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Cognitive Economics and Evolutionary Psychology: changes in consumer preferences in a Piagetian context



Maurizio Mistri Departamento Ciências Económicas, Universidade de Pádua, Itália

resumo

résumé / abstract

Neste trabalho, o Autor relaciona a psicologia cognitiva com uma teoria evolutiva das preferências do consumidor. A teoria evolutiva é apresentada como uma teoria do ciclo de vida das preferências do consumidor a que estão subjacentes factores estruturais de natureza psicológica. Esses factores e processos derivam da psicologia evolutiva de Piaget.

Dans le travail présenté ici, l'Auteur veut lier la psychologie cognitive à une théorie évolutionniste des préférences du consommateur. La théorie évolutionniste est pensée comme une théorie du cycle de vie des préférences du consommateur, théorie à la base de laquelle se trouvent des facteurs structurels de nature psychologique. De tels facteurs et processus résultent de la psychologie évolutionniste de Piaget.

In this paper the Author links cognitive psychology with an evolutionary theory of consumer preferences. The evolutionary theory is expressed as a theory of the life cycle of consumer preferences and at the basis of said cycle there are structural factors of a psychological nature. These factors and processes derive from Piaget's evolutionary psychology.



Introduction¹

Though standard consumer theory assumes that a consumer's preferences are given, there are nonetheless clear signs that some disagree with this dogmatic, methodological approach (Katona, 1951; Sen, 1986; Ackerman, 1997). Sharing such doubts necessarily prompts attempts to identify the means by which a generic consumer, j , changes his order of preferences, j , in the course of time; the passage of the latter from a state, $j1$, to another, $j2$, triggers a learning process, whatever the internal and/or external forces that may have contributed towards said change. In other words, if the consumer is rational and if changes of some kind, cognitive and/or environmental, occur that affect the consumer, he adapts to said changes by means of a learning process.

The learning process in general, and the consumer's learning process in particular, represent evolutionary processes by definition, since they are marked by a genuine path dependence due to the fact that subsequent acquisitions incorporate and go beyond those that went before. I agree with Nooteboom (1997, p. 59) in finding it strange that there is no adequate and consistent evolutionary theory of consumer learning. By adequate and consistent theory, I mean a system that considers consumer learning on the basis of an analysis of the forces that model the consumer's attitudes, and thus also his preferences, in the course of time.

In the present context, the concept of learning lacks any evaluative connotations, since psychological science offers us a number of meanings for said concept that has been progressively evolving. In this work, reference is made to these multiple meanings, reconstructed by means of various theoretical stances of psychology, identifying the relationship that can be found between economic and psychological theorization. As a result, the current theories of standard economic analysis on the topic of consumer behaviour reflect a particular moment of scientific elaboration in the psychological field, but they appear totally inadequate with respect to the more advanced psychological scientific thinking, and they reveal little attention to the debate underway on the learning process and on modalities for its modelling. It is worth noting, moreover, that — after Simon's «revolution» (1976) — even the economists have begun to use new conceptual schemes borrowed from the cognitive sciences. I refer not only to the modelling methods incorporating bounded rationality, but also to the modelling that refers to connectionist patterns, such as neural networks (Salmon, 1995) and genetic algorithms (Dawid, 1996). The use of these conceptual schemes, however, and of the models that derive from them, is by no means neutral with respect to the way in which we conceive and represent learning by economic subjects, starting with the consumer, intended as an emblematic subject that elaborates information and makes decisions designed to maximise his generic utility function, u_j .

The learning process and changing preferences

The modelling of the consumer's learning processes must therefore pay attention to the logical structure of the underlying theories on learning; that is tantamount to saying that, just as there are numerous learning theories, there are equally numerous methods for modelling the learning process. As a result, when he uses a model, the economist must be aware of the theory that lies behind it.

The analysis of change in consumer preferences is a significant field for the application of learning theories and enables exploration of the complex links between the numerous evolutionary processes. Some of these processes concern the individual, while others concern the set of social and emotional interactions existing between different social groups, be they institutional or *ad hoc*, that shape the individual's attitudes and consequently also his preferences.

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In fact, changing preferences always represent a modality for fine-adjusting said preferences and are the outcome of multiple efforts that interact with each other — sometimes converging, sometimes conflictual. In a sense, the individual (i.e. the consumer) evolves due both to an intrinsic evolutionary capacity and to his opportunity to be exposed to «external» influences — and on this point it may be worth recalling, as Ackerman did (1997, p. 653), that the consumer is not an island. Internal forces and external forces identify the two main levels on which the processes that model the individual's attitudes and preferences are investigated. The internal forces involve the subject's cognitive structure in relation to his *hardware* and any change in his attitudes takes practical effect through a change in his cognitive structure and becomes apparent with time (the analysis of this process owes much to Piaget's theorization on the matter of evolutionary psychology). The individual is affected by his own evolutionary progress in his capacity for representation of the world and for conceptualisation; this process is analysed by evolutionary psychology and finds its theoretical foundations in the evolutionary epistemology developed by Piaget (1950) and his school, that assigns considerable importance to the period of life that goes through various cognitive phases from birth to adolescence. It is worth adding that Piaget's approach was subsequently criticised, including his assumption that the evolutionary process ended with adolescence. Criticism also concerned the exact correspondence between cognitive phases and periods of an individual's life (Levorato, 1993). These and other objections are important and aim to revisit the structure of Piaget's contribution, to the point of suggesting that the evolutionary process continues throughout the subject's life. The logic behind Piaget's approach — according to which the individual lives through a process of punctuated cognitive evolution — is retained, however. At the same time, to claim that a person (and hence also a consumer) is not an island means accepting that he is influenced by dynamics of a social order. In this sense, it is worth returning to the contribution from Veblen (1899) and along this line of reasoning we can place the interpretative current of interdependent preferences. The consumer's evolution is therefore also due to the effect of social interaction and to the force of the social fields in which he is immersed, to use a concept borrowed from Kurt Lewin (1948), that we shall return to later.

What interests the economist is that the individual cognitively evolves in stages, and that each stage coincides with a specific cognitive structure (Miller, 1983). This process is coupled with the evolution induced by his relationship with the social groups to which he refers. An analysis of the influences of his social references takes shape in a study of the so-called interdependent preferences; on interdependent preferences, readers can refer to Hayakawa and Venieris (1997), Iannacone (1989), Leibenstein (1950), Pollack (1976), Ragone (1993), among others.

Stability versus change in the consumer's preferences

If we assume that the consumer's preferences are given and that they cannot undergo change, it necessarily follows that there can be no learning processes.

The assumption that preferences are stable can be considered as the consequence of a need of a heuristic order, or as the logical outcome of a compact theoretical position of a psychological nature. For example, it was von Weizsacher (1971, p. 346) who spoke in this sense of a useful «heuristic artifice», while Streit and Werner (1992, p. 127) claimed that the assumption that preferences are stable is a necessary condition to ensure the existence of a competitive equilibrium, on the basis of a hypostatisation of the perfect knowledge of agents lacking any computational restraints. Over and above the instances advanced by a strictly evolutionary approach to preferences, a significant criticism of the hypothesis of stable preferences comes from the work by Kahnemann and Tversky (1979), in the context of a program of research on the foundations of the theory of expected utility. There is now a good deal of literature on the overthrow of preferences and this is attached to the relevant question of the dynamic consistency of the consumer's choices in conditions of uncertainty (McClennen, 1990).

Woo (1992, p. 63), on the other hand, suggests that the assumption that preferences are complete and stable fits into the epistemological pattern that deprives the economic calculation of any psychological connotation. The deprivation of the economic calculation of any element of psycholo-



gism takes a long, complex path, as Shira Lewin (1996) explained. An important step in this path is represented by the work of Pareto (1906, p. 113), whose theory of ordinal preferences is designed to rule out any psychological explanations. For Pareto, ordinal preferences demand no psychological justification; they are the synthesis of empirical regularities deriving from choice-making behaviour.

After Pareto, further contributions reinforced the position of the ordinalists, whose fundamental concern was to explain consumer choices in terms of quantity and price. After S. Lewin (1996, p. 1310), it could be said that the approaches of Slutsky (1915), Hicks and Allen (1934), and Samuelson (1948), though they rule out any hedonism, are obliged to adopt some psychological conception, though this is not developed in terms of the creation of orders of preferences «revealed» by concrete acts of consumption. In fact, for Samuelson, it is in the purchasing acts that we find a concrete explicative content, whereas preferences can only possess this quality if they are derived from the demand function. The economic analysis thus depends exclusively on observed behaviour. The preferences being revealed may represent reactions to specific stimuli created by the prices and quantities, along the lines of that behaviourist conception that remains, after all, at the foundations of the neoclassic approach. From this stance, interest in the topic of learning appears somewhat limited because it is hemmed in by the very way in which such a process is considered.

In my opinion, there may generally be a biunique correspondence between changes in preferences and learning, in the sense that a change in the order of preferences is always the consequence of a learning process. The most straightforward case is that of a change in preferences based on new information.

In the framework *à la* Samuelson, learning remains within the structure of the market equilibrium model; it is translated into an adaptation of one of the quantities (prices/quantities) to changes in the other. It is a matter of a theoretical order entirely consistent with the theoretical foundations of behaviourist psychology, the learning concept of which is essentially mechanistic. The way in which behaviourist psychology considers learning relies on the assumption that a relationship exists between stimuli and reactions (Watson, 1930; Pessa, 1997, p. 315) — so a consumer prefers certain products to others because he is capable of assigning a subjective value to the reaction prompted by a given stimulus. Economic science therefore seems to have no need for any learning theory because the consumer is already armed with the competence he needs for assessing the relationship between a stimulus and its consequences.

The behaviourist approach represents a reaction to the hedonism of the early utilitarian economists and we find behaviourism being opposed to hedonism in psychology. Hedonism coincides with a certain idea of «innatism», so the needs represent impulses that a person naturally possesses and that he can satisfy by means of certain acts of consumption. In an innatist logic, there are no genuine learning processes.

In psychological science, the innatist approach was followed by the behaviourist and the latter was followed by the approach definable as *cognitivist*. The difference between the two approaches lies in their explanation of the learning process. Today, the theoretical and experimental models used to study the learning processes can be said to be separated into two classes, i.e. those of *behaviourist inspiration* and those of *cognitivist inspiration* (Pessa, 1997, p. 313).

As already mentioned, the former are based on the conception of psychology as the study of behaviour and of stimulus-reaction connections, while the latter emphasises the role of the organism and of the internal processes that elaborate the information, mediating between stimulus and reaction. This latter conception of learning appears more plastic and more flexible than the behaviourist approach and poses the problem of the complexity of the interactions between the structure of the mind and the structure of the information.

***Punctuated changing preferences and evolutionary psychology.
Cognitive technologies.***

In the introduction, I mentioned the role of attitudes, whose modelling over time gives rise to preferences proper. In fact, the concept of attitude, such as it has come to be intended in psychological science (Arcuri, 1991) enables light to be cast on the evolutionary processes behind preferences. Thomas and Znaniecki, the first to use the concept of attitude, define this as an individual mental process that determines both the actual and the potential reactions of each individual to the social world. Since an attitude is always aimed towards some object, it can be defined as an individual's state of mind in relation to a value (Thomas and Znaniecki, 1918, p. 21).

This approach expresses the cognitive dynamics of attitudes, both individual and social, each of which follows its own evolutionary course. In cognitive terms, this course is marked by the individual's psychological development, which goes through various stages marked by the progressive acquisition of abilities, through an ongoing structuring of the cognitive processes.

This is the content of the epistemological contribution of Piaget (1950), whose genetic epistemology charts the course of these cognitive phases, especially in the young person. The importance of Piaget's work, for our purposes, lies in the fact that it defines a «cognitive life cycle» for the individual, who progresses from one stage to the next. During these various stages, the person's processes of cognition and categorisation, and thus also his computational structures, become established. A set of such processes can be labelled as a «cognitive technology», to use an expression coming closer to the economist's scientific background. Basically, a cognitive technology comprises the methods an individual uses to elaborate, interpret, classify and memorise information. These methods evolve over time according to schemes that possess an intrinsic topological stability. According to Piaget, the essence of cognitive development lies in structural change, a change that occurs on a level of schemes, regulations, functions, and logical and mathematical operations. The structural change lends meaning to and influences the content of thought (Miller, 1983, p. 80).

In a sense, the evolution of cognitive technologies echoes the evolution of manufacturing technologies, a topic amply studied by the evolutionary economists. The similarity lies in the fact that a higher cognitive level «exceeds» all the lower cognitive levels that precede it; at the same time, just as more advanced and less advanced manufacturing technologies can co-exist in the manufacturing world, there may also be higher and lower cognitive structures co-existing in the world of cognition. On the other hand, a strong element of diversity lies in the fact that, in the manufacturing world, the higher technologies are circulated between enterprises and a new enterprise does not necessarily trace the path covered by technological evolution. In the world of cognition, however, the cognitive evolutionary process is repeated every time in each individual. At each cognitive step, the subject learns to use a new cognitive technology, sometimes abandoning a previously-adopted cognitive technology. It is worth noting that the person's cognitive structures remain constant during each of the stages, giving rise to a sort of sequence of punctuated cognitive equilibria. Of course, every stage absorbs and goes beyond the previous one, with no chance of reversibility — and that is why a dependence path is configured, as mentioned earlier.

Piaget's genetic epistemology was originally oriented towards defining the cognitive stages in young people, as if by adulthood the person had acquired a stable cognitive system, becoming unsusceptible to further changes in his cognitive structures. In fact, more modern research identifies an ongoing process of cognitive evolution, albeit in much lengthier stages than those characteristic of childhood and adolescence (Farneti, 1998, p. 258). A sequence of such stages cannot fail, nonetheless, to induce changes in the individual's attitudes — changes that can consequently lead to changes in his preferences.

Legrenzi and Salmaso (1991, p. 138) claim stoutly that there is a link between attitudes and consumption choices; attitudes have a dual role in consumption choices, however. The first is of a cognitive type, in that it helps to lend consistency to categorisations in the context of a given dominion of goods. In fact, we know that individuals retain only a part of the stimuli that they





receive from their environment because of their limited ability to process the vast amount of complex data available. The individual is capable nonetheless of identifying objects and attributing them a significant structure on the basis of defined attributes or characteristics (Hewstone *et al.*, 1988).

The second effect of attitudes lies in the fact that they can play a significant part in facilitating social interaction because it is through attitudes that the individual expresses values and seeks social approval (Legrenzi and Salmaso: 138). In this context, preferences represent an operational processing of the attitudes, inevitably influenced by the way in which the latter have evolved. On this point, it is worth noting that standard consumer theory reduces attitudes to mere preferences (depriving them of their evolutionary history) and also reduces preferences to cognitive structures that, in Piaget's epistemology, can be defined as a set of abstract mental operations organised into logical-mathematical systems (Miller, 1983).

Social influences and the Lewinian field

So far, we have seen that *j*'s attitudes change due to changes in his cognitive structures, according to Piaget's genetic epistemology, and we have also mentioned the changes that can occur in a person's attitudes as a result of influences brought to bear by the social environments in which he lives, with changes in the nature of the links that connect the individual to his social context. It is in this particular context that we find the contributions of social psychology and economic science has offered a few, important contributions. On the social psychology side, it is assumed that the consumer, *j*, is immersed in a system of complex social relations, one for each social group that he refers to and/or belongs to, and he remains exposed to their modelling dynamics. «Modelling» is used here in the sense of learning through observation of the behaviour of others (Hewstone *et al.*, 1988). The intensity of his relationship with each group changes over time, so the structure of what Kurt Lewin (1942) called the subject's field of relations also changes with time. Lewin uses the term field to mean the life space of a person with his environment. Just as the *j*'s cognitive structures vary with time, we can legitimately assume that the structure of his field will also vary.

For example, the structure of *j*'s psychological field will change progressively as the strength of his relationship with the family (a fundamental institution in which primary cognitive structures are developed) diminishes and the strength of his relationship with other institutions, however informal, increases. Step by step, his preferences will change because the structure of the modelling forces changes. On this point, it seems worth returning to K. Lewin himself, who points out that needs can be modified on the basis of changes that have taken place anywhere in the psychological field due to changes in the infra-personal regions, due to changes affecting the levels of both reality and unreality, and finally due to changes in the cognitive structure of the psychological future and past; this is consistent with the fact that the whole of a person's life space be considered as a field whose parts are interconnected (K. Lewin, 1948).

Not only social psychology, but also marketing theory emphasise the role of imitation, of the need for gratification, of the sense of belonging, in forming an individual's attitudes. Following Veblen's lesson (1899), economic analysis certainly cannot remain indifferent to the role that social institutions have in modelling consumption patterns. Akerman (1997) identifies the red line linking the approach of important critics to the theory of the stability of preferences. For instance, Duesenberry (1949), in explaining the progressive decline in the ratio of savings to income, comes to identify the reason for said phenomenon (which represents a falsification of the hypothesis of the stability of preferences) in the existence of an interdependence of preferences and in the creation of habits or inertial forces; the outcome of such a social interdependence is the effect of demonstration. A similar effect appears significant, because of its distorting consequences, in the analysis that Nurkse (1953) made in his theory of underdevelopment; equally significant is the contribution from Leibenstein (1950) on social entrainment effects and Hirsch's work (1976) on the topic of positional consumption.



A comment on the role of the family

Among the parts comprising the consumer's psychological field, the family must be considered both for its primary institutional role and for its role in modelling the cognitive patterns that superintend the development of preferences. The family's modelling of consumption patterns in the young person certainly takes place in various ways, including imitation and the sense of belonging in particular, bearing in mind that in early life the young person is not yet an independent subject capable of purchase decisional processes. His parents decide for him and try to make him acquire a certain system of tastes. It is common for the family to have an effect of psychological reinforcement by means of coercive systems (Patterson and Reid, 1984).

It is only in a subsequent phase, when the young person's cognitive maturation cycle has been completed, and when the influence of other social reference groups begins to make itself felt, that the young person begins to question the basket proposed by his family. However, psychologists who study the family currently agree that this is a highly plastic institution, where conditioning influences are pluri-directional. There is an abundance of psychological, but also of anthropological literature on the role of the family, while the economic literature appears to be distinctly limited, despite the importance of the family institution in economic processes. It is common knowledge that standard consumer theory assumes that purchasing and consumption decisions are made by single consumers, seen as genuine economic atoms possessing their own independent preference functions. It is more realistic to say that many purchases, and especially the more conspicuous ones, are decided at family level, so it would be better to speak of a family preference function, which is not necessarily the sum of its components' individual preference functions. This preference function represents the outcome of a collective decisional process that sees the family as a fundamental unit of expenditure, also as a result of the fact that, given the complexity of the interactions produced at family level, purchasing decisions very often represent the outcome of a cooperation capable of inducing changes in the utility functions of single members of the family. That the family is the fundamental unit of expenditure is borne out by numerous statistical investigations on consumption that generally relate to the family budget.

Attributes of goods and the learning process

In the context of the behaviourist framework, the consumer reacts exclusively to stimuli represented by variations in prices. In said context, in fact, *j*'s cognitive structures are given, they do not evolve and they are not exposed to field influences. A similar approach fails to take adequately into account the individual's cognitive evolution, or the social and behavioural influences that can come to bear on him. In fact, it has been assumed so far that the economic behaviour of a subject, *j*, is determined by his cognitive technologies (CT) of Piagetian derivation, that evolve in the time, *t*, and by the system of relations of Lewinian type with the social reference groups A, B, ..., W, which can be represented as a vector **Gs**, the weights of which (pA, pB, ..., pW) indicate the weight of each relation that changes, as we have seen, with time. The vector for the *relations of the Lewinian field* can be represented as follows:

$$[1] \quad \mathbf{G s} = \begin{bmatrix} pA, \\ pB, \dots, pW \end{bmatrix}$$

Assuming that the changes are punctuated, i.e. that they take place in steps coinciding with given periods (ti), where i=1,2,...,n, we can then write **Gs**(ti).

The attitude, *a*, of *j* will belong to the set of possible attitudes Ak, where k=1,2,...,n, obtained from the Cartesian product:

[2] CT **Gs** (ti)



Each period, t_i , coincides with a precise value of the Cartesian product that will be called «the attitude» of j , on which his preferences depend. The structure of G_s , as we said before, changes progressively with time, as the respective weights of his relations with the social reference groups change.

The possible combinations are numerous and give rise to a very large number of possible attitudes and consequent orders of preference, defined by a certain cognitive state of j . It goes without saying that if a subject passes from one cognitive state to another, the way in which he represents and classifies single products changes. This change can be indicated in the representation of the goods as a form of evolutionary learning for j . The representation and classification (or categorisation) constitutes one of the fundamental topics of investigation for cognitive psychology. Our problem is not only how to represent the product itself, but also the product combined with the utility that j can draw from it. Since, in order to construct his own order of preference, j , j must arrange the existing or hypothetical goods in order, two by two, and since said procedure can only take place in the course of time, he must possess a system for memorising the attributes of the goods that enables him to recall the cognitive structure of each product when he performs his binary comparisons.

Such a system of memorisation relies on the existence of some method for categorising and coding the goods. A hypothesis amply used by marketing theory experts categorises the product on the basis of the attributes that can be assigned to it. A product can thus also be represented as a vector product,

$$[3] \quad \begin{array}{|c|} \hline [p, p, \dots, p] \dots \\ \hline \dots \\ \hline \end{array}$$

where: p, p, p respectively represent the weights of attributes, ..., as coordinates.

The weight of each attribute varies as a function of change in j 's attitudes according to [2]; establishing the weights, p, p, \dots, p , may not always be a straightforward problem, in the sense that — before he can decide what weight to assign to each attribute of a given product, the consumer j must perform some experiments in order to classify the product concerned as accurately as possible. This is the sense of the contribution from Khilstrom, Mirman and Postlewaite (1984) who consequently speak of an *experimental* consumer. Experimental in the sense that through the repeated use of a product he adjusts the weights to attribute to its features, using a strictly Bayesian technique (Mistri, 1996; 1998).

Clearly, such a learning modality can be usefully represented by modern connectionist techniques, that link the new behavioural patterns to the material architecture of the cognitive machine. It is in just this direction that connectionism moves, researching into learning in terms of adaptation of said architectures. According to the connectionist approach, cognitive processes have to be considered as emerging entities, inasmuch as they are the effects deriving from the cooperation of a large number of elementary constituents. The resulting models are essentially of the kind describable as «neural networks», in which the capacity to represent situations or values is determined by the modalities of change in the connections between basic cognitive units, or neurones.

The applications of neural networks to economic analysis are beginning to acquire significance, especially in the context of their application to the problems of forecasting. In the present context, it is important to emphasise that neural networks can be used to represent both the phenomena of learning by imitation (and thus determined by the influence of the sections of a Lewinian field), and the phenomena of independent learning (such as those consequent to Piagetian evolutionary processes). The phenomena of learning by imitation can be represented using «supervised learning» neural networks, whereas independent learning phenomena are representable by means of «unsupervised learning» neural networks.

Conclusions

In this contribution, I have attempted to offer a totally evolutionary representation of the changing preferences of a generic consumer, j , meaning by *evolutionary* a process that represents the coupling between two processes in evolution: one describes what we could call j 's cognitive ontogenesis and the other describes what we could call the filogenetic process of the culture and technology of the society in which j lives. An ontogenetic process concerns the individual and his personal history, while a filogenetic process describes the varieties that can be adopted by society.

As we have seen, the structural element of the ontogenetic process is represented by the sequence of cognitive stages of Piagetian type, whose coupling with the states of the world expressed by the filogenetic dynamics can give rise to a vast range of changes in preferences. For a full explanation of the concept of evolution in economics, the reader should refer to Hodgson (1994).





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