ON THE NEW THEORY OF CONSUMER BEHAVIOR

Robert T. Michael

University of California, Los Angeles and National Bureau of Economic Research, New York

Gary S. Becker

University of Chicago and National Bureau of Economic Research, New York*

Summary

This essay advocates a reformulation of the theory of consumer behavior, based on the household production function approach suggested in Becker's "A Theory of the Allocation of Time" [1]. The case for the reformulation rests, in part, on inadequacies of the traditional theory of choice, and more importantly, on the new approach's capacity to generate a wide range of cogent testable hypotheses and to provide the social scientist with tools relevant for understanding a broad spectrum of observed human behavior.

> Much that is of chief interest in the science of wants, is borrowed from the science of efforts and activities.
>
> Alfred Marshall

I. The Traditional Theory of Choice

Exposition of the Traditional Theory

The received theory of consumer behavior rests on the view that the consumer unit, say the household, attempts to maximize utility, U, which it obtains directly from the services of goods, x_i, purchased in the marketplace:

$$U = u(x_1, x_2, \ldots, x_n),^1 \tag{1}$$

* Becker's principal contribution is an earlier unpublished paper [2] which sets out the approach; Michael elaborated on this paper and was primarily responsible for writing the present paper. The authors wish to thank Armen A. Alchian, Victor R. Fuchs, Jacob Mincer and George J. Stigler for comments on previous drafts. The research was supported by the National Bureau of Economic Research, but the paper is not an official NBER publication since it has not been reviewed by the NBER Board of Directors.

[1] For expositional simplicity we assume proportionality between the quantity of goods and their service-flow, thus x_i can refer to either the good or the service-flow.

subject to a constraint on its purchases of the goods. In a single period framework

$$I = \sum_{i=1}^{n} x_i p_i \tag{2}$$

where I is money income, p_i is the money price of the good x_i, with the goods inclusively defined. The effects of changes in real income and relative prices on the demand for x_1 are summarized by the demand function

$$x_1 = d_1\left(\frac{I}{p}, \frac{p_1}{p}, \frac{p_i}{p}, T\right) \tag{3}$$

where p is a price index. Variations in demand which are not related to changes in real income and relative prices are attributed to changes in tastes, T. Together these three factors—income, prices and tastes—fully explain consumption behavior.

The single important behavioral "law" which emerges from this approach is that income-compensated (i.e., "pure") changes in the relative price of any good lead to changes in the opposite direction in the quantity demanded of that good,[1] although a few other implications can also be derived. Economists have frequently modified the theory of consumer choice in an attempt to broaden its range of applicability.[2] But these and other modifications leave the basic analytical framework of consumer choice—as expressed in equations (1) through (3)—essentially unaltered. Rather than consider these modifications, we wish to take that basic framework seriously and to point out some of its fundamental weaknesses. While recent modifications in the theory successfully circumvent some of these weaknesses, we will argue that a more fundamental reformulation of the basic model—as suggested below in Part II —does so more effectively and in a less piecemeal fashion.

Weaknesses in the Traditional Theory

Survey data are typically grouped into a relatively small number of cells cross-classified by some set of variables, with cell averages used as observations in analyses. The use of grouped data involves no bias in estimation of regression coefficients (see Cramer [9]) and is frequently used as a way of reducing errors of measurement and other problems with the independent variables, and because economists are frequently interested in aggregate responses rather than the responses of individual consumer units. An additional motivation for using grouped data, however, is that even with sophisticated operational

[1] Even this "law" of human behavior can be viewed under fairly general assumptions as a nonvolitional response resulting simply from the constraint on resources. See Becker [3].
[2] For example, the analyses of searching for information about prices, qualities or varieties and of formulating expectations about the future behavior of prices and income incorporates aspects of decision-making under uncertainty.

definitions of income and prices, these explanatory variables alone appear to "explain" only a small part of the variations in demand for specific goods and services in individual household data. Grouping observations by the independent variables considerably increases the "explanatory power" of the estimating equation (see Cramer [9] or Rockwell [39]).

To whatever extent income and prices do not explain observed behavior, the explanation rests with variations in tastes since they are the portmanteau in the demand curve (see equation (3)). Moreover, even grouped data do not eliminate the need to rely on variations in tastes as an explanation for observed behavior. Indeed, aggregate data exhibit systematic effects on behavior of such factors as family size, family age-structure, education, housing tenure, occupation, race, socio-economic status or other proxies for tastes. For economists to rest a large part of their theory of choice on differences in tastes is disturbing since they admittedly have no useful theory of the formation of tastes, nor can they rely on a well-developed theory of tastes from any other discipline in the social sciences, since none exists. Put differently, the theory which the empirical researcher utilizes is unable to assist him in choosing the appropriate taste proxies on a priori grounds or in formulating predictions about the effects of these variables on behavior. The weakness in the received theory of choice, then, is the extent to which it relies on differences in tastes to "explain" behavior when it can neither explain how tastes are formed nor predict their effects.

To illustrate the reliance on "changes in tastes" in interpreting observed behavior, consider the following examples. If a household's utility function has heating fuel as an argument then its tastes must change seasonally to explain why it purchases more fuel in the winter (when the price of fuel is usually higher). Or, couples must experience a shift in preferences toward snow removal services and medical care services and away from sporting goods equipment and high-cholesterol foods as they age since the market prices of these items are not related to age and yet expenditure patterns appear to change with the couple's age.[1] Of course, by incorporating an intuitively appealing explanation in each case, economists usually interpret these observations in reasonable ways. The important point, however, is that the received theory of choice itself is of modest use in that undertaking.

Furthermore, by implying that utility is derived from goods and services purchased in the market place, the received theory has generally been formulated in terms of monetary prices and monetary income. Hence, its application has tended to be restricted to the market sector where transactions are most easily quantified by the "measuring rod of money".[2] Many other be-

[1] These effects of age are not, as a first approximation at least, a response to the durability of the item.

[2] However, "shadow" prices are increasingly being introduced in discussing the nonmonetary sector.

havioral decisions involving choices made with limited resources among competing ends—a common definition of economics—have been avoided. Decisions about the allocation of a consumer's nonmarket time and decisions about his choice of a religion, a marriage mate, a family size, a divorce, a political party, or a "life style" all involve the allocation of scarce resources among competing ends. Yet, these choices are related to non-monetary factors and have often been ignored by economists.

This concentration on analyzing responses to monetary phenomena has considerably limited the theory's appeal to other social scientists. The political scientist, sociologist, or anthropologist is typically concerned with behavior where monetary phenomena are not pervasive. Hence these other disciplines seldom borrow the economist's theory of choice. Small wonder when that theory relies so heavily on money prices and attributes so much of observed behavior to unexplained variations in tastes.

Indeed, one may wonder why such a theory has survived as a fundamental part of standard economics. But "inefficient" firms may survive in the absence of more efficient ones, particularly when the inefficiency is defined in some absolute sense; so too with theories.

The main point of our paper is that the theory of choice, as formulated, does not make adequate use of its relatively powerful implications. By reformulating the theory of choice, we believe it is capable of explaining a wide range of important phenomena with which the traditional formulation does not cope.

II. The Household Production Function Approach: An Exposition

A fundamental break with the standard approach to the theory of choice has recently been suggested.[1] In broad outline, this approach views as the primary objects of consumer choice various entities, called commodities, from which utility is directly obtained. These commodities are produced by the consumer unit itself through the productive activity of combining purchased market goods and services with some of the household's own time. In this framework all market goods are inputs used in production processes of the nonmarket sector. The consumer's demand for these market goods is a derived demand analogous to the derived demand by a firm for any factor of production.

Formally, let the household's utility function be

$$U = u(Z_1, Z_2, \ldots, Z_n) \tag{4}$$

where Z_i stands for both the services from and the quantity of the commodity Z_i. The commodity is produced by the household using a vector of market goods x_i and a vector of quantities of its own time, t_i:

[1] See Becker [1], Lancaster [22] and [23] and his more extended exposition of the "characteristics analysis" in [24] and Muth [35].

$$Z_i = z_i(x_i, t_i; E) \tag{5}$$

where E is a vector of variables which represents the environment in which the production takes place.[1] These "environmental variables" reflect the state of the art of production, or the level of technology of the production process. The utility function is maximized subject to the production function constraints (equation (5)) and a constraint on the household's available time:

$$T = t_w + \sum_{i=1}^{n} t_i \tag{6}$$

as well as the usual income constraint:

$$I = \sum_{i=1}^{n} p_i x_i, \tag{7}$$

where t_w and t_i are the household's time spent in the labor market and in producing Z_i, respectively,[2] and p_i and x_i are the price and quantity of the market-good input used in producing Z_i.

The time and money income constraints can be collapsed into a single resource constraint on the household's "full income", S.[3]

$$S = wT + V = \sum_i (wt_i + p_i x_i) \tag{8}$$

where w is the wage rate, assumed to be constant, and V is the household's nonwage income. The importance of this concept of full income is that it embodies both the time and money income constraints and its magnitude is independent of the fraction of time the household chooses to allocate to income-earning activities.[4]

The utility function (4) is maximized subject to the constraints of the production functions (5) and full income (8). The Lagrangian may be expressed as

$$L = u(Z_1, Z_2, \ldots, Z_n) - \lambda\left(\sum_i (wt_i + p_i x_i) - S\right) \tag{9}$$

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[1] For most of the exposition which follows the x_i, t_i and E will be treated as scalars although it should be kept in mind that x_i is actually a set of market goods, $x_{i1}, x_{i2}, \ldots, x_{im}$ used in producing Z_i, and similarly for t_i and E.

[2] For expositional simplicity, no distinction will be made between the time of various members of the household, although in principle the time constraint should be applied to each member separately.

[3] By substitution of (6) into the definition of money income

$$I = \sum_j w_j t_{w_j} + V = \sum_j w_j (T_j - \sum_i t_{ji}) + V$$

or

$$I + \sum_j w_j \sum_i t_{ji} = \sum_j w_j T_j + V \equiv S$$

where w_j is the wage rate of the jth family member. Again, the distinction between family members will not be made in the text of this essay.

[4] For a full discussion of its derivation and application see Becker [1].

where the first order conditions for maximization with respect to the commodities imply:

$$\frac{MU_i}{MU_j} = \frac{w\dfrac{dt_i}{dZ_i} + p_i\dfrac{dx_i}{dZ_i}}{w\dfrac{dt_j}{dZ_j} + p_j\dfrac{dx_j}{dZ_j}} \equiv \frac{\pi_i}{\pi_j}. \tag{10}$$

The ratio of the marginal utilities of any two commodities Z_i and Z_j, MU_i/MU_j, must equal the ratio of their marginal costs, π_i/π_j, where the derivatives in (10) are marginal input–output coefficients. These marginal costs are the shadow prices of the Z_i that are determined by the prices of market goods and time, and by the productivity of each in producing Z_i.

Similarly, equation (9) can be differentiated with respect to all factors of production to determine their optimal use:

$$\frac{\dfrac{\partial U}{\partial Z_i}\dfrac{\partial Z_i}{\partial f_{ik}}}{\dfrac{\partial U}{\partial Z_j}\dfrac{\partial Z_j}{\partial f_{jl}}} \equiv \frac{MU_i\ MP_{ik}}{MU_j\ MP_{jl}} = \frac{p_{fik}}{p_{fjl}}, \tag{11}$$

where f_{ik} is the factor k (either goods or time) used in producing Z_i and f_{jl} is the factor l (either goods or time) used in producing Z_j. When both factors are used in the same production function ($i=j$), the condition reduces to a familiar one—equality of the ratio of marginal products to the ratio of the factor prices. Or, alternatively, if $k=l$ (i.e., if the same factor input is used in several production functions) equation (11) implies that the factor will be allocated among commodities to equalize the utility value of its marginal product in the production of different commodities.[1]

Changes in environment, E, may affect factor prices and the input coefficients and thereby alter a commodity's relative price π_i/π, where π is an index of all commodity prices. It may also affect the price level, π, itself by raising or lowering the average π_i as a whole. A change in the average price of all commodities is comparable to a change in the household's cost of living,

[1] The existence of joint products (the use of a factor in more than one production process *at the same time*) can be handled in an analogous manner with the value of the marginal product of factor f_k being

$$\sum_i \frac{\partial U}{\partial Z_i}\frac{\partial Z_i}{\partial f_{ik}}$$

with i an index over the commodities which jointly use the factor f_k. In general, the price of any commodity is then affected by the level of output of the other commodities which use f_k. For an analysis of joint production, see Grossman [16].

Notice that the possibility of using different units of a single input in producing different commodities is not a case of joint production and the commodities' prices are unaffected by the level of production of each other so long as the factor's price remains constant.

or to a change in its opportunity set. So full money income, S, can be converted into full "real" income, S/π, by dividing full money income by the commodity price level.[1] The single constraint on the household's full real income indicates the limitation on its achievable basket of commodities. Forces which affect the market prices households pay and the productivity of the inputs they use alter their π and thus change their full real income. Every household's π may differ just as its full money income may; more efficient household managers have larger real opportunity sets than less efficient ones with the same full money income, S.[2]

Its Antecedents

Although the household production function approach represents a fundamental reformulation of the theory of consumer demand, it is less of a break with the historical development of the theory of choice than it may seem. Jeremy Bentham's *Principles of Legislation* in 1789 set out a list of fifteen "simple pleasures" which he argued was "the inventory of our sensations". These pleasures, which were supposed to exhaust the list of basic arguments in one's pleasure (i.e., utility) function are of senses, riches, address, friendship, good reputation, power, piety, benevolence, malevolence, knowledge, memory, imagination, hope, association and relief of pain.[3] Presumably these pleasures are "produced" partly by the goods purchased in the market sector.

Alfred Marshall suggested an even smaller set of arguments for the utility function when he stated that the basic sources of satisfaction are but two: distinction and excellence.[4] Neither Marshall nor later theoreticians explored the implications of a utility function with so few desiderata, but the household production functions are an attempt to develop a theory of consumer choice consistent with Marshall's contention quoted at the outset of this paper.

Many discussions of the notion that goods are desired not for their own sake but for some specific service which they perform can be found throughout the literature. In discussing the concept of consumption, Nassau Senior

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[1] For a more extensive discussion of full real income, see Michael [29].

[2] If the environmental variable E were endogenous, its equilibrium quantity would be determined by introducing E into the budget constraint with some price p_E, and differentiating the Lagrangian. The equilibrium condition is:

$$\sum_{i=1}^{n} \frac{\partial U}{\partial Z_i} \frac{\partial Z_i}{\partial E} = \lambda p_E,$$

if the effects of E last only one period; that is, if E is a nondurable.

If the effects of E persist over several periods then its optimal level is determined by the conventional tools of investment theory by comparing the present worth of the stream of its value-marginal-product to the present worth of its costs. (See Ghez–Becker [12].)

[3] The obverse of these pleasures constituted "simple pains". For his discussion of each separately, see Bentham [8], pp. 20–27.

[4] See Marshall's chapter on this point for further bibliography on the analysis of wants and desires. Marshall [28], Book III, Chapter II.

notes that "the word consumption has been applied universally as expressing the making use of anything", and hence he suggests that, "it would be an improvement in the language of Political Economy if the expression 'to use' could be substituted for that 'to consume'."[1] Indeed, the interpretation of consumption as both the exchange of money for market goods and services and, concomitantly, the acquisition of utility from these goods and services, has little intuitive appeal. This interpretation of consumption sheds no light on whether the utility is derived from the acquisition, possession, or utilization of the purchased item. By emphasizing that the consumption of the market good involves its use in the production of a more basic commodity, insight is provided into the nature of the usefulness of the good.

Recent literature abounds with studies in which the demand for a product is considered to be derived from a desire for some more basic aims that are produced using characteristics of the product. Keynes' discussion of the demand for money being derived from speculative, precautionary, and other "motives"; Stigler's essay on food consumption to satisfy nutritional requirements; Griliches and others' use of hedonic price indices in relating, say, the demand for automobiles to an implicit demand for such characteristics as horsepower, wheelbase, power steering, automatic transmission, and so forth suggest the pervasiveness of this general view.[2]

Another antecedent is the effort to analyze and quantify the extent of production of goods and services within the home. Reid's 1934 volume *Economics of Household Production* [38] exemplifies this effort. Reid discusses changes over time in the nature and methods of household production (defined as unpaid activities carried on by and for household members but which could be replaced by market goods and services). Both Reid and Mitchell [34] emphasize the importance of good decision making in the managerial role in household production and both point out the difficulty in wide-spread application of "scientific management" in the household.[3] The household production function approach to consumer behavior adopts the notion of production in the home but extends it to incorporate all nonmarket activities and places greater emphasis on technical aspects of multi-commodity production.

Finally, the property of separability of the utility function which has received much attention in recent years is related to the concept of the household production function. Not only does Leontief's early essay on separability

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[1] Senior [42], p. 54.

[2] See Keynes [20], Chapter 15; Stigler [44]; and Griliches [13].

[3] Likening wives to managers in industry, Reid suggests that "scientific management" such as "extensive experimentation often does not appear worthwhile since household production is small scale and unspecialized" ([38] pp. 180–181). In his essay "The Backward Art of Spending Money," Mitchell argues that "The trained intelligence and the conquering capacity of the highly efficient housewife cannot be applied to the congenial task of setting to rights the disordered households of her inefficient neighbors .... What ability in spending money is developed among scattered individuals, we dam up within the walls of the single household" ([34] p. 10).

use essentially the same mathematical notation as equations (4) and (5) above, he argues for its adoption in the analysis of consumer behavior:

> The lack of a precise, operational device for dealing with well-defined groups of individual commodities reduced, however, an important part of the theory of consumers' behavior to hardly more than a collection of isolated, arbitrary definitions.
>
> It is true that practical economists assisted by practicing statisticians, speak of and deal in food, clothing, or cultural needs in general, even measuring the aggregative quantities of these fictitious entities. This, however, only serves to emphasize the limited usefulness of the conceptual apparatus offered to them by the theoretician. The analysis of the internal structure of functions of many variables, ... and the concept of functional separability in particular might help to close that particular gap between pure and applied economics.[1]

The household production function interpretation of functional separability is an important application and one discussed in the following section.

III. Applications of the Household Production Function Approach

By incorporating production concepts into the theory of consumption, the household production function approach implies that households respond to changes in the prices and productivities of factors, to changes in the relative shadow prices of commodities and to changes in their full real income as they attempt to minimize their costs of production and to maximize their utility. A reduction in the price of some factor of production will shift the production process toward techniques that are more intensive in the use of that factor and toward commodities that use the factor relatively intensely. The theory of derived demand implies, for example, that the relative increase in the use of the factor will be larger the greater the elasticities of substitution in production and in consumption.

Likewise, if factor prices remain constant, an increase in the marginal productivity of some input induces several responses. To minimize costs of production, the factor's relative use in the production process will increase. Since the relative price of the commodity using this factor most intensively is reduced, the relative consumption of this commodity will increase. Since the rise in productivity raises full real income, the demand for all "normal" commodities (those with positive income elasticities) will increase. The absolute demand for the factor whose productivity rose will rise (or fall) if the combined effects of substitution in production and consumption and of expansion through the change in income outweigh (or are outweighed by) the productivity effect itself.

The theory of household production functions abounds with empirical applications. Some stem from the resulting structure of consumer demand theory

[1] See Leontief [26] (p. 164 in *Essays in Economics*).

and include an implication regarding relative magnitudes of cross-price elasticities, an interpretation of functional separability, a rationalization of the often-made assumption of diminishing marginal utility of income, and a justification for the use of the household as a basic unit of observation. In addition, the model has proven useful in analyzing behavior related to travel, fertility, marriage, the influence of education, migration and health, and cross-sectional and life cycle patterns of consumption expenditure and time allocation. We will indicate several of these applications briefly.

For any change in the price of one factor, the effect will be greater upon relative *factor* prices than upon relative commodity prices. Hence, in the absence of a much stronger degree of substitutability in consumption than production, the model suggests that factors used in producing the same commodity will have greater cross-price elasticities than factors used in producing different commodities.[1] Thus, the demand for beef and chicken, which are used in producing nutrition, will be more closely related than will the demand for beef and, say, pianos. This intuitively evident implication about substitution, as Lancaster [22] emphasized, cannot be derived from the traditional theory of consumer choice since that theory has nothing to say about which products are close substitutes.

The household production function approach yields a simple interpretation of weakly separable functions.[2] If the utility function is written indirectly with all market goods and nonmarket time as arguments, then

$$\frac{\partial U}{\partial x_i} = \frac{\partial U}{\partial Z_i}\frac{\partial Z_i}{\partial x_i}, \tag{12}$$

therefore, for any two factor inputs f_1 and f_2 of the m factors used in the same production process,

$$\frac{MU_{f_1}}{MU_{f_2}} = \frac{MP_{i_1}}{MP_{i_2}} = \phi_i\,(f_1, f_2, \ldots, f_m) \tag{13}$$

where MP_{i1} is the marginal product of f_1 in producing Z_i. Thus, the ratio of the marginal utilizes depends only on the factors used in that single production process.[3]

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[1] If, for example, p_{xi}, the price of factor x in the production of z_i rises by one percent, the impact on the relative factor price p_{xi}/p_{ti} is also one percent. But the effect on π_i/π_j depends upon x_i's share in the total cost of Z_i. So long as the share is less than one, π_i/π_j changes by less than p_{xi}/p_{ti} and unless the substitution in consumption (between commodities) is sufficiently greater than the substitution in production (between factors in one production process), the effect of a change in p_{xi} on the demand for t_i will be greater than its effect on the demand for, say, x_j or t_j. The argument easily generalizes to the less restrictive case of many different goods and time inputs used in each production function.

[2] Richard Muth explores the separability issue in some depth in [35].

[3] The existence of joint production as discussed above, undermines the separability of the production processes. Some studies related to the use of time in many production activities simultaneously are now underway.

From the usual assumptions of homogeneity of the production function, the marginal product of market goods relative to the marginal product of time declines as the ratio of goods to time rises. From equation (13), the relative marginal utility of market goods or money income also declines. At first glance this proposition may appear to imply diminishing marginal utility of income, but equation (13) pertains to the *ratio* of marginal utilities. As money income rises, the relative decline in its marginal utility (or marginal product) induces households to behave in ways which conserve time and use money relatively intensively. It has been alleged that wealthy households reveal their relatively low evaluation of their money by "frivolous" expenditures on "inessential" convenience items, but these expenditures may also be interpreted as an efficient substitution away from their relatively scarce resource, time, and toward timesaving, more expensive (in money) convenience items. Such behavior indicates nothing about the absolute direction of change in the marginal utility of money income.

The household production function framework emphasizes the parallel services performed by firms and households as organizational units. Similar to the typical firm analyzed in standard production theory, the household invests in capital assets (savings), capital equipment (durable goods) and capital embodied in its "labor force" (human capital of family members). As an organizational entity, the household, like the firm, engages in production using this labor and capital.[1] Each is viewed as maximizing its objective function subject to resource and technological constraints. The production model not only emphasizes that the household is the appropriate basic unit of analysis in consumption theory, it also brings out the interdependence of several household decisions: decisions about family labor supply and time and goods expenditures in a single time-period analysis, and decisions about marriage, family size, labor force attachment and expenditures on goods and human capital investments in a life cycle analysis.

The recognition of the importance of time as a scarce resource in the household has played an integral role in the development of empirical applications of the household production function approach. The essential nature of the time constraint has been stressed in Mincer's analyses of estimated income effects [32] and the division of time between housework and market work [33] as well as in Becker's general treatment of the time constraint [1]. The subsequent empirical work in the past few years may be characterized as falling into three categories.

The first category pertains to activities in which the use of nonmarket time is an essential or relatively large component. Examples include Gronau's [14] study of the demand for modes of passenger transportation in the production

[1] This includes the production of market-earnings potential. See the discussion of the influence of the characteristics of one family member on the earnings of another family member in Benham [6].

of intercity visits, and Owen's [37] study of the demand for leisure time and recreational facilities. Additionally, it has long been recognized not only that consumers sell time in labor markets, but also that they buy time in the form of certain consumer goods and services: the tax consultant, medical advisor, professor, and auto mechanic, as well as the cookbook, frozen foods, vacuum cleaner and television set are all in some measure time-savers. The demand for such items would be quite different if time were not a scarce resource.

Furthermore, the satisfaction obtained from many market goods depends upon the amount of time with which they are consumed. A boat moored to the dock all season, the daily newspaper tossed out without being unfolded, or a quick lunch gulped down between appointments contributes less produce and hence less utility than would a leisurely (time consuming) use of each of these items. So an understanding of the use of time seems necessary for an understanding of the consumption of most market goods and services.[1]

The value of time changes for an individual at various stages in his life and these changes induce substitution toward relatively cheaper means of production as well. The student's life is probably one with a relatively low value of time or high value of goods; hence fraternity bull sessions, hitchhiking and the contemplative life are simply time-intensive modes of producing certain commodities. (Of course, during examination periods time becomes relatively scarce and poor eating and sleeping habits are attempts to conserve this temporarily scarce resource.) During the prime working years, say from age 30 to 55, the value of time is relatively high and one observes the individual working more hours and taking less leisure time. At later stages in the life cycle, when the value of time is again relatively lower, the decline in hours worked, long hours at gardening and viewing television, and other types of leisure activities are evidence of a shift back toward less time-saving behavior.[2]

The second category of applications stems from the close relationship between this framework and the growing human capital literature.[3] With the consumer's own time introduced into the analysis of consumption behavior, the productivity of this time—and hence the human capital embodied in the individual consumer—becomes an important object of analysis. Not only does the productivity of nonmarket time affect consumer behavior, but also the effect of human capital on nonmarket production is one source of the yield on investments in human capital. That is, the analysis of the incentive to invest in education, health, migration, search and so forth should, in principle, incorporate the 'consumption returns" or the nonmarket benefits accruing to the investment. Human capital can raise full real income, S/π (see the discus-

[1] Becker [1] indicates several broad applications and Linder [27] presents an enjoyable and stimulating discussion of some of the ways in which an effective time constraint affects modern society.

[2] For a rigorous analysis of substitution over the life cycle in the allocation of goods and time, see Ghez–Becker [12] and Heckman [17].

[3] For a recent discussion of this literature see T. W. Schultz [40].

sion on p. 384), not only by raising the market value of time (and thereby raising S) but also by raising the productivity of nonmarket consumption activities (and thereby lowering the commodity price index π).

Michael [29] develops this argument empirically and, by studying shifts in detailed expenditure patterns related to increases in the level of schooling, obtains a rough empirical estimate of the magnitude of the consumption return to investments in schooling. Grossman [15] analyzes the household's production of health capital and its derived demand for medical services. He shows, among other thing, how the length of life itself is partly endogenously related to decisions about the optimal investment path in health capital.

This line of development of the model offers a promising approach to estimating the nonmarket returns to human capital investments. Furthermore, it emphasizes the importance of the environment in which nonmarket production takes place. Within this framework the effects of climate (meteorological, political or social), the ability of household members, as well as differences in family size, age, sex, etc. may be analyzed. Fortuitously, the recent popular interest in the nonmonetary "quality" of life and the environment coincides with these developments in the approach to consumer behavior.[1]

Another area in which human capital research is complemented by the household production function approach is in the analysis of labor supply. The new approach not only reproduces the implications of the traditional work-leisure model, but also facilitates analysis of more complicated labor supply decisions. Recent studies by Heckman [17], Ofek [36], and Smith [43] have used this framework to investigate the interaction between the labor force decisions of husbands and wives, as related to their wage rates, age, number of children, wealth, and other variables. Ehrlich [10] has likewise employed the household production function model as part of his analysis of the response of criminal activities to the probabilities of apprehension, punishment, and other variables, while Komasar [21] has studied criminal victimization rates using a similar model. Furthermore, the approach has facilitated the analysis of the supply of parental time to pre-school investments in young children (see Leibowitz [25]).

A third category of applications or behavioral implications of this framework concerns marriage and fertility. By emphasizing the importance of the household as the appropriate unit of analysis, the model is a natural framework in which to analyze decisions about marriage. Becker [4] analyzes the incentives to marry and the optimal sorting of marriage mates by I.Q., education, and other characteristics and applications such as the interaction between marital and fertility behavior. Freidan [11] adopts this framework in empirically ana-

[1] For example, the National Bureau of Economic Research, with the financial support of the National Science Foundation, has recently undertaken a large-scale research program designed to measure social performance and the rate of output in the nonmarket sector (see Juster [19]).

lyzing differences in marriage propensities. Across states in the U.S. this type of analysis also yields implications about the timing of marriage and divorce, and the nature of other other organizational forms of nonmarket production (e.g., polygamous marriage units, extended families, communes, single-member households). (See Becker [5] for a discussion of polygamy.)

In the analysis of fertility, Willis [45] has utilized the household production function framework to develop an extensive model of the demand for children, and is using this model to test the form and stability of the completed-fertility demand function in the United States. Ben-Porath [7] has tested a comparable model with Israeli data; Michael [31] has analyzed the role of education in affecting fertility behavior, especially contraceptive efficiency. These studies and others presented at a recent fertility conference exemplify the considerable progress made in the past decade in the analysis of economic aspects of human fertility (see Schultz [41]).

IV. An Evaluation

Although the approach is relatively new and many of its implications are unexplored as yet, the applications indicated above suggest the diverse uses of the household production function approach to consumption theory. The new approach is not in conflict with the traditional implications regarding household responses to changes in relative prices or real income. On the contrary, an important advantage of the new approach is its greater emphasis on income and price effects and, correspondingly, its reduced emphasis on the role of "tastes" in interpreting behavior.

This shift in emphasis toward changes in prices and income and away from changes in tastes may appear to be simply one of semantics—of hiding an inability to explain tastes behind the camouflage of a production function. But if behavioral responses are attributed to differences in tastes, not much more can be said since there is no useful theory of the formation of tastes. If, however, they are attributed to differences in production processes, these in turn imply differences in prices and income, and some guidance about these effects can be obtained. This distinction seems crucial. Since factors associated with the formation of tastes have been outside the purview of their discipline, economists have conveniently "grouped" their data to reduce the influence of differences in tastes and then proceeded to ignore or analyze in an ad hoc fashion the remaining taste differences. But economists profess to know something about factors associated with production efficiency and have successfully studied such factors. The household production function approach provides new insights into the consumption process; what was previously outside the domain of economic research now appears amenable to economic analysis. Even if most economists continue to focus on more traditional topics,

the household production function approach offers a means by which a wider variety of family behavior can be analyzed.

Consider a logical extension of the view that behavior differences previously attributed to differences in tastes are in fact due to differences in productive efficiency. One might argue that indeed all households have precisely the *same* utility function and that all observed behavioral differences result from differences in relative prices and access to real resources.[1] In the standard theory all consumers behave similarly in the sense that they all maximize the same thing—utility or satisfaction. It is only a further extension then to argue that they all derive that utility from the same "basic pleasures" or preference function, and differ only in their ability to produce these "pleasures". From this point of view, the Latin expression *de gustibus non est disputandum* suggests not so much that it is impossible to resolve disputes arising from differences in tastes but rather than in fact no such disputes arise![2]

The household production function approach incorporates into the theory of choice at a fundamental level the constraints of time, consumer knowledge and inter-household differences in consumption efficiency. While studies have in the past brought in these additional constraints to explain observed behavior, the new approach gives the technology of consumption a principal role in the analysis and treats the money, time and productivity constraints symmetrically. Although the objection by many non-economists that the theory of choice assumes rationality is not well founded,[3] it is difficult to distinguish operationally between irrational choices and poorly informed ones, and the new approach to the theory of choice does give appropriate recognition to the investment in and costly accumulation of information.

If observed differences in behavior are assumed to result from differences in tastes, and if the satisfaction of each person's tastes is used as a guide to normative statements, then differences in behavior cannot be judged normatively. If, however, the observed behavior is assumed to result from different efficiencies with the same set of tastes, these can be judged by the level of full real income which they produce: i.e., by their level of productivity. For example, if education is said to alter tastes, one cannot speak of the effects of education on the level of utility: what is preferable to the college graduate may

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[1] Such a view is not a theory of economic determinism except in the tautological sense that the behavior which results from making choices must be a response to the relative scarcities confronted in making those choices.

[2] To venture one further step, if genetical natural selection and rational behavior reinforce each other in producing speedier and more efficient responses to changes in the environment, perhaps that common preference function has evolved over time by natural selection and rational choice as that preference function best adopted to human society. That is, in the short run the preference function is fixed and households attempt to maximize the objective function subject to their resource and technology constraints. But in the very long run, perhaps those preferences survive which are most suited to satisfaction given the broad technological constraints of human society (e.g., physical size, mental ability, et cetera).

[3] See Becker [3].

not be so to the grade school dropout and the two cannot, even in principle, reach an agreement on which set of tastes is "better". But these judgments can be made if education affects the efficiency of household production functions. Whatever yields greater commodity output is preferable and can be considered as such by both individuals. The school-dropout's behavior differs if his efficiency is less for the same reason it differs if he faces higher market prices—both restrict his opportunity set. The difference in the opportunity set is a measure of the "consumption return" to education and this return should be added to the "market return" in determining the benefit from additional education.[1]

If households can affect the environment in which they live, they will substitute toward those aspects which enhance productivity. They can "produce" higher education, better health, more favorable weather or greater political stability by attending school, exercising, moving, voting, et cetera. If education and age increase one's capacity to evaluate correctly the long-run effects of behavior, the uneducated and the young might be expected to consume more "irrationally". From such reasoning, which is included here as only illustrative, welfare implications about the desirability of various policies might be obtained.

One can substitute the household production functions (equation (5)) into the utility function (equation (4)) to get the "derived" utility function in terms of goods, time and environmental variables:

$$U = u\,(x_1, \ldots, x_n, t_1, \ldots, t_n; E_1, \ldots, E_p). \tag{14}$$

Why then do we use the more complicated and less familiar two-stage formulation given by equations (4) and (5) instead of simply maximizing the derived utility function given by equation (14) subject to the full income constraint? Would this not be more in tune with current theory and just as useful as the alternative approach advocated in this paper? We feel strongly that this is not as useful, even though every statement about the production functions can be translated into an equivalent statement about the derived utility function. The several advantages of the household production function approach are these:

(1) The utility function should pertain exclusively to preferences; it should deal with the final objects of choice by the consumer unit. The derived utility function does not separate preferences from resources and is instead a hodgepodge of some arguments which yield satisfaction, some quantities of time and goods which are directly distasteful, and several arguments—e.g., age, education—which may have little direct utility associated with them. The household production functions effectively separate objects of choice from the means used to produce them.

[1] For some rough estimates see Michael [30].

(2) The two-stage formulation implies a major restriction on the derived utility function, namely, that it is separable in the goods and time used to produce a given commodity. This restriction is extremely important in partitioning goods and time-uses into natural divisions of complements and substitutes (see the discussion on p. 387). The derived utility approach per se says nothing about which goods and time-uses are substitutes and which are complements.

(3) The two-stage formulation permits all the concepts and tools of production theory to be used directly in analyzing consumption: these include factor-neutral or factor-augmenting productivity changes, returns to scale, substitution elasticities, "entrepreneurial" efficiency, and the like.

(4) Put more generally, the household production function approach seems to provide useful parameters for the analysis of consumption, even though all statements are translatable into statements about the derived utility function. (Similarly, although all statements about the quantity theory approach to the demand for money and income determination are translatable into statements about the savings and investment approach, this does not mean they are equally useful approaches. The heated controversies for the last thirty years have been based on different allegations about which approach provides the more useful and stable parameters.)

V. Conclusion

This essay suggests that the household production function approach to consumption theory is a powerful tool of analysis. It systematically and symmetrically incorporates numerous constraints on the household's behavior, strengthens the reliance on changes in income and prices as explanations of observed behavior, and correspondingly reduces the reliance on differences in tastes or preferences. These alterations are desirable primarily because they yield a variety of additional behavioral predictions without heroic ingenuity or ad hoc theorizing by the researcher. By reducing the role of tastes, which have defied effective theoretical analysis, the new approach expands the applicability of the economist's theory of choice into the nonmarket sector and hence makes the theory more useful in analyzing household behavior in its many dimensions.

Of course, the final evaluation of any approach depends on its usefulness. Studies discussed in the previous section dealing with the production of commodities such as "good health", children, marriage, or "intercity visits" are indicative of the kinds of research stimulated by this approach. Still wider application has been inhibited by limited data, and the theory is helpful in indicating some of the kinds of new data which would be of use to researchers. The new variables are more global in nature than the goods and resources traditionally considered. They encompass concepts such as envy, prestige,

physical and psychological health, "circumspectness", and so on—notions often grappled with by sociologists and psychologists. The renewed interest in "social accounting", as distinct from "national income accounting", is consistent with the directions for new research indicated by the household production function view of consumer behavior.

Consumption theory at the hands of practitioners of the household production function approach has been transformed from one of the more sterile areas of economics into one of the most exciting. This, ultimately, is the most convincing evidence of its analytical power and practical advantage.

References

1. Becker, G. S.: A theory of the allocation of time. *The Economic Journal 75*, 493–517, 1965.
2. Becker, G. S.: Consumption theory: Some criticisms and a suggested approach (mimeo), May 1968.
3. Becker, G S.: Irrational behavior and economic theory. *Journal of Political Economy 70*, 1–13, 1962.
4. Becker, G. S.: A theory of marriage: Part I. *Journal of Political Economy*, July/August 1973.
5. Becker, G. S.: A theory of marriage: Part II. *Journal of Political Economy*, March/April 1974, Part II, forthcoming.
6. Benham, L.: Benefits of women's education within marriage. *Journal of Political Economy*, March/April 1974, Part II, forthcoming.
7. Ben-Porath, Y.: Economic analysis of fertility in Israel: point and counterpoint. *Journal of Political Economy*, March/April 1973, Supplement, S202–S233.
8. Bentham, J.: *Principles of Legislation.* Harcourt, Brace and Co., New York, 1931.
9. Cramer, J. S.: Efficient grouping, regression and correlation in Engel curve analysis. *Journal of the American Statistical Association 59*, 233–50, 1964.
10. Ehrlich, I.: Participation in illegal activities: an economic analysis. *Journal of Political Economy*, May/June 1973, 521–565.
11. Freidan, A.: The U.S. marriage market. *Journal of Political Economy*, March/April 1974, Part II, forthcoming.
12. Ghez, G. R. & Becker, G. S.: The allocation of time and goods over the life cycle. National Bureau of Economic Research (mimeo), May 1972.
13. Griliches, Z.: Hedonic price indexes for automobiles: an econometric analysis of quality change. In *The Price Statistics of the Federal Government*, National Bureau of Economic Research (General Series no. 73), 1961.
14. Gronau, R.: *The Value of Time in Passenger Transportation: The Demand for Air Travel*, National Bureau of Economic Research, 1970.
15. Grossman, M.: *The Demand for Health: A Theoretical and Empirical Investigation*, National Bureau of Economic Research, 1972.
16. Grossman, M.: The economics of joint production in the household, Center for Mathematical Studies in Business and Economics, Report 7145, University of Chicago, September 1971.
17. Heckman, J.: Three essays on household labor supply and the demand for market goods. Ph.D. Dissertation, Princeton University, 1971.
18. Houthakker, H. S.: The present state of consumption theory. *Econometrica 29*, 704–740, 1961.
19. Juster, F. T.: A framework for the measurement of economic and social performance. National Bureau of Economic Research (mimeo draft), November 1971.

20. Keynes, J. M.: *The General Theory of Employment, Interest, and Money*, Harcourt, Brace & World, Inc., 1962.
21. Komasar, N. K.: Economic analysis of criminal victimization. *Journal of Legal Studies*, June 1973.
22. Lancaster, K. J.: A new approach to consumer theory. *The Journal of Political Economy 74*, 132–57, 1966.
23. Lancaster, K. J.: Change and innovation in the technology of consumption. *American Economic Review 56*, 14–23, 1966.
24. Lancaster, K. J.: *Consumer Demand*. Columbia University Press, 1971.
25. Leibowitz, A. S.: Women's allocation of time to market and non-market activities: differences by education. Ph.D. Dissertation, Columbia University, 1972.
26. Leontief, W.: Introduction to a theory of the internal structure of functional relationships. *Econometrica 15*, No. 4 (reprinted in his *Essays in Economics*, 1947, Oxford University Press, New York, 1966).
27. Linder, S.: *The Harried Leisure Class*. Columbia University Press, New York, 1970.
28. Marshall, A.: *Principles of Economics*. Macmillan, New York, 1961.
29. Michael, R. T.: *The Effect of Education on Efficiency in Consumption*. National Bureau of Economic Research, 1972.
30. Michael, R. T.: Education in nonmarket production. *Journal of Political Economy*, March/April 1973, 306–327.
31. Michael, R. T.: Education and the derived demand for children. *Journal of Political Economy*, March/April 1973, Part II, S128–S164.
32. Mincer, J.: Market prices, opportunity costs and income effects. In *Measurement in Economics* (ed. Carl Christ). Stanford University Press, 1963.
33. Mincer, J.: Labor force participation of married women. In *Aspects of Labor Economics*. National Bureau of Economic Research, 1963.
34. Mitchell, W. C.: *The Backward Art of Spending Money and Other Essays*. McGraw-Hill, New York, 1937.
35. Muth, R. F.: Household production and consumer demand functions. *Econometrica 34*, 699–708, 1966.
36. Ofek, H.: Allocation of goods and time in a family context. Ph.D. Dissertation, Columbia University, 1971.
37. Owen, J. D.: *The Price of Leisure*, Rotterdam University Press and McGill-Queens University Press, 1969.
38. Reid, M. G.: *Economics of Household Production*. Wiley, New York, 1934.
39. Rockwell, G. R.: *Income and Household Composition: Their Effects on Food Consumption* (Marketing Research Report no. 340), U.S. Department of Agriculture, Washington, D.C., 1959.
40. Schultz, T. W.: Human capital: policy issues and research opportunities. *Human Resources*, National Bureau of Economic Research—Colloquium VI, 1972.
41. Schultz, T. W. (ed.): New economic approaches to fertility. *Journal of Political Economy*, March/April 1973, Part II.
42. Senior, N. W.: *An Outline of the Science of Political Economy*. Sentry Press, New York, 1965.
43. Smith, J. P.: Life cycle allocation of time in a family context. Ph.D. Dissertation, Chicago University 1972.
44. Stigler, G. J.: The cost of subsistence. *Journal of Farm Economics 27*, 303–314, 1945.
45. Willis, R. J.: A new approach to the economic theory of fertility behavior. *Journal of Political Economy*, March/April 1973, Part II, S14–S64.