NOTES AND COMMUNICATIONS

A NOTE ON BECKERMAN: ENVIRONMENT, NEEDS AND REAL INCOME COMPARISONS

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I. INTRODUCTION

Recently Beckerman [2] has proposed that conventional national accounts be revised since ". . . a difference in 'needs' for, and hence expenditures on, certain anti-pollutants, which will show up in conventional national accounts comparisons as being merely difference in 'tastes', should be converted to differences in real income."[1] The author demonstrates this by allowing "goods" and "bads" to enter an individual's utility function with some products being required only in so far as they reduce pollution. Hence they are designated "anti-bads." In the process of describing individual equilibrium and the role of bads and anti-bads for two different individuals an important problem is obscured in this framework. This problem is the definition of the price of "net cleanliness" or the "anti-bad" less the bad. Since this price is important to both the individual equilibrium conditions, which call for equality of the marginal rate of substitution between a private good and net cleanliness with their respective relative prices, and the definition of a national accounting practice, this paper will briefly outline an alternative approach.

II. MODEL

Suppose that the individual consumer's utility function has as arguments service flows and his objective is to maximize his utility by *producing* and *consuming* these services subject to production function and budget constraints. Within this framework the individual does not have "bads" in his utility function. Rather bads are entered into those relationships describing how he produces his final service flows. Hence we can value the bads to the individual by assessing their effect upon his ability to produce these service flows and their value to him. This model is a straightforward extension of the framework originally suggested by Becker [1] and further developed by Cicchetti and Smith [4]. Moreover it parallels the literature on production externalities and their implications for the firm. As a result it allows a completely symmetrical development of national accounts on the basis of individual economic entities.

Consider the following simple example in which we shall hypothesize the individual produces two final service flows (Z_1 and Z_2) by combining a material good (X_1) and time (t_i). He does this subject to a full income constraint in

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[1]Beckerman [2], p. 334.

Becker's [1] terms. Equation (1) describes the utility function with the traditional concavity properties.

$$U = U(Z_1, Z_2). \tag{1}$$

Equations (2) and (3) set out the production functions for Z_1 and Z_2 respectively. Note that a factor outside the individual's control also enters the production of Z_1 and Z_2. This factor, P, will be assumed to be the pollutant or bad in Beckerman's terminology.

$$Z_1 = f(X_{1z_1}, P, t_1) \tag{2}$$

$$Z_2 = g(X_{1z_2}, P, t_2). \tag{3}$$

Full income may be written as the sum of earnings and foregone income as in (4)

$$Y = Wt_w + S. \tag{4}$$

If we assume that all time spent at consumption (i.e., $t_1 + t_2$) is valued at the average wage rate then (4) may be rewritten as (5).

$$Y = W(t_w + t_1 + t_2). \tag{5}$$

Further we shall postulate that Y is the sum of expenditures on the material goods and implicit expenditures on time as in (5a). Hence there is no individual saving.

$$p_1X_1 + W(t_1 + t_2) = Y \tag{5a}$$

where:

$$X_1 = X_{1z_1} + X_{1z_2}$$

p_1 = price of X_1.

Solving for the first order conditions for a maximum we can derive equation (6).

(6)

$$\frac{\partial U/\partial Z_1 \cdot \partial f/\partial X_{1z_1}}{p_1} = \frac{\partial U/\partial Z_1 \cdot \partial f/\partial t_1}{w} = \frac{\partial U/\partial Z_2 \cdot \partial g/\partial X_{1z_2}}{p_1} = \frac{\partial U/\partial Z_2 \cdot \partial g/\partial t_2}{w}.$$

With (6) it is possible to examine the effects of an exogenous increase in P. That is, the quantity of bads or pollutants an individual receives will, for our purposes, be assumed to be outside his control. Thus the marginal products of X_1 and time in the production of each service flow are related to the level of P. Figure 1 illustrates a cross section of the assumed isoquants. As the level of P increases the individual must use more of X_1 (or of time) to maintain the same level of each final service flow.[2] Consider an increase from $\bar{P}$ to $\bar{P} + \Delta P$. In terms of Figure 1, the equilibrium use of X_1 in the production of Z_1 must necessarily increase from OA to OB. This diagram ignores the potential substitution between X_{1z_1} and t_1 in compensating for the increased pollutants, which equation (6) allows one to illustrate.

[2]Whitcomb [5], pp. 43–6, uses these isoquants quite effectively in illustrating the effects of production externalities to the firm.

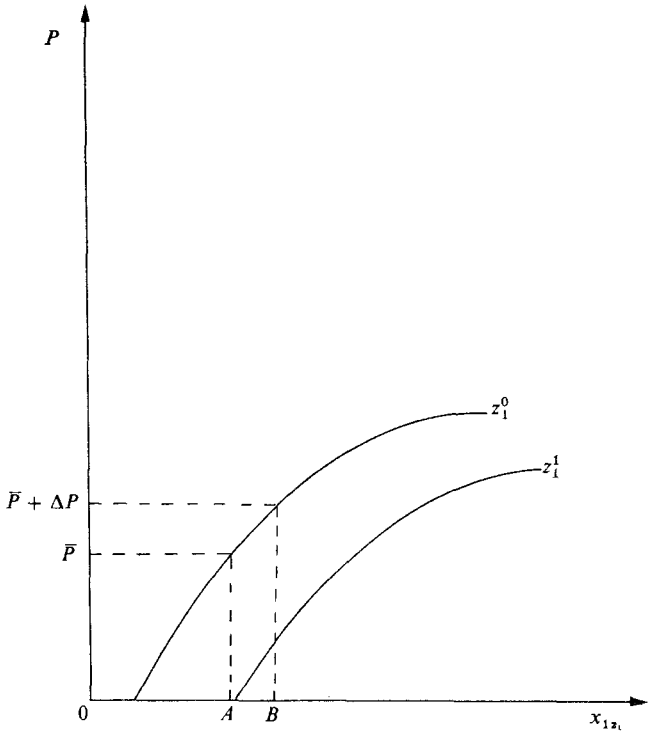

Figure 1

The same kind of increase in P reduces the marginal product of each input in the production of each service flow (e.g., $\partial^2 f/\partial P\, \partial X_{1z_1} < 0$). The sum of these reductions weighted by the marginal utilities of the relevant service flow provides an analytical description of the damage to the individual as a result of an increase in pollutants. To the extent that the marginal products of the commodity, X_1, and the units of time are differentially affected when in different uses, then as (6) indicates a reallocation of resources will serve to redress the balance required for individual equilibrium. It will *not*, however, enable the individual to maintain the same level of total utility. In the absence of additional expenditures of income or time his level of satisfaction must necessarily decline.

The advantage of this analysis is that it does not complicate the inquiry into individual preferences. Beckerman notes that differences in the consumption patterns across countries may appear as taste differences if the levels of pollutants in the two regimes differ. Under his framework, however, in order to distinguish the two—a taste difference versus that due to a scarcity of a non-priced resource (e.g., clear air or water) we nonetheless need to know the specific utility function or functions in question.[3] The analysis of this note dichotomizes the tastes-pollutants question. And our problem is one of defining the consumption technology and the impact of pollutants upon it. While data have not traditionally

[3]It is possible that two individuals have different reactions to some goods or services but the same to others. Hence we need to know the complete specification.

been available for such estimation, conceptually the process is similar to production function analysis for the firm.

III. Conclusions

The purpose of this note has been to suggest an alteration in the framework Beckerman used to illustrate the effects of pollutants upon consumption and to demonstrate that these differing consumption patterns might be misconstrued to be a consequence of different tastes. Unfortunately in order to resolve the dilemma one must know the specific utility function, the isolation of which has presented a persistent problem to economists.[4] The framework proposed here removes the effects of pollutants from that of tastes and may therefore provide a theoretical base more amenable to specific testing. Moreover it provides a disaggregate model in which firm and consumer are treated symmetrically so that formation of national accounts can also preserve this consistency.

References

[1] G. S. Becker, "A Theory of the Allocation of Time," *Economic Journal*, Vol. 75, 1965.

[2] W. Beckerman, "'Environment,' 'Needs' and Real Income Comparisons," *Review of Income and Wealth*, Series 18, December 1972.

[3] P. Bohm, "An Approach to the Problem of Estimating Demand for Public Goods," *Swedish Journal of Economics*, Vol. 73, March 1971.

[4] C. J. Cicchetti and V. K. Smith, "Interdependent Consumer Decisions; A Production Function Approach," *Australian Economic Papers*, (1974) forthcoming.

[5] D. K. Whitcomb, *Externalities and Welfare* (New York: Columbia Univ. Press, 1972).

[4]See Bohm [3] for a discussion.