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PEASANTS AND DUALISM WITH OR WITHOUT SURPLUS LABOR

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THIS paper has four objects. In the first section the economic equilibrium of a peasant family is studied. In the second section we discuss the theory of surplus labor and disguised unemployment and, more generally, the response of peasant output to a withdrawal of the working population. The third section goes into an analysis of a dual equilibrium of a partly peasant, partly capitalist agriculture. In the last section some observations are made on the efficiency of resource allocation in peasant agriculture and in share-cropping. Illustrations on the working of peasant agriculture come mostly from India, though the general framework might be of somewhat wider interest.

I. ECONOMIC EQUILIBRIUM OF A PEASANT FAMILY

A. THE SIMPLEST MODEL

Imagine a community of identical peasant families, with α working members, β total members ($\beta \geq \alpha$), and with a given stock of land and capital. The family output Q, at a given point of time, is a function of labor L alone, and the function is smooth (twice-differentiable throughout) and normal (with diminishing marginal productivity of labor).

$$Q = Q(L), \text{ with } Q''(L) < 0 . \quad (1)$$

Furthermore, the marginal productivity of labor is assumed either (i) to become zero for a finite value of labor ($\bar{L}$), with a maximum output ($\bar{Q}$); or (ii) to approach zero asymptotically.[1] The two alternative possibilities define (1) further.

$$Q = \underset{L}{\text{Max}}\, Q(L) = Q(\bar{L}), \text{ and } Q'(\bar{L}) = 0, \quad (2)$$

or,

$$\lim_{L \to \infty} Q'(L) = 0 . \quad (3)$$

The peasants are guided in their allocational efforts by the aim of maximizing

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[1] For the substitutability assumptions underlying such a production function, see A. Guha (1963). We assume this for the existence of an equilibrium.

the happiness of the family.[2] The peasants have not heard of difficulties of interpersonal comparisons of utility, and make such comparisons blatantly. Furthermore, they know that every member of the family has a personal utility function U which is a function of individual income q, and every working member has a personal disutility function V related to his individual labor l, and the functions U and V are of the same shape for everyone.[3] The marginal utility from income is positive and non-increasing, and the marginal disutility from labor is non-negative and non-decreasing.[4]

$$U = U(q)\text{, with } U'(q) > 0\text{, and } U''(q) \leq 0\,. \tag{4}$$

$$V = V(l)\text{, with } V'(l) \geq 0\text{, and } V''(l) \geq 0\,. \tag{5}$$

Each person's notion of family welfare W is given by the net utility from income and effort of all members taken together, attaching the same weight to everyone's happiness. Attaching subscript i to the utility or disutility of the ith individual, we get the following expression for family welfare, W.

$$W = \sum_{1}^{\beta} U_i - \sum_{1}^{\alpha} V_i\,. \tag{6}$$

It is assumed further that work is equally divided between working members, and income equally between all members. This can either be taken as a rule of thumb or derived from welfare maximization. When the marginal utility of income is strictly diminishing and the marginal disutility of labor is strictly increasing, egalitarian distribution will be the only one consistent with welfare maximization; and even under the less restrictive conditions given by (4) and (5), egalitarian distribution will be one of the rules consistent with welfare maximization, without being unique in this respect.

$$L = \alpha \cdot l\,, \tag{7}$$

$$Q = \beta \cdot q\,, \tag{8}$$

$$W = \beta \cdot U - \alpha \cdot V\,. \tag{9}$$

Leaving out the odd case of welfare maximization at zero labor, by assuming that $Q'(0) \cdot U'(0) > V'(0)$, it is easy to verify that family welfare is maximized when the following condition is met.

$$Q'(L) = \frac{V'(l)}{U'(q)} \equiv x\,. \tag{10}$$

We define x as the "real cost of labor"; it is given by the individual rate of indifferent substitution between income and labor. The rule given by (10) is easy to interpret: labor is applied up to the point where its marginal product equals the "real cost of labor." Given the form of equations (1), (4), and (5), it can be verified that the second-order conditions are also fulfilled.

Two methods of implementation of the decision given by rule (10) are possible. One is that the head of the family takes the decision on behalf of the entire family and tells the individual members what to do. A second interpretation is that each working member is free to decide how much to work, but since he equates the interests of the other members of the family with his own, he is guided to the point given by (10). He equates his

[2] See Robinson (1960), chap. i; see also Mellor (1963).

[3] Alternatively one can modify the formulation of the problem by making the utility function variable with age, for example, children having greater (or less) needs than adults. No essential difference is made in our analysis by such a change.

[4] We are ruling out satiety, that is, marginal utility being zero at very high income levels. No sleep need be lost on this assumption for a peasant economy.

personal marginal disutility from work, that is, $V'(l)$, not with his personal marginal utility from his own share of the marginal product, which is

$$\left[\frac{Q'(L)}{\beta}\right] \cdot U'(q),$$

but β times that, which is the family's total gain from the extra unit of his effort.[5]

Finally, since $Q''(L) < 0$ throughout, not only is $Q'(L)$ a function of L, but L itself is a function of $Q'(L)$, that is, the inverse function exists. But $Q'(L)$ equals the real cost of labor at each point of equilibrium. The value of total family labor employed can, therefore, be expressed as a function of the real labor cost given equilibrium. Similarly, the value of total family output and income can also be expressed as a function of the real labor cost. This relationship we shall find convenient later (Section IIA).

$$L = \phi[Q'(L)] = \phi(x) . \qquad (11)$$

$$Q = \psi[Q'(L)] = \psi(x) . \qquad (12)$$

It is easy to check that ϕ and ψ are decreasing functions of x, that is, a higher equilibrium real labor cost goes with lower volumes of total family labor and output; if $x_2 > x_1$, we have $\phi(x_2) < \phi(x_1)$, and $\psi(x_2) < \psi(x_1)$.

B. PRODUCTION FOR A MARKET

In the last section we considered production for direct consumption only; but peasant economies often rely significantly on the sale of their product to markets. In fact, if the product in question is of the type of, say, jute, or rubber, or cocoa, the whole of the product might be sold. The amount of the product Q may be exchanged for an amount C of products directly enjoyable by the peasants.

[5] Cf. Harsanyi (1955).

We relate individual utility to the individual share of this (c) and correspondingly modify equation (4) keeping it, however, of the same analytical type, with positive non-increasing marginal utility.

$$U = U(c) , \text{ with } U'(c) > 0 , \text{ and } U''(c) \leq 0 . \qquad (13)$$

The peasants are assumed to face a competitive market for the product, and the price of their output in terms of the commodity C is taken to be p per unit.

$$C = Q \cdot p = \beta \cdot c . \qquad (14)$$

The allocational rule for maximization of family welfare, which is still given by (9), is:

$$Q'(L) = \frac{V'(l)}{U'(c)} \cdot \frac{1}{p} . \qquad (15)$$

The right-hand side represents the appropriate definition of the "real labor cost" being the marginal rate of indifferent substitution between labor and product, bearing in mind the rate at which the product can be substituted for the commodity C. The intuitive meaning of the allocational rule remains, therefore, very similar to that of (10).

A somewhat more complicated case occurs when a part of the product Q is sold in the market, and a part is consumed directly. Let y stand for the proportion of the output that is marketed, c for the amount of the purchased commodity enjoyed per member of the peasant family, q for the amount of the self-produced output enjoyed per member of that family. We have a more complicated individual utility function involving both c and q. We assume that there is non-increasing marginal utility for each good when the amount of it is increased in isolation, or when both

goods are raised in the same proportion. However, there is no satiety level for either good.

$$U = U(c, q), \text{ such that } U_q > 0,$$
$$U_c > 0,\ U_{qq} \leq 0,\ U_{cc} \leq 0,$$
$$U_q(c, q) \geq U_q(\lambda \cdot c, \lambda \cdot q), \quad (16)$$
$$\text{and } U_c(c, q) \geq U_c(\lambda \cdot c, \lambda \cdot q),$$
$$\text{when } \lambda > 1.$$

$$Q(1 - y) = \beta \cdot q. \quad (17)$$

$$C = Q \cdot y \cdot p = \beta \cdot c. \quad (18)$$

By maximizing family welfare, given by (9), with respect to variations in family labor (L), and therefore of individual labor (l) and of output (Q), and with respect to variations in the share of the product marketed (y), we get the two following allocational rules:

$$U_q = U_c \cdot p. \quad (19)$$

$$Q'(L) = \frac{V'(l)}{U_q}. \quad (20)$$

The intuitive explanations are, once again, quite simple. The first equation simply states that the product should be divided in such a manner between direct consumption and exchange in the market that the relevant marginal rate of indifferent substitution between the two commodities equals their price ratio. The second equation still equates the marginal product of labor with the real cost of labor at the margin, the latter being defined still as the individual indifferent rate of substitution between labor and the product.

C. FACTOR SUPPLY

If the peasants buy factors other than labor at fixed prices, it is easy to show that the equilibrium conditions will be very similar to those in the competitive model, with the exception of the labor allocational equation.[6] The marginal product of each factor will equal its price in terms of the product, and only labor will have a separate rule, given by the equality of its marginal product with the real labor cost. Assuming the prices (in terms of the good Q) of the n factors f_j (other than labor) to be p_j, we have in profit maximizing equilibrium:

$$\frac{\partial Q}{\partial f_j} = p_j, \quad \text{for } j = 1, 2, \ldots, n; \quad (21)$$

$$\frac{\partial Q}{\partial L} = \frac{V'(l)}{U_q}. \quad (22)$$

This is combined with the marketing rule (19).

II. SURPLUS LABOR AND THE RELATION OF PEASANT OUTPUT TO THE WORKING POPULATION

We now discuss the circumstances under which surplus labor can exist.[7] We define surplus labor as that part of the labor force in this peasant economy that can be removed without reducing the total amount of output produced, even when the amount of other factors is not changed. It is easily seen that if the reduction in the working population reduces the amount of labor put into cultivation, then clearly there would be a reduction in the amount of output produced. Thanks to continually diminishing marginal productivity of labor given by equation (1), a reduction in total family labor (L) will make the

[6] For an illuminating discussion of the competitive model as applied to agriculture, see Nerlove (1958).

[7] The literature is enormous. A good survey of the discussions and a fairly complete bibliography on the topic can be found in Kao, Anschel, and Eicher (1964). The bibliography can be supplemented by including Dobb (1951), Dumont (1957), K. N. Raj (1957), Datta (1960), Robinson (1960), Mathur (1964), Myint (1964), and Das-Gupta (1965).

marginal product of labor positive, even if it was zero to start with, so that a smaller volume of L must mean a smaller volume of output. Thus what is necessary for the existence of surplus labor under these circumstances is that a fall in the number of working members (a) should be compensated by a rise in the amount of work done per person. And this will be the case only if the real labor cost is insensitive to the withdrawal of a part of the population.

We discuss in detail the case of a peasant economy in isolation, namely the model outlined in Section IA, because the debate has usually been in the context of such a case. However, we discuss later the case in which a part or the whole of the output is marketed, that is, the models of Section IB. Considerations raised in Section IC will not, however, be relevant, because by the formulation of the question we are interested in the impact on output of a reduction of the labor force keeping other factors of production constant.

A. THE POSSIBILITY OF SURPLUS LABOR

Relation (12) shows that a reduction in output can occur only when the real labor cost rises; and in consequence of a reduction in the population such a rise in the real labor cost can take place for two different reasons. First, an emigration of labor from the family reduces the number of working members (a), and to maintain the same level of total family labor, each remaining member has to work longer, raising the marginal disutility of effort. Second, with such withdrawal of labor there will be a rise in income of the remaining members, because there will be a smaller number of people to share the family fortune, and this will reduce the marginal utility from income. Both these effects will tend to push up the real labor cost and will shift the equilibrium to a smaller volume of family labor and total output.

The existence of surplus labor depends, in this model, therefore, on the marginal utility schedule and the marginal disutility schedule being *flat* in the relevant region. Only under that circumstance will a rise in income leave the marginal utility unchanged and a rise in individual effort leave the marginal disutility unaffected.

The constancy of the marginal utility of income within a certain range implies an insensitivity of the usefulness of income to its quantity within this region. Given this assumption, with a suitable choice of units, we can make the constant value of marginal utility equal to unity, so that (10) reduces to the following:

$$Q'(L) = V'(l) = x\,. \qquad (23)$$

If, furthermore, the marginal disutility of effort remains constant, say at value z, until a certain critical amount of effort l^* is reached, then we have:[8]

$$x = V'(l) = z > 0\,, \text{ for } l \leq l^*\,, \qquad V''(l) > 0 \text{ for } l > l^*\,. \qquad (24)$$

Assume that the withdrawal of labor in question starts in a situation when the amount of labor put in by each working member in a family is l, so that the total family labor is $(a \cdot l)$. If $l \geq l^*$, there cannot be any surplus labor in this model. If, however, $l < l^*$, and withdrawal of labor can take place in divisible units, then some labor can be removed without affecting the output.

If, on the other hand, it is assumed that labor can be withdrawn only in units of one person (ruling out part-

[8] This violates the twice differentiability condition of the V function at $l = l^*$.

time outside work), and if reorganization of the land-labor allocation cannot take place after withdrawal of labor from some families, then the necessary and sufficient condition for the existence of surplus labor in this model is given by condition (25):

$$\frac{a}{a-1} l \leq l^* . \qquad (25)$$

If, however, land can be reallocated, after the transfer of labor, and if there are a very large number of families, then the necessary condition for the existence of surplus labor approximates that quoted in the divisible case, namely $l < l^*$.

B. ANALYSIS OF THE ASSUMPTIONS UNDERLYING SURPLUS LABOR

In the last section, the existence of surplus labor in a model of rational allocation was shown to depend on the flatness of the schedule of marginal disutility of effort, in the relevant regions. Of the two, perhaps the assumption of a flat marginal disutility schedule up to a critical value is less objectionable. The flatness of the schedule of marginal utility of income until a certain standard of living is reached may be thought to be more dubious. However, near the so-called level of subsistence, when the end of having a "decent" standard of living has not yet been achieved, such non-diminution of the desire to earn more income may not be implausible.[9] This is a verifiable question, and more empirical work is called for to settle it.

Regarding the *necessity* of the two assumptions for the existence of surplus labor, a couple of reservations must be made. First, if the taxation system is such that the rise in income per head as a result of the departure of some members of the family is wiped away by extra taxes, then there will be no rise in *net* income per head, and the question of the invariance of the marginal utility with respect to the variations in income will not arise. This will happen if Nurkse's scheme of utilizing the so-called saving potential is carried out through an appropriate system of taxation (see Nurkse, 1953). Nurkse had concluded that "some form of collective saving enforced by the state may prove to be indispensable for the *mobilization* of the saving potential implicit in disguised unemployment."[10] We find further that even the *existence* of "disguised unemployment" and of the so-called saving potential may depend on taxation or other methods of state interference, unless the marginal utility schedule is flat in the relevant region.

The second point to make is that the flatness of the two schedules is necessary in this model only because the utility from income and disutility from work are taken to be independent of each other. If instead, more generally, we take net utility as a function jointly of income and work, we have to look not only at the "double partial" derivatives, which we have been doing so far, but also at the "cross-partials" between income and work. For example, if it is argued that the marginal disutility from work is less at higher income (since work may be less tiring when a person is well fed),[11] then it

[9] Cf. Alfred Marshall, "It may be noticed here, though the fact is of but little practical importance, that a small quantity of a commodity may be insufficient to meet a certain special want; and then there will be a more than proportionate increase in pleasure when the consumer gets enough of it to enable him to attain the desired end" (Marshall, 1949, p. 79).

[10] Nurkse (1953), p. 43; italics added For an earlier discussion of this problem of utilization of surplus labor, see Dobb (1951), chapter ii.

[11] Contrast this argument with the surplus labor thesis discussed by Leibenstein (1957), Mazumdar

is no longer necessary to assume that the marginal utility of income and the marginal disutility of work are constant with respect to variations in income and work, respectively. We do not need then the flatness of the two schedules. All that is needed is the invariance of the "real labor cost" (x) with respect to joint variations of income and work per person when the size of the family is reduced, and, given a joint utility function, this can come about in a variety of different ways.

C. SURPLUS LABOR AND ZERO MARGINAL PRODUCTIVITY

The existence of surplus labor is sometimes identified with the marginal product of labor being zero. It is in this form that the doctrine has been most widely discussed (see Nurkse, 1953; Lewis, 1954; Georgescu-Roegen, 1960; Ranis and Fei, 1964; among others). And it is in this form that the thesis has been most strongly attacked (see Haberler, 1957; Viner, 1957; Schultz, 1964; and others). In terms of the model put forward here, this situation corresponds to the special case of $z = 0$, when the marginal disutility of labor is nil in the relevant region.[12] It is arguable whether such an assumption is realistic, but we need not go into the question here, for this is covered as a special case, though it is not a necessary assumption for the existence of surplus labor.[13]

Viner (1957) has claimed that "as far as agriculture is concerned, I find it impossible to conceive of a farm of any kind on which, other factors of production being held constant in quantity and even in form as well, it would not be possible by known methods, to obtain some addition to the crop by using additional labor in more careful selection and planting the seed, more intensive weeding, cultivation, thinning, and mulching, more painstaking harvesting, gleaning, and cleaning of the crop."[14]

We need not enter here into a controversy with Viner on the empirical validity of his assertion, but we should point out that even if it were shown that the marginal productivity of labor in agriculture was not zero but positive, it will not follow that there is no surplus labor, as was shown above. Indeed, the assumption of zero marginal productivity is neither a necessary nor a sufficient condition for the existence of surplus labor. We can see from the analysis of the last two sections that it is not necessary. That it is not sufficient follows from considering the case when $z = 0$, but $l = l^*$, where marginal product of labor is zero, but any finite withdrawal of the peasant labor force will reduce the level of output.

A closely related point needs to be

(1959), Ezekiel (1960), and Wonnacott (1962), in which the productivity of people rises with their income. While they consider variations in the *marginal product* of labor with income, we consider variations in the *marginal disutility* of effort with income.

[12] If we assume a significant discontinuity in the marginal productivity schedule so that it falls abruptly to zero from a positive value, then we do not have to assume that marginal disutility of effort is zero in order to assume a zero marginal productivity of labor. For possible reasons behind such a discontinuity, see Eckaus (1955). For a disagreement on the realism of such a discontinuity, see Viner (1957), Oshima (1958), and Schultz (1964).

[13] There is, however, one advantage for the theory of surplus labor in the special case where $z = 0$, because then the existence of surplus labor will be independent of the constancy of marginal utility of income. On the other hand, this is a very strong assumption. Furthermore, with this situation surplus labor can arise only with certain types of production functions, namely, where the marginal product of labor falls to zero for a large L.

[14] Viner (1957), from the extract in Meier (1964), pp. 79–80. Cf. Mellor and Stevens (1956); Rosenstein-Rodan (1957); Pepelasis and Yotopoulos (1962).

clarified here. It is sometimes asserted that the existence of surplus labor requires certain specific types of production functions, with limited possibilities of factor substitutability. This, it should be clear from the preceding analysis, is not the case. While it is true that with some production functions, for example, the Cobb-Douglas, or more generally, a C.E.S. production function with positive elasticity of substitution (Arrow, Chenery, Minhas, and Solow, 1961), the marginal product of labor never falls to zero, this does not, in any way, rule out the existence of surplus labor. At equilibrium we require of course that the marginal product of labor should equal the "real labor cost" (x), and also that the schedule of the "real labor cost" should be *flat*, but it is not necessary that the "real labor cost" be *zero*. Thus we do not have to restrict the class of production functions arbitrarily to admit the possibility of surplus labor.[15]

D. QUANTITATIVE RESPONSE OF PEASANT OUTPUT TO POPULATION WITHDRAWAL

It is easy to overestimate the importance of the problem of the existence of surplus labor. We shall show in Section III that some conclusions that are drawn with the assumption of surplus labor can be drawn just as easily without this assumption. Even for those problems where the existence of a surplus makes a genuine difference, much will depend on the *size* of the surplus and the *extent* of the response once the surplus is exhausted. If the latter response is very weak, the consequences may in general be similar to those of surplus labor. If, on the other hand, there is some, but little, surplus labor, and once this is exhausted output responds very sharply, the surplus labor models of the Lewis type may be of little relevance.

In studying the response of output to labor, we have to make a sharp contrast between units of labor hours and units of population. Sometimes these two concepts are merged together in the literature. When the hours of work are variable, there is little justification for this, irrespective of whether labor is assumed surplus or not. This is a generalization of our point about surplus labor and the marginal productivity of labor, where we showed surplus labor can coexist with positive marginal productivity of labor, that is, the "coefficient of labor hours" may be positive, while the "coefficient of population" is zero. We are now making the more general proposition that the two coefficients can differ widely also in other circumstances. The identification of the two, which is appropriate in the advanced wage economies with more or less fixed hours of work per week, does not at all carry over to peasant economies.[16]

The distinction is worked out below in terms of a rather simplified model.[17] We take the peasant economy model of Section I, and in addition make the following assumptions: (i) non-labor resources can be reallocated after withdrawal of labor from some families; (ii) there are constant returns to scale; (iii) non-labor resources are fully divisible; and (iv)

[15] Note that conditions (2) and (3) are both unnecessary for the existence of surplus labor.

[16] On the general question of the limited applicability of the concepts and assumptions of advanced wage economies to the situation in peasant economies, see Thorner and Thorner (1962), chaps. x, xi, and xiii. See also Daniel Thorner's discussion (1965) of the views of Chayanov on this question.

[17] We have not discussed here the question of intensity of work per hour, that is, working hard or easy for any given length of time. If such variations are considered in terms of the model outlined here, we can treat the value of individual labor (l) as the *effective* time equivalent of total hours of work.

there are a large number of peasant families in this economy. With these additional assumptions, the entire peasant economy can be treated as one production unit, applying a uniform production function, given by equation (1), with Q standing for total output for the economy and L for total labor hours for the economy. The allocational rule (10) will be uniformly followed, and there will be a uniform real cost and marginal productivity of labor. This uniformity will be achieved for each peasant family in spite of indivisibility of the number of persons in each family, through redistribution of non-labor resources. We shall be exploring the conditions for the equilibrium of the economy as a whole, and it will not matter whether the economy is divided into families of equal or unequal size, as long as uniformity of the ratio of non-labor resources to labor resources is maintained for each family. We shall also take α to be the total number of working members and β to be the total number of all members in all families taken together. Since we shall take the number of such families to be very large, we shall treat the newly defined α and β as continuously divisible. We also assume that marginal utility from income and disutility from work are both positive.

We assume further that the ratio of the number of working members to the total number of members is k, and this is a constant, that is, when one working member leaves for work elsewhere, he supports his share of the family, which is k members, so that the peasant economy is left with one less working member and k less consuming members.

$$\beta = k \cdot \alpha . \tag{26}$$

We know from (10):

$$\frac{dx}{d\alpha} = \left[\frac{dV'(l)}{d\alpha} U'(q) - \frac{dU'(q)}{d\alpha} V'(l)\right] \Big/ [U'(q)]^2. \tag{27}$$

From equations (4), (5), (7), (8), and (26), we know that:

$$\frac{dV'(l)}{d\alpha} = V''(l)\left[\left(\frac{dL}{d\alpha}\cdot\alpha - L\right)\Big/\alpha^2\right]. \tag{28}$$

$$\frac{dU'(q)}{d\alpha} = U''(q) \times \left[\frac{Q'(L)\,(dL/d\alpha)\beta - Q\cdot k}{\beta^2}\right]. \tag{29}$$

We know from equation (10), bearing in mind that $Q''(L)$ is uniformly strictly negative, that:

$$\frac{dx}{d\alpha} = \frac{dL}{d\alpha}\cdot\frac{1}{\phi'(x)} = \frac{dL}{d\alpha}\cdot Q''(L). \tag{30}$$

Using (27), (28), (29), and (30), and solving for $dL/d\alpha$, ignoring the possibility of $V'(l) = 0$, we get:

$$\frac{dL}{d\alpha} = \left[\frac{V''(l)}{V'(l)}\cdot L\cdot k - \frac{U''(q)}{U'(q)}\cdot Q\right] \Big/ \left[\beta\cdot\frac{V''(l)}{V'(l)} - \alpha\cdot\beta\cdot\frac{Q''(L)}{Q'(L)} - \alpha\cdot Q'(L)\frac{U''(q)}{U'(Q)}\right]. \tag{31}$$

We can now define a number of elasticities and can express our result as relationships between them. In particular, we define E as the elasticity of output with respect to the number of working members, m the (absolute value of) elasticity of the marginal utility of income with respect to individual income, n the elasticity of marginal disutility from work with respect to individual hours of work, G the elasticity of output with respect to hours of labor, and g the (absolute value of) elasticity of the marginal product of labor with respect

to hours of labor. In the definition of these elasticities, there is of course no implication that they will be constant,

$$E = \frac{dQ}{da} \cdot \frac{a}{Q}; \tag{32}$$

$$n = \frac{V''(l) \cdot l}{V'(l)}; \tag{33}$$

$$m = -\frac{U''(q) \cdot q}{U'(q)}; \tag{34}$$

$$G = \frac{Q'(L) \cdot L}{Q}; \tag{35}$$

$$g = -\frac{Q''(L) \cdot L}{Q'(L)}. \tag{36}$$

We obtain from (1), (26), (31)–(36), the *response equation:*

$$E = G\left(\frac{n+m}{n+m \cdot G+g}\right). \tag{37}$$

The extreme case of surplus labor corresponds in this model to $n = m = 0$, which is exactly the same as the case of having flat regions in the marginal utility and the marginal disutility schedules, as discussed in Section II earlier. It might look from equation (37) as if another such case is $G = 0$, but this does not strictly follow, since G being zero requires that the marginal productivity of labor be zero, which requires, thanks to (10), that the relevant marginal disutility of labor be zero too, and that was ruled out in deriving equations (31) and (37), involving division by $V'(l)$. However, with a slightly different formulation we can get substantially the same result of surplus labor by assuming $Q'(L) = V'(l) = 0$. To assume, however, that it does not only hold trivially for infinitesimally small changes around the point of equilibrium, we need the further assumption that $V'(l)$ stays at zero even when l is increased. Therefore, $V''(l)$ has to be zero over a certain range, which comes to the same thing as n being zero over this range. A slight bit of formalism might be helpful. Putting $n = 0$, that is, having a flat marginal disutility curve in the relevant region, we get from equation (37):

$$E = \frac{m \cdot G}{m \cdot G+g}. \tag{38}$$

The case of surplus labor discussed in Section II, is that of $m = 0$, which makes $E = 0$. The other case, corresponding to zero marginal productivity ($G = 0$), can be seen heuristically by making G smaller and smaller, with an unchanged g, and this makes E indefinitely small. The limiting case of $G = 0$ is ruled out by the derivation, but that it will be approached can be verified from equation (38).

Another special case is $G = E$, that is, a case when the elasticity of output with respect to labor hours coincides with that with respect to working people. If we assume n to be very large, we shall approach this result. Heuristically this corresponds to the case of the marginal disutility schedule approaching the vertical position, which of course will tend toward constancy of the number of hours worked, making the change in labor hours proportional to the change in the number of working people. This is probably the underlying assumption of taking fixed hours of work in traditional analysis. An alternative assumption yielding the same result is that the hours of work are institutionally fixed, which does not apply well to peasant agriculture but is reasonably realistic for capitalist industry.

There is also another very special case when the result of $E = G$ can be expected. This happens when $m = g/(1 - G)$, as can be checked from the *response equation* (37). This critical case can be understood in the following heuristic

terms. When some people are withdrawn from the peasant economy, with an unchanged number of hours of work per person, the marginal physical return from work will increase. On the other hand, since the people left behind will now enjoy a higher income, the utility value of a unit of physical output will now be lower. The condition quoted corresponds to the special case when the two forces just cancel out each other.[18]

Leaving out these special cases, we would not in general expect the elasticity of peasant output with respect to the number of working men to coincide with the elasticity with respect to labor hours. The qualitative relationship between G and E can be checked from (37) to be the following:

$$E \left\{ \begin{matrix} < \\ \equiv \\ > \end{matrix} \right\} G \text{ according as } m \left\{ \begin{matrix} < \\ \equiv \\ > \end{matrix} \right\} \frac{g}{1-G}. \quad (39)$$

With a constant elasticity production function (Cobb-Douglas type), we have, further, $g = (1 - G)$, so that the condition then reduces to:

$$E \left\{ \begin{matrix} < \\ \equiv \\ > \end{matrix} \right\} G \text{ according as } m \left\{ \begin{matrix} < \\ \equiv \\ > \end{matrix} \right\} 1 . \quad (40)$$

Except under very special assumptions it will be illegitimate to equate the proportionate response of output to labor hours with that to the number of working members. This general point holds even when we relax the possibility of having continuous variations in a through the assumptions (i)–(iv) outlined at the beginning of this section. Alternatively, we might consider the consequences of a reduction of a by 1 for one family after another, and considerations similar to m, n, G, and g will also apply in this discrete case. Once again, unless we assume that either (*a*) the marginal disutility schedule is vertical, or (*b*) the number of hours worked is institutionally fixed even in the peasant economy, or (*c*) the effect of population withdrawal on marginal productivity is *exactly* counterbalanced by its effect on the marginal utility of income, there will be no reason to identify G and E. Assumption (*b*) is highly unrealistic, and assumption (*c*) will be the result of a pure coincidence, and even if it happens to be true at some positions of equilibrium, it is extremely unlikely that such a special coincidence will hold throughout. (It must be remembered that the values of m, n, G, and g are not necessarily constant.) Assumption (*a*) of a *vertical* schedule is, in some respects, the extreme case exactly opposite to the one associated with the theory of surplus labor, namely, that the marginal disutility schedule will be horizontal in the relevant region.

[18] It is easy to check that $m = g/(1 - G)$ corresponds to having simultaneously $dl/da = 0$, and $(d/da)[Q'(L) \cdot U'(q)] = 0$.

E. THE PRODUCT MARKET AND PRICE RESPONSE

When a part of the working force moves out of a peasant economy that markets its product (part or whole), the situation is more complex, because the result will depend on the impact of this labor movement on the relative price of the output, and the peasants' reaction to price changes. So we must first determine how the peasants will react to a price change, assuming that they cannot change the amount of other factors to be employed (ruled out by the definition of the problem of surplus labor).

First take the case in which the family markets its entire produce Q for the purchase of the outside commodity C (at an exchange rate p); the allocational rule is given, as we have seen, by equation (15).

$$Q'(L) = \frac{V'(l)}{U'(c)} \cdot \frac{1}{p}. \quad (15)$$

By differentiating this with respect to p, and solving for dL/dp, we get after simplifying:

$$\frac{dL}{dp}=\frac{Q'(L)[U'(c)+U''(c)\cdot c]}{[V''(l)/\alpha]-[U''(c)/\beta][Q'(L)\cdot p]^2-U'(c)\cdot Q''(L)\cdot p}. \tag{41}$$

Now, since $V''(l) \geq 0$, $U''(c) \leq 0$, and $Q''(L) < 0$, the denominator is positive, and therefore the direction of the response of labor supply to the price of the product will depend entirely on the sign of the numerator, of which all items are non-negative except $U''(c)$. For the response of labor supply to product price to be negative, the following condition has to be fulfilled:

$$-\frac{U''(c)\cdot c}{U'(c)}>1. \tag{42}$$

Now, the left-hand side of relation (42) is simply the absolute value of the elasticity of the marginal utility of income, identical with m as defined by (34), except for the substitution of c for q; let us call this elasticity $\bar{m}$. The response of labor, and therefore of output (given positive marginal product, that is, non-zero marginal disutility of work) to the product price, will be positive or negative depending on whether the elasticity of the marginal utility is less than or greater than unity. To summarize:[19]

$$\frac{dQ}{dp}\left\{\begin{matrix}>\\=\\<\end{matrix}\right\}0, \text{ according as } \frac{dL}{dp}\left\{\begin{matrix}>\\=\\<\end{matrix}\right\}0, \tag{43}$$

$$\text{according as } \bar{m}\left\{\begin{matrix}<\\=\\>\end{matrix}\right\}1.$$

In the case when a part of the produce is marketed and a part consumed, the position is more complicated, and we cannot analyze the situation without specifying the shape of the utility function more precisely than we have done so far. As an illustration, we can take the case of a utility function with unit elasticity of substitution, with given coefficients of the two types of goods.

$$U = A(c^{\mu}\cdot q^{1-\mu})^k, \quad \text{where } 0<\mu<1, \quad \text{and } 0<k\leq 1. \tag{44}$$

Given (44), the allocational equation (19) implies that the two goods will be consumed in a ratio (r) that is simply proportional to the price p.

$$r=\frac{c}{q}=\frac{p\cdot\mu}{1-\mu}. \tag{45}$$

From this relation (45) and the equations (17) and (18), giving the value of c and q in terms of the output level Q, price level p, and the marketing ratio y, it follows:

$$y=\mu. \tag{46}$$

That is, in this case the marketing ratio is fixed irrespective of the price level, because the income and the substitution effects of a price increase just cancel out.

The labor allocational rule was found earlier to be given by (20):

$$Q'(L)=\frac{V'(l)}{U_q}. \tag{20}$$

When the price p varies, $Q'(L)$ is affected through the resulting variation in L; $V'(l)$ is affected through variation in l related to the variation in L; and U_q responds to both changes in the consumption ratio r and the size of consumption of q, both of which are themselves functions of the price, the latter through the intermediary of the volume of labor and

[19] Cf. result (40). If m and $\bar{m}$ could be identified, a positive response of total output to price will imply the coefficient of the number of laborers is less than that of labor hours, with a Cobb-Douglas production function.

the quantity of output produced (since the marketing ratio is fixed). Solving for dL/dp, we get:

$$\frac{dL}{dp} = x \cdot T_1 \Big/ \left[\frac{V''(l)}{U_q} \frac{1}{a} + x \cdot T_2 - Q''(L) \right], \tag{47}$$

where

$$T_1 = \frac{\mu \cdot k}{p} > 0, \qquad \text{and}$$

$$T_2 = \frac{(1-k)(1-\mu)}{q \cdot \beta} Q'(L) \geq 0.$$

Since, furthermore, $V''(l)$ must be non-negative, and $Q''(L)$ must be negative, and of course U_q must be positive, and x non-negative, we have the result that the application of labor cannot fall when the price of the product increases. Moreover, ruling out the case in which the disutility of labor (therefore, x) is nil, we shall always have a positive response of labor to price. And this together with positive marginal product (guaranteed also by the positivity of x) must imply a positive response of output to price. We find, therefore, the interesting result that with a utility function with fixed coefficients and unit elasticity of substitution (homogeneous of degree $k \leq 1$), the response of output to price must be positive.[20]

When such a positive response of output to the price level is assumed, the conditions for the existence of surplus labor become less exacting, assuming that the transfer of peasant labor will be accompanied by a rise in the price of their output. Indeed the literature on the problem of the creation of marketed surplus concerns itself precisely with the possibility that a transfer of peasant labor to work elsewhere may produce a shortage of food even when the peasant output is maintained.[21] This is because of the fact that out of the given output produced, the fraction sold in the market outside may not rise pari passu with the movement of the labor force out of the peasant economy. If this shortage of agricultural produce raised its price level, then, with our assumptions, the peasant output may respond positively to it. Thus, even if there is a tendency for the output level to fall when a part of the labor force moves out, *given* the price of the produce, this may be compensated, or more than compensated, by a positive response to the price level resulting from the movement of the labor force itself. In the case of a peasant economy that relies exclusively or inclusively on a product market, the conditions for the existence of surplus labor must take into account this price response.[22]

However, there is a stricter form in which the question of surplus labor can be posed. It may be asked whether the peasant output will remain constant if

[20] Without further empirical research, we cannot say how realistic are the cases covered here. However, it is interesting to note that empirical studies on the response of production to price in Indian agriculture have usually found the response to be positive (see Raj Krishna, 1963, and Dharm Narain, 1965). While these studies have been done mainly for individual crops, and one would expect more positive response there than in the case of peasant output in general (because of the substitution for the more lucrative crop against the others), so far there is relatively little indication of a negative response even for the total output of peasant economies vis-à-vis a general rise in the price level of the peasant output.

[21] For one of the earliest and clearest discussions of this problem in the context of economic development, see Dobb (1951), pp. 45–48, 71–73.

[22] One exception to this rule is the extreme case of marginal disutility of labor being nil, for there the peasants will always apply enough labor to make the marginal product of labor zero, no matter what the price level is. In such a case, however, when the marginal disutility is nil and stays nil in the relevant range, the possible existence of surplus labor has already been shown, independently of the utility function.

a part of the labor force moves out, given the amount of non-labor resources used, *and* assuming that the relative price of output does not change. Given this formulation of the question, the condition necessary for the existence of surplus labor is extremely similar in the case of a peasant economy with a product market, as in the case of a peasant economy without one, discussed in the earlier sections. In the case of the peasants who sell all of their product, with labor allocational rule (15), we now require, as before, that the marginal disutility to work and marginal utility from income (now in terms of c rather than q) both be flat schedules. In the case when a part of the output is directly consumed and a part sold in the market, the condition reduces to a flat marginal disutility schedule and constant marginal utility when the amount of the two commodities obtained goes up in the proportion indicated by the appropriate utility function. In the case of the fixed-coefficient homogeneous utility functions studied earlier, the requirement on utility simply boils down to the degree of homogeneity being 1, that is, $k = 1$ in equation (44), in the relevant region.

III. DUAL EQUILIBRIUM OF A PEASANT ECONOMY AND CAPITALIST FARMING

Typically peasant and capitalist agriculture coexist in varying proportions in many parts of the world. The nature and consequences of this dualistic equilibrium are studied in this section.

A. POSITIVE WAGES WITH SURPLUS LABOR AND THE WAGE GAP

As a preliminary, we discuss briefly a more familiar problem that has engaged a number of economists, namely, the explanation of a positive wage outside the peasant economy when there is surplus labor inside it. One explanation that has been put forward is the efficiency-enhancing effects of nutrition and, therefore, of higher wages.[23] Another approach is to postulate an institutional minimum wage rate.[24] A third approach suggests that a peasant leaving his family loses his income from the farm (roughly, the *average* product per person), and the wage rate outside must compensate for this.[25]

This question is, in some respects, ill-conceived. Surplus labor only implies that some people can move out without reducing output, that is, $E = 0$, but this does not require that the marginal product of labor be zero, that is, $G = 0$. If $G > 0$, this implies that there is some marginal disutility of effort, that is, $z > 0$. Why should we expect the wage rate to be zero, when there is some marginal disutility of effort?

While the question of the coexistence of positive wages with surplus labor can be dismissed as misconceived, there is a question closely related to it for which these theories have relevance. There is usually a substantial gap between the wage rates outside the peasant economy and the real cost of labor (and, therefore, of marginal productivity) inside it. To a great extent this can be explained in terms of the theories discussed above, supplemented in the case of the rural-urban differential by considerations of different costs of living and possible variations in earner-dependent ratios.

Insofar as wage employment takes the form of full-time work per day, though

[23] This was worked out by Leibenstein (1957) and has been further studied by Mazumdar (1959), Ezekiel (1960), and Wonnacott (1962).

[24] See Nurkse (1953), Ranis and Fei (1964), and others. This is a modern extension of a Ricardian concept.

[25] See Lewis (1954).

not necessarily per year, one further reason for the wage gap can be seen in the shape of the marginal disutility schedule, which will rise after a point at least, even if it is flat at the beginning. If the point l^*, where the marginal disutility schedule starts rising, is to the left of such full-time work, then the relevant marginal disutility will be higher in wage employment than that for the lower level of work per person in the peasant equilibrium. In this context it is interesting to note that an institutionally determined minimum number of hours of work per person in wage employment can serve the same function as an institutionally determined minimum level of wages, namely, have the effect of causing a wage gap.

B. PRODUCTIVITY OF LABOR AND OF LAND

The existence of a wage gap binds together such dissimilar models of growth as those of Lewis (1954) and Ranis and Fei (1964), on the one hand, and that of Jorgenson (1961), on the other. This wage contrast is sometimes taken to be one that applies between industry and agriculture only, and sometimes as one that relates to wage employment and family employment in general. We shall take it in the latter form, and assume the existence of such a gap even within the agricultural sector between wage-based farms and family-based farms.

We start by reinterpreting equation (1). Let us assume that there are constant returns to scale, and only two factors of production, namely, land and labor. Let Q stand for product per acre and L for labor per acre. We assume, temporarily, that the peasants and the capitalists use the same production function, but the former run their farms on family lines while the latter use hired labor, and there is a "wage gap," that is, the wage rate (w) is higher than the equilibrium real cost of labor (x).[26]

The crucial relation to be used is equation (12), relating output per acre to equilibrium labor cost, and since $w > x$, we have immediately the result that the capitalist farms will have a lower output per acre than the peasant farms.

$$\psi(x) > \psi(w) . \qquad (48)$$

Thus while the capitalist farms will have a higher productivity of labor, the peasant farmers will have a higher productivity of land.

A special case of this result has attracted a lot of attention in the context of the debate over the relative efficiency of peasant farming and capitalist agriculture. If the real cost of labor in "overpopulated" peasant economies is zero ($x = 0$), and the wage rate in the capitalist sector is positive ($w > 0$), we have:

$$\psi(0) > \psi(w) . \qquad (49)$$

In his study of the rubber industry in Malaya and Indonesia, Bauer (1948) makes an observation that is substantially the same as inequality (49).[27] Georgescu-Roegen (1960) has traced the origin of this line of throught to the historical "Agrarian Doctrine" and has related it to the logic of feudal agriculture.[28] It played an important part in the develop-

[26] We can take any case of peasant farming, with or without a product market, and provided we are careful enough to take the right "real labor cost," given respectively by the right-hand side of equations (10), (15), and (20), the analysis will apply equally well in each case.

[27] "In the choice of planting density the rational course is not the same for estates and small holders. The majority of small holders incur no cash wage costs and attempt to maximize the gross yield per surface unit. On their densely planted holdings the trees are of smaller girth and yield per tree—lower than on estates, but the yields per surface area are higher" (Bauer, 1948, p. 363).

[28] Cf. Nicholls (1960), Dandekar (1962), Sen, *Economic Weekly* (1962), and Myint (1964).

ment of political thinking in Russia (see, for example, Lenin, 1893).

It should, however, be noted that while in these arguments inequality (49) is used (often implicitly), inequality (48) is more general. It is not necessary that the real labor cost in peasant farms be zero ($w > x = 0$), as assumed by Bauer (1948), Georgescu-Roegen (1960), and others; it is sufficient that there be a wage gap ($w > x$).[29]

C. SEASONAL WAGE GAP AND PRODUCTIVITY

Agriculture being a seasonal operation, it is somewhat misleading to speak in terms of a homogeneous unit of labor. A unit of labor at the time of harvesting is not replaceable by a unit of labor at a slack period. Indeed it has been found in many peasant economies that at the harvesting time many peasant families themselves hire outside labor. Around this busy season the labor market becomes much more perfect, and we could even assume that the wage gap disappears at this time of the year. How is the result of the last section affected by the existence of only a seasonal wage gap?

Let there be two seasons, one in which there is no wage gap ($x_1 = w_1$) and another in which there is one ($x_2 < w_2$). If it is assumed that the labor in the two seasons must be used in fixed proportions (say, with r units of season 1 labor with one unit of season 2 labor), then it is easy to see that the real labor cost of the composite unit of labor will be higher for the capitalist farm than for the peasant farm, and the old result of a higher output per acre of the peasant farms will still hold.[30]

$$\psi(r \cdot x_1 + x_2) > \psi(r \cdot w_1 + w_2) \ . \quad (50)$$

[29] This gap has to exist in comparable efficiency units so that a gap reflecting higher productivity of labor in capitalist enterprises (for example, in Leibenstein's model [1957]) will not serve this purpose.

We can, however, dispense with the assumption of strict proportionality and simply assume that labor in different seasons is essentially complementary each to the other, with positive cross-partials. The marginal productivity of both kinds of labor is diminishing, and an increase in the application of slack-season labor (for example, transplanting) increases the marginal productivity of busy-season labor (for example, harvesting).

It can be shown that the fulfilment of the second-order condition of maximization of profits (the so-called stability conditions) guarantees that the use of a factor will increase when its equilibrium price falls.[31] Since the cross-partials are positive, this greater use of slack-season labor will increase the marginal productivity of the busy-season labor, and increase its use. Thus, a lower value of the real cost of slack-season labor will mean that more busy-season labor will also be used per acre in the peasant farms. Together this will guarantee that the output per acre will be higher for peasant farms with more labor being used in both seasons than in the capitalist farms. Thus there need not be a wage gap in each season; its presence in some seasons is sufficient, provided labor of each kind raises the others' productivity.[32]

D. THE LAND MARKET

So far we have assumed that the amounts of land held by peasant farmers and by capitalist farmers are given. Only

[30] This suggestion came up in the context of discussion on Indian data on agriculture; see Mazumdar, *Economic Weekly* (1963), and Sen, *Economic Weekly* (1964).

[31] See Hicks (1946), Mathematical Appendix to chap. vii; also Nerlove (1958), chap. i.

[32] In fact it can be checked that, for this result to hold, it is sufficient that the particular relationship

in terms of this assumption has it been possible to work out the conditions of equilibrium with differential labor costs in different modes of production. We can now inquire what will be the effect of having a perfect market in renting land. If we consider a two-factor case (with land and labor) and continue with the assumption of constant returns to scale, the answer is immediately seen. Such an equilibrium cannot exist. As long as the marginal productivity of land is higher for peasant farmers than for the capitalist farmers, it will be in the interest of the capitalist farmer to rent his land out to the peasants. The process of transfer will continue until either the labor-cost gap vanishes or, alternatively, all land owned by the capitalists is rented out.

As a matter of fact, the imperfection of the land market is quite a fair assumption for most underdeveloped countries. For one thing, a variety of regulations, traditional and modern, makes renting out land a more hazardous occupation than lending capital; there are regulations about tenancy and customary rights of the cultivators. Also in most societies there are restrictions put on the maximum rent chargeable when there generally is no corresponding limitation on the profits to be enjoyed by using wage labor.[33] Imperfections arise from the other sources also.

E. AN ILLUSTRATION FROM INDIAN AGRICULTURE

It has been noted by the *Studies in the Economics of Farm Management* (1954–57), produced by the government of India, that in most areas studied the value of output per acre, both gross and net, becomes smaller as the size of the holding increases.[34] It has also been observed that the amount of labor applied per acre decreases with an increase in the size of the farms and that the proportion of capitalist farms as opposed to peasant farms rises with size. These facts fit well with the explanation expressed in relation (48) or (49).[35] The data are not entirely conclusive (for example, there are some exceptions to this negative relation between output per acre and size); there are also some complications introduced by the existence of factors other than land and labor. There is some evidence that the amount of capital used per acre is also higher for the smaller farms than for the larger ones.[36] The measurement problems here are enormous, but taking the data at their face value, we face the question of which caused what. The higher cost of borrowing that the smaller farms face makes it unlikely that they have any price advantage in the use of purchased capital goods, so that the natural explanation would seem to be that the cheaper cost of labor may act indirectly to increase the amount of capital used per acre for smaller farms.

This can happen in at least two different ways. First, as exemplified by the case of labor of two seasons, in the previ-

that Hicks calls "regression" does not take place between slack-season labor and output (Hicks, 1946, pp. 93–96, 320–23).

[33] The imperfection of the land market is not a modern phenomenon produced by land reforms. The assumption of a perfect land market for a traditional peasant agriculture is a very weak one. For the situation in India in the pre-British period, see Gupta (1958) and Habib (1963). The importance of the problem in the thinking of the eighteenth-century British lawmakers has been studied by R. Guha (1963).

[34] But the "profits" per acre as defined by the *Studies* (1954-57) is higher for the larger farms. We discuss the concept of "profits" later.

[35] Discussed by Sen, Mazumdar, Agarwala, and Bardhan in *Economic Weekly* (1962–64).

[36] See the *Studies* (1954–57) and Randhawa (1960).

ous section, a lower price of one factor will tend to increase the use of its complementary factor; the lower labor cost of the smaller farms will have such an effect on the use of capital also.[37] Second, much of the capital used in smaller farms is not brought from outside but produced (or reared, in the case of the livestock) with direct labor in the family economy itself. Here the cheaper cost of labor will reflect itself directly in the cheapening of the capital goods, and the differential price advantage that the peasant farmers have in the use of labor will imply such an advantage also in the use of capital.[38]

Also there are some indications that the smaller farms may be inherently more fertile. There is relatively little data on this,[39] and what estimates there are tend to be partly circular in this context, being based on output per acre indirectly. However, such a correlation between the sizes of the farms and fertility can be expected for the following economic reasons. If there is a tendency for higher income to lead to a larger size of family (say, due to greater ability of the members of the family to survive famines and other crises), then there will be a tendency for the more fertile farms of a certain size to sustain bigger families than less fertile farms of the same size. Subdivision through inheritance will, therefore, be faster on the former, and a correlation will thus be established between natural fertility and smallness of the holdings.[40]

The evidence regarding Indian agriculture, therefore, cannot be viewed as conclusive at this stage. It is possible that part of the reason for the higher productivity per acre of the smaller farms is its cheaper labor, acting also on capital through complementarity and direct embodiment of cheap labor; but it is also possible that the explanation lies partly in natural fertility differences. Without more empirical work on this, these different elements cannot be separated out; however, it can be asserted that the expectation based on relation (48) is not contradicted, and is, if anything, supported by Indian data, insofar as these data have been analyzed.[41]

Certain methodological problems of cost accounting in Indian agriculture are also raised by this problem of the wage gap.[42] *The Studies in the Economics of Farm Management* (1954–57) computed "profits" of different kinds of enterprises by imputing to family labor the market wage rate as shadow labor cost, and it came to the frightening conclusion that much of Indian agriculture is being run

[37] Variation of the intensity of capital utilization may, however, make it difficult to take account of relationships of this kind in terms of simple neoclassical analysis, as has been discussed by Bagchi (1962). In an unpublished paper, "Productivity and Disguised Unemployment in Indian Agriculture: A Theoretical Analysis," Bagchi has analyzed the Indian farming situation in terms of a more complex model, emphasizing particularly the problem of seasonality.

[38] There will be some saving of working capital also, because peasant agriculture is not based on wage advances so far as the marginal units of labor are concerned, and this reduces the need for work-in-progress (discussed in my note, "Working Capital in the Indian Economy: A Conceptual Framework and Some Estimates," in Rosenstein-Rodan [ed.], 1964).

[39] See Khusro (1964).

[40] See Sen, *Economic Weekly* (1963, 1964).

[41] This relation has been observed in other economies as well, some even in Europe, for example, in prewar Poland. "Labour productivity is unquestionably higher on the landed estates than on the peasant farms. The yield per acre, however, is higher in the latter owing to the use of more labour, especially in stock-breeding" (Pohorille, "Development and Rural Overpopulation: Lessons from Polish Experience," in I.L.O., 1964).

[42] For a general discussion on the confusion of categories in Indian farming, see Thorner and Thorner (1962), chaps. x–xiii.

on "losses."[43] This illustrates the problems that arise if the wage gap is ignored. If the family-based farmers did have to pay the market wage rate for their labor, they would not have applied that much labor, and would have certainly avoided the "loss." But since they in fact faced a lower real labor cost, they applied labor beyond the point where the marginal product equals the market wage rate, and for these marginal units incurred fictitious "loss." And it appears that in many cases the "loss" over these units overcompensated the profits on units prior to the critical point, leading to an over-all mythical "loss."[44] This illustrates the danger of analyzing peasant equilibrium in terms of ideas borrowed from a capitalist economy.

IV. LABOR ALLOCATION AND DIFFERENT ECONOMIC SYSTEMS

In this section we start by analyzing the problems of allocational efficiency in a wage system as opposed to peasant agriculture. Then the question of sharecropping is discussed.

A. THE WAGE SYSTEM AND ALLOCATIONAL DISTORTIONS

Three different interpretations of the wage gap need to be carefully distinguished. Insofar as the wage gap reflects a pure distortion of the market, which is the form we have been studying, the efficiency implication is clear. The peasant family is guided properly by its calculation of the real labor cost, reflecting the rate at which the members are ready to substitute labor for output, but the capitalist farmer is misguided by an inefficient market mechanism. His allocation is, therefore, correspondingly distorted.

Two qualifications must, however, be made. First, insofar as the peasant faces a distorted capital market, with an unduly high price of borrowing capital from usurious money lenders, he too may get a wrong signal from the market mechanism. Second, when the assumption of uniformity of all peasant families is dropped, different peasant families may equilibriate at different levels of real labor cost, and then the allocation of labor *between* different peasant enterprises may also suffer from the imperfection of the labor market.

A second interpretation of the wage gap is that it is not a market *distortion*, but a *genuine* reflection of the higher social cost of hired labor as opposed to own labor. If people prefer to work for themselves rather than be "wage slaves," the capitalist farms are at a disadvantage, but there is no misallocation on this account.

A third interpretation of the wage gap is that it reflects the higher efficiency of wage labor. This can happen in at least two different ways: (i) higher wages attracting the cream of the labor force, peasant farming being left to the less efficient ones; and (ii) higher wages leading to greater efficiency through better nutrition.[45] Insofar as this is the case, labor in efficiency units may not be any more expensive for the wage farms than

[43] Cf. "This is an alarming situation, for if 50 per cent or more of the farmers are carrying on the business at a loss, the farming community cannot be considered to be comfortably placed in any sense of the term" (*The Studies in the Economics of Farm Management*, Report on Madras, 1955–56, p. 146).

[44] In terms of the model outlined in Section IA, when the market wage rate is given by w, and the equilibrium real labor cost by x, the necessary and sufficient conditions for an over-all "loss" are given by:

$$\psi(x) - \phi(x) \cdot w < 0 . \qquad (51)$$

No story of low and negative returns from family farms emerges from this.

[45] See Leibenstein (1957), Mazumdar (1959), and Galenson and Pyatt (1964).

for the peasant farms. Consequently, there will not necessarily be any special advantage to peasant farming. But if this were the whole story, it would indeed be difficult to explain the observed difference between productivity per acre of peasant and capitalist farms (Section IIIE). Since capitalist farmers have cheaper access to capital, if the peasant farmer does not have the advantage of cheaper labor (in efficiency units) and cheaper capital goods made by directly embodying labor, then the explanation of the observed productivity difference has to rely exclusively on natural differences in the fertility of different kinds of land.

Therefore, according to some interpretations of the wage gap, the wage system distorts, and the peasant farms have distinct allocational advantages. This is worth remembering because of the prevalence of facile generalizations about the superior efficiency of "extensive, relatively mechanized, commercial agriculture" over "small-scale, labor-intensive peasant agriculture."[46]

On the other hand, it is not possible to conclude from the preceding discussion that peasant agriculture is necessarily more efficient than wage-based farming. The allocational efficiency discussed so far is a purely static one related to the utilization of *given* resources. It is indeed possible for peasant farming to yield more output but less savings, and make less contribution to future growth. This whole problem is analogous to the conflicts faced in the problem of the choice of techniques of production, which has been discussed a great deal, and which is unnecessary to repeat here.[47] Apart from savings, there is also the question of "marketed surplus," which is generally assumed to be proportionately smaller for the smaller farms.[48]

Furthermore, it is illegitimate to eulogize peasant farming on the basis of an analysis in which every type of farm has access to the same production function and to the same factors of production. A peasant farmer in an underdeveloped area might be constricted to a less efficient set of production conditions for at least three different reasons: (i) he might not have access to economies of large scale; (ii) he might not have the necessary technical know-how or access to the same factors of production; and (iii) he might be forced to shun experimentation with new techniques, because the precarious nature of his existence makes him more averse to taking risks. The classical arguments for large-scale farming (both capitalist and co-operative) were based mainly on consideration (i), but it is possible that consideration (ii) is of greater importance, particularly "where technically superior factors of production are a principal source of agricultural growth."[49] Consideration (iii) might also be important in certain situations, for example, in the use of fertilizers in areas

[46] See United Nations (1962). See also the frequent references to the "losses" of the smaller farms in *The Studies in the Economics of Farm Management* (1954–57). The position is rather more complicated with co-operative farms; see Sen (1966).

[47] Sen (1960), chaps. ii and v. The question depends crucially on the fiscal possibilities. See also Ranis (1959), Ohkawa and Rosovsky (1960), and Johnston and Mellor (1961).

[48] The importance of the marketed surplus was emphasized by several classical writers. In fact it was Adam Smith's preoccupation with this and his identification of this with "supply" as such that Marx found to be "a naïve misunderstanding" (Marx, 1957, p. 140). On the relevance of marketed surplus for economic development, see Dobb (1951). Regarding the empirical question as to whether the proportion of the output marketed does or does not increase with the size of the farms, see Raj Krishna (1965) and Dharm Narain (1961).

[49] Schultz (1964), p. 189; see chaps. viii–xii. See also Griliches (1960).

of uncertain rainfall. Thus while the "wage gap" may distort the allocation of wage-based farms, and the peasant farms seem to have a distinct advantage in the utilization of labor, it is not possible for us to argue from this that peasant farming must be of superior economic efficiency.

B. SHARE-CROPPING AND LABOR ALLOCATION

There is a widely prevalent system in many underdeveloped areas of the world, namely, share-cropping or tithe cultivation, by which the cultivator gets a certain proportionate share (h) of the produce (with $0 < h < 1$), while the landowner gets the rest. This fits in neither with peasant farming nor with capitalist farming. We examine now the allocation of labor under this system. In this case there is no proper "wage gap," but the allocation is not according to the "real cost" of labor either.

The sharing can take place either on the basis of the net product or on that of the gross product. And in the latter case, the landowner might be expected to pay for the value of the non-labor inputs, or alternatively, the cultivator may be expected to do this. We take first the case of the sharing of the net product, with the payments for the hired factors being made out separately.

It is easy to verify that the rule for the allocation of non-labor inputs will be the same as under peasant farming. When p_j are the prices (in units of output Q) of the factors f_j (other than labor), we have:

$$\frac{\partial Q}{\partial f_j} = p_j, \qquad \text{for } j = 1, 2, \ldots, n. \quad (21)$$

The rule for labor allocation will, however, be different, even if each member of the cultivating family identifies his interests with those of his family (as assumed in the case of peasant farming).

$$Q'(L) = \frac{V'(l)}{U'(q)} \cdot \frac{1}{h}. \quad (52)$$

Since $h < 1$, the share-cropper's relevant labor cost is higher than the "real labor cost." Output will thus be restricted, and the marginal product of labor will exceed the "real cost of labor." There is, thus, misallocation under share-cropping.[50]

This result differs from the analysis of share-cropping by Georgescu-Roegen (1960), quoted earlier, who does not identify any misallocation of this type. This difference is due to Georgescu-Roegen's exclusive concern with the case when the marginal disutility of effort is nil, that is, $V'(l) = 0$. Then we have, irrespective of the value of h, the result:

$$Q'(L) = 0. \quad (53)$$

This is the same result as under peasant farming (with the assumption of no "real cost" of labor), and explains Georgescu-Roegen's argument that in an overpopulated feudal economy, people will work up to the point where the marginal product of labor is zero, irrespective of the share of the produce they receive (Georgescu-Roegen, 1960, p. 26). The same assumption also explains Georgescu-Roegen's conclusion that in an overpopulated economy, "the feudal formula warrants maximum welfare" (p. 31).

We have seen before that the existence of surplus labor does not imply either that the marginal product of labor is zero or that the marginal disutility of effort is nil. Hence there is nothing con-

[50] Furthermore, labor use under share-cropping would be less intensive than by a comparable peasant family. However, insofar as the share-cropper is poorer, his marginal utility of income will be higher, and that will probably compensate partially the influence of h being less than one.

tradictory in assuming the presence of surplus labor along with asserting that there is misallocation of resources under share-cropping.

We can now consider cases of sharing of the gross output. Here the misallocation is more pervasive. If the landowner pays for the non-labor inputs, the marginal product of these factors will exceed the price of them by the proportion $(1 - h)$.

$$(1-h)\cdot\frac{\partial Q}{\partial f_j}=p_j, \quad \text{for } j=1, 2, \ldots, n. \tag{54}$$

This represents a marginal distortion of a restrictive nature.

A similar distortion will take place when the cultivator meets the non-labor costs and the sharing is on the basis of the gross output.

$$h\cdot\frac{\partial Q}{\partial f_j}=p_j, \quad \text{for } j=1, 2, \ldots, n. \tag{55}$$

To take a mixed case, when either side can provide the non-labor inputs in any amount they like, the following result can be seen to hold in equilibrium.

$$\text{Max}\left\{\left(h\cdot\frac{\partial Q}{\partial f_j}\right), \left[(1-h)\cdot\frac{\partial Q}{\partial f_j}\right]\right\} = p_j, \quad \text{for } j=1, 2, \ldots, n. \tag{56}$$

As long as *either* side finds it worth its while (in view of its own share) to supply a given input, it does so. But even here, there will be some distortion of a restrictive nature, compared with peasant farming (equation [21]), since $0 < h < 1$.

When the gross output is shared, the non-labor factors will not be allocated according to the proper marginal costs and products, and this will create allocational distortions even if the labor application formula is the same as under peasant farming. That is, even if we make the assumption made by Georgescu-Roegen (1960) of no disutility of effort, and assume that labor is applied according to rule (53), there will still be resource misallocation if there is sharing of gross (as opposed to net) output.[51]

We can conclude that quite apart from problems of "equity" and "exploitation" involved in share-cropping, there is also a problem of inefficient allocation. This is present whenever the marginal disutility of effort in the relevant region is positive, even if the sharing is of the net product. Furthermore, when the sharing is of the gross product, there is misallocation even if the disutility of effort is assumed to be uniformly zero.

V. CONCLUDING REMARKS

In this paper we started with an analysis of a peasant family in economic equilibrium, by making explicit assumptions about its objectives and the economic circumstances. Equilibrium with direct consumption of own produce was contrasted with that involving the sale of a part or the whole of the product to the market. With this framework as the background, the paper ranged over a variety of issues involving resource allocation in backward agriculture. The main conclusions are the following.

1. The existence of surplus labor does not necessarily require the assumption of zero marginal disutility of work (or that of a discontinuity in the production function, or that of the effects of better nutrition on productivity). It is sufficient to assume flat sections in the marginal rate of indifferent substitution between income and work in the relevant region.

2. Closely related to this point is the observation that the assumption of sur-

[51] Sharing of gross, as opposed to net, output is quite common. See, for example, *Studies in the Economics of Farm Management* (1954–57).

plus labor does not conflict with an equilibrium at a positive marginal product of labor, labor being measured in terms of hours of work, rather than in terms of number of persons. It is also shown that the existence of surplus labor is consistent with a production function with any degree of substitutability between labor time and other factors.

3. In a peasant economy that markets a part or the whole of its product, even complete flatness of the marginal rate of indifferent substitution is not necessary for the existence of surplus labor because under certain conditions the rise in the price of the peasant output resulting from the transfer of a part of the labor force will stimulate production by the remaining members of the peasant economy. The exact conditions for the existence of such a positive stimulus from a price rise were specified.

4. The importance of the question of the *existence* of surplus labor may have been unduly exaggerated by both sides in the dispute. Some of the standard results derived from a model of surplus labor, for example, allocational advantages of peasant farming as opposed to capitalist farming, were shown not to require the assumption of surplus labor, only that of an imperfect labor market with a gap between the "real cost of labor" in peasant farming and the market wage rate.

5. Even for problems where the existence of surplus labor makes a crucial difference, much depends on the size of this surplus and the extent of the response of output to the withdrawal of the labor force once this surplus is exhausted. This response cannot be calculated without bringing in variations in hours of labor as a part of the population is withdrawn. In terms of the utility functions used for the peasant families, this variation can be quantified. The practice of relating the peasant output to the size of the peasant population, treating hours of labor as constant, seems to be legitimate only under some very special assumptions.

6. The simultaneous existence of surplus labor and positive wages is not a genuine problem at all, except in the special model of surplus labor where zero marginal disutility of effort is assumed. However, the problem of a gap between the wage rate and the corresponding real cost of labor in the peasant economy is a genuine question, and the existing theories on why the wages are positive throw considerable light on the rather different question of the existence of the "wage gap." Further explanations were suggested as possible additions to this list.

7. Given the use of only two factors of production, namely, labor and land, higher output per acre of peasant farms over capitalist farms is usually explained in terms of disguised unemployment or seasonal unemployment. It was shown that it is sufficient to assume that there is a seasonal wage gap if labor applied in one season raises the productivity of labor in the other. The result is, of course, not contradicted by assuming seasonal unemployment, or year-round surplus labor, or zero marginal disutility of work, but the result does not depend on these assumptions being made.

8. The simultaneous existence of capitalist farms and peasant farms, with different equilibrium labor cost, is possible only with the further assumption of an imperfect land market, if the two-factor production function has constant returns to scale. However, the assumption of such imperfection does not seem to be particularly unrealistic.

9. The higher productivity per acre

of the smaller farms compared with the larger ones in India may be related to these considerations. However, some alternative explanations are also possible. But the practice of imputing the market wage rate to family labor in peasant farming used in Indian official publications, which show a considerable part of Indian peasant agriculture having "losses," seems to be based on a confusion of concepts.

10. According to some interpretations of the wage gap, the wage system suffers from market distortions, and peasant farming has some distinct advantages in the allocation of labor. From this, however, a general conclusion in favor of the superior efficiency of peasant farming cannot be drawn.

11. Even though share-cropping as a method is free from the wage system, it leads to inefficient allocation of resources when the relevant marginal disutility of effort is positive. Even when this disutility is nil, there are distortions when the sharing is on the basis of the gross product, as opposed to the net output.

Finally, a general remark. This paper is basically an attempt to apply the postulates of rational behavior to the details of allocational decisions in peasant and dual economies. The differences between the allocational results of the peasant economies and those of the others are traced here to differences in objective circumstances. It is seen that the special features of peasant and dual agriculture made familiar by two decades of development economics can be fitted well into a framework of rational behavior. Nevertheless, it is worth emphasizing that, for the purpose of this paper, rationality is an assumption that is explored and not a hypothesis that is tested.

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