SURPLUS LABOR, UNDERNOURISHMENT, AND LABOR MARKET RATIONALITY IN LDC AGRICULTURE: THE LEIBENSTEIN MODEL

KOJI TAIRA*

In his book and articles (3–5), H. Leibenstein explores an intriguing theoretical dilemma of a purely competitive agricultural labor market in the setting of surplus labor and economic backwardness in less developed countries (LDCs). This dilemma also has fascinating implications for public policy on wages, profits, and employment. The peculiarities of this "Leibenstein model" have been commented upon by H. Oshima (8) with respect to their empirical validity. D. Mazumdar (7), Yong Sam Cho (1), and P. Yotopoulos (11) have examined their theoretical plausibility.

The dilemma of the Leibenstein model is that the free play of supply and demand in the labor market results in full employment of all the available workers, at wages which are too low to secure an adequate nutrition for workers and at profits lower than would be the case if the employers (landlords) paid higher wages and adjusted employment accordingly. Thus, everyone is worse off under this type of free competition than they would be under non-competitive arrangements. This article scrutinizes this peculiar "market solution" and examines the rationale of the postulates and assumptions embedded in the Leibenstein model, with the help of more recent developments in thinking and evidence concerning LDC agriculture. Essentially, the article is an exercise in price theory but its message is that theorizing in economic development must meet the canons of price theory in order to be useful for sound policy recommendations.

1. *The Leibenstein Model: An Interpretive Summary*

a) The demand for and supply of labor in the model are in terms of numbers of workers. There are many employers and many workers in the postulated labor market, which is closed for analytical purposes. Both capital (land) and labor (workers) are in fixed supply. To simplify the analysis, it is assumed that each employer (landlord) has a fixed amount of land on which to employ labor.

b) Wages are paid by the day at daily rates.

c) The production function for each employer has three factors: (i) the number of workers (m); (ii) the number of "work units" (n), a measure of work performance by certain standards of effort or intensity per hour; and (iii) land, which is constant ($\bar{L}$). Thus, output (y) is

* Professor of Economics in the Department of Economics and in the Institute of Labor and Industrial Relations, University of Illinois at Urbana-Champaign, U. S. A. Reserving to himself the responsibility for remaining defects of the article, the author is indebted to his colleagues, especially L. Neal, J. Simon, P. Schran, R. Vandendries, and P. Yeung, for useful comments and suggestions on its earlier versions.

$$y=f(m, n, \bar{L}) \qquad \cdots(1)$$

d) The marginal product of a worker (f_m) has the usual characteristic of any marginal product of labor, positive but diminishing over the relevant range for wage and employment determination. It shifts and changes its shape as the number of work units in the production function changes.

e) The number of work units that a worker can provide per day is a rising function of the daily wage he earns. Thus

$$n=h(W) \qquad \cdots(2)$$

The basic reason for this function is that with a higher wage, the worker eats better and is therefore physically stronger. (This is not an individual's labor supply curve.)

f) Each employer is a price-taker by definition. He maximizes his profit by equating the wage rate to the marginal product of a worker; i. e.,

$$f_m= W \qquad \cdots(3)$$

g) Conceptually, there is a wide range of daily wages. A higher wage enables each worker to turn out more work units. Given the size of land, the marginal product of a worker diminishes quickly after a small number of physically strong workers is employed. In contrast, at a very low wage rate, again given the size of land, a large number of workers can be put to work and the marginal product of a worker diminishes slowly. One may therefore infer, as illlustrated on the right-hand side of Figure 1, that the derived demand for workers for each employer is the curve connecting the loci of profit-maximizing wage-employment solutions on various marginal product curves[1]. The market demand for workers is the sum of these demand curves over all the employers.

h) The market demand and supply determine the wage rate and employment. Since the market supply of workers is fixed, the solution means the full employment of all the available workers at an appropriate wage rate. This market solution is reflected on each farm as a level of employment, $\bar{m}$, on Figure 1.

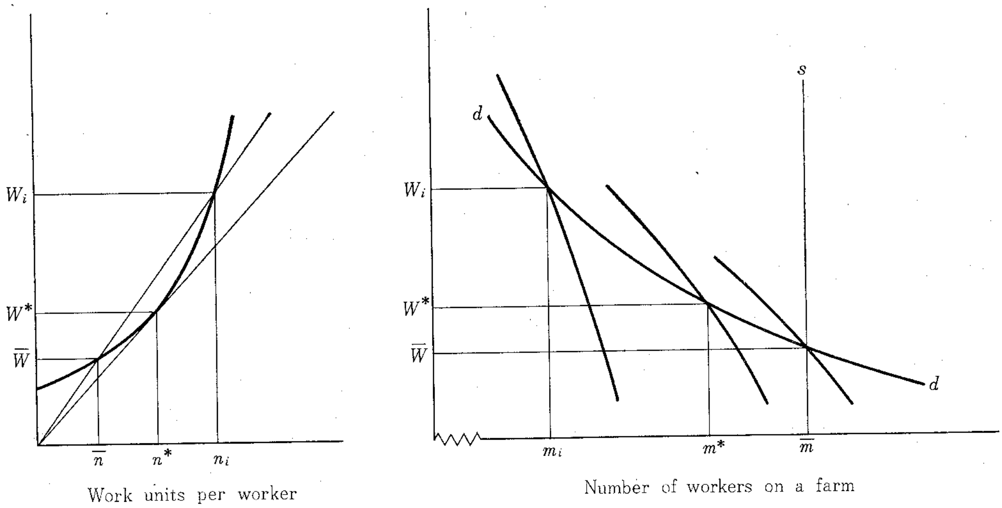
i) It is felt, however, that each worker is capable of turning out a much larger number of work units than what the market has solved for him $(\bar{n})$. As illustrated on the left-hand side of Figure 1, the worker cannot work more because the market-determined wage $(\bar{W})$ results in undernourishment.

j) It is also felt that the market solution gives employers lower profits than are possible under the conditions characterized by Equations 1 and 2. Should employers act as a group instead of as

1) The derived demand here corresponds to Leibenstein's "optimum employment" curve, OE(3, p. 71). The difference is that Leibenstein first substitutes n in the production function with W via Equation 2 and then draws OE. OE,however, is a peculiar curve. It is drawn tangent to each marginal product of a worker and the point of tangency occurs where the marginal product of a worker is equal to the daily wage which has fixed and shaped that particular marginal product curve. It seems that Leibenstein has determined too much on the basis of too little information.

competitors, they could make the largest possible profits, though at the expense of unemployment. Short of the maximum profits, however, there is a solution which would provide employment of all the available workers at a wage higher than the market-determined full employment wage, and employers' net revenues higher than the market-determined full-employment profits.

Figure 1



2. *The Peculiarities of the Model*

Several weaknesses of the model have come to light thanks to the aforementioned authors. The basic difficulty with the model is that the behavioral postulates and assumptions built into it do not lead to a unique profit-maximization solution for the use of resources by the firm. A crucial question seems to be what Equation 2 means to the individual employer. Although Leibenstein is ambivalent about this question, his undernourishment, full-employment solution cannot be obtained unless it is specifically assumed that Equation 2, as illustrated on the left-hand side of Figure 1, is *unknown* to the individual employer. It is therefore useful to discuss employer behavior under two assumptions: when the employer is unaware of Equation 2, so that its effect on his employees' job capability is totally exogenous to his labor strategy; and when he fully knows the existence and characteristics of Equation 2.

In the Leibenstein model, unemployed workers can obtain jobs by undercutting the prevailing wages, while employers are ready to cut wages whenever there are opportunities to do so. But Equation 2, though unknown to employers, is an objective constraint on the work performance of workers; at lower wages, workers exert themselves less or become exhausted more quickly. Whenever workers' job capability goes down, therefore, employers favor employing more workers to fill the labor requirements on their farms. In this way, the Leibenstein model under free competition eventually brings about a full employment solution.

One may ask why employers fail to notice the objective conditions that relate wages to work performance. One plausible explanation may be that LDC landlords just do not care so much about the use of labor, due, for example, to their high preference for leisure. It may therefore be said that the full employment of workers in the Leibenstein model, though at semi-starvation wages, reflects the basic underemployment of employers' managerial resources in relation to the use of knowledge leading to higher returns. (More on this later.) The lesson seems to be that incompetent employers in the LDC setting tend to employ, rather carelessly, large numbers of low-quality workers, and to forego, willingly or by habit, potentially more profitable alternatives. The situation is one in which the capitalist spirit is weak.

One now proceeds to examine how employer behavior is affected by the knowledge of Equation 2. Simple though it may appear at first, this small change in the assumption entails enormous analytical complications. In the case of the market solution coupled with employers' ignorance of Equation 2, the daily wage rate is determined by the market and therefore becomes "a given" as far as each employer is concerned. The daily wage rate also determines the number of work units that each worker can turn out; hence, the number of work units per worker is also "a given" to the employer. The remaining variables to be determined by the employer in the course of profit maximization are the number of workers to be employed and the amount of output to be produced. These variables are fully determined by the combination of Equation 1 (production function) and Equation 3 (a condition of profit maximization). Now, however, by giving to the employer full information on Equation 2, one turns two former "givens" (the daily wage rate and work units) into unknowns to be solved by the employer. But the system is one equation short and therefore under-determined.

Yotopoulos rightly takes Leibenstein to task on the system's lack of necessary and sufficient conditions for a unique profit-maximization solution. Other writers like Cho and Mazumdar, finding some merit in the problem posed by Leibenstein, arrive at their solutions by additional assumptions. However, some of these assumptions are implicit and only confuse the issue rather than clarify it once and for all.

Because of the specific shape of Equation 2, the employer knows that the wage per work unit decreases first as the daily wage rate rises and increases after a certain daily wage rate (W^*) is reached. Therefore, it can be argued that of many possible profit-maximizing points along dd on Figure 1, there may be a point like the one represented by the number of workers equal to m^* at W^* wage that gives the largest of maximum profits[2].

In order to establish that the shape of Equation 2 leads to such a maximum maximorum of profits, however, it is necessary to compare the marginal contribution of a work unit to output (as may be obtained from the production function) and the marginal cost of a work unit (as may be obtained from Equation 2). As Yotopoulos points out, Leibenstein has overlooked this crucial

2) This argument is essentially Cho's (1, p. 38). Leibenstein is extremely vague about the relationship between Equation 2 and maximum profits. But it may be supposed that Leibenstein may have had thoughts similar to Cho's in the use of Equation 2. Cho is much more rigorous and precise in the use of Equation 2 than Leibenstein.

relationship. Any point along dd on Figure 1 satisfies the equality of the marginal product of a worker to the daily wage rate. In addition to this rule at the point of the maximum maximorum of profits, the equality of the marginal product and marginal cost of a work unit must be satisfied, i. e[3].,

$$\frac{1}{m}f_n dn = dW \qquad \cdots(4)$$

It may be noted that within the postulated production function, the marginal product of a work unit is the increment in output due to a marginal increase in the work units supplied by *every one* of the workers employed, so that this marginal product of a work unit within the firm is divided by the number of workers employed (m) to obtain the marginal product of a work unit per worker[4].

From this relationship alone, however, one cannot uniquely fix the location of the maximum maximorum on dd. One at least knows the shape of dW from Equation 2, which starts from zero or a low constant and rises steeply. But one is not informed of the exact shape of the marginal productivity function for the work unit per man (the left-hand side of Equation 4). From the way Leibenstein looks for the maximum maximorum of profits exclusively through Equation 2 (or through dW alone), he may well have assumed the marginal product of a work unit per worker to be constant. Since each additional work unit becomes more expensive while adding a fixed amount to output, sooner or later the marginal cost of work unit will catch up with its marginal product.

Some clarification has thus been obtained on the nature of the maximum maximorum of profits. Even so, one is not yet clear about the exact values of n and W that attain this level of profits. One tempting "solution," though not necessarily correct, is to rely exclusively on the average price of work units that emerges from Equation 2 and to jump to the conclusion that the minimum cost of work units should maximize the profits. Cho has taken this postition. Since the marginal cost of a work unit also goes through the point of the minimum average price of work units at n^*, this can be a "solution." But so long as one works with a general production function of the type in Equation 1, there is no compelling reason to suppose that m^* and W^* uniquely maximize profits.

3. *A Simplified Production Function*

The peculiar indeterminateness of the profit maximizing process in the preceding section may be disposed of once it is recognized that a worker is useless to an employer unless he supplies

3) This follows from the calculus of profit maximization, where profit is $(f(m, n, \bar{L}) - mW)$ and its total differential is set to zero. Rearranging terms, this results in

$$(f_m - W)\,dm + (f_n dn - m dW) = 0$$

and each of bracketed terms is zero.

4) The concept of marginal product of a work unit per worker is Mazumdar's (7), though he puts it to a different use.

work units. In other words, for the purposes of production, workers can be "melted" down into an abstract, homogeneous resource input measured by work units. From a historical and institutional point of view, as Marx argued, the idea that living persons in their productive roles can be reduced to a quantum of "labor power" measured by an objective yardstick is a great breakthrough in perception which divides the "capitalist" and "pre-capitalist" mentality. This breakthrough is a gain in the knowledge of the essentials of production and can therefore be considered an example of technological change as will be commented upon in the next section. LDC landlords, not yet fully "capitalist" in their attitudes toward life and work, may have difficulties in considering an aggregate of work units as some mass of a resource conceptually independent of the number of workers. Viewed in this way, the analytical difficulties in the Leibenstein model may have stemmed from a basic, but implicit, assumption that employers in the model just did not have the rigorous profit-maximizing mentality and that a man was an indivisible unit of labor, so that an hour of one man's labor might not be added to an hour of another man's labor to obtain two hours of work. However, if the game is profit maximization and if the rules of the game are competition and economic rationality, it is conceptually permissible, even unavoidable, to reckon labor in terms of work units, especially where it is clearly known that a man's work units are uniquely related to his daily earnings.

This simplifies the production function 1 into

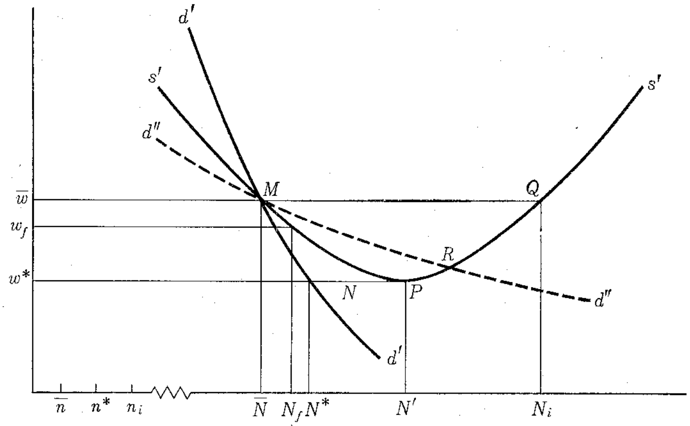
$$y=F(N, \bar{L}) \qquad \cdots(5)$$

where N is the sum of work units obtained from workers employed in the firm. Since land is fixed, there is a unique marginal product schedule for labor in each firm. The lowest wage rate per work unit (w^*) is objectively given by Equation 2, which is fully known to employers. Thus each employer equates this wage rate with the marginal product of a work unit and finds the profit-maximizing combination of wages and employment. The total number of work units thus found can be divided by the number of work units per worker at the minimum wage rate per work unit (n^*) in order to obtain the number of workers employed $(N^*/n=m^*$ on Figures 1 and 2).

On Figure 2, the demand for labor is $d'd'$ which is the marginal productivity curve for work units. The maximum number of work units that the firm can use profitably is N^*. Figure 2 is "synchronized" with Figure 1, so that at the daily wage rate equal to $w^*n^*(=W^*)$, the workers available in the labor market are capable of supplying too many work units for the capacity of the existing firms to absorb. On Figure 2, work units equal to N^*N' are unemployed and these, when divided by n^*, result in the number of unemployed workers per firm. Although Leibenstein insists that since the unemployed have no other alternatives they press down wages and prevent employers from making maximum profits, Figure 2 suggests that lower daily wages mean higher prices for work units and that it is a peculiar employer who does not resist the higher labor cost where cheaper labor is still available.

Somewhere along $d'd'$ above the profit maximizing employment and the corresponding wage rate per work unit, there is a point which represents a full employment of workers available in the

Figure 2



Work units on a farm

market. These workers supply $\bar{N}$ work units in total at the rate of $\bar{n}$ per worker and earn a daily wage equal to $\bar{w}\bar{n}(=\overline{W})$. Within the logic of Figure 2, however, there is no valid reason for the employer to employ all the workers. Even if he is forced to accept the wage rate per work unit equal to $\bar{w}$, he may choose to obtain n_i of work units from each worker for the same total number of work units required, leaving $\bar{N}N_i$ of work units and the corresponding number of workers unemployed. So long as the labor requirements in terms of work units are filled, the employer is indifferent to a choice between a large number of physically weak workers and a small number of physically strong ones. To make the employer prefer a larger number of workers requires assumptions about goals other than profit maximization, and this preference cannot be assumed to be an inseparable ingredient of employer behavior in a competitive market.

One may suppose that there is a curve going through points M, P, and Q. This curve, labelled $s's'$ for convenience, represents different numbers of work units that a firm can have if it hires all of its share in the market supply of labor at full employment. However, it is not a supply curve of labor. It has no operational meaning to an individual employer. One should not be misled to suppose that its intersection with $d'd'$ is an equilibrium solution; a moment's reflection is enough to assure anyone that around the point of intersection there are no dynamic forces to bring deviations in the wage or employment back to that point as in the case of ordinary supply and demand. The only equilibrium solution for the firm that can last within the logic of Figure 2 is N, despite the associated unemployment of workers and work units. (Mazumdar considers M a solution, because his farm is a family farm and he assumes that the family must employ all of its workers. This setting is different from the one Leibenstein uses.)

Figure 2 can also be used for examining one of Leibenstein's audacious claims that has to do with "full employment net revenue." From Figure 1 (left-hand side) and Figure 2, it may be inferred that net revenue (profit) rises as W rises, reaches its maximum at W^*, and decreases as wages rise further. In terms of Figure 2, this can be seen by moving down toward N along $d'd'$

first and moving back up from N. Between M (full employment) and N, net revenue increases while unemployment increases. Leibenstein wonders if there is not a point between M and N which gives a higher net revenue than that at M while fully employing all the workers and their work units. This means that the wage per work unit (w_f) is higher than the marginal product of a work unit under full employment (N_f). In other words, the employer pays the difference between the wage per work unit and the marginal product of a work unit, out of his net revenue. Leibenstein assumes that the employer may still obtain, after having paid workers in full at w_f per work unit, a net revenue higher than that at M.

So long as one operates within general functions such as Equations 2 and 5, it is impossible to establish whether or not such a "full employment net revenue" function exists. Theoretically, there is no logical basis for supposing that such a "full employment net revenue" function exists at all. Furthermore, all of these considerations for the possibility of "full employment net revenue" being higher than the profit at M under full employment are entirely superfluous, because the choice for the employer is not between M and some other point. Contrary to what Leibenstein has assumed, the market forces are not likely to keep employers at M, *provided employers have full knowledge of Equation* 2. Leibenstein supposes, compounding the confusion, that employers can utilize the knowledge of Equation 2 only when they act as a group to cut down competition among themselves, and that when they act individually, they will have to take an equilibrium market solution that corresponds to M. This is certainly a peculiar constraint to put on employer behavior and market process[5].

4. *Variations in the Theme*

Two additional observations on the Leibenstein model may be made in the light of empirical and theoretical developments that have taken place since the presentation of the model. These have to do, first, with the shape and level of the marginal productivity of labor in LDC agriculture and, second, with the question of how technological change can be conceptualized in relation to LDC agriculture which, as in the Leibenstein model, is in stationary equilibrium with allocative efficiency fully realized.

(i) Although Figure 2 is an illustration of Leibenstein's surplus labor situation under an alternative production function, one may ask how plausible it is that the marginal product of labor, $d'd'$, should be shaped and positioned in such a way as to cut $s's'$ from above on the forward falling section of $s's'$. Why should it not cut that section of $s's'$ from below and go all the way to cut the forward rising portion of $s's'$ at a point like R? This amounts to asking whether the employment of work units could be more elastic with respect to the marginal product of a

5) If the feeding of unemployed workers is a problem, the more reasonable way of generating resources for the purpose——"reasonable" in the sense that it does not directly disturb the economic calculus——is some kind of income tax which may be fixed to fall upon employers by varying the minimum taxable income. Compared with this alternative, Leibenstein's proposal to force employers to employ more workers than they desire, and to do so at their expense in the form of foregone profits, seems to be too punitive.

work unit than workers' capability to supply work units with respect to the average price of work units. From the left-hand side of Figure 1, one knows that over the forward falling section of $s's'$, the elasticity of workers' capability to supply work units with respect to w is higher than unity[6]. If $d'd'$ should be cutting $s's'$ from below at M, this would represent a very high degree of elasticity of agricultural employment with respect to the marginal product of labor[7].

The proposition that the marginal product of labor in LDC agriculture is zero would lead one to reject a high elasticity of agricultural employment at positive marginal productivity of labor. But there is increasing evidence that the marginal product of labor in agriculture is positive even in LDCs that are traditionally assumed to be full of labor surplus (9). In other words, LDC agriculture has absorbed an enormous amount of labor without reducing the marginal product of labor to zero. This speaks for a considerable elasticity of employment with respect to the marginal product of labor. From this, it seems more natural today to suppose that the relationship between the marginal product of a work unit and workers' capability to supply work units in the setting of Figure 2 would be more like $d''d''$ than like $d'd'$. Under $d''d''$ and $s's'$, workers are fully employed and supplying all the work units they can turn out at the daily earnings afforded to them. This is perhaps the most effective blow on the entire apparatus and postulates of the Leibenstein model.

(ii) In the foregoing exploration of the Leibenstein model, two situations are assumed about employers' managerial input into production: (1) ignorance of quality changes in workers as a function of daily earnings; (2) knowledge and use of these changes. The net profit is larger under the second situation than under the first, i. e., there is a positive return to knowledge. It is useful to ponder the meaning of this relationship.

One immediately notes that this relationship is a kind of technological change "embodied" in one of the two factors of production within the stipulated framework, namely, labor. The use of the knowledge of Equation 2 means replacing inferior workers with superior ones. By doing this, the firm earns an increased profit. Now the firm will notice that superior workers are working in the same old way; tools, land, crops, and work organization remain the same as before. The firm will then wonder if qualitative changes in tools, land and crops may not product still larger profits. A technological change "embodied" in one factor suggests a "technology gap" in the other factors. With respect to land, for example, changes that are easy to think of include better land preparation, more fertilizer, better drainage or irrigation, more careful planting and weeding, and so on. The qualitative improvement of land cannot be obtained without an appropriate outlay. If we suppose that the outlay for land improvement is positively associated with the profit from farming, then we may imagine that the efficiency of a given space of land measured by "land

6) The elasticity of Y with respect to X is $(dY/dX)(X/Y)$. In the case stated in text, Y is $\bar{m}n$ and X is W/n, where $\bar{m}$ is constant.

7) In terms of the formula under Note 5 above, Y is N and X is F_n. If the production function is Cobb-Douglas, for example, in the form, $log\ y=A+a\ log\ N+b\ log\ L$, the elasticity of N with respect to $\partial y/\partial N$ (where L is fixed) is equal to $1/(a-1)$. Since $a<1$, the absolute value of the elasticity is larger than unity.

units" may be functionally related to profits in a way similar to Equation 2 which relates "work units" of a given worker to his wages[8]. In Figure 2, the changes in the quality of land may be represented by the shift to the right of the marginal product curve of labor.

The above is a conceivable, and highly useful, extension of the Leibenstein model. It seems to be capable of further analytical mileage to be tapped, because it internalizes the search for technological change within the theory of the firm, and because the orthodox price theory has not caught up with the need for incorporating technological change in the behavior of the firm. Many growth models, which assume perfect competition, have passed up this question by assuming that technological change occurs regularly as a gift of *deus ex machina* without the firm actively looking for it or investing in it. This habit of conceptualizing technological change in growth becomes an obstacle when a stationary state with allocative efficiency fully realized is postulated as an initial condition, and forces of growth have to be generated within this context. This is the problem that has burdened *T*. Schultz in the transformation of traditional agriculture in the wake of the realization that LDC agriculture is "poor but efficient" in every respect by economists' criteria of resource allocation (9, pp. 130 *et seq*). (This was also J. Schumpeter's problem when economic development was to be generated in a system that was so efficient in resource allocation that it always tended to settle down in the stationary equilibrium of "circular flow".)

Conclusion

H. Leibenstein's diagrammatic illustrations of his model of a competitive labor market in LDC agriculture have attained a level of artistic virtuosity. One feels, however, that despite the appearance of precision and determinateness in the diagrammatic exercise, Leibenstein has left an agonizing number of loose ends and incongruities[9]. One would have liked more rigorous attention paid to the elementary logic of economic analysis where analysis mattered, as in the case of competition, profit maximization, and market-individual relationships[10].

The peculiar postulates and assumptions of the Leibenstein model may be taken as indicators of the "state of the arts" in LDC agriculture, especially backward management or entrepre-

8) An equation for "land units" may be included in the Leibenstein model after an appropriate adaptation of the production function. Equation 1 may now be written:

$$y=f(m, n, \bar{L}, q) \qquad \cdots (1')$$

where q stands for "land units" just as n stands for "work units." To this, Equation 2 and its counterpart for "land units" must be added:

$$n=h(W) \qquad \cdots (2)$$

$$q=H(\pi) \qquad \cdots (2')$$

where π is the profit accruing to the landlord who ploughs it back into land for increasing "land units." The addition of q does not make the system any more indeterminate than before because it brings its own solution through π which is determined in the same manner as before. The system is still underdetermined, i. e., one equation short.

9) Regretably, Ezkiel (2) has taken the Leibenstein model too seriously and has produced totally superfluous manipulations of it without examining its postulates and mechanism.

10) In a similar vein, I have elsewhere examined another well-known work of Leibenstein's (10).

neurship. The model therefore suggests the need for incorporating technological change in the firm's profit-maximizing behavior. For this reason, the defect of the model may turn out to be a virtue pointing the way toward an analytical method of "embodying" technological change in the theory of the firm. This takes on added significance, when it is recalled that technological change is at best a convenient assumption, even in the finest growth models[11].

References

(1) Yong Sam Cho, *"Disguised Unemployment" in Underdeveloped Areas with Special Reference to South Korean Agriculture* (Berkeley and Los Angeles: University of California Press, 1963).

(2) Hannan Ezkiel, "An Application of Leibenstein's Theory of Underemployment," *Journal of Political Economy,* 58 (October 1960).

(3) Harvey Leibenstein, *Economic Backwardness and Economic Growth* (New York: Wiley and Sons, 1957), especially Chapter 6.

(4) Harvey Leibenstein, "The Theory of Underemployment in Backward Economies," *Journal of Political Economy,* 65 (April 1957).

(5) Harvey Leibenstein, "Underemployment in Backward Economies, Some Additional Notes", *ibid.,* 66 (June 1958).

(6) Harvey Leibenstein, "Allocative Efficiency vs. '*X*-Efficiency'," *American Economic Review,* 56 (June 1966).

(7) Dipak Mazumdar, "The Marginal Productivity Theory of Wages and Disguised Unemployment," *Review of Economic Studies,* 26 (June 1959).

(8) Harry T. Oshima, "Underemployment in Backward Economies, An Empirical Comment," *Journal of Political Economy,* 67 (June 1958).

(9) T. W. Schultz, *Transforming Traditional Agriculture* (New Haven and London: Yale University Press, 1964).

(10) Koji Taira, "A Note on Analytial Properties of Galenson-Leibenstein Investment Criterion," *Bulletin of the Oxford University Institute of Economics and Statistics,* 27 (June 1965).

(11) Pan A. Yotopoulos, "The 'Wage-Productivity' Theory of Underemployment: A Refinement," *Review of Economic Studies,* (January 1965).

11) At this point, one is reminded of another interesting, though problematical, article of Leibenstein's (6). This article dissociates "*X*-efficiency" from"allocative efficiency"while what is more theoretically challenging is to "embody" "*X*-efficiency" in the allocative process of the firm.