The Irrelevance of Sraffa's Analysis without Constant Returns to Scale*

One fundamental result in Sraffa's *Production of Commodities by Means of Commodities* [13, 1960] is the relationship between the rate of profit (r), the maximum rate of profit for a given production technique (r^*), and Sraffa's measure of the "real wage" (w^s). Sraffa proves that

$$r = r^* \ (1 - w^s) \tag{1}$$

where the "real wage" w^s is defined by deflating the nominal wage rate W by a price index

$$\sum_{i=1}^{n} P_i c_i^*$$

with the unique consumption basket weights $c_1^*, \ldots, c_n^*$ being determined via Sraffa's Standard Commodity. The relationship (1) shows that when the profit rate is at its maximum value $r = r^*$, Sraffa's "real wage" rate is zero with $w^s = 0$, while when the profit rate is zero, labor receives its maximum "real wage" $w^s = 1$. (It is important to remember that w^s is defined by use of Sraffa's very special weights $c_1^*, \ldots, c_n^*$.)[1] Obviously this relationship (1)

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[1] With or without the assumption of constant returns to scale, Sraffa's measure of the "real wage" is economically flawed. Sraffa's unique consumption basket weights $c_1^*, \ldots, c_n^*$ are determined from the technology alone; they are weights derived from the right-hand characteristic vector associated with the Frobenius root of the production technique matrix. These weights are not related in *any* way to human needs or preferences, and there is absolutely no economic reason why they should be relevant for defining any "real" wage. (Thus, for example, Sraffa's Standard Commodity may be such that he must assign a relatively large weight in his consumption basket to a commodity such as pig iron which is *never* consumed by humans!)

Eatwell [6, 1977, pp. 61–68] interprets Sraffa's w^s

is the basis for various notions of "exploitation" as, for example, in Eatwell [5, 1975].

If one accepts the position taken by Eatwell [6, 1977] and assumes that the size and composition of output are given, the question of constant returns to scale does not arise. Constant returns to scale is only an issue if we wish to compare situations in which the size of output differs. On this obvious fact there can be no disagreement.

However, presumably one would like to say more. For example, if for some perhaps Marxian or Ricardian based reasons we were willing to take Sraffa's measure of the "real wage" (w^s) as exogenous, would the relationship (1) then determine the equilibrium rate of profit? When the size and composition of output are taken as given, the answer is "Yes." Thus, for example, suppose that for a given size and composition of output denoted by the subscripts one we calculate that $r_1^* = 50\%$ and suppose also $w_1{}^s = 50\%$ is exogenously determined by some unspecified mechanism. It is then true that the equilibrium rate of profit will be

$$r_1 = \frac{1}{2}(1 - \frac{1}{2}) = 25\%.$$

Now consider a new situation with a different size and composition of output denoted by subscripts two. We may again calculate Sraffa's Standard Commodity in this new situation and his corresponding "real wage," $w_2{}^s$, as well as the new maximum profit rate r_2^*. It remains true, by virtue of (1), that

$$r_2 = r_2^* (1 - w_2{}^s).$$

But in general *nothing* more can be said unless the two different situations are generated from a constant returns to scale technology! Thus if Sraffa's "real wage" remains constant in both situations with $w_1{}^s = w_2{}^s = 50\%$, the equilibrium profit rate in the second situation may change in *any* direction. On the other hand, if constant returns to scale prevail, then (1) remains valid even if the size and composition of output changes because r^* and the consumption basket weights $c_1^*, \ldots, c_n^*$ remain invariant.[2]

It is in this sense, then, that one must question what economically meaningful propositions remain valid when constant returns to scale is denied. If we follow Eatwell [6, 1977] and take the size and composition of output as given data in every situation, most of the interesting economic questions concerning the equilibrium relationship between r and w^s are assumed away at the outset. One is left with mere description of given data with no theory about the effects of changes in that data. I conclude that constant returns to scale is irrele-

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as the wage share rather than a real wage, but this begs the issue because the composition of output is determined by Sraffa's Standard Commodity weights. If workers in fact do not receive the wage share w^s, there is no economic relevance to the $r - w^s$ trade-off, and equation (1) becomes a mere description of facts void of significant predictive content; for example, then one could not even infer that workers would be in any sense better off with a higher rather than a lower value of Sraffa's wage share w^s.

It is interesting to note that in the Marx case of "equal organic composition of capital," the relationship

$$r = r^* (1 - w) \qquad (1')$$

always is valid where w is defined by

$$w = \frac{W}{\sum_{i=1}^{n} P_i c_i}$$

for *any* consumption basket weights $c_1, \ldots, c_n$. But "equal organic composition of capital" is an empirically freak case. Sraffa's attempt to generalize (1') to (1) necessitates that he use consumption basket weights that may be economically meaningless from the point of view of human needs or preferences.

The interested reader is referred to the following references for a more complete discussion of these and related issues: [1, Burmeister, 1968; 2, 1974; 3, 1975; 4, 1976]; [7, Marx, 1909–13]; [8, Meek, 1967]; [9, Miyao, 1976]; [10, Morishima, 1973]; [11, Ricardo, 1911]; and [12, Samuelson, 1971].

[2] Thus provided constant returns to scale prevail, equation (1) defines a functional relationship between the rate of profit r and Sraffa's "real wage" w^s, which is independent of the size and composition of output. To answer economic questions such as, "What will happen to r if w^s rises or falls?" one must either (i) provide a theory to determine how changes in w^s effect the size and composition of output, or (ii) assume constant returns to scale. Since Eatwell [7, 1977] does not offer (i) but rather takes the size and composition of output as given data in every situation, his approach is mere description lacking predictive significance.

vant for Sraffa's analysis only if one is content to pose irrelevant questions.

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The Irrelevance of Returns to Scale in Sraffa's Analysis: A Comment

Eatwell has taken Burmeister and myself to task for failing to reach "any clear-cut conclusion" in our recent exchange [2 and 5, 1975]. If I interpret Eatwell correctly, the *desideratum* here should have been a "conclusion" that extended far beyond the bounds suggested by the title of Eatwell's note; in brief, a conclusion that ranged over "the structure of classical theory; the contrasting structure of neoclassical theory and the implications for the development of economics of the re-adoption of the classical view . . ." [4, Eatwell, 1977, p. 62]. In any event, Eatwell proposes to evaluate our positions with respect to these issues. My comments will center upon the following particulars of this evaluation: (1) returns to scale and the Sraffa system, (2) the relevance to that system of Samuelson's Nonsubstitution Theorem [7, 1951; 8, 1961], and (3) the classical tradition in price theory.

Constant Returns

Eatwell writes that "Levine is content to 'insist' that constant returns to scale are not a necessary part of [Sraffa's] analysis . . . without . . . providing any clear *analytical* basis for his insistence" [3, 1977, p. 61, emphasis added]. I am afraid that I am still "content"; for what we