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# Share Leasing and Production Efficiency

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ABSTRACT

This report reviews the current economic literature on the relationship between type of land lease and agricultural resource allocation. Current economic theory of land leasing does not provide a completely satisfactory explanation of lease choice in U.S. agriculture primarily because of deficiencies in the treatment of bargaining and part-owner operators. In addition, results from the literature on the principal-agent problem and on implicit contracts have not been fully exploited in the landleasing literature.

Keywords: Share leasing, resource allocation, land leasing, production efficiency, risk and uncertainty, principal-agent problem, bargaining, implicit contracts.

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# Share Leasing and Production Efficiency

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## INTRODUCTION

From the Depression up to 1982, the proportion of land in farms leased by the farm operator never fell below 35 percent. In 1982, the proportion was over 40 percent, with roughly a third of this leased land under share lease.<sup>1/</sup> The heavy reliance by farm operators on leased land means that the question of how leasing arrangements affect resource allocation is of more than theoretical importance.

This paper examines the most important issues in the debate over the relationship between resource allocation and type of land lease. There is a large literature on the economic implications of different leasing arrangements. However, most, if not all of the literature is set within the context of less-developed economies. Our aim is to see how much of this work is applicable to the question of how leasing arrangements affect resource allocation in modern U.S. agriculture.

From the time of Adam Smith until recently, the prevailing view was that the type of land lease was indeed an important determinant of the level of agricultural productivity.<sup>2/</sup> Received theory held that renters farming under a share lease would use less labor per acre than renters farming under cash

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<sup>1/</sup> Under a share lease, the rental payment consists of a portion of the output of the farm. The actual value of the rental payment is therefore not determined until the end of the production period when the output of the farm is known. In addition, a share lease frequently calls for some sharing of input costs by landowner and renter. This is in contrast to a cash lease under which the rental consists of a fixed payment, determined at the beginning of the lease period. While there is a wide variety of different lease arrangements, for simplicity, we consider only the above "pure" forms of share and cash leases.

<sup>2/</sup> Currie (20) provides a discussion of the views of some of the early economists such as Smith, Ricardo, and Mill. Underscored numbers in parentheses refer to sources listed in the Bibliography.

leases. A number of theorists have challenged this view since the late 1960's, arguing that share and cash tenancies lead to the same level of input use.

The theories examined first conclude that share leasing leads to an inefficient allocation of resources. The theories examined next conclude that share leasing leads to an efficient allocation of resources. The theories discussed in these two sections share the assumption that there is no production uncertainty. Finally, theories in which production uncertainty plays a prominent role are discussed.

#### SHARE LEASING AS AN INEFFICIENT FORM OF TENURE

We discuss two models in this section: the tax-equivalent approach and the screening approach.

##### The Tax-Equivalent Approach

The tax-equivalent approach represents the most common type of model, leading to the conclusion that share leasing is an inefficient form of tenure. It derives its name from a similarity to models of ad valorem taxes. An ad valorem tax on the output of a firm shifts the firm's marginal revenue downward, thereby lowering the profit-maximizing level of output below what it would be without the tax. The tax-equivalent approach to share leasing takes the view that the output share paid to the landowner has the same effect on the share renter that an ad valorem tax has on the firm.

Renters working under share leases receive only a fraction of the value of their marginal product (defined as price times the marginal product of labor), so they will supply less labor than under cash leases. Because labor input per acre and, consequently, output per acre, is lower under share lease than under cash lease, share leasing is said to inefficiently allocate resources. To see this, first consider the efficient case: a farmer renting land under a cash lease. Cash renting is considered efficient because it leads to the maximum level of output for given factor supplies and prices. Define the following variables:

- L : proportion of renter's labor employed on share-leased land,  
 $0 \leq L \leq 1$ .
- t : number of acres rented.
- q : output as a function of labor and land,  $q = q(L, t)$ .
- c : per acre cash rental.
- w : exogenously determined wage rate of labor.

Assuming that the price of a unit of output is fixed at unity, the renter's net income y can be expressed as:

$$y = q - ct + w(1 - L) \quad (1)$$

Maximizing y with respect to labor input and solving the first order conditions results in the following relationship:

$$q_L = w \quad (2)$$

where  $q_L$  is the marginal product of labor. The value of the marginal product of the renter's labor is equal to the market wage rate, w. To be as

efficient as cash leasing, share leasing must also result in the equalization of the value marginal product of labor with the market wage rate.

Now consider the case of an otherwise similar renter working under a share lease. The share renter's net income is expressed as:

$$y = (1-r)q + w(1 - L) \quad (3)$$

where  $r$  is the landowner's share of output ( $0 \leq r \leq 1$ ) and all other variables are as previously defined. As with the cash renter, we assume that the share renter chooses the level of labor input that maximizes income. This maximization leads to the following condition:

$$(1-r)q_L = w \quad (4)$$

As  $r$  is between zero and one, the value of the marginal product of the renter's labor,  $q_L$ , exceeds the market wage rate,  $w$ . If the marginal product of labor is positive and is a declining function of the quantity of labor supplied, equation (4) indicates that the share renter uses less than the efficient quantity of labor, "efficient" defined by equation (2). (The use of less than the efficient amount of labor is termed shirking.) As a consequence, for any given set of prices, the total output of the farm will be lower under share leasing than under cash leasing.

The tax-equivalent model poses the following question: How would an income maximizing renter allocate labor given two alternative income-generating activities: (a) working at a fixed wage rate or (b) share leasing a given amount of land at a specified rental proportion? Implicit in this simple formulation are the assumptions that the renter has no role in determining either the rental share or the amount of land to be share leased. Relaxing these two assumptions does not significantly alter the tax-equivalent conclusions (7, 11, 44). However, there are three further assumptions that appear to be more important to the tax-equivalent result.

The first assumption involves the opportunity cost of the renter's time. Equation (4) asserts that the share renter will allocate additional time to working on leased land up to the point that the return of an additional unit of time on the leased land is equal to the perceived opportunity cost of the renter's time. In this case, the opportunity cost of the tenant's time, defined as the maximum available return in other activities, is assumed to be the prevailing wage rate for hourly labor. There is a strong presumption that the prevailing wage rate is a reasonable measure of the renter's opportunity cost. However, if wage opportunities are completely absent or severely limited,  $w$  is zero or close to zero, and the tax-equivalent model predicts that share leases and cash leases lead to a very similar, if not identical, level of labor input. Few jobs in the modern American economy permit an employee much flexibility in hours worked. Given the structure of modern labor markets, it is unlikely that the renters would be able to make the marginal adjustments in labor supply between the wage market and share leasing required by the tax-equivalent model.

On the other side of the argument, the fact that most farmers renting land today operate owned land as well as rented land increases the likelihood that the opportunity cost of the renter's time on share-leased land will be relatively high. Consider a situation in which the timing of an operation--planting, for example--is critical in attaining maximum yields. Under

ordinary conditions, a farm operator can be expected to allocate sufficient time to plant all land--rented as well as owned--to achieve maximum yields. However, in any given year, conditions may be such that timely planting is not possible on all land operated (for example, excessive rain just before planting). The renter will then have incentive to work on owned land before working the share-leased land. The land the renter plants in a more timely manner is likely to have higher yields than the land planted later. In this case, we would observe lower output on share-leased land than on owned land.

When conditions are "average," there generally would be no difference in resource allocation patterns. When conditions are unexpectedly adverse such that timely working of all land is not possible, share-leased land would tend to have lower output per acre than cash-leased or owner-cultivated land. This is similar to the conclusion reached by Holstrom and Weiss in a slightly different context (29).

The predominance of part owners as renters in the United States increases the likelihood that the opportunity cost of the renter's time working share-leased land is high, even in the absence of wage labor opportunities. However, the absence of non-farm labor opportunities make the tax-equivalent model less plausible for full-tenant operators.

The second assumption crucial to the tax-equivalent conclusion is that all resource allocation decisions are made entirely by the renter. If this assumption does not hold--that is, if the landlord also participates in resource allocation decisions--the result of the tax-equivalent model will not generally hold, even in the presence of a positive opportunity cost of the renter's time. Most of the literature on share leasing, particularly the tax-equivalent models, assumes an adversarial relationship between renter and landowner. If renters and landowners have a cooperative relationship, they may be able to put together a bundle of resources superior to what either could do separately (22, 49). Under this line of reasoning, output would be higher under share leases that reflect the partnership agreement than under share leases that reflect the traditional landlord-renter adversarial relationship. Many share leases may represent a partnership agreement more than a pure land lease or a pure labor contract. In these cases, at least the major resource allocation decisions will be made jointly by renter and landowner.

The third important assumption leading to the tax-equivalent result is that all relevant variables are known with certainty by all agents. Two sources of uncertainty have been examined in the leasing literature: uncertainty regarding production and prices and uncertainty regarding the ability of prospective renters. Production and price uncertainty will be discussed below. Uncertainty regarding the renters' ability is the basis for the second group of models discussed in this section.

#### The Screening Approach

According to the screening view (24, 43, 2), cash leases, share leases, and wage contracts coexist because of asymmetric information regarding the ability of individual renters. Renters know their own ability, but landowners do not. Hallagan, for example, makes the following assumptions: (1) output is an increasing function of two types of labor, basic and managerial, (2) all renters possess the same amount of basic labor but different amounts of managerial labor, and (3) landowners, who also possess



managerial but no basic labor, cannot tell how much managerial labor is possessed by a renter until after a contract is signed (24). If landowners offer all renters cash leases, output will be lower for the renters with low managerial ability because less than the optimal amount of managerial labor will be applied. If landowners offer all renters wage contracts, landowners will have to provide all managerial input because a wage contract provides no incentive for workers to provide any of this type of labor.

The optimal strategy for landowners is to let renters choose the contract that maximizes their incomes. High-ability renters will maximize their income with cash leases. Lower ability renters' incomes will be maximized under share leases because landowners will provide some managerial input beyond what renters can provide. If the landowners provide enough managerial labor to fully compensate for renters' deficiencies, total output will be high enough that renters' shares exceed what they could attain under cash leases. Finally, renters with the least managerial ability will maximize their income by the choice of a wage contract. Landlords then provide all managerial input.

Screening theories thus predict that cash leases will be held only by high-ability renters, and share leases will be held only by renters with less managerial ability. Individuals with little or no managerial ability will work for wages. In a world without uncertainty, such an arrangement does not imply that output will necessarily be lower on share-leased land than on cash-leased land because the landlords are assumed to provide the managerial input that renters cannot. However, if landowners provide no inputs, output will be lower on share-leased land than on cash-leased land (2, p. 85). Furthermore, if production uncertainty is present and if renters are risk averse to some degree, output may differ according to the ability of renters and the elasticity of substitution between land and labor (43, p. 328).

The screening view of the world is consistent with the concept of the tenure ladder. Young farmers have less entrepreneurial ability than older, more experienced farmers. The youngest, least experienced farmers will therefore maximize their expected income under fixed wage contracts, while those who already have some experience will attain their maximum expected income under share contracts. As the young farmers gain experience (accumulate human capital), they will be able to bid more for fixed-rent contracts.

#### Summary of Tax-Equivalent and Screening Approaches

Both the tax-equivalent models and the screening models predict that output will be lower on land rented on shares than on cash-leased land, provided the landlord does not participate in the farm operation. There is, however, an important distinction between the underlying reason for this lower productivity. The lower productivity of share-lease renters is due to the fact that these renters are simply less capable, according to the screening approach. Because renters are assumed to have the option of choosing different types of leases, the observed differences in productivity are in a sense optimal. Furthermore, the lower productivity of share renters does not imply that output will be lower on share-leased land than on cash-leased land. The crucial question here is how much labor input (including management labor) the landowner provides.

In contrast, the inefficiency of the traditional tax-equivalent model (which assumes that the renter owns no land) arises because renters do not have the

choice of cash renting. Their options include only wage labor and share leasing. In other words, there is an element of coercion behind the tax-equivalent approach. This view of share leasing has been used to justify proposals restricting the use of share leases in many less-developed countries.

If share leasing is inefficient, why does it persist? The most common explanation is the existence of imperfections in related markets. Binswanger and Rosenzweig point out that an imperfection in a single market, such as the land market, cannot explain share leasing (12). However, if more than one relevant market is imperfect, landlords may be able to exploit the restricted opportunity set of the renters. For example, if landlords control access to capital as well as to land, they may be able to link the two markets, thereby exploiting landless renters (2, 6, 16, 37, 43).

Neither the traditional version of the tax-equivalent model, in which the operator is a landless tenant, nor the screening view appear to be very relevant to U.S. agriculture. The traditional tax-equivalent model requires market imperfections that either do not exist in the modern U.S. economy or are relatively insignificant. The screening model has greater potential as an explanation of leasing in the United States. However, recent evidence indicates that many operators rent land under both cash and share leases and that operators go from cash renting to share renting and *vice versa* (33). The screening model does not provide a totally adequate explanation of these observations.

The tenure-ladder variant of the screening hypothesis is not a promising model of land leasing in the United States. Partial support for the tenure-ladder concept comes from the fact that a higher proportion of full tenants are younger and less experienced than either part owners or full owners. However, Kloppenburg and Geisler found little evidence that a progression from wage laborer to share renter to cash renter to full owner ever existed, as the tenure-ladder hypothesis asserts (36).

More important, the tenure ladder makes no attempt to explain the lease choice of part owners. The fact that part owners operate 71 percent of all leased land in farms means that the tenure-ladder hypothesis is largely irrelevant as an explanation of lease choice in the United States.

Perhaps the most promising aspect of the above theories is the application of the tax equivalent analysis to the part owner. As discussed above, the opportunity costs of the part owner's time on share-leased land is well-defined. Even if the part owner entered into a share lease with no intention of shirking, situations could arise in which the operator faces a choice of achieving optimal yields on owned land or on share-leased land.

#### SHARE LEASING AS EFFICIENT AS CASH LEASING

Initiating what will be called the equal efficiency model of share leasing, Cheung (19) took the position that share leasing leads to the same pattern of resource allocation as cash renting. Cheung asserted that the only possible equilibrium position in a world of perfect competition is where the value marginal product of labor is equal to the wage rate and, at the same time, the landlord's return from share-leased land is the same as the return from

cash-leased land.<sup>3/</sup> If these conditions are not met, as in the tax-equivalent models, renters' income from the combination of wage labor and share leasing will exceed their income from wage labor alone. Likewise, landlords will receive less than the equilibrium return to land. However, according to Cheung, renters' surplus will be extracted from renters by the market process. Landlords will be able to use competition among renters to find renters who agree to supply sufficient levels of labor input such that their total income from share leasing and wage labor is the same as their total income would be if all their time was spent at wage labor.

Cheung posited an income-maximizing landlord who owns H acres. The owner's income is equal to the owner's share of gross revenue per leased farm,  $rq$  (output price is still assumed equal to 1), times the number of farms leased out,  $m$ . Assuming that the landowner is constrained to offer the renter a total return at least equal to what could be earned working entirely for wages at  $w$ , the exogenously determined wage rate, the landlord's maximization problem can be solved by maximizing the following expression (19, p. 1113):

$$\text{Max } Z = mrq + a[wL - (1-r)q] \quad (5)$$

$m, r, L$

where  $a$  is a Lagrangian multiplier and output per farm ( $q$ ) is a function of labor (where  $L$  is still defined as the proportion of the renter's time spent working leased land) and land per farm,  $t (= H / m)$ . In this model, the landlord's decision variables are  $m$  (or  $t$ ),  $r$ , and  $L$ . The first order conditions lead to the requirement that the marginal value product of labor is equal to the wage rate (19, p. 1114).

$$q_L = w \quad (6)$$

where  $q_L$  is the marginal product of labor. This is identical to equation (2) which is the standard of efficiency. Hence, share leasing leads to the same resource allocation as cash leasing.

Cheung asks: Given that a landlord desires to rent out land and that the renter has the option of working for wages or farming on shares, what rental share, what amount of land rented to each renter, and what amount of labor supplied by the renter will maximize the landlord's income? The crucial assumption here is that the landlord chooses the level of labor input, not the renter. The renter chooses between sharecropping and working for wages but the level of labor input is chosen to maximize the landlord's income, subject to the constraint that the renter's income is equal to what could be earned at wage labor.

If all tenures are equally efficient and equally remunerative to each agent, why would anyone choose one type of lease over another? Cheung's answer is that the interplay of risk aversion and transaction costs determines lease choice. Share leases are more costly for the landlord to enforce than are cash leases because renter input levels must be specified and monitored. For this reason, a landlord might be seen to prefer a cash lease. However, share leases provide a degree of risk spreading for the renter that is absent from

<sup>3/</sup> See also Adams and Rask (1), Boxley (14, 15), Gisser (23), Kim (35), and Scott (51).

fixed rent leases so a risk averse renter would prefer a share lease. Cheung concludes that share leases will be chosen over fixed-rent leases if the gains from risk sharing are high enough to overcome the higher transaction costs of share leases. Alston, Datta, and Nugent (4) and Datta, O'Hara, and Nugent (21) present models in which transaction costs play a prominent role.

The crucial assumption of the equal efficiency view is that the landowner is able to specify, and enforce without cost, the labor input of renters: "The total amount of renter inputs ... are contractually stipulated, which is essential because the renter would commit less if only the rental percentage were prescribed" (19, p. 1115). First of all, share contracts in the United States do not stipulate in very great detail the renter's inputs, particularly labor input and the timing of inputs.<sup>4/</sup> In fact, many share leases are oral contracts (33). It is very difficult to specify the precise input requirements of an operation as complex as farming in such contracts.

Because of his insistence on "contractually stipulated" input levels, the absence of explicit, detailed stipulation of input requirements in share leases is prima facie reason for rejecting Cheung's version of the equal efficiency argument. Rejection of Cheung's (19) argument does not, however, mean that a more general equal efficiency view should also be rejected. A commonly observed phenomena of labor markets is that while labor contracts do not specify in any detail the duties and obligations of the parties to the agreement, labor and management behave, for the most part, as if such contracts existed. In other words, labor and management enter into implicit contracts (25, 18, 17). Landlords and renters might also enter into implicit contracts.

Even if share contracts specify renter input levels in sufficient detail, Cheung's result will not generally hold if enforcement of share leases, which consists primarily of supervision of the renter, is necessary but costly. Assuming the same behavioral rules for the landowner as for the tenant, the landowner will allocate time to supervision up to the point at which the marginal benefit of an additional unit of time spent supervising is just equal to the benefits accruing from spending that time in the next highest valued activity. There is no reason to believe that this would lead to a level of supervision sufficient to attain the "efficient" level of output on share-leased land. The more valuable the landlord's time in other activities, the less time will be spent supervising share renters.

Share-leasing contracts are costly to enforce (13, 49,). The fact that landlords incur significant enforcement costs with share leases gives support to Ip and Stahl's argument that even if no output differences between cash and share lease tenants are observed, share leasing is inefficient if one looks beyond the narrow confines of the agricultural sector (32). Positive supervision costs for the same level of output as would be obtained under a cash lease indicates that more resources per unit of output are expended under a share lease than under a cash lease.

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<sup>4/</sup> Reid argues that landlords specified input levels in greater detail for share leases than for cash leases in the United States around the turn of the century (49). However, this does not mean that input levels were specified in sufficient detail to ensure equal efficiency.

The fact that enforcement is not only costly but also imperfect casts further doubt on the claims that share leasing will actually achieve the same level of output as other tenure forms. If share leasing creates incentives for the renter to shirk, as asserted by Chueng, and if, in addition, there is a nonzero probability that landlords will either not detect the shirking or will not penalize the renter when shirking is detected, then at least some renters will successfully shirk. Undetected shirking by even a few share-lease renters would result in lower output per acre averaged over all share leases compared with the average cash lease output per acre unless the non-shirking share renters have higher output per acre than do cash renters. Furthermore, the imperfect nature of enforcement introduces an additional source of uncertainty. If landlords are risk averse to any degree, they may be willing to accept low, but nonzero, levels of shirking rather than take the risk of dismissing good tenants.

The force of the above criticisms is somewhat mitigated if the contract specifies crops or cropping practices for which inputs, particularly labor, are used in essentially fixed proportions. Such contract provisions reduce landlord monitoring costs and the contract would not have to specify input levels in much detail.

Rao constructs a model predicting that share leasing will be more prevalent for crops with fixed input proportions than for crops with high elasticities of substitution among inputs (46). From the perspective of the equal efficiency result, fixed coefficient technology is desirable because it reduces the number of variables necessary for monitoring input intensity, thereby reducing the landlord's costs of monitoring. Rao, on the other hand, emphasizes the coordination advantages of fixed-coefficient technology. His view is that a share lease requires agreement between tenant and landlord on production decisions. When a crop with relatively fixed input proportions is grown, such agreement is more likely than when there is a wide choice of input combinations (see also 30).

The equal efficiency approach is based upon the idea that perfect markets will equalize returns. Proponents of this view hold that the tax-equivalent model assumes a smaller opportunity set for the landlord than is warranted in a private property, free market economy. In such an economy, the contract between landlords and renters will specify the level of labor supply required of renters. In addition, these contracts will be fully, and without cost, enforced. The landlord's return on his asset (land) will thus be the same in all uses. As pointed out above, the contract between the renter and the landowner does not appear to specify renter inputs in sufficient detail for the equal efficiency result, nor is the contract enforced without cost. The equal efficiency model thus depends upon either the operation of implicit contracts or the presence of fixed coefficient technology, in which case specification and monitoring of input levels is greatly simplified.

A major difficulty with implicit contracts as an explanation of share leasing behavior is that implicit contracts are by definition unobservable. However, contributing to the plausibility of implicit contracts is the fact that there are likely to be community pressures creating incentives for both parties to honor implicit contracts. If farm operators desire a reputation within their community of being "good farmers," they will expend the same amount of effort on leased land as owned land. Likewise, landlords may also desire the



reputation of "good" landlords. In short, a desire for fairness may play an important role in land leasing.<sup>5/</sup>

Finally, the equal efficiency view contradicts two commonly accepted postulates of economic behavior. First, the equal efficiency claim that the only position "consistent with an equilibrium with private property rights" (19) is one for which all tenures are equally efficient requires the renter's maximization process to be one of equating average returns and not marginal returns (41). This may in fact be the correct position. But, because it is contrary to the standard marginalist view of the economist's world, it needs greater support than provided by Cheung. Second, a standard result in the literature on the firm's behavior under uncertainty is that a firm operated by a risk-averse manager will have lower levels of output than an otherwise similar firm operated by a risk-neutral manager (47, 50,). The equal efficiency view claims that output levels will be the same for both risk-averse and risk-neutral operators.

One of two conditions must be met with regard to applicability of the equal efficiency approach to U.S. agriculture. Either input levels must be "specified" in implicit contracts or production technology must require relatively fixed input requirements. If neither of these conditions hold, then other explanations of share leasing must be found.

#### SHARE LEASING AND UNCERTAINTY

One of the reasons given most frequently for the contemporaneous existence of share and cash leases is that share leasing provides a way to spread production and price risk between landowner and renter. In other words, share leasing is a response to the presence of uncertainty. The simplest way to incorporate uncertainty into the basic share-leasing model of equation (3) requires two changes. First, the production function of (3) can be made stochastic by appending a random variable  $\theta$  with mean of 1 and variance greater than zero. Output is thus given by:

$$q^* = q(L, t)\theta \quad (7)$$

where  $q(L, t)$  is the same production function as before. Second, rather than the income maximization asserted in equation (3), agents are assumed to act in order to maximize the expected utility of income. Representing the utility of income by  $U(y)$ , the expected utility of income for a share tenant is:

$$E[U(y)] = E U[(1-r)q\theta + w(1 - L)] \quad (8)$$

where  $E[\ ]$  is the expectations operator. This approach leads to a number of different conclusions regarding the relationship between resource allocation and leasing. We first discuss some of the conditions under which this model

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<sup>5/</sup> See Kahneman, Knetsch, and Thaler for an example of how attitudes of fairness may constrain a firm's behavior (34). Baumol shows how the consideration of fairness changes some results of standard economic theory (10).

leads to the conclusion that production per acre or per unit of labor will differ among farms under share leasing.

Stiglitz has shown that if landlords and renters can mix contracts in the sense of entering simultaneously into cash, share, and wage contracts, there are no risk-sharing advantages to share leasing (53). If contract mixing is not possible, or is too costly, then share leasing has a clear risk-sharing function. In such a case, the more risk-averse landowners will have fewer renters per acre than the less risk-averse landowners. If the supply of renter labor is perfectly inelastic, labor input per acre and hence output per acre will differ across farms according to the risk aversion of the landowner (53).

The above specification follows the equal efficiency assumption that it is possible for the landowner to specify the renter's labor input. Labor input per renter is thus assumed constant: the differences in output per acre arising from differences in the degree of risk aversion among landowners. If output is a function of the renter's effort, effort being unobservable, there is an incentive problem. The productivity of renters will differ according to the degree to which their effort responds to changes in their output share, and "output will in general differ on different farms: the economy will not be productively efficient unless the production function has unitary elasticity" (53, p. 245).

Under slightly different assumptions, the approach embodied in equation (8) leads to the conclusion that share leasing is more efficient than cash leases. Newbery (42) and Newbery and Stiglitz (43) have shown that the presence of uncertainty in related markets may mean that production efficiency can be attained only with share leasing. For example, if there is uncertainty associated with the labor market and this uncertainty is uncorrelated with the random variable  $\theta$  in (8), "they [share contracts] allow the economy to increase output in every state of nature if factor markets are risky" (43).

Sutinen also attempts to show that share leases are more efficient than cash leases (55). However, he demonstrates only that if renters choose share leases, forcing them to enter into either cash leases or wage contracts will result in lower output. Sutinen does not compare the output level for renters who choose share leases with the output level for renters who choose cash leases. Hence, his conclusion that share leases are more efficient than cash leases is unjustified simply because the question is unexamined.

There is an important distinction between two questions regarding the relative efficiency of share leases. One question is whether the productivity of a given tenant will be higher under a share lease than under a cash lease. This is the question addressed by Sutinen. It is only of interest when there is an element of coercion in lease choice. The other question is whether the productivity of tenants who choose share leases will be higher than the productivity of tenants who choose cash leases. This question is the more relevant one in the context of U.S. agriculture.<sup>6/</sup>

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<sup>6/</sup> Baron (9) uses a model almost identical to Sutinen's so the criticisms that apply to Sutinen's model also apply to Baron's.

The models discussed in this section focus on the role played by uncertainty in the choice of lease type. The conclusion to be drawn from this work regarding the effects of lease type on resource allocation is that output may be higher or lower under share leasing. It is an empirical question, depending upon such factors as the form of the production function, risk preferences, and uncertainty in factor markets. However, if output is indeed lower under share leases than under other tenures, the lower output is not to be attributed to the share lease per se but to the fact that under conditions of uncertainty, a risk-averse individual will behave differently than a risk-neutral individual.

#### SUMMARY AND CONCLUSIONS

The screening model does not provide an adequate explanation of lease choice in the United States, and, hence, of the relationship between leasing and resource allocation. The simple version of the tax-equivalent model was rejected because the markets for land and capital are well developed in the United States. In addition, imperfections in the labor market make it unlikely that the marginal allocation of labor between share-leased land and wage labor are possible. We also reject the Cheung model's ability to explain the relationship between leasing and resource allocation because of the assumption that contracts specify renter input intensity. A further objection is that, as presented by Cheung, the equal efficiency result requires that there be sufficient competition among renters. This may be a reasonable assumption when potential renters outnumber landowners. When landlords outnumber renters, as is the case in this country, the equal efficiency result may not hold because the renter may have market power vis-a-vis the landlord. However, rejecting Cheung's model does not mean we rule out Cheung's result.

One of the most obvious deficiencies of the above theories is the absence of explicit consideration of the bargaining process. Bargaining plays a major role in only one study. Bell and Zusman modeled the landlord-tenant bargaining process as a Nash cooperative game under the assumption that renters outnumber landlords (11). The situation in the United States is the reverse: landlords outnumber renters roughly two to one. Hence, if either party has a bargaining advantage, it is likely to be the renter. Recent work on noncooperative bargaining (54) and cooperative bargaining (45) may provide some useful insights.

In addition to the bargaining aspects of leasing, we need to better understand the implications of the implicit contracts and principal-agent approaches. Stiglitz's work shows that an essential feature of a share-lease contract is that output depends upon the effort of the tenant, a variable that the landowner cannot observe and hence cannot directly monitor (53). Such a situation is called a principal-agent problem and has been widely studied elsewhere (26, 28, 31, 39, 40). The work on the principal-agent problem has great promise as a framework for analyzing share leasing in U.S. agriculture.

More complete modelling of the bargaining process and the use of the principal-agent framework are as applicable to agriculture in less-developed countries as they are to U.S. agriculture. In addition, there are at least four aspects peculiar to U.S. agriculture that must be addressed if we are to

attain a full understanding of the resource allocation implications of farmland leasing in the United States.

First, more research into the behavior of part owners is necessary. The behavior of part owners is important because of their dominant position in U.S. agriculture, particularly in the land rental market. Second, we need a better understanding of the nature and extent of the partnership aspect of share leases. The above discussion demonstrated the importance of the degree to which the landowner contributes to the farming operation. Third, we need to develop leasing models which account for the fact that the U.S. market for buying and selling farmland is well developed. The presence of a functioning land market gives renters an option assumed to be absent in the literature discussed in this paper.

Finally, as pointed out in Johnson and others, there are a number of provisions in both the tax code and Federal farm programs encouraging landowners to use share leases (33). The relationship between leasing and resource allocation may be very different when a particular lease is chosen for tax or government program considerations than when chosen for other reasons such as its risk-spreading advantages.

There are two aspects of the question of leasing and resource allocation not addressed in this paper that require further research. First, the scope of this paper was limited to the analysis of the shortrun effects of leasing practices. We looked only at how leasing practices affect the use of variable inputs, primarily labor. Longrun implications, such as the effects of leasing patterns on capital investments, are also important and warrant further study. Second, we considered only single product farms in this paper, so the focus was on how lease choice affects input intensity. However, in a multiproduct context, lease choice may affect resource allocation patterns through the choice of product mix as well (5, 8).

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