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COMMENTS ON

"The Effect of Income-Transfer Programs on Income Distribution"

by

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In view of the current concern with revision of the welfare system, Mr. Duymovic and Professor Farrish have chosen a timely subject. Their paper is unusual in its focus on macroeconomic aspects of income redistribution. I would like to briefly summarize the structure and properties of their three sector model and than raise a few questions which the macroeconomic approach subsumes.

The Three Sector Duymovic-Farrish Model

The notation used herein corresponds with that of Duymovic and Farrish except that the following two parameters are introduced:

a) θ $\equiv$ the proportion of w which comes from the wage earning sector. $0 \leq \theta \leq 1$

b) λ_3 $\equiv$ The marginal propensity to consume of welfare recipients. $1 \geq \lambda_3 > \lambda_1$

Introduction of these parameters necessitates only formal changes in the six equations which describe the Duymovic-Farrish Model. If $\lambda_3 = 1$, the new system would be equivalent, since $\theta \equiv \Delta\beta / W$. The resulting system of six equations may be reduced to the aggregate demand schedule of (7):

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$$(7) \quad C + I = F(\Theta, W) + bY = Y \quad \text{in equilibrium where:}$$

$$F(\Theta, W) \equiv (\lambda_1 - \lambda_2)(\beta - \Theta W) + W(\lambda_3 - \lambda_2) + \delta$$

$$0 < b \equiv \alpha + \lambda_2 + \gamma(\lambda_1 - \lambda_2) < 1$$

Since the marginal propensity to consume is higher for welfare recipients than for other sectors, a redistribution of income to welfare recipients increases the aggregate average propensity to consume by raising the intercept term, $F(\Theta, W)$. The slope of aggregate demand (b) is not affected by an income redistribution. As long as the new solution to (7) does not exceed the full employment level (Y_p) then the income variations associated with income redistribution are entirely real. If $\bar{Y}$ exceeds Y_p then part of the income variations will be inflation.

Equilibrium national and sector incomes are found by solving (7) for $\bar{Y}$ and making appropriate substitutions in the six equation system to obtain (8), (9) and (10).

$$(8) \quad \bar{Y} = \frac{F(\Theta, W)}{1 - b}$$

$$(9) \quad \bar{L} = \gamma \frac{F(\Theta, W)}{1 - b} + \beta - \Theta W$$

$$(10) \quad \bar{Z} = \frac{1 - r}{1 - b} F(\Theta, W) - \beta + W(\Theta - 1)$$

The effect of variations in Θ of W on aggregate and sectoral incomes can be found by examining the sign of the appropriate partial derivatives of (8), (9), and (10). To facilitate such an examination, note from (7) and associated definitions that:

$$F_w \equiv \frac{\partial F(\Theta, W)}{\partial W} = -\Theta(\lambda_1 - \lambda_2) + \lambda_3 - \lambda_2 > 0$$

$$\text{and} \quad F_\Theta \equiv \frac{\partial F(\Theta, W)}{\partial \Theta} = -W(\lambda_1 - \lambda_2) < 0$$

Returning to (8), (9), and (10) to evaluate derivatives:

$$\frac{\partial \bar{Y}}{\partial W} = \frac{F_w}{1 - b} > 0$$

$$\frac{\partial \bar{Y}}{\partial \Theta} = \frac{F_\Theta}{1 - b} < 0$$

Thus, a transfer of income from low marginal propensity to consume groups (wage earners and non wage earners) to high marginal propensity to consume groups (welfare recipients) is associated with an increase in aggregate demand and employment. This result is dependent upon the condition $\lambda_3 > \lambda_1 \geq {}_2$. An increase in the proportion (Θ) of W coming from the wage earning sector decreases Y. This result reflects the condition $\lambda_1 > \lambda_2$. Now consider the effect of variations in w and Θ on $\bar{L}$.

$$\frac{\partial \bar{L}}{\partial W} = \frac{Y}{1 - b} F_w - \Theta \gtreqless 0$$

The condition under which $\frac{\partial \bar{L}}{\partial W}$ is non-negative is: $\Theta \leq \frac{Y(\lambda_3 - \lambda_2)}{1 - \alpha - \lambda_2}$

similarly: $\frac{\partial \bar{L}}{\partial \Theta} = \frac{Y}{1 - b} \quad F_\Theta - W < 0$

That is, as the <u>proportion</u> (Θ) of the welfare transfer donated by wage earners increases, the wage component of aggregate income diminishes. Not surprisingly therefore, there exists for any given level of welfare transfer, an associated upper bound on Θ. If this bound is exceeded, the wage earning sector will be worse off at the specified level of welfare transfer than at a lower level.

Taking partial derivatives of $\bar{Z}$ yields the following:

$$\frac{\partial \bar{Z}}{\partial W} = \frac{1 - r}{1 - b} F_W + \Theta - 1 \gtreqless 0$$

$$\frac{\partial \bar{Z}}{\partial \Theta} = W[\frac{1 - r}{1 - b} (\lambda_2 - \lambda_2) + 1] \gtreqless 0$$

The sign of $\frac{\partial \bar{Z}}{\partial W}$ may be either positive or non-positive since it depends on the sum of a positive component, $\frac{1 - r}{1 - b} F_W$ and a non-positive component, $\Theta - 1$. The indefiniteness of $\frac{\partial \bar{Z}}{\partial \Theta}$ is at first sight surprising. Intuitively, one might expect that as the proportion donated by the wage earnings sector increases, the income of the non-wage earner would increase because of the shift in the "welfare burden". However, this shift is from a low marginal propensity to consume group (non wage earners) to a high marginal propensity to consume group (wage earners). The resulting diminution of aggregate income may be sufficient to effect a reduction in $\bar{Z}$.

As Duymovic and Farrish note (p. 12) it is always possible to specify bounds on Θ such that wage earners are left at least as well off with the welfare transfer as without it. Similarly, another set of restrictions on Θ may permit the non wage sector to remain at least indifferent. In order that both donor groups remain at least indifferent one can specify the following:

$$\left.\frac{\partial \bar{L}}{\partial W}\right|_{W=\bar{W}} \geq 0 \leq \left.\frac{\partial Z}{\partial W}\right|_{W=\bar{W}}$$

and solve for restrictions on Θ such that these specifications will hold. The restrictions one obtains are:

$$(11) \qquad \frac{1 - (\frac{1 - r}{1 - b})(\lambda_3 - \lambda_2)}{1 - (\frac{1 - r}{1 - b})(\lambda_1 - \lambda_2)} \leq \Theta \leq Y(\frac{\lambda_3 - \lambda_2}{1 - \alpha - \lambda_2})$$

subject to (12) which holds by definition of θ:

$$(12) \qquad 0 \leq \theta \leq 1$$

substitution of the hypothetical values, used by Duymovic and Farrish, in (11) gives the following:

$$(11) \qquad .1 \leq \theta \leq .98$$

$$(12) \qquad 0 \leq \theta \leq 1$$

Obviously, (12) is a redundant pair of constraints given (11), but this need not always be the case. Indeed (11) and (12) could involve inconsistent restrictions in which case one or the other or both donor groups would of necessity be made worse off. For the hypothetical values used it may be seen that (11) places very minimal restrictions on θ, a pleasant outcome since it permits latitude in designing redistribution measures. I have not explored the sensititity of (12) to variations in the parameters.

Possible Modifications and Extensions

One of the features of the Duymovic-Farrish model is its simplicity which must be regarded as a virtue at least for the purpose of today's discussion. Some obvious extensions are readily made. For example, introduction of linear import-export relationships changes conclusions quantitatively but not qualitatively. Another extension of the model would postulate a relationship between gross national product and welfare payments. For example, a linear relationship $W = W_0 + wY$ would affect the intercept (via W_0) and the slope (via w) of the aggregate demand schedule. One could then distinguish between the effects and changes in marginal payments (via changes in w). I would expect this model to have properties highly similar to those of the Duymovic-Farrish model but reinforced or dampened depending on the sign of w. This modification would be appropriate for a welfare criterion which focused on maintainance of historical parity of incomes as opposed to some minimum absolute level. Such a criterion automatically compensates for inflation.

Another possible avenue for extension of the Duymovic-Farrish Model involves an ambiguity between consumption and investment in a dynamic model. I suspect there are programs and plausible models in which a significant portion of the income transfer would constitute investment in productive capacity as well as an act of consumption. Some education and nutrition programs could be regarded an investments in human capital. There is some evidence which suggests that subclinical levels of malnutrition may impair the learning capacity of rodents. Should the same be true of humans, then school breakfast and lunch programs would increase the adult productivity of recipients. Thus, the specific nature of redistribution programs and the marginal expenditure patterns of recipient households is a matter of some importance to the conclusions suggested by the model.

The unemployment rate has, for several years, been at unusually low levels yet seldom has sentiment been stronger for changes in the welfare system. Unfortunately, it is under precisely these full employment conditions that the Duymovic-Farrish Model lends least support to redistribution programs. If one favors greater redistributive effort this may not be the most propitious moment to offer such a model.

I have some doubts about the propriety of the Duymovic-Farrish usage of Pareto Optimality. My objection is one of nomenclature rather than the criterion they propose per se. There are two senses in which their usage of Pareto Optimality is unsatisfactory. The first is the obvious problem of aggregation within a sector. The Paretian conditions are stated in a disaggregated individual context. Secondly, the test they propose is weaker than Pareto Optimality unless they propose to test any proposed program against all possible programs for an optimum optimorum. Optimality is hard to oppose without sounding professionally subversive. However, their weaker test seems to me to be more sensible than devoting much time to optimization in the problem under discussion. Even at the micro level for which they were developed, the Paretian conditions are of little use in the matter of income redistribution. Indeed, the conventional assumptions under which they are developed include independence between utility functions. This assumption is an acceptable abstraction in most demand analysis, but its use for income redistribution questions postulates non existence of the problem. A logical positivist could escape the conundrum by postulating a normal distribution of malevolent and benevolent individuals about a mean of indifference. In view of these considerations I would suggest that a more appropriate label be chosen for the restriction that donor sectors remain indifferent or better. Two possibilities are a "sectoral compensation test" or "multiplier induced compensation". Such a label more accurately reflects the concepts and level of aggregation involved. While the weaknesses of aggregate indices are not avoided by a change in nomenclature they are not masked by it either.

If benevolence and malevolence exist between individuals and groups, the sign of a sector's income derivatives, discussed earlier, may not be good indices of the political position of its constituents. Three additional complications arise in translating these rates of change in sectoral incomes into political outcomes. Obviously, the relative voting power of different sectors is important. The distribution of benefits within a sector is important too. Assume a sector in which 50% of voters gain slightly and 50% of voters lose heavily, and a sector in which all constituents are modest gainers. The aggregate gain may be the same in both cases but the voting positions of the two would differ drastically. Thirdly, many individuals may fall in more than one sector simultaneously. In such cases the individual's political position will presumably reflect some weighted function of his economic stakes in various sectors.

Finally, to state the obvious, the current welfare controversy is in large measure a "guns-versus-butter" issue concerning the composition of gross national product. Shifts in the composition of gross national product inevitably distribute gains and losses among individuals. Aggregation of winners and losers will not change their status.