AN EXTENSION OF SEN'S MODEL OF THE VALUATION OF LABOUR IN SURPLUS LABOUR ECONOMIES

by

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Professor A. K. Sen argues in his book *Choice of Techniques*[1] that if the objective of a surplus labour economy is to maximise growth, as opposed to the level of immediate output, and savings are suboptimal, labour drawn from the agricultural to the industrial sector should not be regarded as 'costless' even though its marginal product may have been zero. The reasoning is that while the marginal product of the labour may be positive in industry, a low-shadow wage will cause consumption out of money wages to increase more than production reducing the size of the investible surplus. If greater importance is attached to an additional unit of saving than consumption, the transference of labour involves a 'cost' in terms of extra consumption. The cost of a unit of labour is equal to the extra consumption induced by an extra unit of employment. The increase in consumption is given by [3, p. 54]:

$$X = W.c - d (1 - c') \quad \dots\dots\dots\dots\dots\dots\dots\dots(1)$$

where W is the industrial wage,

c is the propensity to consume of workers,

d is the consumption of workers when 'unemployed' in agriculture,

and c' is the propensity to consume of the former hosts of the unemployed workers in agriculture.

To take account of the consumption of capitalists, Equation (1) can be extended to:

$$X = W.c - d(1 - c') + (P_I - W.) c^* \dots\dots\dots\dots\dots\dots(2)$$

where P_I is the marginal product of workers in industry and c^* is the propensity to consume of capitalists.

[1]*See* [3, especially the Introduction and Chapter 5].

If c and c' are assumed to be close to unity and $c^* = 0$ (as Sen assumes), the extra consumption will approximate to the wage rate (W) with the implication that labour should be valued at the industrial wage. The real cost of labour $(W^*) = W$. If $c < 1$ and/or $c' < 1$, the real cost of labour can be less than W, but W^* can never be greater than W.

Sen's analysis assumes that the marginal product of labour in the agricultural sector is zero. This seems unnecessarily restrictive and hard to reconcile with the various definitions given of disguised unemployment in surplus labour economies. Zero marginal product is one possible definition of disguised unemployment but is not exhaustive and is certainly a very static definition. Disguised unemployment can obtain with either positive or negative marginal product depending on its definition; and in practice marginal product may be positive or negative, depending on how agriculture is organised. Even if disguised unemployment is defined with reference to units of labour time rather than units of labour, it is not inconceivable that in a nonprofit-maximising extended-family system, living at subsistence, the marginal product of a unit of labour time may be negative. But even if negative marginal product is an unrealistic assumption in a static analysis, its possibility needs no elaboration in a dynamic setting. This is the concept of the dynamic surplus where migration from the land involves or induces reorganisation of all the factors of production such that labour productivity increases.

Alternatively, a movement of labour from agriculture to industry may temporarily reduce agricultural output unless remaining workers work longer, in which case marginal product in agriculture must be considered positive. It will be recalled that in Lewis model of unlimited supplies of labour [1], the definition of disguised unemployment includes workers with a positive marginal product since all labour beyond the point where the marginal product is equal to the subsistence wage is unlimited in supply to the industrial sector and, therefore, disguisedly unemployed.

Suppose, then, that we define disguised unemployment either as negative marginal product or in the Lewis sense. On these alternative definitions, with $c' < 1$, it is clear that the production effects as well as the consumption effects of labour transference from agriculture to industry must be considered in estimating the real cost of labour. The purpose of this note is to incorporate the production effects into Sen's framework of analysis and, thus, to give a more general formulation of the real cost of labour in surplus labour economies, when savings are suboptimal.

The change in the aggregate surplus (S') with respect to the transference of labour from agriculture to industry is given by:

$$S' = (P_I - W.c) - c^* (P_I - W) - (P_A - d) (1-c') \dots\dots\dots\dots\dots(3)$$

where P_I, W, c, d, c', and c^* are the same as in Equations (1) and (2) and P_A is the marginal product of workers in agriculture. On Sen's assumptions that c' = 1, c^*= 0 and P_A = 0, the aggregate surplus (S) will be maximised when $P_I - W.c$ = 0 *i.e.*, labour must be valued at W.c (or W, if c = 1) to discourage the use of labour beyond the point where marginal product in industry is less than consumption which would reduce the investible surplus. If c' < 1, S will be maximised when $(P_I - W.c) + d(1-c') = 0$, and labour must be valued as in Equation (1).

Let us now relax the assumption that P_A = 0 and state the conditions for S to be maximised giving various values for c' and c^*. On Sen's assumptions that c' = 1 and c^*= 0, it does not matter, in fact, whether P_A is negative, zero or positive; we arrive at the same result as in Equations (1) and (2).

If c' = 0 and c^* = 0, S will be maximised when $(P_I - W.c) = (P_A - d)$ (assuming second-order conditions satisfied). This tells us that even if $P_I - W.c$ = 0, which is the condition for the surplus to be maximised in the industrial sector, it will pay to induce labour into the industrial sector by reducing its shadow price below the value of extra consumption out of the industrial wage as long as $P_A < d$. Clearly, P_A can be negative, zero or positive (but < d), which is in line with our three definitions of disguised unemployment. If P_A = 0, as in Sen's analysis, the real cost of labour is W.c — d, as in Equations (1) and (2)[2]. If P_A = d which, in the Lewis model, is where unlimited supplies of labour come to an end, the real cost of labour is merely W.c which is greater than the change in consumption given in Euqations (1) and (2). If P_A < d, the real cost of labour is:

$$W^* = W.c + (P_A - d) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots(4)$$

The real cost is greater or less than the change in consumption given in Equation (2) according to whether $P_A \gtrless 0$.

If 0 < c', $c^* < 1$, which is the more general case to consider, S will be maximised when

$$(P_I - W.c) - c^* (P_I = W) = (P_A - d) (1 - c') \dots\dots\dots\dots\dots (5)$$

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[2]*See* also Sen's reference to work by Professors Vakil and Bramanand [3, footnote 11, p. 54].

The real cost of labour is given by:

$$W^* = W.c + c^*(P_I - W.) + (P_A - d)(1 - c') \quad \ldots\ldots\ldots\ldots\ldots\ldots (6)$$

The real cost is greater or less than X in Equation (2) according to whether $P_A (1 - c') \gtrless 0$.

Substituting Equation (5) into (6) gives $W^* = P_I$. Using Equation (6), we get the result that for the surplus to be maximised labour must be employed up to the point where:

$$P_I = Wc + c^*(P_I - W) + (P_A - d)(1 - c') \quad \ldots\ldots\ldots\ldots\ldots\ldots (7)$$

The simple proposition is that if the objective is to maximise growth and savings are suboptimal, it will be advantageous to encourage labour out of agriculture into industry so long as the increase in the investible surplus in agriculture is greater than the decrease in the investible surplus in industry. If the marginal product in agriculture is not zero, the production effects of labour transference must be considered (in conjunction with c') in arriving at the shadow price of labour. In the case of a classical savings function, for example, with $c = 1$ and $c^* = 0$, but $c' > 0 < 1$, the shadow wage would be $W + (P_A - d)(1 - c')$.

In view of the restrictiveness of the assumption that $P_A = 0$, the conclusion is that a better guideline for the shadow price of labour would be the wage that equated the change in the investible surpluses in agriculture and industry rather than a wage which simply reflected the increased consumption involved in labour transference.

REFERENCES

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3. Sen, A. K., *Choice of Techniques and the Aspect of the Theory of Development.* 3rd edition. (Oxford: Blackwell Ltd., 1968).