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# Alternative Theories of Sharecropping: Some Tests Using Evidence from Northeast India



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# Alternative Theories of Sharecropping: Some Tests Using Evidence from Northeast India

*by Clive Bell**

*The recent debate concerning the efficiency of sharecropping contracts yields a number of testable hypotheses, four of which can be examined in the light of some primary data for a group of sharecroppers in northeast Bihar. The salient feature of the empirical analysis is the comparison of the resource allocation patterns on owned and rented land cultivated by the same farmer, which provides a more powerful test of inefficiency than those advocated previously. Broadly speaking, the findings support the 'Marshallian' position that such contracts do involve inefficiency—in the Bihar context, at least.*

## I INTRODUCTION

Until recently, at least, economists reared in the Anglo-Saxon tradition, as exemplified by Marshall *[1920: 534–37]*, have had a poor opinion of sharecropping. Their verdict ran as follows: a tenant whose contract stipulates solely the fraction of gross output to be paid as rent will have an incentive to use variable inputs less intensively than an owner–operator or a tenant leasing in land on a fixed rent basis. Under competitive conditions, fixed rent contracts will lead to a pattern of resource allocation which is Pareto optimal, so that production under sharecropping will not be efficient. Those in the Marxist tradition also have small love for sharecropping. Their analysis rests on the view that it is a device for extracting a surplus from the peasantry in certain kinds of agrarian settings, usually termed 'quasi-' or 'semi-feudal'. The demise of sharecropping commonly heralds an historically progressive change in the mode of production, and is therefore to be welcomed. (The static–dynamic contrast in these two positions is evident.)

The modern challenge to the conventional (Anglo-Saxon) wisdom was mounted by Cheung *[1968, 1969]*. His important work combined theoretical and empirical analysis to arrive at the conclusion that resource allocation under fixed rent and (suitably formulated) sharecropping contracts will be identical. There followed a number of theoretical contributions to the literature, with Bardhan and Srinivasan *[1971]* and Bell and Zusman *[1976]* pursuing a 'Marshallian' line, and Newbery *[1973, 1975, 1976a, b]* and Stiglitz *[1974]*—hereafter, the 'new school'—extending Cheung's approach in a major way.[1] But the

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[illegible] of this debate [illegible] not hinge solely on the quest for [illegible] improvements in the [illegible] of contracts and incentive systems. Given [illegible] legal [illegible], however weakly enforced, aimed at limiting the crop share to which a [illegible] may legally lay claim, or even at [illegible] contracts entirely, the fortunes of the 'Mar[illegible]' side [illegible] important bearing on much existing land tenure policy in [illegible].

[illegible] purpose of this paper is to subject some of the predictions of the two [illegible] analyses of [illegible] to empirical tests using a [illegible] evidence from Purnea District, Bihar. A key feature should be stressed [illegible] the outset. As most sharecroppers in [illegible] own farm land of their own, close attention is paid to [illegible] own and sharecropped land cultivated by the [illegible]. However, the [illegible] also includes 'pure' sharecroppers, [illegible] on owned and sharecropped land [illegible] made between two sorts of tenant, also. To anticipate, [illegible] 'Marshallian' on farms with both own [illegible] land, but more 'Cheungian' as regards the [illegible] tenants.

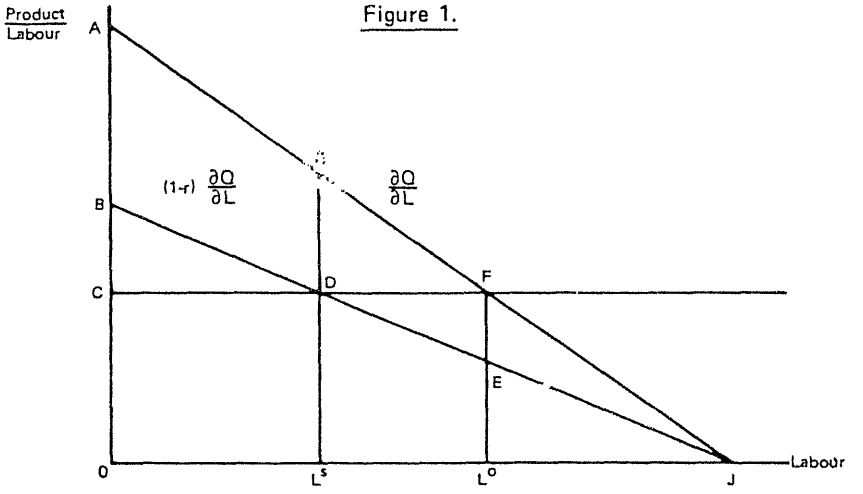
[illegible] Section II, the essential features [illegible] two sides are outlined in brief, and a [illegible] hypotheses on which their predictions differ are [illegible] background features of the [illegible] land tenure situation. The hypotheses are [illegible] the [illegible] of value added and policy [illegible] in Section V.

## [illegible]

In order to [illegible] the hypotheses on which the predictions of the two approaches [illegible] it is necessary to sketch out the essential features of their respective analyses. Given limitations of space, it is not possible to [illegible] the [illegible] side. What follows is designed [illegible] to highlight their basic points of disagreement in a way which [illegible] the [illegible] task of interpreting the evidence.

[illegible] with the [illegible]. Consider a perfectly certain and [illegible] in which output (Q) is produced with land (H) and [illegible] (L). [illegible] farmers, one an owner-operator and the other a [illegible] (or [illegible]) of the output in rent, are cultivating [illegible] and fertility in Figure 1, their respective [illegible] are shown as AGEJ and BDEJ (drawn as straight lines [illegible]), for each value of L, the correspond[illegible] point on [illegible] as high as its counterpart on [illegible] market, the marginal cost of [illegible] land is constant at the going wage w [illegible] in units of farm [illegible] in Figure 1). If both agents [illegible] marginal cost with marginal revenue), the owner-operator or a tenant paying a fixed rent[2] will [illegible] L units of labour, while the sharecropper will employ only $L^s$ units. [illegible] the difference between $L^o$ and $L^s$ will grow greater as the

Figure 1.




landlord's share of gross output increases (which corresponds to BDEJ rotating downwards about J). The respective levels of gross output are $OAFL^o$ and $OAGL^s$. In the latter case, ABDG accrues to the landlord, and the sharecropper's income net of wages (actual or imputed) is BCD. Producer surplus is lower on the sharecropped holding by an amount DFG, which is a measure of the welfare loss attributable to the inefficiency arising out of that contract.[3] According to this line of analysis, then, the enforcement of legislation which reduces the share appropriated by landlords will improve efficiency, raise tenants' incomes and secure greater equity between landlords and tenants. If stronger (first-best) medicine can be administered, then sharecropping contracts should be prohibited and fixed rents left to find their competitive levels.

In the above analysis, the area of land cultivated by both agents was taken as given, so let us now turn our attention to the demand for sharecropping leases which specify r alone. The tenant maximises income (net of actual and/or imputed labour costs):

$$Y = (1-r)Q - wL \tag{1}$$

where $Q = F(H, L)$. Then the first order conditions are:

$$(1-r)\frac{\partial F}{\partial H} = 0 \tag{2}$$

and

$$(1-r)\frac{\partial F}{\partial L} = w \tag{3}$$

Equation (3) is familiar; in Figure 1, it takes the guise of BDE intersecting CDR at D to determine $L^s$. But equation (2) is a cause for disquiet. If the production function does not admit of a zero marginal

productivity of land for finite H and L, there will be excess demand for tenancies whatever the rental share—provided it is less than unity—and each landlord will be able to act as a monopolist. Even if the production function were so accommodating, the tendency noted above for sharecroppers to undersupply variable inputs for any given area they lease in finds its obverse in their attempts to go on hiring in land until its marginal product falls to zero. For given any level of labour inputs, the sharecropper can profitably spread it over additional plots, thus producing extra output, in which his share is $(1-r)$, at no extra cost to himself.

Johnson *[1950]*, perhaps the first to note this odd implication of the Marshallian approach concludes that the landlord will seek to enforce the application of a minimum bundle of inputs and that there are basically three ways in which he can do so:

(a) to specify in detail what the tenant must do;
(b) to grant only a short term lease with a view to a periodic assessment of the tenant's performance;
(c) to share in the costs of cultivation in the same proportion as he shares in gross output *[p.118]*.

Johnson concentrated on the second option. The tenant knows he must put up an average performance in terms of gross output which will yield to the landlord a satisfactory return per acre, or forfeit the lease. It is easily demonstrated that this will ensure production efficiency on all plots, whatever the form of contract under which they are leased *[Newbury, 1976a]*.

Cheung, however, confines himself to option (a), citing examples of such contracts from pre-War China *[1969: 76–8]*. Suppose the landlord is able to *enforce* a contract specifying the minimum labour input per acre (l) to be applied by the tenant, as well as the rental share. Then if there is a perfectly elastic supply of would-be tenants who have the alternative of certain employment as labourers earning an exogenously determined wage, there will be a competitive equilibrium described by some $(r^*, l^*)$ in which the rent per unit of land will equal the marginal product of land and the marginal product of labour will equal the wage *[ibid: 19–21]*. This will come about through would-be tenants offering contracts whose utility (to them) is not less than that of being a wage labourer. Recalling Figure 1, the inefficiency noted above will be eliminated by the landlord stipulating a minimum labour input $L^o$, thereby taxing away the tenant's producer rent (BCD) and leaving him with the imputed cost of his family's labour, which is the level of their alternative earnings in the labour market. No monopoly power is needed, for competition among tenants will lead to excess demand for tenancies more favourable (to them) than $(r^*, l^*)$ and to zero demand for those which are less so (which limits the terms the landlord can stipulate).

From the foregoing account of a competitive and certain world, it is now possible to define precisely one major bone of contention between the two sides which is susceptible to empirical testing.

*H1A. 'Marshallians' argue that inputs and output per acre on share-cropped holdings will be lower than those owner-operated holdings of the same fertility. The 'new school' contends that there will be no differences at all.*

However, an intelligent interpretation of the data requires some consideration of risk and of imperfections in factor markets. Newbery and Stiglitz have made notable contributions to the literature by generalising Cheung's basic results to an uncertain world. If agents maximise expected utility, and can mix certain wage, fixed rent and sharecropping contracts, then production will be efficient everywhere. Also, *contra* Cheung, share tenancies offer no advantage over suitable combinations of wage and fixed rent contracts, which raises the question of why share contracts should be observed, for they entail higher transactions and enforcement costs. Newbery *[1976b]* seeks the explanation in factor market, as opposed to production, uncertainty and goes on to prove that under particular conditions, share contracts will be production efficient even with risky wages.

Concerning factor market imperfections, only those affecting the labour market will be treated in any detail. When land ownership is highly concentrated, it is probable that the labour market will be oligopsonistic. Moreover, as the demand for labour shows strong seasonal variations and depends on the state of nature, the notion that employment offers are available in any amount at a perfectly certain wage is difficult to accept. These factors, together with the transactions costs of entering the labour market and a psychic aversion to working for others, will combine to make the reservation price of family labour somewhat lower than the going wage for a range of family labour input levels (however the wage is determined). One consequence of this has received much attention: the inverse relationship between farm size and output per acre, commonly attributed to higher labour intensities on smaller holdings. According to the 'new school's' account, there is no place for such a phenomenon—given the twin assumptions of constant returns to scale and perfect competition in all factor and product markets. The convinced Marshallian, on the other hand, would be very bothered about the sampling design because the tenure status and farm size effects on two key variables would have opposite directions if pure tenants had smaller holdings than owner–tenants or owner–occupiers. Indeed, they might balance one another almost exactly and so provide (ill-founded) support for the 'new school'.

All this suggests care in testing *H1A*. Consider a farmer who owns some land which he supplements with other parcels leased in on a sharecropping basis. His access to inputs, traded or non-traded, and his aversion to risk are common elements in his decisions concerning the allocation of resources on his owned and leased-in plots, so that their particular influence on the conditions for *H1A* to hold can be eliminated by examining the *differences* in resource allocation on his two sorts of plots. In other words, the gamut of imperfections and complications of the real world, which do not impinge equally on all individuals, are

sources of variations which can be controlled for in the following way: for each farmer who cultivates both his own and sharecropped land, take the difference between input and output levels per acre on owned and sharecropped land, respectively. This constitutes the salient methodological feature of this paper.

In the light of the foregoing, two further hypotheses may be offered which have some original features. First,

*H1B. With imperfections in the labour market and with the presence of non-tradeable inputs, the Marshallian version of H1A will be seen most clearly by comparing the difference between input and output levels per unit of land on owned and leased plots which are cultivated by the same farmer.*

Secondly, there may be some correlation between the size of a farm and the tenure status of its plots. That being so, we have:

*H1C. If pure tenants have smaller holdings than owner–tenants and owner-operators, comparisons of input intensities and yields across types of farmer by the tenure status of the plots they cultivate will show differences smaller than (or even opposite to) those observed within owner–tenant holdings.*

The conditions for testing *H1* are undeniably stringent, and by relaxing some of them it is possible to arrive at some additional testable hypotheses. What happens, for example, if there are variations in soil fertility and the incidence of irrigation among plots, the latter being of considerable importance in Purnea? Mill and Marshall seemed to have regarded the rental share as determined by custom *[Cheung, 1969: 46]*, which carries the implication that r would be the same for all contracts. Bardhan and Srinivasan do not address this issue directly. In their general equilibrium framework, land-augmenting technical progress reduces the rental share. Does that finding reveal anything about differences in the rental shares on plots of differing fertility, even if the latter were interpreted as variations in the effective supply of land services obtainable from identical acreages? With constant returns to scale and a uniform r, an acre of land 'twice as fertile' as the average will be combined with twice the average labour input, so resource allocation (in efficiency units of factors) will be the same across all plots. But the tenant's producer surplus will be twice as large as the average, too, and the strength of excess demand will wax with the fertility of the plots in question. No easy resolution of this difficulty seems in sight within a competitive framework.

For the 'new school', Cheung states that r will be higher for more fertile land, given the alternative earnings of the tenant *[1969: 56]*. However, r need not vary with soil fertility, even with a contract stipulating (r, l), though the assumptions are restrictive.[4]

One final possibility is that if, for some reason or other, the rental share is fixed across the board, then only land of a certain fertility will be

leased out, given some suitable stipulation of input intensity. This poses obvious difficulties for empirical testing, as highly detailed information is required.

Subject to the foregoing reservations, therefore, we may state the following hypothesis:

*H2. Variations in soil fertility and the incidence of irrigation may not affect the rental share [Marshall and Mill]. The 'new school' argues that such variations will alter r, more fertile land being associated with higher rental shares.*

Closely related to *H2* is a hypothesis concerning contributions by the landlord to the variable costs of cultivation. The analysis of this section may be readily generalised to the case where there are many variable inputs (fertilisers, pesticides, seed, water, etc.) provided they are all fully tradeable in perfect markets. Contributions by the landlord to cover part of such costs will lower the tenant's cost of cultivation, so that the rental share will rise to leave the latter's earnings at their alternative level *[Cheung, 1969: 56]*. It is not clear how traditional Marshallian analysis would handle this issue because r is regarded as fixed. However, the neo-Marshallian analysis of Bardhan and Srinivasan *[1971]* indicates that if the landlord's share of the costs of variable inputs increases, then so does the rental share. In a disequilibrium situation, it might be argued that r will remain unchanged and the fraction of the cost of any input contributed by landlords will be r also. While this suggestion is rather speculative, it should be noted that if the landlord's contribution to each and every variable cost is the same proportion as his share in output, then resource allocation is production efficient—provided land is rationed 'correctly' *[Bell, 1976]*. Alternatively, as Cheung points out *[1969: 45–46]*, if r is fixed, then there will generally exist some landlord contribution to variable costs such that all the relevant conditions for a competitive equilibrium are satisfied. Some empirical observations on these matters will be made later in the paper.

*H3. Traditional Marshallian analysis does not give a clear prediction concerning the effects on r of contributions by landlords to variable costs. The 'new school' predicts that r will rise as a consequence; if r is fixed then landlords' contributions must take particular values.*

Now nothing has been said about returns to scale, though under competitive conditions increasing returns are ruled out. Suppose there are constant returns to scale. If contracts stipulating minimum input bundles are enforceable, then each tenant will get an income from cultivation which equals the alternative earnings of his household's resource endowments (assuming they are all fully tradeable) whatever the area he leases in. Thus tenant holdings are of indeterminate size, a well-known result from the theory of the firm. In practice, it may be argued that the transactions costs of hiring non-family inputs will cause the tenant to lease in an area which matches his household's resource

endowment (principally labour) as closely as possible. This notion appears to underlie, albeit implicitly, the treatments of both Cheung and Stiglitz. More explicitly, as each lease from a different landlord entails a separate transactions cost, the tenant will settle for a single landlord *[Cheung, 1969: 55]*. Stiglitz scents deeper problems:

> The difficulty is that there is nothing in the assumptions made so far which would seem to warrant a requirement that a worker work with only one landlord. (That is, under the assumptions of constant returns to scale, there is no difference between a worker selling half his time to a landlord to work on a half an acre, or selling all his time to a landlord to work on a whole acre). The fixed costs of moving from one landlord to another, the difficulty of making sure that the labourer is really spending half his time with each of the two landlords, the suspicion that the worker will allocate more of his 'effort' at certain crucial times to the contract with the greater incentive payoffs . . . —all important considerations which we have omitted from our analysis—provide some explanation of why workers work only with one landlord. *[1974: 225–6]*.

Strikingly, he presumes that the evidence will rescue him from the difficulties arising out of his own assumptions.[5] He puts his finger also on a key element in predictions derived from the Marshallian approach.

If the minimum input provision is not enforceable, then even if all inputs are fully tradeable in perfect markets and each landlord rations the area of land leased to each tenant, the tenant can 'shop around' among many landlords in the hope of increasing the total size of his holding, as the logic of equation (2), subject to transactions costs, requires. Again, if some inputs are nontradeable (for example, management skills), then it is not clear that a minimum input intensity can be enforced completely, and the tenant will have an incentive to spread his endowments of such inputs as widely as possible, seeking contracts with several landlords if one will not accommodate him.

Under diminishing returns, suppose the holding size and the levels of other inputs are given. Then tenants will attempt to subdivide the holding into smaller plots until output ceases to rise, i.e., constant or increasing returns set in. (The cost curves must be U-shaped *[Newbery, 1973: 12]*). Provided the stipulations concerning variable input intensities can be enforced, landlords will go along with such moves. But, as Stiglitz notes, enforcement will become difficult if tenants achieve subdivision by leasing in one small parcel from each of many landlords. Thus:

*H4. The Marshallian approach predicts that sharecroppers will attempt to lease in land from several landlords. The 'new school' predicts that each tenant will settle for a single landlord and, somewhat less clearly, that the area leased in by a tenant will be such as to match his household's resource endowment.*

## III THE TENURIAL BACKGROUND AND THE SAMPLE

An immediate conclusion from Section II is that the process of hypothesis testing cannot be divorced from the detailed features of the

agrarian system being studied. To begin with, a brief outline of the tenurial situation is needed. As Purnea came under the Permanent Settlement, it is no surprise that much of the land in the district should be cultivated by tenants. Moreover, sharecropping is virtually the sole form of lease encountered there.

TABLE 1

TENURE STATUS OF ALL SIZE CATEGORIES OF OPERATIONAL HOLDINGS

| *Proportion of households operating holdings which are:* | *All India* | | | *Purnea* | |
|---|---|---|---|---|---|
| | *1954/55* | *1960/61* | *1961/62* | *1961* | *1967/68* |
| (i) entirely owned | 60 | 71·6 | 76·1 | 46 | 48 |
| (ii) entirely leased | 17 | 4·3 | 4·1 | 15 | 7 |
| (iii) partly owned, partly leased | 23 | 24·1 | 19·8 | 39 | 45 |
| Total | 100 | 100 | 100 | 100 | 100 |

*Sources:* *NSS*, nos. 36, 113, 144.
1961 District Census Volume.
Chakraverty *[1969: 99]*.

Regarding the amount of land leased out, the position is summarised in Table 2, which is mercifully consistent with Table 1.

TABLE 2

THE EXTENT OF TENANCY: AREA LEASED IN AS A PERCENT OF TOTAL OPERATED AREA

| *Year* | *All India* | *Purnea* |
|---|---|---|
| 1954/55 | 20·34 | |
| 1960/61 | 12·53 | |
| 1961/62 | 10·70 | |
| 1967/68 | | 25·7 |
| 1970/71 | 10·57 | |

*Sources:* *NSS* (cited in *Narain and Joshi [op. cit.]* and *Bardhan [1976]*.
Chakraverty *[1969: 100]*.

A summary picture of the tenure status of all size categories of operational holdings for India and Purnea at diverse points in time is set out in Table 1, for which the sources are not strictly comparable. The National Sample Survey (NSS) estimates have been criticised *[Narain and Joshi, 1969; Bardhan, 1971; Sanyal, 1972]*. While changes in definition and increased under-reporting of tenancy may well have exaggerated the trends, their qualitative features hold good. The 1961 Census survey results stem from a 20 per cent random sample. Chakraverty's Report *[1969]* is based on a two-stage, stratified random sample of 1,444 cultivators, i.e., about 0·5 per cent of the district total, with a cut-off point at 20 acres. According to the Census survey, this truncation omits 3·3 per cent of the households, though very few of the omitted group will be leasing in land. While both of the latter are less reliable than the NSS data, two conclusions may be drawn with fair confidence: that landlease contracts are far more common in Purnea

than in India generally; and that in both cases, tenants possessing some land of their own have come to outnumber overwhelmingly pure tenants in recent years. The latter confers great importance on *H1B*. As well as being a methodological construct, it also happens to be the most relevant statement of the resource allocation hypothesis.

The household survey was undertaken in 1971 to furnish a report[6] to the Land Reforms Commissioner, using a limited number of case studies covering a range of tenurial situations. Eventually, the planned sample rose to about sixty, a number sufficiently large to warrant some care in testing simple hypotheses, and to give one some faith that the data so gathered are 'typical'. The selection of farmers and enumeration were entrusted to the senior development and/or extension officers of nine Blocks distributed widely over the district. Each Block sample contained six or seven households, and a range of tenancy situations (see below) was included. Given the dispersion over Blocks and tenancy situations, the sample should be a random drawing. In any case, the emphasis on *H1B* is an additional source of confidence.

Naturally, a major weakness of the rather disjointed and haphazard way in which the coverage of the enquiry was determined was the lack of any systematic statistical design to sort out the relative importance of the many sources of variation in farm performance. Here, the factors which come to mind are the tenure status of land operated, location and administrative support (Block) and farm size. For these purposes, an analysis of variance design would have been appropriate. The chances of extracting unambiguous conclusions from the data suffered accordingly, and much of the inference in the paper is perforce indirect.

Granted the overwhelming preponderance of sharecropping, the survey covers three basic tenure conditions: land sharecropped under an unrecorded lease (u), under a recorded lease (r) and land owned by the household (*raiyatwari* status, R). Leaving aside the pure *raiyat* (R), there are six logically distinct categories of cultivator, which may be grouped as follows: the pure *bataidar* (B), comprising subgroups u, r and ur; and the mixed *raiyat-bataidar* (RB), comprising Ru, Rr and Rur.

Unfortunately, many of these categories have but few observations,[7] and they are not equally represented (even remotely) in each Block —some are not represented at all—so that comparisons are likely to be distorted by the 'Block' effect. As the Blocks included in the survey differ widely in their agro-economic (soil and irrigation) and administrative (IADP/non-IADP) characteristics, such comparisons based on very few observations would be futile or misleading. We shall have to remain content with the assumption that intra-group differences are not too important and the 'Block' effect is attenuated by a more balanced representation of these broader groupings within each Block than is the case for the finer subgroups. Moreover, as it turns out, only 3 of the 26 households with recorded leases paid no more than the maximum legal rental share, and in one of those it was 35 per cent as laid down in the 1885 Act rather than the 26 per cent of the 1961 Amendment. Thus, there need be no great qualms about aggregating u and r leases

together—on the score of short run resource allocation considerations, at least.

Another potentially important source of variation in behaviour is farm size. Table 3 shows the distribution of the sampled households by holding size and tenure status, together with Chakraverty's *[1969: 99]* much larger sample which adequately reflects the structure of the parent population. It permits also an unblushing presentation of a finer breakdown by tenure status.[8] Moreover, there is also the useful addition of the category of pure *raiyatwari* (R) households, which helps to provide a more complete picture of the tenure situation, even though large R holdings are certainly under-reported. Chakraverty's data suggest strongly that the average farm size in group RB exceeds that in group B; but the intra-group spread is large in both. We shall return to this issue shortly.

TABLE 3

DISTRIBUTION OF SAMPLED HOUSEHOLDS BY HOLDING SIZE AND TENURE STATUS (PURNEA DISTRICT)

| *Holding size (acres)* \ *Group* | *Sample* | | *Chakraverty* | | |
|---|---|---|---|---|---|
| | *RB* | *B* | *RB* | *B* | *R* |
| Below 1·00 | — | — | 4 | — | 9 |
| 1·00– 2·49 | — | 3 | 95 | 51 | 150 |
| 2·50– 4·99 | 10 | 11 | 235 | 42 | 171 |
| 5·00– 7·49 | 7 | 6 | 175 | 15 | 132 |
| 7·50– 9·99 | 8 | 3 | 65 | 2 | 71 |
| 10·00–12·49 | 4 | — | 36 | 2 | 73 |
| 12·50–14·99 | — | 1 | 23 | — | 29 |
| 15·00–19·99 | — | — | 7 | — | — |
| 20·00–29·99 | 3 | 1 | — | — | — |
| 30 and above | — | — | — | — | — |
| Total | 31 | 25 | 640 | 112 | 692 |

The land operated by the sampled households may be classified in two ways: (i) by the tenure category of the household operating the land, and (ii) by the tenure status of the plots of land cultivated. In Table 4, the figures denote the net cultivated area after subtracting the area of house plots and waste lands. Overall, cultivators in group RB appear to sharecrop in about 1·8 acres for each acre they actually own.[9]

TABLE 4

DISTRIBUTION OF SAMPLE HOUSEHOLD OPERATIONAL HOLDINGS BY TENURE STATUS

| *Household Group* | *Land Operated (acres)* | | |
|---|---|---|---|
| | *B status* | *R status* | *Total* |
| B | 135·8 | | 135·8 |
| RB | *156·7* | *87·7* | *244·4* |
| A11 | 292·5 | 87·7 | 379·2 |

There is one further preliminary. So far, land has been treated as a homogeneous factor of production. Although the survey does contain information on variations in soil types, there is no basis for their aggregation into a single variable, either in the survey or elsewhere. Moreover, the great majority of plots are designated as 'sandy' or 'sandy-loam'. This is important inasmuch as irrigation probably enhances the productivity of such soils much more strongly than that of heavier types. The fraction of land sampled which is irrigated (virtually all of it by public canal) is somewhat lower than the 26·9 per cent given in Chakraverty *[1969: 11]*, but that survey includes a substantial R group also.

TABLE 5

INCIDENCE OF IRRIGATION BY GROUP AND TENURE STATUS

| *Household Group* | *Unirrigated Acreage* | *Irrigated Acreage* | *Total* | *Percentage Irrigated* |
|---|---|---|---|---|
| B | 101·9 | 34·9 | 135·8 | 25·7 |
| RB: B | 128·8 | 27·9 | 156·7 | 17·8 |
| R | 65·0 | 22·7 | 87·7 | 25·9 |
| Total | 294·7 | 85·5 | 379·2 | 22·5 |

The significance of these differences in the incidence of irrigation may be investigated by performing t-tests on the proportions of net area receiving irrigation. (In keeping with the generally agnostic stance of this paper, all tests are two-tailed unless there are indications to the contrary.) The relevant comparisons are as follows, the intra-group RB test being of the paired-t variety:

TABLE 6

| | | *Proportion of net acre irrigated* | *F ratio* | *t-ratio* |
|---|---|---|---|---|
| B land: | group B | 0·284 | 1·18 | 0·94 |
| | group RB | 0·199 | | |
| All land: | group B | 0·284 | 1·18 | 0·45 |
| | group RB | 0·244 | | |
| Group RB: | B land | 0·199 | 0·70** | 1·40 |
| | R land | 0·272 | | |

**significant at the 1 per cent level. (In this case, the statistic is the simple correlation coefficient—as is appropriate.)

While concluding that none of the differences is significant, it seems prudent to conduct the tests which follow in 'standard' as well as unweighted acres. The usual yardstick, under Indian conditions, of a double weight for irrigated land will be employed.

Are tests which search for tenurial effects involving comparisons between groups R and RB likely to be vitiated by the farm size effect? The unweighted mean acreages are 7·88 and 5·43, respectively, a difference which is significant only at the 10 per cent level.[10] The corresponding means in standard acres are 9·52 and 6·81, again significant at the 10 per cent level. These results suggest that inter-group comparisons are not entirely without hazard, especially given most economists' unwarranted neglect of 'Type II' statistical errors. Thus *H1C* may well be in force.

To complete the background, note that there is a large, arguably important, group of 'sharecroppers', which is not covered: permanent agricultural labourers attached to big farmers, almost invariably under annual contracts. In addition to their wages, these workers are commonly given a small area of land, usually about one acre gross over two seasons which they cultivate with inputs supplied free by their landlord. All they provide is labour, and the gross produce is split 50:50 after harvest wage payments in kind have been made. (Their absence from the sample accounts partly for the very small fraction of sampled cultivators with holdings of less than 2·5 acres.) These agents seem to be like the 'worker tenants' who feature in some of the theoretical literature cited above. Their contracts have more the character of a wage bonus scheme of payment by results than of sharecropping proper, for such workers furnish no management skills—indeed, they do not even choose the crop.

Finally, the sample does not include a good 'control' group to provide a benchmark against which the performance of the various sharecropper categories can be measured. Such a group would be the pure *raiyats* holding between 2·5 and (say) 10 acres (thereby correcting for the farm size effect when examining the impact of share rent leases on resource allocation and distribution). Even if *H1B* is a powerful and appropriate form of *H1A,* such a 'control' would have instilled greater confidence in the conclusions of the subsequent sections by completing the taxonomy of cultivator categories.

## IV HYPOTHESIS TESTING

The hypotheses in section II are taken *seriatim:*

*H1.* The ideal procedure would run as follows: Let output be a function of a set of n inputs ($X_j$)—land, seed, labour, draught, fertiliser, and so on. To allow for perfect generality, let the production functions for owned and sharecropped land be different, say $F(X_1 \ldots X_n)$ and $G(X_1 \ldots X_n)$, respectively. According to the Marshallians, we should observe $\partial F/\partial X_j = (1-r^i)\ \partial G/\partial X_j = p_j$ for the $j^{th}$ variable input; by contrast, the 'new school' predicts that $\partial F/\partial X_j = \partial G/\partial X_j = p_j$. Hence, if F(.) and G(.) were estimated, the set of marginal products may then be derived given the levels of input use.

However, this 'ideal' procedure is beset by two problems. Methodologically, obtaining good estimates from cross-section data is extremely difficult, and the computed marginal products may be

correspondingly unreliable.[11] In practice, such estimation is ruled out anyway because the survey data on input use are seriously incomplete.

Fortunately, a good alternative is available. Let the superscripts b and r denote observations on B land and R land, respectively, and lower case letters input and output (q) intensities (per unit of land). Then the set of vectors $[q^b; x^b]$ and $[q^r; x^r]$ convey all the extant information relevant to *H1*. Further, if we confine ourselves to the most powerful form, *H1B*, then we should pair off two vectors for each farmer. Let $[\Delta q; \Delta x] = [q^r; x^r] - [q^b; x^b]$, that is, we construct a vector of the differences in input intensities and yields on B and R land for each farmer in group RB. Plainly, Marshallians predict $E[\Delta q; \Delta x] > 0$, whereas the 'new school' predict $E[\Delta q; \Delta x] = 0$, E being the expectations operator. Given the multivariate nature of the problem, an appropriate way to test this hypothesis is to employ Hotelling's $T^2$ statistic, which is a generalisation of Student's t for a single variate. In keeping with the rest of the paper, the latter (null) hypothesis will be tested.[12]

Now to the survey data, such as they are. There is information on the following input flows:[13] land, intermediates and hired labour. These data, like those for output, are available on a cropwise basis as well as in aggregate. Let us take them in turn.

As the tests are formulated in intensive magnitudes, variations in cropping intensity can be taken to represent variations in land service flows. Each of the variable inputs—intermediates and labour—is associated with some difficulty or other.

The intermediates reported are seed, compost, fertiliser, pesticides and irrigation by public canal or tank. But seed alone accounts for more than 80 per cent of the total value of intermediates for crop production, the use of fertilisers and pesticides being confined largely to the cultivation of wheat on irrigated R land (as Marshallians would expect). For a given crop variety, seed requirements per acre are, to all intents and purposes, fixed by technical factors. Thus the tenure effect must manifest itself largely through changes in the cropping pattern. For individual crops, with no scope for substitution, the tenure effect cannot be picked up. The results set out in Table 9 should be examined with this consideration in mind.

That leaves 'variable' labour inputs. Ploughing labour is perfectly correlated with draught inputs, while harvest labour and the harvest wage-bill are determined by the level of output. Hence, comparisons must be in terms of labour inputs in transplanting, weeding and hoeing operations. Here, the difficulty stems from the survey questionnaire, which sought information only on *hired* labour inputs. The critical issue, then, is whether or not inferences can be made about total (family plus hired) labour use from the survey data. This entails something of a digression.

Let the acreages of R and B land operated by a household be $H_1$ and $H_2$, respectively. Its labour endowment is $L_f$, and total labour hired is $L_h$. Total labour inputs per acre are $l_1$ and $l_2$, respectively, and labour is assumed to be homogeneous. The landlord appropriates a share r of

gross output, and the going wage in the perfectly competitive labour market is w. In a 'new school' setting, the lease contract specifies $(r, \bar{l}_2)$. Let there be constant returns to scale in a world with land and labour only and let output per acre be given by f(l) on both B and R land. The farmer maximises

$$W = H_1 f(l_1) + (1-r)H_2 f(l_2) - w(H_1 l_1 + H_2 l_2 - \bar{L}_f)$$

subject to $l_2 \geq \bar{l}_2$

Hence,

$$\frac{\partial W}{\partial l_1} = H_1.(f' - w) = 0$$

Now $(r, \bar{l}_2)$ are set such that the gross income from B land equals the wage-cost of cultivating it:

$$(1-r)H_2 f(\bar{l}_2) = wH_2\bar{l}_2$$

As $l_1 = \bar{l}_2$ in equilibrium, then the distribution of $L_h = (H_1 l_1 + H_2\bar{l}_2 - \bar{L}_f)$ over R and B is immaterial to the maximisation condition, provided some labour is hired i.e., $\bar{L}_f/(H_1 + H_2) < \bar{l}_2$ $(= l_1)$

Assuming, therefore, that cultivators are indifferent to the allocation of family labour between R and B plots, then $El_{1h} = El_{2h}$. If, however, the family feels that toiling on B land to produce income for the landlord involves psychic costs which are not fully reflected in the wage rate[14] (the objective conditions for maximisation are unaltered), then the tenant may apply $\bar{L}_f$ to R land (subject to $f'(\bar{L}_f/H_1) \geq w$) and simply top up with hired labour on B land. In this case, $El_{1h} < El_{2h}$. An alternative possibility is that the reservation price of family labour $(\hat{w})$ is lower than the going wage. This will not affect either of the results just obtained. But it will be germane to the normalised farm size effect stemming from variations in $\bar{L}_f/(H_1 + H_2)$, which will reduce the ability of tests across groups B and RB to detect tenure effects.

Now to a Marshallian world. Again, the farmer maximises

$$W = H_1 f(l_1) + (1-r)H_2 f(l_2) - w(H_1 l_1 + H_2 l_2 - \bar{L}_f)$$

The first order conditions are:

$$\frac{\partial W}{\partial l_1} = H_1(f' - w) = 0$$

$$\frac{\partial W}{\partial l_2} = H_2[(1-r)f' - w] = 0$$

$$\text{or} \qquad f'(l_1) = (1-r)f'(l_2) = w \Rightarrow l_1 > l_2$$

Hence, if the allocation of $\bar{L}_f$ between $H_1$ and $H_2$ is immaterial, then $El_{1h} > El_{2h}$.[15] If, however, the allocation of family labour does matter then the sign of $E(l_{1h} - l_{2h})$ depends on the magnitude of $\bar{L}_f/(H_1 + H_2)$ relative to $l_1$, which depends in turn on w and the concavity of f(.). Moreover, if $\hat{w} < w$, the chances are even greater that $El_{1h} < El_{2h}$ when in fact $El_1 > El_2$. This, therefore, is a problematical case where inferences from hired to total labour inputs are concerned.

To sum up, in a Marshallian setting inferences from hired to total labour inputs in the context of *H1B* will always be safe but sometimes conservative (in that one may observe $l_{1h}<l_{2h}$ when in fact $l_1>l_2$). For the 'new school', $l_1=\bar{l}_2$ implies $l_{1h}\leq l_{2h}$, so that by taking $(l_{1h}-l_{2h})$ in statistical tests, the dice are being loaded in their favour.

Aggregating over all crops, a summary of mean input intensities and yields classified by cultivator group and the tenure status of plots is presented in Table 7.

TABLE 7

MEAN INPUTS AND OUTPUTS PER ACRE

| | | *Cropping Intensity* | *Intermediates Rs./acre* | *Hired Labour Rs./acre* | *Yield Rs./acre* |
|---|---|---|---|---|---|
| Group B | | 1·44 | 32·5 | 33·8 | 442·8 |
| Group RB: | B | 1·40 | 33·0 | 35·6 | 378·3 |
| | R | 1·76 | 64·3 | 46·7 | 561·9 |

Taking group RB first, is the vector of differences in RB means on R and B land, namely [0·36, 31·3, 11·1, 183·6], significantly different from zero? The value of $T^2$ is 31·37, so F is 7·06 with 4 and 27 degrees of freedom. Thus, the vector of differences in means is highly significantly different from zero ($F_{0.001}=6{\cdot}33$). This rejection of the null hypothesis supports the Marshallian prediction in *H1B*. (Using 'standard' acres, F falls to 5·32, still inside the 1 per cent level, *viz* 4·14.)

Turning to *H1C*, we compare the vectors of means for group B and the B land cultivated by group R. In this case, $T^2$ is 19·23, so F=4·18 with 24 and 4 degrees of freedom. As $F_{0.001}=4{\cdot}22$, we conclude that the difference is significant at the five per cent level, and almost so at the one per cent level. The difference in yields—though not in input intensities—is less pronounced than that for R and B land cultivated by group RB, which is consistent with the farm size effect on resource allocation having some force—but not enough to offset the Marshallian one. Comparing across groups for B land, inputs differ little, but output per acre on group B holdings is somewhat higher (though far lower than yields on R land). There are two factors at work here. First, B land farmed by group B is somewhat better served by irrigation than that farmed by RB. Secondly, and more importantly I suspect, per acre inputs of *family* labour on B land are probably a good deal higher among group B than among RB, even though hired labour inputs per acre are virtually the same. For the former group has a higher ratio of family labour to cultivated land and its income per head is lower (see below). Hence, in the face of labour market imperfections, the reservation price of family labour is likely to be lower too. If, moreover, RB tenants reserve their family labour largely for the cultivation of R land, then *a fortiori* the intergroup difference between total labour input on B land will tend to be heavily in group B's favour.

These findings suggest that RB tenants were very successful in 'diverting' resources to the land which they own. And even the B group

seemingly managed to get away with lower input intensities and yields than those prevailing on the sampled R land. Thus, even if landlords worked to enforce the R-vector in Table 7, they were apparently unable to do so.

As we have data on individual crops, we can probe more deeply into the structure of inputs and outputs. Differences in output per net acre are entirely attributable to some combination of differences in cropping pattern, cropping intensity and yields. For a given cropping pattern and intensity, differences in yields stem from differences in cultivation technique (input levels per gross acre); these will be considered last of all. The matter of cropping intensity has been dealt with above. For cropping pattern variations, we select a set of crops so that all cells of a tabulation of crop type against household type have non-negligible entries. The six crops chosen—jute, maize, summer paddy, winter paddy, wheat and pulses—normally cover 80-90 per cent of the gross area sown in the district *[Government of Bihar, 1970]*, leaving a residual category, 'others'. This may appear somewhat arbitrary, but the number of observations, given the area entered in each cell of Table 8, is already somewhat low and a finer subdivision would call into question the reliability of the following goodness of fit tests.

TABLE 8

CROPPING PATTERNS BY GROUP AND LAND TENURE STATUS

| *Group* \ *Crop* | *Jute* | *Maize* | *Summer Paddy* | *Winter Paddy* | *Wheat* | *Pulses* | *Others* | *Total* |
|---|---|---|---|---|---|---|---|---|
| B | 39·9 | 7·0 | 18·3 | 77·5 | 15·8 | 20·6 | 14·9 | 194·0 |
| RB: B | 36·9 | 15·6 | 17·5 | 84·8 | 21·4 | 28·9 | 5·8 | 210·9 |
| R | 22·1 | 13·5 | 11·6 | 40·3 | 24·8 | 10·9 | 22·6 | 145·8 |
| RB Total | 59·0 | 29·1 | 29·1 | 125·1 | 46·2 | 39·8 | 28·4 | 356·7 |

Of the four logically possible two-way comparisons, the most relevant are:

(i) between B and RB households, thereby giving some recognition to the fact that there will be some complementarity between cultivation on R and B plots within a single RB management; and

(ii) between B and R land operated by RB households, where the 'tenure' effect will not be diluted, as in (i), by the preponderance of B land among RB households or by differences in general status factors between the B and RB groups, but in which the 'complementarity' effect may show up strongly in small samples.

The results of these contingency tests are:

(i) $\chi^2 = 8{\cdot}85$ (6 d.f.); (ii) $\chi^2 = 28{\cdot}30^{**}$ (6 d.f.)

** significant at the 1 per cent level

Thus, while the groups' respective cropping patterns are not significantly different, R and B land cropping patterns within group RB are highly so, which is a striking result—not least because landlords ought to be able to enforce cropping patterns more easily than input intensities for individual crops. Moreover, the difference arises from disproportionately large allocations of R land to wheat and certain high value crops (such as tobacco) in 'other', which require relatively heavy inputs of variable capital per (gross) acre and close supervision, and whose cultivation entails the possibility of a large loss, even under irrigated conditions. Tables 5 and 6 do suggest that the RB group's R land is better served by irrigation than their B land, but the difference is not statistically significant. Thus, recalling the findings for *H1B*, part of the difference in mean output per net acre for this group derives from cropping pattern differences. These, in their turn, probably reflect Marshallian influences on the allocation of non-tradeable endowments such as management and draught power (see below), and perhaps on the allocation of working capital for other non-labour variable inputs, these markets being highly imperfect.

Finally, there are comparisons to be made involving variable inputs

TABLE 9

MEAN VALUES OF VARIABLE INPUTS AND YIELDS BY CROP (RS /GROSS ACRE)

| *Crop* | *Variable* | *Group B* | *Group RB* | |
|---|---|---|---|---|
| | | | *B land* | *R land* |
| Jute | $l_h$ | 27·2 | 35·6 | 41·6 |
| | m | 12·3 | 10·8 | 20·2 |
| | q | 438·8 | 332·6 | 368·8 |
| Maize | $l_h$ | 19·6 | 25·5 | 21·9 |
| | m | 13·5 | 33·8 | 18·3 |
| | q | 252·9 | 272·2 | 280·6 |
| Summer paddy | $l_h$ | 35·8 | 26·1 | 43·1 |
| | m | 23·9 | 20·9 | 21·4 |
| | q | 229·5 | 199·8 | 220·7 |
| Winter paddy | $l_h$ | 32·2 | 35·0 | 35·2 |
| | m | 26·4 | 21·6 | 28·2 |
| | q | 328·9 | 322·4 | 410·4 |
| Wheat | $l_h$ | 23·5 | 23·8 | 23·7 |
| | m | 69·5 | 69·0 | 91·4 |
| | q | 347·9 | 245·2 | 390·4 |
| Pulses | $l_h$ | 2·0 | 4·0 | 1·4 |
| | m | 12·4 | 17·1 | 18·3 |
| | q | 255·1 | 150·6 | 167·5 |
| Other | $l_h$ | 11·9 | 2·0 | 19·1 |
| | m | 16·9 | 10·7 | 29·3 |
| | q | 233·3 | 128·7 | 284·9 |

*Note:* $l_h$ denotes hired labour; m, intermediate inputs and q, yields.

and outputs per gross acre on a crop by crop basis. The mean values of the variables are set out in Table 9. Within group RB, all of the yields and 10 out of 14 of the input levels run in the Marshallian direction —though the only significant differences detected at the five per cent level, in a two-tailed test involve the yields for wheat and 'other', and both variable inputs for 'other'. (Recall the preponderance of these crops in the cropping pattern on R land.) A crop by crop comparison of group B's means with those for the R land reveals a similar qualitative pattern. The dearth of statistically significant differences is not, of course, surprising given the small number of observations in each category (ranging from 6 to 22, with a mode around a dozen). Where B land is concerned, the measures of input intensities differ little between the two groups, but cropwise yields are generally higher for group B. As indicated above, this may well reflect a higher *total* labour intensity on B farms than on the B land of RB farms.

*H2.* With minor exceptions, the same rental share (50 per cent of the crop) prevailed across the board, irrespective of land quality or irrigation facilities, and the same usually applied to crop residues. The exceptions were three of the 26 tenants possessing recorded leases (see section III) and a few instances of tenants getting $\frac{9}{16}^{th}$ of their jute plantings—jute being a labour intensive crop. These findings square closely with my own field observations in Purnea, and they tend to support the Marshallian side, as crop residues are worth only a tiny fraction of the crops from which they are derived. Interestingly enough, some sharecroppers feared that they would be allocated poorer land in future, which would reflect a rational move by landlords if the rental share were fixed and circumstances changed to the disadvantage of tenants.

Why should landlords lease out irrigated plots at all if these are generally more productive? On this point, there seems to be a rather general presumption that landlords will keep such plots for self cultivation. Now, if all factors, including land, were tradeable in perfect markets and non-increasing returns to scale ruled on both types of land, plots would earn their competitively determined rents whether they were cultivated under a lease or not; the existence of irrigation facilities would be immaterial. But the question is not as naive as it would appear at first sight. In practice there are likely to be some pseudo-indivisibilities as well as imperfections. The rental crop share may be fixed by custom across the board, and this may well be incompatible with competitively determined rents on irrigated land, unless the landlord makes an appropriate contribution to variable costs. Moreover, tenants may be highly risk-averse and eschew the cultivation of high yielding varieties of crops, which may be risky, even under irrigated conditions. The landlord, being less risk averse, is more likely to choose such techniques for the plots he cultivates directly. Both of these factors would encourage a landlord to reserve irrigated land for his own cultivation, a choice which Zaman *[1972]*, for example, apparently regards as so obvious as to require no explanation. Chakraverty's evidence on this issue *[1969: 49]* is plainly impressionistic.

As far as indivisibilities are concerned, fragmentation of holdings within the command of an extensive public canal system may leave sizeable numbers of irrigated plots which are better leased out if limited management skills and draught power are but imperfectly, if at all, tradeable, or if there is some form of capital rationing. Of course, for any given bundle the marginal products of such factors are likely to be higher on irrigated plots (ignoring fragmentation)—hence the intuitive notion that leased out land will tend to be less well served by irrigation than land under own cultivation. Sadly, the survey data reveal nothing about the propensity of landlords to lease out irrigated land.

*H3.* Ten of the sampled sharecroppers reported that landlords contributed 50 per cent of the costs of one or more inputs—seed, fertiliser and irrigation—the rental share being 50 per cent also. As only a subset of variable inputs is subject to such cost-sharing, these contracts are not 'ideal' (efficient) leases *[Bell, 1976].* Further, although such contributions are not necessarily inconsistent with the predictions of the 'new school', there are grounds for believing that these cost-sharing arrangements on only a subset of inputs (hereafter 'partial cost-sharing') would be the appropriate (competitive) ones only by fluke. For given that a 50 per cent rental share holds across the board, with the exceptions noted above, the ten cases of partial cost-sharing would have to involve land of lower productivity. Yet in five of these cases, some of the land leased was irrigated. Once again, then, the findings favour the Marshallians.

The real reasons for the limited appearance of partial cost-sharing in Purnea over the past few years probably lie elsewhere. With the completion of the Kosi canal system in the late 'sixties, tenants stood to gain documentary evidence of occupancy, namely, a receipt for the payment of irrigation charges. Naturally landlords were anxious to avoid this, and paid the dues themselves. With an inflexible rental share, the charges had to be recovered in cash from the tenant; but not all landlords were able to make such an exaction. More importantly, the completion of the canal system coincided with the introduction of high yielding varieties of wheat and paddy, which proved to be both rather risky and working capital intensive. Under these circumstances, cost-sharing on 'new' inputs alone will tend to be profitable to both landlord and tenant: (i) the higher the rental share; (ii) the higher the elasticity of output with respect to all variable inputs combined; (iii) the lower the output elasticity of 'new' variable inputs combined; and (iv) the more risk-averse the tenant relative to the landlord *[Bell, 1976].* Also, if such contributions by landlords to the variable costs of cultivation do raise input intensities and yields on sharecropped holdings relative to those on holdings for which the landlord makes no cost contribution, then the above tests of *H1,* in which no allowance was made for such effects, were biased in favour of the 'new school'.

*H4.* According to Cheung, there should be but one landlord to each tenant. As supporting evidence, he cites the fact that there were only 1·24 leases per tenant family in Taiwan in 1949, the odd fraction being explained by the use of marginal plots *[1969: 61].*

In Purnea, however, the story is rather different. Of the 56 tenant farmers in the sample, 26 had two or more landlords. In a separate enquiry which I conducted in two villages in the district during 1969–70, 27 out of a sample of 54 households were sharecropping in some land, of whom 6 belonged to the class of permanent servants, 3 to the B and 18 to the RB groups, respectively. As households in the first category necessarily have a single landlord (see section III), they can be left out of the reckoning. The distribution of the remainder by the number of landlords from whom land was leased ran as follows:

TABLE 10

THE DISTRIBUTION OF TENANTS BY NUMBERS OF LANDLORDS

| No. of landlords | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| No. of farmers | 7 | 6 | 4 | 2 | 1 | 0 | 0 | 1 |

Thus, only one-third of the tenants had a single landlord and one-third had more than two. The average was 2·48, with a 95 per cent confidence interval between 1·67 and 3·29. The distribution of holdings by size was similar to that reported in Table 3. Although these figures do not constitute conclusive evidence, they are scarcely consistent with Cheung's prediction. Why is this so? The landlords in these two villages, as in most of Purnea, are members of a comparatively numerous class of *kulaks* owning between 20 and 100 acres. Cheung's sources, however, estimate that landowners with a hundred or more tenants were common prior to the Taiwan 1949 Reform. As cultivating distant plots is costly, it is virtually inevitable that tenants will deal with a single landlord if a numerically very small group of rentiers own most of the land. If, in addition, holdings are generally small, the transaction cost of acquiring a lease will tend to become important compared to total costs, and tenants will prefer to deal with a single landlord. (Incidentally, Cheung's insistence on competitive analysis does not square easily with the apparent monopolistic potential of these real world landlords whose leasing behaviour provides his evidence.) Conclusion: another round to the Marshallians.

We turn now to the 'weak' prediction of the 'new school' in *H4:* that the area leased in by a tenant will be such as to match his household's resource endowment. The simplest form this may take is that the area operated will be closely correlated with the number of workers the family can provide, that is, either adult males or adults of both sexes. To avoid the tangled problems of female participation rates,[16] tests using both measures will be performed. A closely related hypothesis is that cultivators will seek to lease in more land as their families (and hence subsistence requirements) grow in size. One way of testing these hypotheses is to use cross-section data to provide correlations of family workforce on size with holding size—on the implicit assumption that the sampled households were in 'equilibrium'. Of course, the causal direction in the 'significant' relationships will be ambiguous. For example, perhaps rich cultivators, who may have better access to leasing

opportunities (and the liquidity to hire people to work the land so leased), also have more surviving children and therefore larger completed families. This might show up as a high correlation between holding size and the number of children. The simple correlation coefficients corresponding to the foregoing hypotheses are set out in Table II; results for both standard and unweighted acreages are reported.

TABLE 11

CORRELATIONS BETWEEN HOLDING SIZE AND FAMILY VARIABLES

| | *H with M* | *AD* | *F* | *C* | *Ĥ with M* | *AD* | *F* | *C* |
|---|---|---|---|---|---|---|---|---|
| Group B | 0·359† | 0·333 | 0·555** | 0·582* | 0·435* | 0·330 | 0·467* | 0·456* |
| Group RB | 0·120 | 0·098 | 0·140 | 0·137 | 0·112 | 0·129 | 0·209 | 0·217 |
| All households | 0·223† | 0·201 | 0·305* | 0·300* | 0·246† | 0·218 | 0·310* | 0·294* |

*Notation: H,* holding size; *Ĥ,* standard holding size; *M,* males; *AD,* adults; *F,* family members; *C,* children

†denotes significant at the 10 per cent level; * at the 5 per cent level; ** at the 1 per cent level.

The most striking feature of these results is the qualitative difference between the relations for group B and those for RB. Operational holdings for the latter are correlated with family structure and endowment in a very feeble way. In the case of group B, the correlation between holding size and family 'needs' is stronger than that between holding size and the 'ability' to cultivate; but both are significant at acceptable probability levels. The field labour potential of the women in such households is seemingly limited, a finding which corroborates observation in the field.

The comparatively poor showing of the 'weak' form of *H4* is probably attributable to the fact that in Purnea there is a sizeable proportion of the rural population which neither owns nor operates any land, and is therefore available for hire by other households.[17] The survey results confirm this in that they indicate substantial net labour hire by both B and RB households (see Table 13 below), with the implication that the 'ability' to operate a holding in this context is not defined by the number of workhands the family itself can provide.

But labour is not the sole endowment of tenant households. In section II, stress was also laid on the role of nontradeables. Management and farming skills come to mind immediately in this connection. In Purnea, at least, there is another important nontradeable: the service of draught animals, even though the animals can be bought and sold as capital goods. The proportion of the total supply of bullock team-days hired out is very small in most parts of the district; even where hire is possible, the sharecropper commonly has liquidity problems. Although tractors are beginning to make an appearance, the market for draught services is insignificant and will remain so until mechanisation is much further advanced.[18] Under these circumstances, draught livestock are a virtually indispensable asset for the would-be sharecropper because landlords are

very reluctant to lease out land unless the tenant has an assured source of draught power. Thus, his draught animals are a key resource in the tenant's endowment of factors.

Among the sampled households, only one lacked any draught animals at all and its holding was also the smallest at 1·3 acres. Two others possessed but a single bullock, and operated holdings of 3·3 and 3·4 acres. In these cases, the land preparation problem would have been solved by entering into a mutual exchange contract over a season or more with another family in the same straits. In gross terms, some 600 team-days, or 2 team-years were hired out; this is just under 3 per cent of the gross availability of draught services owned by the sampled households.

The average values of draught livestock owned by groups B and RB were Rs. 526 and Rs. 805, respectively. These money values must be taken as rather notional, mainly because the market for bullocks is hardly likely to be perfect. Nonetheless, as peasants are usually acute where valuations of this kind are concerned, this approach also allows for the age and quality of stock in a way which is almost certainly to be preferred to a simple unweighted count. Such money values do not, however, constitute a satisfactory guide to the real input services (horse-power-hours) the draught animals are able to provide. For their capital value would fall with age simply on account of the growing expectation of mortality. As a depreciation case, therefore, they fall somewhere between the 'one hoss shay' and 'radioactive decay' extremes, so that their (point) capacity to provide real factor services will tend to be understated by the rate of interest multiplied by their market asset values—if the latter are anchored fairly closely to net present values, at least.

In order to test for a relationship between the ownership of draught power and leasing, a simple linear regression of the value of the tenant's draught stock (D) on the area he cultivates (H) should suffice. The results are set out in Table 12; those for 'standard' acreages are little different.

TABLE 12

REGRESSIONS OF DRAUGHT POWER ON AREA CULTIVATED

| | | | | |
|---|---|---|---|---|
| Group B: | $D = 238{\cdot}6$ (2·18*) | $+ \; 52{\cdot}5H$ (3·22**) | $F = 10{\cdot}37^{**}$, | $R^2 = 0{\cdot}311$ |
| Group RB: | $D = 304{\cdot}3$ (2·56*) | $+ \; 63{\cdot}6H$ (5·26**) | $F = 27{\cdot}60^{**}$, | $R^2 = 0{\cdot}488$ |
| All households: | $D = 247{\cdot}8$ (3·11**) | $+ \; 63{\cdot}6H$ (6·84**) | $F = 46{\cdot}80^{**}$, | $R^2 = 0{\cdot}464$ |

*Note:* t-values are shown in brackets.
*denotes significant at the 5 per cent level; ** at the 1 per cent level.

Thus the relationship between draught power endowment (so measured) and acreage operated is strong for both groups, and particularly so for RB tenants. The better fit for the RB group may be due to a

greater ease of matching draught and operational area when some land is owned and the decision to lease in land is a partial adjustment. Comparing these results with those of the preceding section, it appears that draught power endowment is a more powerful determinant of the tenant's ability to lease in acreage than his family labour supply. Certainly this is so for the RB group.

## V THE DISTRIBUTION OF VALUE ADDED

The division of output between landlord and tenant is the central issue in any land tenure system. But in Purnea district, any discussion of this issue must include hired labour, for even poor cultivating households, whatever their tenancy status, make extensive use of it. Indeed, they commonly hire in much more labour than they hire out (see below). However, the discussion is limited in one respect: there is little available information on the dealings between landlord and tenant in factor markets other than that for land. Of the 56 tenants surveyed, 4 reported supplying labour, and 10 supplying bullocks to their landlords. Going by other field observations, these were not feudal exactions, but market transactions—albeit under price and timing conditions favourable to landlords. Information on indebtedness was collected, but I have no access to it presently. No information was sought on the marketing channels used by the sharecropper, though my own fieldwork uncovered very few cases of sharecroppers being forced to sell their crops to their landlords. Of course, credit and marketing do provide additional means for landlords to extract surpluses from tenants if the landlords are monopolists. However, if they are monopolists and there are no effective legal restrictions on rents or rental shares, a single instrument will allow them to exert the whole of their monopoly power—as Newbury *[1975]* makes clear in his critique of Bhaduri *[1973]*.

TABLE 13

THE DISTRIBUTION OF VALUE ADDED FROM CROP CULTIVATION (RS PER TENANT)

| | | *Landlord* | *Hired Labour* | *Tenant* | *Total* |
|---|---|---|---|---|---|
| Group B | | 1004 | 338 | 879 | 2221 |
| | | 45·1 | 15·3 | 39·6 | 100 |
| Group RB: | B land | 748 | 377 | 472 | 1597 |
| | | 46·8 | 23·6 | 29·6 | 100 |
| | R land | | 269 | 1010 | 1279 |
| | | | 21·0 | 79·0 | 100 |

*Note:* These are weighted averages. The figure in the lower right hand corner of each cell shows the proportion of total value added received by each class of income receiver by tenant category and the tenure status of land operated.

Before examining the figures, however, a comment is needed on the division of the produce. The division of the *gross* produce into two equal parts holds very widely in India and elsewhere. Even in cases of leases

under recorded rights, this ratio almost invariably prevails, presumably because enforcement procedures are so feebly applied that the landlord in question is able to use his bargaining power to overcome the provisions of the law. In a traditional system, the only intermediate inputs are seed, and perhaps irrigation and compost, the costs of which the sharecropper normally has to meet in full. Thus the sharecropper's share of *net* product, even if he hires no labour, must be less than 50 per cent. Now that fertilisers, certified seeds and pesticides have made their appearance, the sharecropper who uses them without any contribution from his landlord—as is now commonly, though not always, the case—faces a further fall in his share of value added despite an absolute rise in income, as diminishing returns apply to increases in a subset of inputs.

How, then, is it that the figures in Table 13 show the landlord's share of value added as being significantly less than 50 per cent? The answer lies in the practice of paying labour a *fixed* share in kind (usually one-eighth or one-ninth) of the gross yield of the plots harvested, however many labourers are employed. The landlord and tenant divide the harvest in the ratio 50:50 *after* this payment in kind has been made, either to family or hired labour (or in combination). To give an example, suppose a plot yields a crop worth Rs.900, one-ninth of which is paid to harvest labour and after intermediate inputs worth Rs.90 have been applied. Both the tenant and the landlord gets Rs.400, for the gross value of production less harvest payments in kind is Rs.800, which is then split equally. Thus the landlord's share of value added turns out to be 0·49 (400/810), and not 0·62 (500/810), as one might at first suppose. Nor should it be thought that this is a phenomenon restricted to Purnea. Dated though they are, the *Agricultural Labour Enquiries* indicate similar forms of harvest wage payments over the whole of India.

In Table 13, the figures for the tenants cover inputs of family labour, bullocks, management, and interest and depreciation on other fixed and working capital. The division of net product tends to fluctuate from crop to crop, even on the same farm, because although the rental share is 50 per cent in all but three cases, the normal ratio of intermediate inputs to gross output does vary considerably over different crops. Moreover, as the samples are small, and even a single poor crop will have large effect on the estimated means, weighted averages may provide a clear picture. Nevertheless, too much should not be made of the differences in the shares of hired labour: they are not significant, even at the 10 per cent level.

Turning to the labour hired out by the two groups of households, their respective average gross earnings were Rs.86 (B) and Rs.133 (RB). Recalling Table 13, it appears that group B hired in four man-days for each one they hired out, the corresponding ratio for group RB being almost five to one. These figures are greatly at variance with the stylised sharecropper family which cultivates using solely its own labour, even though a very few of the sampled households conform to it.

We are now in a position to draw some conclusions about desirable

forms of intervention. However, the following discussion is seriously incomplete in two respects, and its findings must be viewed with some caution. First, land is leased both ways in most size classes of holding, so that policies which transfer income from landlord to tenant do not have an unambiguously desirable effect on the size distribution of incomes, unless the landlord is richer than his tenants. Secondly, and more importantly, there is not enough evidence to predict the consequences for the landless of a change in landlord–tenant distribution. If reforms raise the intensity of cultivation and the resulting increases in tenants' incomes lead them to substitute leisure for income at the margin, then the incomes of the landless might be improved also, provided landlords do not substitute too much family for hired labour on the plots they cultivate themselves. For the landless, at least, the utility of extra leisure must be well below the utility of extra income because much of their 'leisure' is involuntary. The lack of correlation between family work-force and area cultivated for group RB coupled with the significant relationship in the case of the poorer group B provides a hint that such income–leisure substitution may occur; but it is no more than a hint.

Given these reservations, what would be done? The best solution is to transfer the ownership rights of land leased to the tenant, making the element of confiscation as large as possible. A declared element of confiscation in official policy will increase the turmoil and uncertainty attending the reform measures, with the result that land prices should fall further still. In this way, the cost to the tenants of acquiring ownership rights will be kept low and the power of the landlords, which stems from their control over productive assets, will be undermined.

Failing this 'radical' course, there remains the more limited, albeit still difficult, aim of reducing the rental share. Then the comparative performance of the two theories becomes highly relevant. According to the 'new school', as a competitive equilibrium rules prior to the imposition of (lower) legal ceilings on the landlord's share, tenants will offer compensating payments or extra variable inputs, or landlords will resume leases for own cultivation, or some combination thereof—unless the (enforceable) law specifies otherwise. In general, the subsequent adjustments will leave unaltered the distribution of income between landlords and tenants, so rental share reductions will usually be fruitless. The Marshallian approach, by contrast, predicts that both distribution and allocative efficiency will change for the better. As the evidence for Purnea lends support to the relevant predictions of the Marshallian school, let us attempt some rough and ready calculations of the effects of recording all leases and then enforcing a maximum rental share of 25 per cent.

On the conservative assumption that there were no changes in input intensity and, 'optimistically', no income–leisure substitution nor any fall in income from other sources, Table 13 indicates that landlords would have received only about 23 per cent of value added from 'B' land. The groups' average income per head from all sources would then be about Rs.195 and Rs.245, respectively, compared with Rs.140 and Rs.210 at the time of the survey.

A set of calculations allowing for changes in input intensities with no resumption of tenancies is not possible because the production function is not known. A crude order of magnitude, however, may be derived from the well tried (but less trusted) Cobb-Douglas function. Let the output elasticities of capital and labour be $\alpha_1$ and $\alpha_2$, respectively. Then with constant input prices, the elasticity of demand for each input with respect to $(1-r)$ is $1/(1-\alpha_1-\alpha_2)$.[18] As the ratio of the inputs will be unaffected by changes in r if their prices are constant, then a fall in r from 0·50 to 0·25 will increase output to $(1{\cdot}5)^{(\alpha_1+\alpha_2)/(1-\alpha_1-\alpha_2)}$ times its initial level. With likely values of $(\alpha_1+\alpha_2)$ falling in the range 0·4 to 0·6, the proportional production gain would be of a similar order, 75 per cent of it going to the tenant (and hired labour). On these assumptions, therefore, the indirect enhancement of the incomes of the tenant and, less certainly, the landless through rental share reduction would be at least as large as its direct impact.

## VI CONCLUDING COMMENTS

In summary, how do the 'Marshallian' and 'new' approaches to share tenancy fare in the light of this particular body of micro evidence? The critical points may be set out *seriatim:*

*H1:* Among RB households, both input and output per (net) acre are higher on R land, stemming from differences in cropping pattern, cropping intensity and (to a lesser extent) crop-specific differences in levels of variable inputs per gross acre. Comparisons between RB and B households yield similar, though less conclusive, differences between B and R land, owing to additional sources of variation. There, the suspicion of a 'farm size' effect is, in itself, incompatible with the assumption of a perfect labour market.

*H2:* The same rental share (50 per cent) prevails across the board, irrespective of land quality or irrigation facilities, with the exception of three of the tenants having recorded leases and odd instances of jute cultivation.

*H3:* Ten of the sampled sharecroppers reported that landlords contributed 50 per cent of the costs of one or more inputs—seed, fertiliser and irrigation—the rental share being unchanged at 50 per cent.

*H4:* At most, only half the tenants lease from a single landlord, and a good proportion of them have contracts with more than two landlords.

On the first and last counts, then, the central predictions of the 'new school' are refuted by the survey data. Correspondingly, Marshallians can take considerable satisfaction in these findings. On the remaining two counts, the position of the 'new school' is also rather shaky, though whether there is a strong 'customary' element in the constant rental share is an open question. In Purnea, at least, the finding in *H3* has to do with changes in the contractual form of the lease when there is a technical advance in crop production.

One further conclusion which is relevant here is that family labour

supply does not appear to be the central factor in the workings of the tenure system. Family labour endowments are not correlated with the area of operational holdings among group RB, and the relationship is not particularly strong among group B. Moreover, the sampled households are overwhelmingly net hirers of labour, the value of their family labour time sold to other households being only about 20 per cent of what they themselves bought. This finding matches the importance we have laid on the other inputs the tenant supplies: supervision, management, variable capital and draught power, three of which are but imperfectly tradeable. Such considerations call into question competitive analyses, which rest primarily on appeals to the alternative earnings of factors in perfect markets.

Yet while the empirical findings presented in this paper offer little comfort to the 'new school', it cannot be said that the analytical foundations of the Marshallian position inspire much confidence. That the predictions of the latter are generally in accordance with the facts does not mean that the underlying analysis is defensible. In particular, excess demand for land is virtually certain in a Marshallian setting when population pressure is high, so that land will have to be rationed. Under these circumstances, the essence of the situation for both landlord and tenant is that they have to bargain, and the rental share will be determined by the agents' respective bargaining strengths *[Bell and Zusman, 1976]*, Also, imperfections in the markets for factors other than labour and land are likely to exercise a powerful influence on rental shares and resource allocation. Despite the notable contributions of the 'new school', existing theory still leaves much to be desired.

NOTES

1. In the main, these authors have cast their analysis within a competitive framework —or at least they claim to do so. For a disputatious exchange concerning the validity of such claims, see Newbery *[1974]* and Bardhan and Srinivasan *[1974]*. Bell and Zusman recognise that excess demand for tenancies is likely to rule in a Marshallian setting, and then proceed with an analysis based on formal bargaining theory.

2. A fixed payment per plot, whether actual or imputed and whatever its level, does not alter the marginal conditions for any of the variable inputs and hence has no effect on the profit maximising input bundle.

3. On the labour supply side, either the marginal valuation of leisure equals the parametrically given wage rate, or, if labour is a produced good, the ruling wage rate should be such as to minimise the cost of an *efficiency* unit of labour. But whichever the case, the level of producer surplus measures the level of Paretian 'welfare'.

4. For the $i^{th}$ quality of land, let land inputs in efficiency units be given by $H^i = g(H, i)$, where H is the area in natural units (acres). Output from this acreage is given by $Q = F^i(H^i, L)$ and the conditions for a 'competitive' equilibrium are

$$\frac{\partial Q}{\partial L} = w, \quad r^i = \frac{(\partial Q/\partial H^i)}{Q/H^i} = \frac{Q - wL}{Q}$$

which are the generalised counterparts of those derived by Cheung (1969, p.24). Clearly $r^i$ is independent of i (the index of soil fertility/irrigation) if, and only if, $(\partial Q/\partial H^i)/(Q/H^i)$ is so. We have,

$$\frac{\partial Q}{\partial H} = \frac{\partial Q}{\partial H^i} \cdot \frac{\partial H^i}{\partial H} = \frac{\partial Q}{\partial H^i} \cdot \frac{\partial g}{\partial H}, \text{ and } \frac{Q}{H^i} = \frac{Q}{H} \cdot \frac{H}{H^i} = \frac{Q}{H} \cdot \frac{H}{g}.$$

Hence the constancy of $r^i$ swings on that of $g/(H\partial g/\partial H)$ One simple case is that in which variations in fertility are purely land augmenting: $h^i = A(i).H$, i.e., each physical acre is scaled up by some appropriate soil fertility index. (In this case, $g/(H\partial g/\partial H) = 1$.)

Alternatively, if the elasticity of substitution between labour and land is unity, then the index i may involve both factors. Thus, we conclude that only special forms of production conditions and g(.) will keep $r^i$ independent of i.

5. While a theoretical *tour de force,* Stiglitz's paper is devoid of that sort of evidence in particular and micro-economic evidence in general.

6. See Bell and Prasad *[1972].* The survey questionnaire was designed by S. D. Prasad, then Kosi Area Development Commissioner, in collaboration with several of his senior officers and some I.D.S. (Sussex) colleagues (S. D. Briggs, Charlotte Burns and Geoff Wood). The structure and substance of that section of the report dealing with the analysis of the survey results was my responsibility alone, however.

7. The numbers are: B, 25 (u, 14; r, 7; ru, 4); R, 31 (Ru, 16; Rr, 6; Rur, 9).

8. The proportions are: R, 47·9%; u, 6·3%; r, 0·9%; ru, 0·45%; Ru, 36·8%; Rr, 3·9%; Rur, 3·5%.

9. It is not known from the survey whether the tenants sampled were also sharecropping out land. My field experience in Purnea suggests that RB farmers do occasionally rent out some of their R land, but only on a minor scale.

10. As non-normality tends to increase the apparent significance of t-tests results *[Keeping, 1962: 208],* one must conclude, from a glance at Table 3, that the observed difference in operational holding size means may not be significant, even at the ten per cent level.

11. Of course, comparisons between groups B and RB require that marginal products be estimated at the respective geometric means of input levels. As noted above, observations on RB may be paired off, thus eliminating the variance due differences in management, input access and prices.

12. This has the additional advantage that $[T^2/(N-1)][(N-p)/p]$ has the central F-distribution *[Anderson, 1958: 106],* where N is the number of observations and p is the number of variates. Anderson provides a complete treatment of the $T^2$ statistic, including a discussion of the circumstances under which the $T^2$-test is the most powerful of certain classes of test.

13. Data on draught service flows were available in the primary returns, but not in the digest to which I have access at present.

14. This formulation is akin to the general line adopted by Sen *[1975].*

15. Differentiate the first order conditions totally with r and w held constant: $f''(l_1)dl_1=0$, $(1-r)f''(l_2)dl_2=0$. Then, $dl_1=0=>$
$\frac{dL_i}{L_i}=\frac{dH_i}{H_i}$ i=1, 2. Now, $dl=d[(L_1+L_2)/(H_1+H_2)]=sdl_1+(1-s)dl_2$,
where s is the ratio of R acreage to total land operated. Also, $dl=d[(L_f+L_h)/(H_1+H_2)]=dl_f+dl_h$. But the constancy of r and w implies that dl=0 and hence $dl_f=-dl_h$. Hence, $0=s(dl_{1f}+dl_{1h})+(1-s)\ (dl_{2f}+dl_{2h})$ or, $sdl_{1f}+(1-s)dl_{2f}=-[sdl_{1h}+(1-s)dl_{2h}]$. That is, an extra family workland per acre will be distributed among R and B plots in the ratio of their areas alone—if the allocation of family labour is a matter of indifference. Thus the sign of $(l_{1h}-l_{2h})$ will be unaffected.

16. That the notion of 'potential workforce' has strong normative overtones is now widely accepted. After Myrdal's critique *[1968]* such measurements have been attempted only by the thick-skinned.

17. A reservation price of family labour lower than the ruling wage would act as a simple shift variable in this situation.

18. For an analysis of the role of draught power in Purnea's sharecropping system, see Bell *[1976].*

19. Differentiate $W=(1-r)AK^{\alpha 1}L^{\alpha 2}-wL-\rho K$ with respect to K and L to get the first order conditions, keeping r, w and ρ constant, and then solve for K and L. Note that the optimal factor ratio is invariant with respect to r for any given w and ρ.

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