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Efficiency, Share Tenancy, and Allocative Behavior in Peasant Farming:
A Safety-First Approach*

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The resource allocation behavior of peasant farmers is explored in a safety-first model in which farmers may be owner-cultivators, owners-cum-sharecroppers, or pure sharecroppers. Both the risk effect and the incentive effect influence resource allocation decisions. Unlike the results in a simple model with certainty, sharecroppers may use land more or less intensively than owners-cum-sharecroppers. Comparisons are made among the three classes of farmers in terms of the relative intensity of land use. Finally, the implications of gambling-type behavior arising from disaster avoidance are explored.

I. Introduction

In analyzing peasant decision-making under risk, security-based or safety-first models have received considerable attention (Roy; Kataoka; Roumasset; Moscardi and de Janvry; and Kunreuther and Wright). In the paper, a safety-first model of farmer behavior is developed to analyze allocative behavior under which land is cultivated more intensively in owner-farming as

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ed of land rented-in under sharecropping tenancy). Contract choice is not endogenous; the model does not attempt to explain the choices among wage, fixed-rent, and share-rent contracts. Instead the model focuses on the effects of the type of contract on the resource allocation decisions. In particular the model is incomplete because the behavior of the landlord is omitted from the analysis.

Because of the potential for differential resource-use patterns in rented-in land, the relation between inputs and output is represented by the following two sets of production functions (using two crops and three inputs to illustrate the model).

$$(1)\ Q_1 = g(L_1, X_1, Y_1)\, u_1$$

$$(2)\ Q_2 = h(L_2, X_2, Y_2)\, u_2$$

$$(3)\ \overline{Q}_1 = \overline{g}(\overline{L}_1, \overline{X}_1, \overline{Y}_1)\, u_1$$

$$(4)\ \overline{Q}_2 = \overline{h}(\overline{L}_2, \overline{X}_2, \overline{Y}_2)\, u_2$$

where Q_i represents the physical output of crop i in owned land, $\overline{Q}_i$ represents the physical output of crop i in rented-in land, L_i, X_i and Y_i represent the amount of land and of the two other variable inputs used in cultivation, and u_i represents the random component associated with crop production. Similarly, the output prices have random components (for convenience we assume that the random disturbances that affect prices have no effect on outputs and vice versa).

Total net income of the owner-cultivator in the two-crop model is represented by (5), and the net income of the owner-cum-sharecropper and the sharecropper (assuming that the cultivator receives a crop-share of θ from the output of his rented-in land) are represented by (6) and (7), respectively.

$$(5)\ r = P_{Q_1} Q_1 + P_{Q_2} - \{w_x(X_1 + X_2) + w_y(Y_1 + Y_2)\}$$

$$(6)\ r^* = P_{Q_1} Q_1 + P_{Q_2} Q_2 + \theta(P_{Q_1} \overline{Q}_1 + P_{Q_2} \overline{Q}_2) - \{w_x(X_1 + X_2 + \overline{X}_1 + \overline{X}_2) + w_y(Y_1 + Y_2 + \overline{Y}_1 + \overline{Y}_2)\}$$

$$(7)\ r^{**} = \theta(P_{Q_1} \overline{Q}_1 + P_{Q_2} \overline{Q}_2) - \{w_x(\overline{X}_1 + \overline{X}_2) + w_y(\overline{Y}_1 + \overline{Y}_2)\}$$

Table 1

FIRST-ORDER CONDITIONS BY TYPE OF CONTRACT

First-Order Conditions for Owner-Cultivator

$$(8)\quad E(VMP_{L_i}) = \lambda\sigma_r[\{(\bar{d}-\mu_r)/\sigma_r^2\}E(P_{Q_i})E(Q_i)\sigma_{u_iv_i}^2 + \{(\bar{d}-\mu_r)/\sigma_r^2\}E(P_{Q_j})E(Q_j)\sigma_{12}+1]^{-1}.$$

$$(9)\quad E(VMP_{X_i}) = w_x[\{(\bar{d}-\mu_r)/\sigma_r^2\}E(P_{Q_i})E(Q_i)\sigma_{u_iv_i}^2 + \{(\bar{d}-\mu_r)/\sigma_r^2\}E(P_{Q_j})E(Q_j)\sigma_{12}+1]^{-1}.$$

$$(10)\quad E(VMP_{Y_i}) = w_y[\{(\bar{d}-\mu_r)/\sigma_r^2\}E(P_{Q_i})E(Q_i)\sigma_{u_iv_i}^2 + \{(\bar{d}-\mu_r)/\sigma_r^2\}E(P_{Q_j})E(Q_j)\sigma_{12}+1]^{-1}.$$

First-Order Conditions for Owner-cum Sharecropper

$$(11)\quad E(VMP_{L_i})^* = \lambda_1\sigma_{r*}[\{(\bar{d}^*-\mu_{r*})/\sigma_{r*}^2\}E(P_{Q_i})E(Q_i)\sigma_{u_iv_i}^2 + \{(\bar{d}^*-\mu_{r*})/\sigma_{r*}^2\}\theta E(P_{Q_i})E(\bar{Q}_i)\sigma_{u_iv_i}^2 + \{(\bar{d}-\mu_{r*})/\sigma_{r*}^2\}E(P_{Q_j})E(Q_j)\sigma_{12} + \{(\bar{d}^*-\mu_{r*})/\sigma_{r*}^2\}\theta E(P_{Q_j})E(\bar{Q}_j)\sigma_{12}+1]^{-1}.$$

$$(12)\quad \theta E(VMP_{\bar{L}_i})^* = \lambda_2\sigma_{r*}[\{(\bar{d}^*-\mu_{r*})/\sigma_{r*}^2\}E(P_{Q_i})E(Q_i)\sigma_{u_iv_i}^2 + \{(\bar{d}^*-\mu_{r*})/\sigma_{r*}^2\}\theta(P_{Q_i})E(\bar{Q}_i)\sigma_{u_iv_i}^2 + \{(\bar{d}^*-\mu_{r*})/\sigma_{r*}^2\}E(P_{Q_j})E(Q_j)\sigma_{12} + \{(\bar{d}^*-\mu_{r*})/\sigma_{r*}^2\}\theta E(P_{Q_j})E(\bar{Q}_j)\sigma_{12}+1]^{-1}.$$

$$(13)\quad E(VMP_{X_i})^* = w_x[\{(\bar{d}^*-\mu_{r*})/\sigma_{r*}^2\}E(P_{Q_i})E(Q_i)\sigma_{u_iv_i}^2 + \{(\bar{d}^*-\mu_{r*})/\sigma_{r*}^2\}\theta E(P_{Q_i})E(\bar{Q}_i)\sigma_{u_iv_i}^2 + \{(\bar{d}^*-\mu_{r*})/\sigma_{r*}^2\}E(P_{Q_j})E(Q_j)\sigma_{12} + \{(\bar{d}^*-\mu_{r*})/\sigma_{r*}^2\}\theta E(P_{Q_j})E(\bar{Q}_j)\sigma_{12}+1]^{-1}.$$

$$(17)\ E(VMP_{X_i})^* = w_x \phi^*_{Q_i}$$

$$(18)\ \theta E(VMP_{X_i})^* = w_x \phi^*_{\bar{Q}_i}$$

From (17) and (18), we get

$$(19)\ E(VMP_{\bar{X}_i})^* = (\phi^*_{\bar{Q}_i}/\phi^*_{Q_i})\ (1/\theta)\ E(VMP_{x_i})^*$$

By assumption $\phi^*_{Q_i} = \phi^*_{\bar{Q}_i}$, the riskiness associated with the cultivation of crop Q_i on both owned and rented-in land is the same. Thus, for $0<\theta<1$, $E(VMP_{\bar{X}})^* > E(VMP_X)^*$, which means that there is an incentive on the part of the owner-cum-sharecropper to restrict resource-use on rented-in land as compared to owned land. It is also quite evident that the tendency to cultivate the sharecropped land less intensively will be stronger, the lower the value of crop-share, θ the farmer receives. The result is analogous to the results obtained in what Cheung calls the "tax equivalent approach." It is not being argued here that the result is one which we would observe with much frequency in the real world, because as Cheung and others have pointed out, the landlord will often take steps to ameliorate the disincentive effects of the share contract.

Case 2

In case two the differences in the resource use of an owner-cultivator and an owner-cum-sharecropper are explored. The relevant first-order conditions, (9) and (13), yield the following efficiency conditions for the use of variable input X in the cultivation of crop Q_i by an owner-cultivator, and by an owner-cum-sharecropper on his owned land, respectively.

$$(20)\ E(VMP_{X_i}) = w_x \phi_{Q_i}$$

$$(21)\ E(VMP_{x_i})^* = w_x \phi^*_{Q_i}$$

Using (20) and (21), we obtain:

$(\phi^{**}_{\bar{Q}_i} / \phi_{Q_i}) > \theta$. Only in a very special case of both $\phi^{**}_{\bar{Q}_i} < \phi_{Q_i}$ and $(\phi^{**}_{\bar{Q}} / \phi_Q) < \theta$ will $E(VMP_{\bar{X}_i})^{**}$ fall short of $E(VMP_{X_i})$. Although the out-come is an empirical matter, there would appear to be greater possibilities for less intensive land-use under sharecropping tenancy. This may be attributed to two distinct factors affecting resource use in peasant farming — the incentive and risk effects.

A. Incentive Effect

Because $\partial\{E(VMP_{X_i})^{**}/E(VMP_{X_i})\}/\partial\theta = -(\phi^{**}_{\bar{Q}}/\phi_Q)\ (1/\theta^2) < 0$, it follows that given the relative risk factors $(\phi^{**}_{\bar{Q}} / \phi_Q)$, the lower the valus of θ, i.e., the lower the crop-share that the sharecropper receives on his rented-in land, the stronger will be his tendency to cultivate the land less intensively as compared to that of an owner-cultivator (analogous to the results obtained in Case I).

B. Risk Effect

Again, since $\partial\{E(VMP_{\bar{X}_i})^{**}/E(VMP_{X_i})\}/\partial(\phi^{**}_{\bar{Q}}/\phi_Q) = (1/\theta) > 0$ it follows that for a given crop share, θ, the higher the value of $\phi^{**}_{\bar{Q}}/\phi_Q)$, i.e., the higher the 'risk' factor associated with crop-cultivation for a share-cropper relative to that for an owner-cultivator, the greater the tendency on the part of the former to cultivate his land less intensively as compared to the latter. Thus, both risk and incentive effects combine to induce a less intensive use of variable inputs on sharecropped land relative to that on an owner-operated holding.

Case 4

Finally, the allocative behavior of the pure sharecropper and that of an owner-cum-sharecropper in the cultivation of his *rented-in* land are examined. Using the relevant first-order conditions (14) and (16),

$$(26)\ \theta E(VMP_{\bar{X}_i})^{*} = w_x \phi^{*}_{\bar{Q}_i}$$

$$(27)\ \theta EE(VMP_{\bar{X}_i})^{**} = w_x \phi^{**}_{\bar{Q}_i}$$

From (26) and (27), it follows that

that of an owner-cum-sharecropper in the use of his rented-in land, it was noted that the sharecropper may cultivate his land more intensively as compared to the owner-cum-sharecropper. With income-earning capacity from farming activities barely sufficient to meet the subsistence needs of the farm family, the sharecropper resorts to 'gambling type' behavior in order to have the best chance of achieving his subsistence goals. Behavior of this sort has indeed been observed among the poorer farmers in peasant agriculture. Scandizzo and Dillon found in a sample of sharecroppers and small holders in a drought-prone area in Northeast Brazil that the latter tended to be more conservative that the former.

In most less developed countries sharecroppers generally have fewer assets than do land owners. Thus sharecroppers are more likely to be in the situation in which expected income is less than subsistence needs. There will, of course, also be land owners who are also forced to resort to gambling type behavior.

The paper has focused on the derivation of results concerning the relative intensity of land use under sharecropping as compared to owner cultivation. The results are in part analogous to the results obtained by Cheung in a model in which uncertainty is ignored. There is, however, an important difference between this safety-first model and what Cheung calls the "tax-equivalent approach." In the safety-first model land may be used more or less intensively under sharecropping, whereas in the certainty model, there is only an incentive effect and thus sharecropping necessarily leads to less intensive land use. In the safety-first model in which relative risk factors also affect resource allocation decisions, the relative intensity of land use rankings can be reversed.

Thus, in a safety-first model, sharecropping may lead to a higher or lower intensity of land use. The model is, however, like the "tax-equivalent approach" criticized by Cheung, incomplete. The landlord would be aware of the disincentives that may operate under the share contract and would, subject to transaction cost, take actions to enforce a higher level of variable input use. In the safety-first world of uncertainty, however, the disaster avoidance motive of the tenant may make the landlord's monitoring efforts unnecessary (or less necessary), a result that does not follow in the simple certainty model.