of Management, 3(1), April 1979
16  V.B. Hall & P.A. Volker  Economic Record, 56(152), March 1980
17  W.P. Hogan  Australian Journal of Management, October 1979
18  W.P. Hogan  Malaysian Economic Review, 24(1), April 1979
19  P. Saunders  Australian Economic Papers, 19(34), June 1980
21  I.G. Sharpe & P.A. Volker  Australian Economic Papers, 18(33), December 1979
23  U.R. Kohli  Australian Economic Papers, 21(39), December 1982
26  W.J. Mer sure  Applied Economics, 15, February 1983
27  W.J. Mer sure  Australian Economic Papers, 20(37), December 1981
29  W.J. Mer sure  Journal of Industrial Economics, 31, March 1983
30  W.J. Mer sure  Review of Economic Studies, 50(169), January 1983
31  P. Saunders  Economic Record, 57(159), December 1981

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