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ENTREPRENEURIAL TALENT, SHARECROPPING, RESOURCE ALLOCATION AND LAND OWNERSHIP

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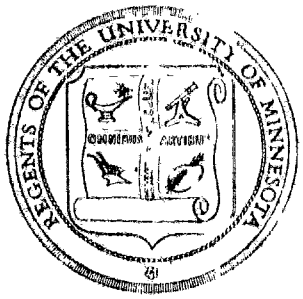

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ENTREPRENEURIAL TALENT, SHARECROPPING, RESOURCE ALLOCATION, AND LAND OWNERSHIP*

A decade ago Steven Cheung (1968, 1969) challenged the traditional view that sharecropping led to an inefficient use of resources:

> "The prevailing impression is that sharecropping results in inefficient allocation of resources. It will be shown here that the inefficiency argument is illusory. The implied resource allocation under private property rights is the same whether the landowner cultivates the land himself, hires farmhands to do the tilling, leases his holdings on a fixed rent basis, or shares the actual yield with his tenant" (Cheung 1968, 1107-1108).

The purpose of the present paper is to reassess the perspective opened by Cheung, and to formulate the problem in a somewhat broader context. More specifically, we will show that Cheung's analysis implicitly postulates the absence of specialized entrepreneurial talent or skills (non-tradeable) on the part of the tenant. In contrast, we postulate the existence of such scarce, non-tradeable talent and analyze the consequences to resource allocation. The analysis also utilizes a more general objective function than that specified by Cheung. We will show that if such talent exists, the contracting behavior postulated by Cheung does not lead to an efficient allocation of resources, but that if somewhat different (and plausible) contracting behavior is postulated, an efficient allocation can be obtained even if the ownership of land is dominated by a landowning class. If this last assumption

is relaxed, the analysis provides insights into why some individuals may choose to be owner-operators, others to be landowners, and still others to be share-tenants. In addition, the analysis shows the importance of imperfections in the capital market in creating a tenant class.

In the section which follows we briefly review Cheung's analysis and make some comments on it. Then in the next section we postulate a more general framework in which we show, among other things, that efficiency is compatible with other values of the share rental rate than that implied by Cheung's analysis. This is followed by a still more general model involving a production function with decreasing returns to scale - one consistent with the existence of scarce entrepreneurial talent - and in which the conditions necessary for resource efficiency and the consequences of the failure to realize those conditions are examined. The last section attempts to draw some of the implications of the analysis.

Cheung's Model

The traditional tax-equivalent approach to the analysis of share-tenancy argued that equilibrium in the use of, say, labor would be at the point in which the net (net of rental payments) marginal product of labor equals the (given) market wage rate. That is,

$$(1 - r)MP_t = w$$

where

r = share-rental rate;

w = wage rate; and

MP_t = marginal product of labor.

Figure 1, drawn under the assumption of two homogeneous factors (land and labor) is taken from Cheung (1968, p. 1108) and illustrates this equilibrium (point A). However, Cheung argues that A cannot be a true equilibrium since

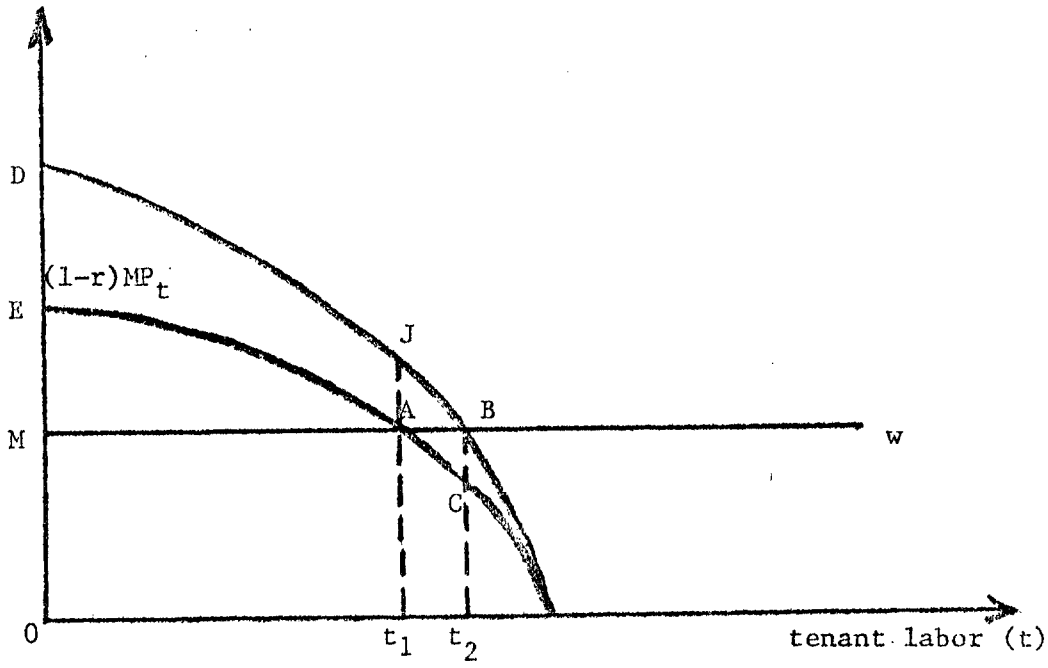
> "...area MEA represents the amount received by the tenant over and above his alternative earning (area $OMAt_1$). The existence of this residual earning for the tenant (area MEA) is inconsistent with equilibrium. Under private ownership of land, the landlord can extract the residual earning from the tenant or he can stipulate in the share contract an amount of tenant input larger than t_1" (1968, p. 1109).

Hence, equilibrium is at B, with the tenant supplying t_2 units of labor. Total factor payments to labor are $OMBt_2$ and to land, MDB. Moreover, so long as the share-rental ratio, r, is freely negotiable, it would equal the elasticity of production with respect to land (hereafter denominated ε).

Realism can be introduced into this analysis by recognizing that labor, for example, is not homogeneous and, in fact, possesses varying degrees of entrepreneurial talent or skills that cannot be traded. In effect, consideration of these non-tradeable skills amounts to the introduction of a third input into the production process. Moreover, if these skills are truly scarce, their owner will receive a return to them only as a residual income claimant (see Friedman).

Presumably, these scarce skills would also increase the productivity of land and the landowner would, in principle, be desirous of acquiring

Figure 1: The Tax Equivalent Approach Illustrated



as much of this scarce talent on his land as possible. However, the worker has a "monopoly" of his own particular talent. If both the land and labor markets should be freely competitive, he should be able to capture the economic rent to his scarce resource. If a landlord class held a monopoly of land, however, the tenant would not be able to capture this rent, although the natural complementarity between scarce land and scarce labor could lead to a joint maximization in which landowner and worker would share the return to the worker's scarce talent. But to see that we need a more general framework of analysis.

A More General Model

The assumption that "labor" is differentiated and that at least part of this differentiation may be attributable to production (or income) increasing skills that cannot be traded is tantamount to saying that the tenant in the sharecropping arrangement can have some influence over the decision-making process.[1/] A fairly easy way to take account of this multiple involvement in the decision-making process is by way of a more complex objective function that attributes (different) weights to the income of each participant (Kutcher and Scandizzo, 1976, and Brandao, 1979). Such a formulation is more general than that specified by Cheung, and we will show that it includes Cheung's model as a special case. Moreover, an analysis of the equilibrium conditions from this more general formulation will show that the rental ratio, r, can be set at any level in the interval $[0, \varepsilon]$ and an efficient sharecropping arrangement still be possible. This result differs from Cheung's, in

which a characteristic of the equilibrium position is that the rental ratio be equal to the elasticity of production for land.

Assume that the objective function is a weighted average of the landowner and tenant's incomes, with weights $\lambda_1(\geq 0)$ and $\lambda_2(\geq 0)$, respectively. In the present context these weights are assumed to reflect the relative power of the contracting parts in the determination of the optimum value of the variables. Cheung essentially assumed that the tenant or potential tenant had no weight in this process. Hence, he assumed that $\lambda_1 = 1$ and that $\lambda_2 = 0$. In contrast, we assume only that $\lambda_1 > 0$ and $\lambda_2 \geq 0$.

Following Cheung, the constraints to the maximization problem are the availability of land,[2/] the tenant's production function, and the feasibility of the contract for the tenant.[3/] This latter constraint, which Cheung (1968) refers to as the constraint of competition, requires that the tenant's income from farming should be no less than his alternative income or opportunity costs as a worker. To simplify the analysis, we assume that his special skills are unique to production agriculture, and that his immediate employment alternative is as a "pure" laborer (i.e., no decision-making responsibility) either in agriculture or in the nonfarm sector.

Mathematically, we have:

$$\text{Maximize } \lambda_1 r\, q(h, t) + \lambda_2 \left[(1 - r)q(h, t) - w\bar{t}\right]$$

$$\text{subject to } (1 - r)q(h, t) - wt \geq 0$$

$$h^* - h \geq 0$$

$$t \geq 0;\ h \geq 0;\ r \geq 0;$$

where: h = quantity of land rented by the tenant;

t = quantity of labor applied to the land under lease;

q = quantity of output produced;

$q(h, t)$ = tenant's production function. (It is assumed that $q(\ )$ is homogeneous of degree one and twice differentiable.);

r = share rental rate ($0 \leq r \leq 1$); and

h^* = land availability.

The Lagrangean for this problem is:

$$L = \lambda_1 \, r \, q(h, t) + \lambda_2 \, [(1 - r)q(h, t) - wt] + \lambda_3 \, [(1 - r)q(h, t) - wt] + \lambda_4 [h^* - h].$$

The Kuhn-Tucker first-order conditions, assuming that $t > 0$ and $h > 0$, are:

$$\frac{\partial L}{\partial h} = [\lambda_1 \, r + (\lambda_2 + \lambda_3) \, (1 - r)] \, \frac{\partial q}{\partial h} - \lambda_4 = 0 \tag{1}$$

$$\frac{\partial L}{\partial t} = [\lambda_1 \, r + (\lambda_2 + \lambda_3) \, (1 - r)] \, \frac{\partial q}{\partial t} - (\lambda_2 + \lambda_3)w = 0 \tag{2}$$

$$\frac{\partial L}{\partial r} = [\lambda_1 - (\lambda_2 + \lambda_3)] \, q \, (h, t) \leq 0 \tag{3}$$

$$r \, \frac{\partial L}{\partial r} = [\lambda_1 - (\lambda_2 + \lambda_3)] \, r \, q(h, t) = 0 \tag{4}$$

$$\frac{\partial L}{\partial \lambda_3} = (1 - r) \, q \, (h, t) - wt \geq 0 \tag{5}$$

$$\lambda_3 \, \frac{\partial L}{\partial \lambda_3} = \lambda_3 \, [(1 - r) \, q \, (h, t) - wt] = 0 \tag{6}$$

$$\frac{\partial L}{\partial \lambda_4} = h^* - h \geq 0 \tag{7}$$

$$\lambda_4 \, \frac{\partial L}{\partial \lambda_4} = \lambda_4 \, (h^* - h) = 0 \tag{8}$$

$$r \geq 0;\ \lambda_3 \geq 0;\ \lambda_4 \geq 0 \qquad (9)$$

From these conditions it is easy to see that the rental ratio, r, being greater than zero implies that $\lambda_1 = \lambda_2 + \lambda_3$, (10)

and that,

$$\frac{\partial q}{\partial h} = \frac{\lambda_4}{\lambda_1} > 0. \qquad (11)$$

Since λ_3 can only be zero or some positive value, it follows that for an equilibrium to occur, the weight of the landlord at a minimum has to be as large as that of the tenant's.[4/] Moreover, the larger the weight of the landlord in the decision-making process, the larger will be the rental ratio, other things being equal.

The partial of q with respect to h, of course, is the marginal product of land. In equilibrium, this marginal product will be greater than zero, and equal to the shadow price of land, λ_4, "corrected" for the weight of the landlord in the decision-making process, λ_1. (See equation 11.)

Substituting (10) into (2), we have

$$\frac{\partial q}{\partial t} = w,$$

which is to say that in equilibrium, the marginal product of the tenant's labor will be equal to the opportunity cost of labor, herein assumed to be constant and exogenously determined. It follows from equation (5) and the assumption of constant returns to scale that the rental ratio, r, is no greater than the production elasticity for land, ε, which implies that $\varepsilon > 0$. Hence, the existence of a positive rental ratio implies the inequality in (11).[5/] Thus, we have shown that when

$\lambda_1 > 0$, a positive rental ratio is sufficient for $\lambda_1 \geq \lambda_2$ and for the marginal product of land to be positive. On the other hand, if $\lambda_1 > \lambda_2 \geq 0$, we have $r > 0$ and $h = h^*$ (the rental ratio is positive and land is a binding constraint). This follows from equations (3), (6), (4), and (2). Moreover, in this case, the rental ratio, r, is equal to the production elasticity of land, ε. But if $\lambda_1 = \lambda_2$, then the rental ratio could be less than the production elasticity, and the equilibrium position would be indeterminate.

The interesting point here is that Cheung's model is a special case of the above formulation of the problem in which he makes the extreme assumptions that $\lambda_1 = 1$ and $\lambda_2 = 0$ (i.e., that the tenant has no weight in the objective function). In this case, as Cheung (1968) shows, the rental rate will be equal to the production elasticity for land. However, our more general formulation makes it clear that the equality of the rental ratio with the production elasticity is not a necessary condition for efficiency, as Cheung implies. Rather, efficiency is compatible with other values of r, and ε is only the maximum value r can take on as long as there is a competitive labor market. In general, $r \geq 0$ is sufficient to guarantee efficiency in labor use.

From our more general formulation it can be concluded that Cheung's approach is only one means of assuring efficiency in resource use. In particular, we have shown that it is not necessary to completely ignore the tenant in the contracting process. As long as $r > 0$, it follows that $\lambda_1 \geq \lambda_2$, and that λ_4, the shadow price of land, be greater than zero. In this case, $r \leq \varepsilon$ as opposed to $r = \varepsilon$, which is obtained when $\lambda_1 > \lambda_2$.[6/]

A Still More General Case

An obvious implication of the tenant owning a specific (non-tradeable) factor that increases production or income is that the production function in the variable inputs will be homogenous of degree less than one, in which case it will present decreasing returns to these factors. The purpose of this section is to formulate the problem so as to take account of this possibility. We shall see that the efficiency conditions are in this case different. In particular, $\lambda_2 = 0$ will not imply efficiency if the opportunity cost of the tenant is properly specified.

If the opportunity cost of the tenant is specified as above (i.e., $(1 - r)\, q\,[h, t] - wt > 0$), the implication is that the tenant would engage in a share-constract even if the return to his specific factor were zero. However, if the would-be tenant possesses unique talents that increase production or income, income maximization on his part will require that he reap the economic rent to this scarce factor. In this case the proper specification of the above constraint would be

$$(1 - r)\, k\, q\,[h, t] - wt \geq 0$$

where k is the degree of homogeneity of the production function in labor and land. Observe that $k\, q\,[h, t]$ is that portion of production attributable to the factors land and (pure) labor,[7] and $(1 - k)\, q\,[h, t]$ is the portion of production attributable to the scarce entrepreneurial skill of the tenant.

One way the tenant could reap this economic rent is to become an owner-operator, of course. Hence, the alternative to his being a share-cropper is not that of hiring out his "pure" labor skills, but rather

what his income would be as an owner-operator. If a landowning class held a monopoly on the land, then this possibility would be ruled out. But more on that later.

The Kuhn-Tucker conditions with the modified labor constraint become:

$$\frac{\partial L}{\partial h} = \left[\lambda_1 r + (\lambda_2 + k\lambda_3)(1 - r)\right]\frac{\partial q}{\partial h} - \lambda_4 = 0 \qquad (1')$$

$$\frac{\partial L}{\partial t} = \left[\lambda_1 r + (\lambda_2 + k\lambda_3)(1 - r)\right]\frac{\partial q}{\partial t} - (\lambda_2 + \lambda_3) w = 0 \qquad (2')$$

$$\frac{\partial L}{\partial r} = \left[\lambda_1 - (\lambda_2 + k\lambda_3)\right] q(h, t) \leq 0 \qquad (3')$$

$$r\frac{\partial L}{\partial r} = \left[\lambda_1 - (\lambda_2 + k\lambda_3)\right] r\, q(h, t) = 0 \qquad (4')$$

$$\frac{\partial L}{\partial \lambda_3} = (1 - r)\, k\, q(h, t) - wt \geq 0 \qquad (5')$$

$$\lambda_3\frac{\partial L}{\partial \lambda_3} = \lambda_3\left[(1 - r)\, k\, q(h, t) - wt\right] = 0 \qquad (6')$$

$$\frac{\partial L}{\partial \lambda_4} = h^* - h \geq 0 \qquad (7')$$

$$\lambda_4\frac{\partial L}{\partial \lambda_4} = \lambda_4\left[h^* - h\right] = 0 \qquad (8')$$

$$r \geq 0;\ \lambda_3 \geq 0;\ \lambda_4 \geq 0 \qquad (9')$$

Again, note that $r > 0$ implies that

$$\lambda_1 = \lambda_2 + k\lambda_3 \qquad (10')$$

and that

$$\frac{\partial q}{\partial h} = \frac{\lambda_4}{\lambda_1}. \qquad (11')$$

Equation (10') is easily obtained from (4'). Substituting (10') into (1') we obtain (11'). Now, substitute (10') into (2') to obtain:

$$\lambda_1 \frac{\partial q}{\partial t} = (\lambda_2 + \lambda_3)\, w \qquad (12)$$

or, if $\lambda_2 + \lambda_3 \neq 0$

$$\beta \frac{\partial q}{\partial t} = w \qquad (13)$$

where $\beta = \dfrac{\lambda_1}{\lambda_2 + \lambda_3} \leq 1$

Either equation (12) or (13) show that in general, there will be inefficient use of labor in this model except in a particular case discussed below. Moreover, from (5') and (13) it can be shown that:

$$r \leq \frac{\epsilon}{k} + \frac{\eta}{k}(1 - \beta) \qquad (14)$$

where $\eta = \dfrac{\partial q}{\partial t} \cdot \dfrac{t}{q}$ is the elasticity of output with respect to labor.

The above inequality (14) has one interesting implication. If $\epsilon = 0$, we obtain from (14) that:

$$r \leq 1 - \beta = \frac{(\lambda_2 + \lambda_3) - \lambda_1}{\lambda_2 + \lambda_3} .$$

Notice, now, that if $\lambda_3 = 0$, $r \leq \dfrac{\lambda_2 - \lambda_1}{\lambda_2} = 0$

which contradicts the assumption $r > 0$. Therefore, $\lambda_3 > 0$, and from (6') and (10')

$$r = \frac{(1 - k)(\lambda_1 - \lambda_2)}{\lambda_1 - \lambda_2 (1 - k)} \qquad (14')$$

Equation (14') shows that it is possible for the share rental to be positive even if $\epsilon = 0$. This is so because under the conditions postulated, the nature of the contract allows the landowner to capture a

portion of the return to the tenant's specific factor. More specifically, even if the marginal product of land were zero, the rental share could still be positive.

Let us examine now two particular cases of the above formulation. First, consider Cheung's case, i.e., $\lambda_1 = 1$ and $\lambda_2 = 0$. It follows from (10') that $\lambda_3 > 1$ and so $\beta = \frac{1}{\lambda_3} < 1$. Thus,

$$\frac{\partial q}{\partial t} = \lambda_3 w > w$$

and

$$r = \frac{\varepsilon}{k} + \frac{wt}{k\, q(h,\, t)} \quad (\lambda_3 - 1).$$

That is, labor is inefficiently allocated and the share rental rate is greater than the elasticity of production of land.

Intuitively, the landowner is in this case a monopsonistic "purchaser" of labor. Consequently, the worker with superior skill is not able to collect the economic rent for his scarce talent. Since labor is not paid its marginal productivity, the misallocation of resources is the logical result.

Second, consider the case in which $\lambda_1 = \lambda_2 = 1$. This is the case in which joint income is maximized. It follows that $\beta = 1$, $\lambda_3 = 0$ and from (5'), (6') and (14)

$$r \leq \frac{\varepsilon}{k}$$

which means that r can, at most, be equal to the contribution of land to total production. Furthermore, since $\beta = 1$, labor will be efficiently utilized.

Note that even in this latter case the maximum r is higher than the land elasticity of production. This is so because the landowner will be able to capture some of the return to the specific factor in consequence of the very nature of the sharecontract, as we have argued before. Since this specific factor ultimately materializes itself in the final output, the landowner will receive a portion of this return.[8/] This is a good reason for landowners to choose tenants with some specific factors as opposed to common workers.

Some Implications

Two important themes recurrent in the literature on share-tenancy are (1) that the tenant is exploited by the landowner and (2) that share-tenancy leads to a misallocation of resources. Cheung took issue with the latter point and showed that, with his assumptions, the use of resources would be efficient except in those cases where the government intervened to fix the share ratio. Given Cheung's perspective, the allegation about exploitation is largely irrelevant, since he assumed perfectly functioning factor markets.

Our analysis shows that if labor has unique entrepreneurial talents, there can be a misallocation of labor if the landlord has full weight in making production decisions, since he will have no reason to pay labor for its full contribution to production. If equal weight is provided to the tenant in making production decisions, however, the tendency will be to strike a bargain in which joint income is maximized. In this case there would be no loss in resource efficiency and presumably no exploitation, since a "monopoly" of land would be counterposed

against a "monopoly" of skill. In passing, it should be noted that such a system would be characterized by widely observable variations in the share rental, depending on the entrepreneurial skills of the tenant.

The obvious question is why owners of scarce entrepreneurial talent and skill would ever want to share the rent from this scarce resource with others. Clearly, he could avoid this by becoming a landowner, and thusly, reaping the full rent to his scarce entrepreneurial talent. If factor markets were freely competitive, this is exactly what would happen. Moreover, such share-tenancy as did emerge would be a means of landowners acquiring the use of unskilled labor, and not that above.

But, there are many obvious cases in which the tenant is more than an unskilled worker. How does this come about, and what is its motivation? At least two cases seem pertinent. First, there are obvious cases where the control of land is held by an aristocracy or oligarchy. In these circumstances there will be both inefficient use of resources and exploitation of labor in the sense that the latter is not able to reap the rent to its scarce talent.

It is important to note that in such circumstances the landowner would not be indifferent to who his tenant was. There would be continual searching for those individuals who could maximize the productivity of the landowner's resources. Moreover, the landowner would be willing to pay more for the services of more talented individuals. Hence, empirically, one should observe variations in rental ratios, and unless there are strong sanctions to support class distinctions, a tendency for monopoly control of land to disappear.

A monopoly or oligarchic control of land is not a necessary condition for a sharecropping system to emerge, however. If capital markets are imperfect, the worker with entrepreneurial talent may not be able to acquire land, even though he has superior entrepreneurial skills, due to either internal or external capital rationing. In that case, sharecropping could be an intermediate step on the way to land ownership, and the means to offset the effects of capital or credit rationing. Empirically, what one should see in this case is the effective operation of the agricultural ladder, with people moving up from a common laborer, to a sharecropper, to an owner-operator, all within a lifetime.

A land reform is often proposed as the means to do away with sharecropping. The clear implication in this case is that resources are not being used efficiently and/or that the tenants are being exploited.

Our analysis suggests at least two policy alternatives to land reform. The first, of course, is to make credit markets perform more efficiently. This would enable those most able to till the land to gain control of it. Moreover, the pressures for land ownership would help to make the land market more competitive.

Similarly, education could help to break down the monopoly or oligarchistic tendencies in a traditional society. To the extent the labor force were educated or trained, especially with entrepreneurial tools, the worker's position in the bilateral-monopoly discussions would be strengthened. The more skills he acquired, the better bargain he could negotiate, and ultimately, the land market would be competitive.

There is one final distributive implication. In those cases where there is a tendency for class ownership of land, land prices could be expected to be higher than they otherwise would be. The point is that the rent to the scarce managerial talent could be realized only through land ownership. Hence, landowners would bid up the price of land in order to gain access to it, and hence, we should expect land prices to rise to reflect the value of the scarce agricultural talent.

A Concluding Comment

The above analysis has been conducted exclusively with a static framework. It suggests that if markets were functioning perfectly, share-tenancy would tend to disappear. An obvious implication of the persistency of share-tenancy, then, is that factor markets are not perfect and that labor, for example, can in fact, be exploited.

Such a conclusion is premature, however. In the first place, the use of a static model precludes the use of a dynamic model in which risk and uncertainty are relevant. Second, share-tenancy can be an important means of sharing risk and uncertainty. Hence, it can have a life independently of the proposition presented above.

FOOTNOTES

* Helpful comments on earlier drafts of this paper were received from Bruce A. McCarl and Eliseu Roberto de A. Alves.

1/ It also implies that the production function is homogeneous of degree less than one in land and labor. This aspect of the analysis will be introduced in the next section.

2/ It is implicit in Cheung's formulation that land be a binding constraint in the optimal solution. This is a requirement that must be met if r is to be positive at all, as we shall see below.

3/ No constraint on the availability of labor is imposed since it is desired to keep the model as close as possible to Cheung's.

4/ This is a logical consequence of assuming that land has no opportunity cost outside of agriculture - the assumption implicit in Cheung's analysis. See also footnote 2/.

5/ If a solution for the Kuhn-Tucker conditions exists with $r > 0$, it follows that $h = h^*$. Thus, the objective function is strictly concave in r and t and the Kuhn-Tucker conditions are also sufficient for a maximum.

6/ That is, even if $\lambda_1 = \lambda_2$, efficiency will be attained. That should not surprise anyone since this case is equivalent to the maximization of joint income.

7/ From Euler's Theorem, $k\, q\,(h,t) = h \frac{\partial q}{\partial h}(h,\ t) + t \frac{\partial q}{\partial t}(h,\ t)$

8/ This is easy to see in this case. The "unexplained" part of production can be measured by $q\,(1 - k)$. This total is divided between the parties such that the tenant receives $R^1 = (1 - r)(1 - k)\, q$ and the landowner receives $R^L = r\,(1 - k)\, q$. When r is set at its maximum, $rk = \varepsilon$ and, therefore, $R^L = (r - \varepsilon)\, q$. That is, the difference between the share-rental and the land elasticity of production accrues to the landlord as a "rent" extracted from the tenant.

REFERENCES

Bardhan, P. K. and Srinivasan, R. N., "Cropsharing Tenancy in Agriculture: A Theoretical and Empirical Analysis," American Economic Review 61 (1971): 48-64.

Bardhan, P. K. and Srinivasan, R. N., "Cropsharing Tenancy in Agriculture: Rejoinder," American Economic Review 64 (1974): 1067-1069.

Brandao, Elizabeth S., "The Effects of New Technology on the Small Farmers Income in Northeast Brazil," M.S. Thesis, Purdue University, 1979.

Cheung, Steven N.S., "Private Property Rights and Sharecropping," Journal of Political Economy 76 (1968): 1107-1122.

Cheung, Steven N. S., The Theory of Share Tenancy, The University of Chicago Press, Chicago and London, 1969.

Friedman, Milton, Price Theory, A Provisional Text, Aldine Publishing Company, Chicago, 1962.

Kutcher, Gary P. and Scandizzo, Pasquale L., "A Partial Analysis of Share Tenancy Relationships in Northeast Brazil," Journal of Development Economics 3 (1976): 344-354.