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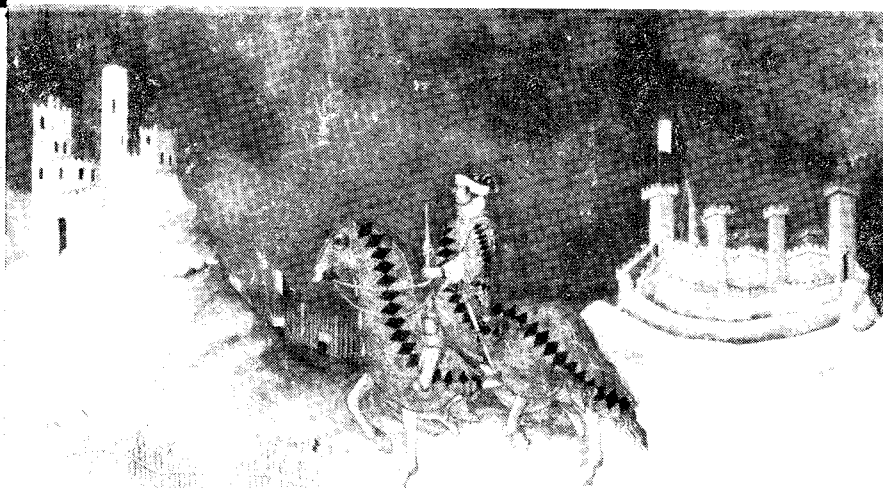
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QUADERNI DEL DIPARTIMENTO
DI ECONOMIA POLITICA

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ALTERNATIVE APPROACHES TO THE THEORY OF
CONSUMER CHOICE WITH ENDOGENOUS TASTES



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Siena, aprile 1996

Abstract. According to orthodox consumer theory, tastes are usually considered fixed or dependent exogenously on time. However, the hypothesis that consumer tastes could be obtained as the result of an endogenous process has been investigated in some heterodox models. After having summarized the various meanings with which tastes have been used in economics, a classification of the literature divided in two parts is given. The first part deals with the models based on a self-centered approach according to which the consumer's current choices influence his own future choices. The second part is concerned with the models assuming that consumers' choices are interdependent. It turns out that a unifying approach to the case does not exist and can be provided only by interdisciplinary analysis.

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I. INTRODUCTION

Consumer theory has not yet clearly defined what is the meaning of tastes and what are the relations between tastes and preferences. A common method to avoid this issue is to regard both concepts as equivalent or, alternatively, to consider preferences as the only way through which tastes can be known, a fact implying that any attempt to distinguish between the two is bound to fail. On the contrary, the view taken in this paper is that there are a number of theoretical reasons for considering tastes as distinct from preferences which must be briefly mentioned before dealing with the models founded on such a distinction. But in order to avoid semantic confusions, the first step to take is to summarize the various meanings of the two concepts as they have been used in economic literature.

The theory of consumer choice defines preferences as a binary representation of individual choice but employs this tool according to two different theoretical frameworks. The first considers preferences as given and takes the choice behavior as determined by the consumer's preference ordering. The second starts from the consumer's choices and derives preferences in terms of them. Both approaches present some problems which the consumer theorist has to face. In the first approach preferences are given independently from the situation of choice. What this assumption implies is that the only way to define a choice as rational is to assure its internal consistency by imposing some abstract conditions on preference ordering. On the contrary, if a context-dependent definition of rationality is acknowledged, it becomes necessary to account for other elements besides those implied by the internal features of preference ordering. Tastes are often invoked to play that role permitting to extend the model of consumer's behavior beyond what is strictly imputable to his isolated action and to include the interaction between his choices and his social environment. For example, Rothenberg (1962, p. 281) writes that "The tastes of an individual - even if we depreciate the effect of advertising - are not nearly so heroically his. They, and he himself, are *only* a relatively stable structure of organized interchanges with a social environment".

In the second approach, preferences are an *ex-post* concept, which are defined only after choices are known. According to this interpretation, observed behavior is the only source of information to infer the consumer's true preferences. But if one assumes that the mere observation of the effective choices is insufficient to understand the real preference ordering of the consumer, it is then necessary to employ a different concept that has to be more subjective and introspective than revealed preferences. This role of an *ex-ante* concept is often played by tastes which economists and decision theorists refer to in order to indicate the relevant set of values to better

understand the way the consumer determines his own choices. Such a role becomes clear in a dynamic setting whenever tastes are employed to describe the way in which past consumption influences the actual preference ordering. In a classical contribution, Gorman states that "it is commonplace that choices depend on tastes and tastes on past choices" (Gorman 1967, p. 218), implying that tastes and not preferences are the basis for the consumer's intertemporal choice.

In order to unify these different meanings of tastes, Gorman (1967) introduces the following utility function,

$$u = u(x, \alpha),$$

where x represents the goods (or commodities) available for choice and α the generic "taste parameters". According to this definition, tastes represent any element different from the objects of choice that influences the consumer's preferences.

Following a classification given by Pollak (1978),¹ this paper intends to survey how recent economic literature has specified the taste parameters making their change endogenous to the models of consumer's behavior. Section III deals with the models that adopt a self-centered approach to the problem by making consumer's tastes endogenous through their dependence on his own past choices. Section IV considers models assuming consumers' choices as interdependent by making taste parameters endogenous through their dependence on other consumers' choices. But before discussing these different approaches, it is necessary to briefly describe in section II how consumer theory generally deals with tastes, that is by assuming them fixed or dependent exogenously on time.

II. EXOGENOUS TASTES OR DE GUSTIBUS NON EST DISPUTANDUM

Usually, there are two ways for practically ignoring tastes. The first is to assume that tastes change exogenously with time, the second is to assume fixed tastes. Both assumptions allow one to avoid the problems discussed in the introduction and to design an abstract framework that is more convenient analytically but also scarcely relevant for an empirical analysis.

The assumption of exogenous tastes has the effect of keeping the validity of the results obtained without considering how consumer's preferences change for effect of his or other consumers' past choices and of essentially avoiding any real dynamic complication in consumer theory. Some examples drawn from the literature can explain this judgement better.

¹ Pollak (1978, p. 375) distinguishes two principal specifications of endogenous tastes, that are habit formation and interdependent preferences, and two other types, that are those influenced by advertising or by prices.

This use of the concept of tastes is clear in Hammond (1976) and (1977). In both papers, Hammond assumes that the only way to know consumer's tastes is through his choices and through this simplification, he is able to tackle the problem of dynamic inconsistency. In Hammond (1976, p. 163) the change of tastes is defined through a purely revealed approach. Any plan is indeed revealed in the sense that at every choice node the consumer reveals it by the choice of an immediate successor of the node itself. On this account, the necessity of both connecting the successive choices in a single plan and interpreting such a plan according to tastes disappears, while tastes are only invoked when it is necessary to explain an inconsistent choice. This also explains why Hammond does not recognize any difference between an exogenous and an endogenous change of tastes. Being preferences the only mean to know the "true" tastes of a consumer, both types of changes are essentially preferences getting reversed over time.² In another paper, Hammond (1977, p. 338) indeed assumes that a consumer has constant tastes when his preferences are "harmonious" according to Strotz's (1955-56) classical definition and introduces a different term to explain his approach, namely consequentialism that basically corresponds to the belief that a behavior is rational if and only if it can be explained by its consequences.

Similarly, Johnsen and Donaldson (1985) define the act of planning through a simple framework, in which a choice node is followed by a set of chance nodes, corresponding to the set of possible states of Nature, and then by another choice node. Having ruled out any form of uncertainty or "surprise" from the model, Johnsen and Donaldson state that if an agent deviates from the originally chosen plan after the chance nodes, this is evidence of changing tastes. On such a basis, they analyze the conditions to impose on the relation among the successive preference orderings to allow consistent planning, that is a behavior implementing the original plan whatever state obtains. Therefore, their formal apparatus essentially confirms the results obtained by assuming intertemporal separability, according to which the agent's future preferences are shaped by considerations that abstract from, and thus are separable from, the background of earlier preferences.

If these examples show how exogenously changing tastes allow to ignore the effect of the parameters tastes, the option of considering tastes as fixed is common to most economic literature. As well known, the standard way of modelling the consumer is through given preferences and this method prevents any explicit analysis of tastes.

The most quoted reference on this issue is probably a passage taken from Milton Friedman's *Price theory* (1962), where the author acknowledges a clear-cut

² "The *essential* problem with changing tastes, be they exogenously or endogenously changing, is that strict preferences get reversed over time, and that, had the reversal been anticipated, quite a different option (...) might have been chosen" (Hammond 1976, p. 162).

division of labor between economics and psychology, according to which economists give up analyzing tastes and leave to psychologists the task of studying the process of formation and change of tastes.³ According to Stigler's authoritative review article, Slutsky was the first author to put utility theory on such a basis claiming that "we must take it completely independent of psychological assumptions and philosophical hypotheses" (Slutsky 1915, p. 1), and as a consequence "with Slutsky's development, introspection no longer plays a significant role in utility theory" (Stigler 1950, p. 382). From then on, this stress on quantitative variables rather than on subjective and psychological concepts has characterized consumer theory more and more. Savage's *Foundations of Statistics* was the most influential contribution to overcoming any distinction between tastes and preferences and to abandoning a subjective view of preferences and utility. In this work, preferences have to be interpreted in terms of choices without using introspection as a source of information (Savage 1954, p. 17) and therefore preferences are not distinguishable from tastes. This position has been recently revised by Stigler and Becker's paper entitled "De Gustibus Non Est Disputandum". Their initial assumption is that "tastes are the unchallengeable axioms of a man's behavior: he may properly (usefully) be criticized for inefficiency in satisfying his desires, but the desires themselves are *data*" (Stigler and Becker 1977, p. 76). Therefore, economic analysis has to consider tastes as data and assume that they neither change capriciously nor differ basically among people. In this context, apparently irrational behavior such as addiction, habit or fashion, that common sense attributes to changing tastes, can be explained without any reference to tastes. In particular, the consumption of a beneficial addictive good like music is the effect of the accumulation of the "consumption capital", which summarizes a process of learning by doing. The growth of this capital increases the productivity of the time spent listening to music and, consequently, the marginal utility of time allocated to music. On the contrary, if the good is harmful, the inversion of the same effect explains the decrease of its consumption over time. In order to solve the contradiction represented by the addictive and harmful goods like heroin, Stigler and Becker introduce an ad hoc hypothesis explaining their addictive effect, namely the rigidity of the demand for these goods with respect to their shadow prices. The consequences of this approach for the economic meaning of tastes are clear in the last two sections of Stigler and Becker's paper. Here, advertising influences consumer's demand not through a change of tastes but through a change of the shadow prices of the goods, while the demand for fashion is formalized by introducing a new variable in the

³ "Economic theory proceeds largely to take wants as fixed. This is primarily a case of division of labour. The economist has little to say about the formation of wants; this is the province of the psychologist. The economist's task is to trace the consequences of any given set of wants" (Friedman 1962, p. 13).

household production function, namely the individual's social distinction (see also Becker 1974).

This contribution has originated a vast literature which has extended and tested the original theory, but has also caused other works full of harsh criticism against it. The authors supporting Stigler and Becker's view are principally involved with the attempt to develop a theory of rational addiction, that is required by the great generality of such a phenomenon: "People get addicted not only to alcohol, cocaine, and cigarettes but also to work, eating, music, television, their standard of living, other people, religion, and many other activities" (Becker and Murphy 1988, pp. 675-6). But in this paper, as in the others discussed in the next section, addictive behavior is explained by choosing a proxy for tastes on a priori grounds, that seems arbitrary or at least empirically inadequate like Stigler and Becker's rigid demand curve.

These considerations point out the basic misunderstanding which characterizes the debate following "De Gustibus". The real problem in the denial of the economic importance of changing tastes is that such a negation does not matter. Actually, the whole of neoclassical consumer theory adopts indirect means of representing a change in tastes. In static models this role is usually played by the change of elasticity of the consumer's demand as in Stigler and Becker's model. In metastatic models, as Hammond (1977) defines the neoclassical techniques of choice over time, the changes of tastes are often represented by the changes in the rate of time preference.⁴ But in a real dynamic context, that is one involving decisions made after the resolution of some uncertainty, this set of tools appears insufficient to fully capture the evolution of the consumer's behavior.

Although this point has not yet been stressed sufficiently, most critical comments on Becker and Stigler's paper share this view. Marschak (1978), Pollak (1978), Winston (1980), Hirschman (1985), Cowen (1989) criticize Becker and Stigler's approach because it avoids dealing with tastes through nothing but a semantic change that is not really useful to explain the consumer's behavior. These authors basically underline how consumption capital or shadow prices have no greater explanatory power than changing tastes and how the whole household technology approach, which considers the consumer as a producer, cannot replace psychological inquiry.

In conclusion, the view taken here is that tastes are implicitly present in a large part of orthodox consumer theory, while Becker and Stigler's theory is subject to the same critique made by Sen (1973) to the revealed preference approach, namely it is not founded on the absence of any psychological hypothesis but on ad hoc psychological assumptions. Then the best way to assess its usefulness is measuring its

⁴ For an historical overview, see Loewenstein (1992)

capacity to theoretically represent a common empirical phenomenon as the change of tastes. In this light, the assumption of a rigid demand curve for drugs or other harmful addictive goods is nothing but a rough method to describe a more complex psychological process that may be explained better by explicitly considering tastes as endogenous, as in the models discussed in the next sections.

III. ENDOGENOUS TASTES: THE SELF-CENTERED REPRESENTATION

Gorman (1967) states that past and actual choices are connected by tastes. But while in his pathbreaking paper Gorman studied only the conditions assuring the existence of a generic choice indicator, the utility function he proposed can be used to classify the models where tastes are made endogenous through the introduction of habit formation processes. In this light, three different specifications of the taste parameters can be recognized. The first approach can be defined as the *naïve* approach, because it assumes that the consumer fails to recognize the full impact of the habit forming effect on his future preferences. In this case, the taste parameters are usually represented by the consumption vector of the past period, x_{t-1} , and the consumer's preferences are described by a short-run utility function. The second and the third approach can be defined as *rational* because the consumer is supposed to be fully aware and to take full account of the manner in which his consumption at any moment affects his future preferences. This implies that both approaches assume the intertemporal utility function as the object of analysis but they adopt different methods to maximize it. One class of models maximizes utility on the whole relevant horizon adopting either the backward induction method proposed by Strotz's classical paper (1955-56) or a solution concept explicitly designed for strategic models, as Nash equilibrium. In this case, the taste parameters correspond to the set of all the short run utility functions in all the periods relevant for the consumer's choice. The other *rational* approach starts from a long-run utility function referred to a single period but introduces a state variable that summarizes the past effect of the habit formation process. Then it usually employs standard optimal control theory to obtain a solution. In this framework, the taste parameters are just represented by the state variable and the consumer maximizes the expected discounted utility as a function of past history.

The *naïve* approach, according to the standard version (Peston 1967, Pollak 1970, von Weizsäcker 1971, Krelle 1973, Gaertner 1974), specifies the process of habit formation through a utility function, including the consumption vector of the last period,

$$u = u(x_t, x_{t-1})$$

In another version (Pollak 1970 and McCarthy 1974), x_{t-1} is substituted with the geometrically weighted average of consumption in all past periods,

$$u(x_{i,t}, y_{i,t-1}) = u\left(x_{it}, (1-\delta_i) \sum_{j=0}^{\infty} \delta_i^j x_{i,t-1-j}\right),$$

where $0 < \delta_i < 1$ is a memory coefficient.

Pollak (1970) studies the special case in which the short-run utility function is additive and depends linearly on x_{t-1} (or y_{t-1}). Through a simple maximization, he obtains a locally stable system of short-run demand functions that are locally linear in income⁵ and derives the long run demand function as the steady state solution of the short-run demand functions. This method raises the problem of the existence of the long-run demand function. Pollak (1976) shows that existence depends on the characteristics of the utility function. If the short run demand function is indeed determined by maximizing $U(x_t, x_{t-1})$ subject to the budget constraint, the long-run demand function, that is, the steady state ($x_t = x_{t-1} = x$) of the short-run demand functions, is not given by the maximization of $U(x, x)$ but of $U(x)$, which takes full account of the effect of the habit formation process on present and future preferences.

Von Weizsäcker (1971) does not acknowledge this problem and restricts his attention to the case of two goods, $i=1,2$. He starts directly from the implicit short run demand equations,

$$x_{i,t} = x_i(p_{1,t}, p_{2,t}, y_t, x_{1,t-1}, x_{2,t-1})$$

where p and y indicate prices and income. He claims - improperly in the case with more than two goods (Pollak 1976, El-Safty 1976, Hammond 1976a) - that integrability conditions are fulfilled and therefore he considers smooth and convex short-run indifference curves as the necessary and sufficient conditions for having well behaved long run indifference curves as well. Then von Weizsäcker analyzes the properties of the steady state demand functions so obtained and shows that, depending on the dimension of the addictive effects ($\partial x_t / \partial x_{t-1}$), it is possible that a change evaluated as inferior in the short-run may be considered superior in the light of the steady state indifference function, a fact that has relevant implications in terms of social welfare and public choice. Apart from these consequences that do not generalize beyond the two-good case, it is interesting to underline a different interpretation given to the model. According to von Weizsäcker himself (1971, pp. 358-60), the short run utility function may correspond to a single trial performed in order to reach a "satisficing" (à la Simon 1957) utility level, while the long run utility function corresponds to the intrinsic level to which the consumer is interested.

⁵ Pollak's model adopts the Klein-Rubin linear expenditure system implying demand functions with linear Engel curves (see Klein and Rubin 1947, Stone 1954).

The introduction of the level of aspiration or satisfaction as a tool to describe the consumer's choice appears, among others, in Krelle (1973) and, more recently, in Gilboa and Schmeidler (1993). Fisher and Shell (1968), Houthakker and Taylor (1970), Philips (1972) and El-Safty (1976a) introduce similar processes of learning by doing followed by the consumer that are represented by the evolution of a state variable. In El-Safty's version, the taste parameters are represented by the magnitude of the habit strength, h , which follows a process given by the difference equation

$$h_t = (1 - \delta)h_{t-1} + x_{t-1},$$

where δ represents a measure of memory loss. If the consumer does not anticipate the future changes in tastes and follows the *naïve* behavior, the model's solution is very similar to that of Pollak's discrete time formulation. But in his paper, El-Safty discusses two other results, namely that the demand vector converges if and only if the adaptation process, captured by the habit strength coefficient, converges and that conditions assuring the existence of the long-run demand function have to be adapted to the functional form of the short-run utility function.

The *rational* approach excludes the possibility that the consumer may be limitedly rational and assumes perfect information and fully optimizing behavior. These hypotheses make this approach fit for a normative theory and allow us to reduce the changing tastes case under the same analytical framework used for fixed tastes, but weaken enormously its plausibility as a descriptive model.

A first variation of this approach assumes that an optimal consumption plan can be calculated under changing tastes by giving the problem a recursive structure and then solving it through standard dynamic programming methods. According to the original intuition of Strotz (1955-56) developed by Pollak (1968) and Peleg and Yaari (1973), this method of solution is defined as sophisticated in order to distinguish it from a myopic one. The principal problem with this approach is that analytical convenience requires us to adopt intertemporal separability in order to apply recursive methods. An enlightening discussion is contained in Yaari (1977), who proposes a different solution. He introduces a habit formation process by making the hypothesis that a deterministic process governs the changes in the utility function and then by employing the model so obtained to solve the dynamic inconsistency problem. Very simply, the optimal consumption path is given by the standard recursive programming procedure with finite horizon T , in which the last T th choice function is derived first and the first choice function is derived last. If x_t is the consumption vector to be consumed in period t , and there is perfect knowledge of all prices and incomes, the optimal consumption plan (x_1^*, \dots, x_T^*) is the solution of the following system,

$$\begin{aligned}
x_1^* &= \max U_1(x_1, h_2(x_1^*), h_3(x_1^*; h_2(x_1^*)), \dots, h_T(x_1^*, x_2^*, \dots, x_{T-1}^*)) \\
x_2^* &= h_2(x_1^*) \\
&\vdots \\
x_T^* &= h_T(x_1^*, x_2^*, \dots, x_{T-1}^*)
\end{aligned}$$

where h_t is the function that maximizes the quantity U_t , that is the utility function defined at time t for every feasible consumption plan (x_1, \dots, x_T) .

The existence problems connected with this solution, generated by the non-convex feasible sets (Blackorby, Nissen, Primont and Russell 1973), and the fact that it may be Pareto-dominated have suggested adopting other solutions. An alternative method is to represent the intertemporal decision through the fiction of more selves. This line of research (Phelps and Pollak 1968, Ainslie 1975, Yaari 1977, Elster 1979, Winston 1980, Schelling 1984) assumes that dynamically incoherent behavior originates because an individual behaves *as if* he is composed of two or more selves that alternatively determine intertemporal decisions. In this analytical framework, the process of individual choice can be analyzed employing game-theoretical solution concepts and the solution to the dynamic incoherence problem can correspond to different criteria for ordering the successive selves of the same individual. However, this method, as the other one proposed for dealing with dynamic inconsistent behavior that is precommitment, seems inappropriate for models with endogenous tastes that are founded on the abandonment of the intertemporal separability assumption.

Indeed, a more common alternative is to incorporate the effect of past and future preferences into current demands by relaxing the assumption of intertemporal separability. In general terms, these models introduce in the utility function a state variable representing the stock of habits. This variable changes continuously according to a law described by a differential equation that breaks time separability by adding in lags to the arguments of direct utility. The result is that the classical model of life-cycle utility without habit formation can be employed to solve intertemporal models with habit formation. Such an expedient is functional to safeguard the validity of the standard methods of intertemporal maximization but has serious shortcomings both as a descriptive model and as a reference for empirical research.

The correspondence between models with and without habit formation is explicitly claimed by Lluich (1974), who proposes to maximize the following intertemporal utility function,

$$U(x(t), s(t)) = \int_0^\infty e^{-\rho t} u(x(t), s(t)) dt$$

In this model, the vector of the stock of habits, s , changes according to

$$\dot{s}(t) = x(t) - \delta s(t)$$

where δ is the constant rate of the depreciation of the stock of habits.

If an optimal program exists and the problem satisfies sufficiently strong smoothness conditions, the solution is given by optimal control methods. Lluch's discussion points out how the optimal solution differs from the solution without habit formation only by the introduction of some additional constraints capturing the present and future utility effect of the changes in the stock of habits. For example, the marginal utility of habits has to be equal to the full price of the addictive goods given by its discounted money price plus the discounted future utility costs of the addictive stocks. Moreover, Lluch confirms the correspondence with standard life-cycle model adopting log-linear and quadratic utility functions to make the solution explicit and discusses some empirically relevant consequences, namely that a high rate of time preference makes habits disappear more slowly (see also Philips 1974, p. 258) and that the anticipation of a future price growth lowers addicted consumption.

A substantial improvement of the model is obtained by Spinnewyn (1981) who makes models with habit formation equivalent to the models without habit formation through the imputation of the consumption costs induced by habit formation process to the past decisions. In such a way, the cost of the consumption of a commodity is the sum of the current price and of the future consumption induced by the current choice. The principal outcome is that the consumption of the more strongly habit forming commodities is discouraged in the short run in favour of the less habit forming ones. Such a tendency could be reversed in the long run but its effect depends on the specific form of the utility function adopted.

Analogous solutions are obtained by the authors following Becker and Stigler's suggestion to represent the change of tastes as a change in the household production possibilities given constant tastes. These models (Boyer 1983, Iannaccone 1986, Becker and Murphy 1988, Chaloupka 1991, Becker, Grossman and Murphy 1992) adopt Lluch's framework, defining first what conditions allow to rationally explain addiction behavior and then deriving solutions through the maximization of an Hamiltonian. A partial departure from Lluch's model is represented by the fact that these models discriminate between beneficial habits having positive marginal utility and the harmful ones and explicitly treat the effect of this distinction on the optimal plans. For example, Iannaccone (1986) solves the following problem:

$$\begin{aligned} U(x(t), s(t)) &= \int_0^T e^{-\rho t} u(x(t), s(t)) \\ \text{s.t. } \dot{s}(t) &= f(x(t), s(t)) - \delta s \\ \dot{A} &= rA - pY \end{aligned}$$

The solution of the Hamiltonian gives the conditions for habit formation, which depend on adjacent intertemporal complementarity, that is a measure of the intertemporal elasticity of commodity substitution which has the same role of the demand elasticity in Stigler and Becker's model. Becker and Murphy (1988) discuss

the possibility that adjacent complementarity can imply unstable and multiple steady states, a result explaining some empirically relevant facts concerning addictive behavior.

The principal problem posed by this approach, as Winston (1980) or Herrnstein and Prelec (1992) argue, is that rational addiction is a contradiction in terms, in the sense that "for a behavior to be called an addiction, rather than just a personal bent or appetite, it must be *unwanted*" (Herrnstein and Prelec 1992, p. 338). According to this view, addiction cannot be treated within a rational choice approach and it is rather necessary to appeal either to behavioral models or to the already mentioned more selves approach.

A radical departure from the previous models is proposed by Browning (1991), who develops an intertemporal non-separable model. He employs a dual representation for preferences given by the following profit function,

$$\Pi(p_1, \dots, p_T, \lambda_t^{-1}) = \max \left[\lambda_t^{-1} U(x_1, \dots, x_T) - \sum_t p_t x_t \right],$$

that is linear homogenous and decreasing in p_1, \dots, p_T and λ_t^{-1} . In this expression, λ_t is the Lagrange multiplier - or the marginal utility of expenditure - of the intertemporal utility maximizing problem. Since optimal allocation requires that the discounted value of λ be kept constant over the whole horizon, we can employ it to represent the evolution of future wealth. The functional form adopted by Browning for the profit function is called simple non additive preferences (SNAP) and depends on one-period lagged, one-period lead and current prices,

$$\Pi(p_1, \dots, p_T, \lambda_t^{-1}) = - \sum_{t=1}^{T-1} \Phi_t(p_t, p_{t-1}, \lambda_t^{-1}).$$

From this function, Browning derives the λ -constant (or Frisch) demand function having the following form:

$$x_t = \partial \Phi_{t-1}(p_{t-1}, p_t, \lambda_t^{-1}) / \partial p_t + \partial \Phi_t(p_t, p_{t+1}, \lambda_t^{-1}) / \partial p_t.$$

This model, which defines current demand as the sum of a component based only on past demand and a component taking account of its effect on future preferences, allows us to clearly reject time separability and to obtain estimates on aggregate data. Despite the progress achieved by this paper, a reconciliation between theoretical dynamic modelling and the available empirical evidence remains the principal problem to solve in this research area. Some attempts are contained in Chaloupka (1991), Becker, Grossman and Murphy (1994) and Loewenstein and Prelec (1992), but this recent work does not present an analysis based on micro-data, which are essentially to produce the interplay between theoretical and empirical considerations that characterize standard consumer theory (for a survey, see Blundell 1988).

IV. ENDOGENOUS TASTES: THE INTERDEPENDENCE AMONG CONSUMERS

As the previous section has shown, economists have paid great attention, especially in the last two decades, to the self-centered approach to consumer theory. On the contrary, they have hitherto widely neglected the importance of the interdependence between consumers. This fact is particularly surprising if we consider the actual stress on game-theoretical concepts and techniques in economics. However, the use of interdependent preferences as a way to make tastes endogenous has characterized in the past the work of some borderline economists. Veblen's classical discussion, Leibenstein's 1950 paper on bandwagon and snob effect, some works published in the seventies and the recent models pertaining to information economics represent research awaiting a more thorough study and extensive development.

In order to classify these contributions, it is useful to recognize three different means of representing the interdependence among consumers:

- a) connecting the consumers' choices through a medium of influence that is not directly controlled by themselves,
- b) introducing bilateral direct relations among the demand functions of identical consumers,
- c) formalizing a social order founded on unilateral relations among different consumers.

Starting from the first class, the introduction of prices in the utility function is the most common way of representing interdependent preferences through a variable different from the demand function. There may be two different reasons for this inclusion. The first - that is the interesting one here - corresponds to the well-known Veblen effect associated with the expression *conspicuous consumption*. The second consists in judging quality by price and can be viewed as a direct consequence of the difficulties in collecting information about the real quality of goods. Economic analysis has usually ignored this distinction claiming, for example, that "when a society begins to appraise the value of goods *by* their price, it may end by valuing them *for* their price" (Scitovsky 1944-45, p. 104). But it is important to note that the theoretical equivalence of these two patterns of behavior is doubtful because they have quite different characteristics and purposes.⁶ Even if both patterns imply a direct relation between utility and price, only in the case of *snob appeal* price is a variable,

⁶ Alcaly and Klevorick (1970) takes account of this distinction and applies it to Lancaster's consumer theory. Snob effect is represented by a specific price *attribute* independent from other characteristics, while, if the consumer judges quality by price, there may be complementarity between price changes and the variations of the specific characteristic judged by price.

explaining choice per se and, therefore, a medium of influence among consumers. On the contrary, when the consumer judges quality by price, prices are included in the utility function as a proxy for some features of the goods that are imperfectly known or completely ignored. Within this framework, the most appropriate way to consider prices as reliable indicators of the missing information is to consider them as a result of the interdependence between producers and customers rather than among consumers. This interpretation is clearly pointed out by Nelson's work on the economic consequences of advertising (Nelson 1974, 1975) and by Milgrom and Roberts' signalling model (1986), which will be discussed below.

In his book on the leisure class, Veblen describes conspicuous consumption as "a means of reputability to the gentleman of leisure" (Veblen 1899, p. 75) through which the leisure class firmly establishes its upper position in the social hierarchy. But such a behavior spreads beyond the higher class because emulation and envy make this phenomenon pervasive. Therefore, the purchase of higher price goods, independently from their capacity to provide satisfaction, has to be considered, in Veblen's approach, not a waste but a normal consequence of the principle of consumer's sovereignty.

A model that formalizes Veblen's sociological approach is contained in Pollak (1977). Pollak starts by claiming the independence between normal prices p^n , which influence preferences and depend on both current and past prices, and market prices p^m , which enter the budget constraint. Then he defines a normal price dependent preference ordering and derives an utility function $u(x, p^n)$ to be maximized, subject to the budget constraint $\sum x p^m = Y$. In the demand function so obtained,

$$x_t = x_t(p_t^m, Y_t, p_t^n),$$

the following assumptions

$$\begin{aligned} \frac{\partial p_t^n}{\partial p_\tau} &\geq 0 && \text{per ogni } \tau \leq t \\ \frac{\partial u_t}{\partial p_t^n} &\geq 0 \end{aligned}$$

describe the Veblen effect.

Within this model, a change in the market prices affects both budget constraint and utility function and makes the demand function non-homogenous. In order to restore homogeneity,⁷ Pollak assumes that preferences change only with variations in relative rather than absolute normal prices, implying that demand functions are homogenous of degree zero in current prices and income. Aside from the clear destructive consequences for any welfare judgement, Pollak himself points out that

⁷ Before Pollak's paper, Kalman (1968) studies conditions guaranteeing the homogeneity of a demand function derived by price dependent preferences but he does not distinguish between normal and market price. An annoying consequence is that inflation increases utility. In Allingham and Morishima (1973), the ratio between prices and general price level is substituted for monetary prices.

price dependent preferences cause another problem. If one assumes that in steady state, market prices are equal to normal prices, the demand function can be rationalized by more than one price dependent preference ordering and this causes a revealed preference approach to fail.

In a quite different interpretation, Gilboa and Schmeidler (1993, 1994) have recently suggested considering prices as a tool employed by consumers for selecting a "satisficing" behavior based on aspiration levels. They adopt the following utility function,

$$u_i = u_i(v_i, \alpha p_i) \quad \text{with} \quad \begin{aligned} \partial u_i / \partial v_i &> 0 \\ \partial u_i / \partial (\alpha p_i) &< 0 \end{aligned}$$

where v_i is the "intrinsic" utility of the good i , corresponding to the consumer's tastes, p_i is its price and α is a "salience of money" coefficient measuring the importance attached by the consumer to prices. According to a behavioral approach, α increases (decreases) if the consumer's choices, determined by his actual aspiration level, imply an expenditure higher (lower) than income and this changes the degree of dependence between prices and preferences. But according to this scheme, the interdependence among consumers, if it exists, is only indirect, because it is an indirect effect of the market activity.

The same remark is appropriate for describing the way in which economists have employed other mediums of influence to describe the interdependence among consumers. Usually these models are too closely related to psychological and sociological arguments to be exhaustively treated within economics. A simple method to distinguish economic models from those belonging to other social sciences is to refer them to the subjects involved in these relations. According to this convention, advertising belongs to the realm of economics because it concerns the relations between firms and customers. The residual class of models employs a number of factors as personality core, social role identifications, moral and political suasion, audience effects, education and custom, fads and fashion so far as they are not directly created and controlled by producers. Even if such factors have also been studied by economists,⁸ their direct analysis seems too demanding for a quantitative science like economics.

The judgement about the theoretical nature of advertising is even more controversial. As mentioned before, most literature on the subject tries to analyze why firms may choose to advertise rather than study how advertising affects consumers' choices, even if considering the latter aspect involves necessarily extra-economic questions. In order to solve the problem, a distinction between informative and

⁸ Two examples, that try to overcome this perhaps too strict division of labor, are Gintis (1974) on education and Cosgel (1994) on the audience effect.

persuasive advertising has been made in literature.⁹ In the first case, the effect of advertising is to "correct tastes" (Rothenberg 1962, p. 279) rather than to change them, while in the second case, consumer tastes are "moulded" by the producers.

The approach usually ascribed to Richard Nelson clearly belongs to the first class. In his work, advertising is described as a signal of a high quality product. In order to obtain this result in the case of *experience qualities* which are qualities of the brands not determined prior to purchase, it is sufficient that the consumers' repeated purchases reveal the real quality of the product because it is advantageous for high quality producers to advertise more than low quality producers. But as Milgrom and Roberts (1986) and Wolinsky (1980) point out, the same result can be obtained by employing prices and so the theorist must explain why effort should be wasted in advertising. Apart from this problem, not easily solvable in a purely economic approach,¹⁰ there are clear reasons to exclude this line of research from consumer theory with endogenous tastes. The simpler reason is that these models, in line with the classical approach of Schmalensee (1972), consider tastes as entirely exogenous and explicitly exclude the fact that consumer's tastes may be changed by advertising.¹¹ They are built over a strict asymmetrical relation between producers and consumers, where producers determine quantities, prices and advertising to maximize profits and consumers determine the only real quality of goods. Once they do this, their fixed tastes permit them to maximize utility according to the standard approach.

Turning now to persuasive advertising, the best known approach is the one described by Kenneth J. Galbraith (1958, 1970), who repeatedly underlines the great impact of producers' persuasion on consumers' tastes. His position is founded on a vast part of psychological and sociological literature which points out the risks of mass media influence on individuals. But if economists accept the actual growing incidence of the attempted persuasion through advertising as self-evident, they have to treat it directly as a determinant of the taste parameters.

A proposal to adopt some intermediate models between these two extreme positions has been made by Boyer, Kihlstrom and Laffont (1979) and Luini (1994). These models try to distinguish formally between informative and persuasive (or *fraudulent*) advertising, that is the advertising leaving unchanged or making to decrease the customer's information, by comparing the differences between the quality

⁹ This classification has a classical antecedent in Marshall's (1919) distinction between "constructive" and "combative" advertising, that is however referred to the producers' side.

¹⁰ For an attempt, see Milgrom and Roberts (1986).

¹¹ "There is another possible function of advertising which I have not analyzed because I do not know how: advertising's impact on a consumer's utility function, holding information constant. The change-in-taste idea cannot be effectively tested because no real theory about taste changes has been developed. Fortunately, one does need such an idea to explain the major features of advertising behavior" (Nelson 1974, p. 752).

assessments of customers that have or have not received the advertising message. The fundamental hypothesis is that the consumer changes his probability distribution about the quality of a good by employing advertising according to Bayes' rule. In this framework, to receive fraudulent advertising corresponds to adopting an incorrect correlation between the information provided by advertising and the real quality of the goods. Therefore, even non-informative advertising will have effect on the consumer's choices. The model's results are that even fraudulent advertising increases demand in a measure depending on the difference between the levels of quality of the goods presents in the market and on the reliability of the different sources of information.

The second class of models with interdependent preferences is founded on the explicit acknowledgement of the social nature of the preference formation process. This approach is characterized by the presence of a set of identical consumers whose consumption behavior is influenced by external effects that are common to all of them, bilateral and symmetric and is discussed for the first time by Leibenstein (1950) and Duesenberry (1949).

Leibenstein (1950) proposes a detailed classification of the factors explaining consumer static demand. Aside from the qualities inherent in goods and the Veblen effect, he considers the bandwagon and the snob effects. Both effects are represented by a functional relation between consumer demand and market demand with a positive derivative for the bandwagon effect and a negative derivative for the snob effect. Leibenstein's final aim to obtain aggregate demand curves, is achieved through the introduction of a fictitious diminishing marginal external consumption effect, which undoes the effects of the non-additivity implied by such externalities.

Duesenberry (1949) starts from the idea that the consumer's choices are connected over time through habits and learning processes. Habit causes the well known Duesenberry effect, represented by an asymmetry between changes of the consumption level and of the budget constraint. It is only after having overcome this rigidity that consumers are able to learn which consumption pattern is successful. But the ensuing learning process is basically a social phenomenon because it depends on the "demonstration effect" and, therefore, on the comparison with the other consumers' consumption patterns. This process can be described as a sequence starting with an increase in the other consumers' expenditure which raises the frequency through which the consumer comes in contact with goods different from those habitually consumed. This comparison may reveal that new goods are superior for fulfilling the consumer's needs. Finally, the consumer changes his consumption pattern and probably increases his expenditure. Duesenberry employs the following utility function to express the interdependence among consumer,

$$u_i = u_i(x_i, x_i^e, r_j),$$

where x_i and x_i^e respectively represent the actual and expected demand of the consumer i and r_j is a weighted average of the consumption expenditures of the other consumers, with weights proportional to the frequency of social contacts among consumer i and the other consumers.

Recent work which follows the same approach formally develops these two references. Pollak (1976a) tries to work out Leibenstein's insights in terms of a formal model. He assumes that consumer i 's preferences depend on consumer j 's past consumption and vice versa, that is¹²

$$x_{i,t} = x_{i,t} \left(\sum_j x_{j,t-1} / N \right) \quad \text{with } i, j \in \{1, \dots, N\}$$

The model's logic clearly points out the similarity to Pollak's habit formation model discussed previously. Both models adopt a system of demand functions locally linear in expenditure and obtain similar results for short-run and long-run demand. Pollak's original contribution is the substitution of Leibenstein's simultaneous interdependence with lagged interdependence. To understand the well known problems caused by this variation, we can refer to game theory. In an extensive form game, the temporal sequence can be represented by the rules of the game inducing asymmetry among the players and the destruction of any possible equilibrium as in the case of the Stackelberg duopoly. On the contrary, the bilateral reactions typical in the Cournot-Nash duopoly permit us to ignore conjectural variations, by simply avoiding to deal with a dynamic problem.

The importance of the relative frequency of contacts among consumers is stressed by Krelle (1973) and Gaertner (1974). Both papers describes social interaction through a measure of "sympathy" between the consumers. While Krelle does not exactly specify how this measure is defined, Gaertner assumes that the consumer i is more influenced by the other consumers having a consumption pattern not "too much" different from his pattern. Formally,

$$x_{i,t}(x_{j,t}, d_{i,j}) = x_{i,t} \left(d_{i,j} \frac{x_{j,t-1} - x_{i,t-1}}{x_{j,t-1}} \right) \quad \text{with } x'_{i,t}(\cdot) > 0,$$

where $d_{i,j}$ is a distance-parameter between consumers i e j which is positive for two consumers that are sympathetic and negative in the opposite case. The intuition behind this is that the similarity of the consumption plans makes the individual "reassured and prompted to stick to his recent consumption pattern", while large differences in

¹² Pollak (1976a) proposes even a variation in which the influence does not regard i 's past consumption. Formally,

$$D_{it} (\sum_j D_{jt-1} / I) \quad \text{with } i, j \in \{1, \dots, I\} \text{ and } j \neq i.$$

This variation does not imply significant changes in Pollak's result, except with values of I too small. A similar model of interdependence is contained in Prajs and Houthakker (1955, p. 19).

consumption pattern "lead to alienation and antipathy" (Gaertner 1974, p. 332). Moreover, the model includes a cumulative process that is similar to Duesenberry's demonstration effect, according to which the consumer imitates more consumers having a higher demand than himself, than those having a lower demand.

A different version of the same approach describes influences connecting the single consumer to some groups of consumers. There are two different suggestions to consider. The first comes from Hayakawa and Venieris (1977), who, starting from Lancaster's (1971) consumption theory, introduce, in a limited rationality model, a psychological concept, namely reference groups. These groups are composed of other consumers considered by the consumer as the "significant others" and he tries to emulate them by consuming, in Lancaster's terms, the same bundle of characteristics. Given a series of simplifying assumptions, Hayakawa and Venieris derive a traditional map of indifference which allows us to select an optimal solution. The second suggestion is represented by the threshold model of Granovetter and Soong (1986), where any consumer changes his consumption pattern according to the proportion of some relevant group of other consumers that are changing their pattern in the same way. Each consumer is indeed supposed to decide whether to purchase one unit of a given commodity according to two different levels, a lower and a higher threshold, assumed by this proportion. Once the lower threshold is surpassed, the consumer is induced to buy the commodity. The bandwagon effect ceases and is substituted by a snob behavior when the higher threshold is reached and surpassed. The other relevant assumption is that an increase of market prices p makes the lower threshold higher and the higher threshold lower, while a decrease of p has the opposite effect of decreasing the lower threshold and increasing the higher threshold. If the proportion of consumers who have purchased a certain commodity at time t is ρ_t and the consumers cumulative distribution functions of lower and upper threshold are respectively F_l and F_u , intertemporal demand will be expressed by the following path,

$$\rho_{t+1} = F_l(\rho_t, p) - F_u(\rho_t, p).$$

Being a difference between F_l and F_u not necessarily monotone with respect to ρ_t , the model may produce a multiplicity of equilibria and the presence of chaotic and unstable market outcomes.¹³

A characteristic of the last model is that definite equilibria cannot be rationalized by only economic assumptions. This point opens two possibilities, to attempt an extra-economic explanation of the preference formation process along the lines suggested before, or to explicitly assume some kind of asymmetry among the consumers as provided by the third approach. This class of models can be interpreted

¹³ Iannaccone (1989) extends Granovetter and Soong's model showing that chaotic results can be partially avoided if consumers' expectations are given by an exponentially weighted moving average of the past consumption.

as an outgrowth of information economics. The starting point is the idea that the process of belief formation has a very limited role in determining the economic agents' behavior because their decisions are basically the result of a very complex market interaction. A way to define the rationality of the economic agents is then to describe it in terms of mimetic or imitative patterns of behavior, as argued by Orléan (1989). His model of generalized imitation, that is founded on the sociological approach to opinion transmission within groups, seems particularly appropriate to explain speculative behavior in financial markets, but in order to apply it to consumption theory, it is useful to introduce an asymmetry between the consumer in order to model unilateral relations.

Some authors adopt an ordered array of consumers that allows them to establish a sequential criteria of decision so that each consumer is only concerned with the consumption of the consumer placed above him. Other authors assume the presence of an upper class or a distinguished agent that lower classes or anonymous agents try to emulate. Pollak (1976a) discusses both assumptions pointing out their implications for aggregate demand. Formally, he adopts the following demand functions,

$$x_{i,t} = x_{i,t}(x_{j,t-1}) \quad \text{with } i < j \text{ in an ordering } 1, 2, \dots, N$$

and

$$x_{i,t} = x_{i,t} \left(\sum_j x_{j,t-1} / U \right) \quad \text{with } i \in (1, \dots, L) \text{ lower class}$$

$$j \in (1, \dots, U) \text{ upper class}$$

The first function is based on a hierarchy but it implies results that are similar to the model with symmetric agents and habit formation processes. The only difference is the relevance of the distribution of past consumption that influences the individual consumption pattern. The same is not true for per capita demand functions. In the two-class models, the distribution of expenditure between classes is the most significant but the demand of the lower class depends on the average past consumption of the upper class. If the behavior of the upper class is determined by a habit formation process, we can easily see that results are similar to the hierarchy model.

Pollak's first model can be newly interpreted employing a new concept drawn from information economics. According to Bikhchandani, Hirshleifer and Welch (1992), imitative processes can be represented through a sequence of actions called informational cascade, where at some stage it is optimal for an individual to ignore his own private information and to take decisions only on the basis of the past decisions of all those individuals placed before him in the sequence. The crucial condition is that each individual observes a conditionally independent signal concerning the value to infer, or the consumption pattern to imitate. In this context, if a sufficiently long

sequence of individuals makes the same decision, the other individuals conform to it regardless of the signal received and begin an informational cascade.

The two-class model has been developed by Karni and Schmeidler (1990) in a game theoretical framework. They introduce a utility function implying that the preferences of the agents of the upper class for a certain consumption pattern increase (decrease) with the number of agents of upper (lower) class that adopt the pattern, while the preferences of the agents of the lower class increase with the number of agents of both classes that adopt the same pattern. It is possible to show that these assumptions can imply a cyclical equilibrium play as those usually associated with fashion but also other patterns of demand variation. Despite this indeterminacy, Karni and Schmeidler's model allows us to confirm both Pollak's idea that in the models with two classes the distribution of expenditures is relevant and Granovetter and Soong's suggestion that the introduction of externalities in consumption theory makes any conclusion about equilibrium indefinite.

But there are at least other two problems in these asymmetric models. The first is to define who influences whom and to make the social order dynamic through a transition rule from a class or a position to another. As regard the choice of a hierarchy and the limits of classes, whatever criteria may be chosen, the ensuing analysis would be, to a large extent, arbitrary because the results greatly depend on sociological and psychological arguments. The second problem is discussed by Scitovsky (1986) who points out how the upper class - or the distinguished agent - has no superior example to emulate. To provide a solution to this flaw,¹⁴ Scitovsky argues the following point: "To secure status therefore, the rich must not only have the money to outspend others, they must also manage to spend it well: in ways that others regard as superior and desirable, and set an example worth following. To resolve that problem requires that crucial ingredient of many, perhaps most enjoyable activities: the right degree of novelty" (Scitovsky 1986, p. 201). But this suggestion raises the question as to how the degree of novelty can be meaningfully defined. Pollak (1976a) adopts an opposite view assuming that the upper class or the distinguished agent follows a habit formation process. However, it seems that any definite answer has to rely on some principle or theory drawn from the social sciences in general. This impression has to be extended to the whole literature discussed here. It is clear indeed that, notwithstanding the many problems - especially the presence of chaotic and weak equilibria - caused by the appearance of asymmetry among consumers, these models

¹⁴ A solution may be given by Schumpeter's version of the consumer innovator miming the entrepreneur innovator and as this last finding a better solution not only for himself: "But he also triumphed for others, blazed the trail and created a model for them which they can copy. They can and will follow him, first individuals and then whole crowds" (Schumpeter 1934, p. 133 quoted by Jonsson 1994).

show that in order to gain insight into models with interdependent preferences, it is necessary to introduce in economics some explicit assumptions about social structure.

V. CONCLUDING REMARKS

Even if it is not the intention of this paper to cover all theories of consumer behavior including endogenous tastes but rather to survey a part of theoretical economics where this idea has been developed and discussed, a striking impression received from this study is that there is not a structured approach to the case but only alternative approaches, not gathered in an unified system yet. In the closing sentence of the foregoing section, this fragmentariness seems attributable to the lack of a more intense and rigorous interdisciplinary approach to the problem.

A support to this idea is contained in the work of some authors (for example, Scitovsky 1976 and Yaari 1977) that explicitly consider tastes as "preference systems" which the consumer's behavior can be referred to in order to appraise its motivations and "ends" (Etzioni 1988, p. 138). Rather a lot of work has been done recently, starting with Frankfurt (1971) and Sen (1974), on recasting this meaning of tastes in ways that enable us to use the concept of "metapreferences", which relies heavily on moral arguments. For example, Sen (1977, p. 337) defines metapreferences as "rankings of preference rankings to express our moral judgements", clearly showing that his purpose is to make the model of individual choice richer than what is permitted by the only economic discourse. Such an interpretation is confirmed by Hirschman in an article significantly entitled "Against Parsimony". In his words, "the economic approach presents us with too simpleminded an account of even such fundamental economic processes as consumption and production" (Hirschman 1985, p. 7). In order to make economics more complicated, Hirschman has recourse to metapreferences. He claims first that a "taste is almost defined as a preference about which you do not argue - *de gustibus non est disputandum*. A taste about which you argue, with others *or yourself*, ceases ipso facto being a taste - it turns into a *value*" (Hirschman 1985, p. 9), then he argues that metapreferences are the useful concept to describe a change in values. In this way, metapreferences become the tool through which economic behavior turns to depend on moral and extra-economic variables in general.

However, in many models discussed in this paper such an interdisciplinary approach may be obtained without employing moral arguments. Concerning the self-centered representation, it is not satisfactory for example to deliberately ignore a more pathological view of the addict behavior, according to which addiction

necessarily involves personal conflict and inconsistent behavior. A possible way to tackle these issues is to employ the fiction of more selves and then to apply a strategic conception of rationality. Generally, a more realistic view of economic addiction seems to require the knowledge of a set of psychological and sociological concepts largely ignored in economics. These tools become even more necessary if one considers that the processes through which an economic agent determines his levels of aspiration, as those recently considered by the limited rationality models, are usually asymmetric habit formation processes.

Devising interdisciplinary methods for correcting the strong assumptions that underlie consumer theory seems appropriate to the models assuming interdependence among consumers as well. For example, a topic to develop further is the updating of price dependent preferences model in the sense of the Veblen effect. Recent research indeed deals with prices as quality signals. On the contrary, it has been argued (Alcaly and Klevorick 1970) that a clear distinction among the phenomenon of snob appeal and judging quality by price is necessary. For this purpose, Leibenstein's paper may be useful again: "The conspicuous price [that is Pollak's normal price] is the price other people think the consumer paid for the commodity and which therefore determines its conspicuous consumption utility" (Leibenstein 1950, p. 203). The close connection of this definition with game theoretical reasoning require us to employ more psychological than purely economic tools. A last example may concern the explanation of the persuasive effect of advertising. In this regard, Akerlof and Dickens (1982) have recently proposed to recur to the theory of cognitive dissonance, a concept widely employed in psychology. The corollary is again to adopt into economic models an approach more open to the contribution of other social and human sciences.

A final remark is about the elements of consumer theory with endogenous tastes omitted in this survey. The most important is probably the interaction between theoretical and empirical work. The increasing availability of individual level data allows real improvements in the testing of consumer theory with endogenous tastes. But actually the most interesting area of current research is represented by experimental economics. The laboratory simulation of individual decision making has recently originated an impressive quantity of work,¹⁵ that may represent an important source of new ideas and concepts to increase our understanding of consumer's behavior.

¹⁵ For a survey, see Camerer (1995).

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