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BEYOND RATIONALITY: IMAGES AS GUIDE-LINES TO CHOICE

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Abstract: *in this paper I will discuss a representation of the decision-making process that is based on images production, exploration and exploitation, in order to propose theoretical refinement of the link between decisional behaviour and mental images in economic contexts. To do so, I will start by shortly presenting Beach and Mitchell’s model (1987). I will then extend it to economics, by comparing its implications with those deriving from two more traditional approaches, both the neoclassical one and those recently derived from Simon’s bounded rationality theory. The most significant consequences of an image-based model appear to be: i) wider cognitive foundations for the decision process; ii) the need to extend the concept of rationality by enlarging its relationship with that of imagination; iii) a new and fuller “image” of the economic agent.*

1. INTRODUCTION: THE HISTORICAL BACKGROUND

Traditionally, the economic analysis of decision processes has been dominated by two theoretical paradigms, the neoclassical one whose mathematical foundations were originally proposed by Arrow and Debreu (1954), and the one started by Simon’s contributions on bounded rationality and problem-solving (1947; 1955; 1956; 1957; 1981; 2000). They have both been enriched and extended in the last three decades.

As well-known in the Arrow-Debreu world rationality is identified with a methodological strategy that consists of solving maximization problems. The representative agent’s decision process can be broken down into three logical steps (to simplify, we do not take any time dimension or uncertainty structure into consideration): he draws a list of all the possible decisional options; he figures out the consequences of any option; he then compares these expected implications and chooses the option whose consequences maximize his utility.

Simon has strongly criticised this approach by pointing out the binding and unrealistic hypothesis on which it depends. It requires complete and perfect information, while the last turns out to be

usually only partial, not without cost and not even always detectable. It is calibrated on a representative agent with unlimited computational and predictional abilities, while the human mind, and even expert systems, face serious structural limitations to their “power”. Due to the intrinsic limitations, human mind performances cannot fit the standards of such “olympic” perfection and consequently the economic agent, when faced with a problem, will find solutions commonly not optimal but “satisficing” according to his subjective and modifiable aspiration level.

Within Simon’s contributions, once the need to study the decision-making process in interdisciplinary terms by integrating results achieved in economics, cognitive psychology, neurobiology and artificial intelligence is understood, the exploration of the psychological dimension in economics has been forwarded at different depth levels (Devetag 1996).

Experimental studies, mainly initiated by Kahneman e Tversky (1979; 1986; 1992), appear to be innovative for many aspects but are still challenged by the attempt to leave the conceptual frame within which the experiments have been contextualised and interpreted substantially unmodified. It exhibits “varying degrees of departure from the standard model, while still maintaining a somewhat similar conception of the decision maker as (imperfect) utility maximizer” (Devetag 1996, p.57).

From this point of view the emergent perspective in a cognitive approach to economics is rather different; it is identified by the search for microfoundations to individual and collective behaviour in the functioning mechanisms of the mind. The most significant root of this approach can be found in Friedrich A. von Hayek’s work. In 1952 he published “The Sensory Order”¹, a book concerning the psychology of perception that, once “rediscovered” by the economists in the early seventies (Agonito 1975), became the corner stone of a totally innovative conception of the economic agent, no longer anonymous but characterised by his neuronal structure and personal living (Rizzello 1999). In the ample study that has progressively developed from this text and its implications, surprisingly little attention has been devoted to the topic of imagination. It is our aim to outline that, on the contrary, it plays a crucial role in the decision-making process.

The paper is structured as follows: in section two we present a psychological model elaborated by Beach and Mitchell (1987), known as “Image Theory”; in section three we show that imagination is not a new tool in economics but has received much attention from important economists, among which are Boulding and Schackle; in section four an extension of “Image Theory” to economics is proposed. We compare an image-based approach with those traditionally recurrent in the literature in order to outline the most significant differences; in section five we explore the implications of

¹ The author worked on this book for more than twenty years. He argued that mind is a framework that orders perceptual stimuli through act of classification and interpretation; the meaning that we attribute to sensorial data depends on both the genetic structure of the brain and on personal experience accumulated throughout life: the integration of these two factors constitutes the neuropsychological dimension of human diversity. Many recent studies have supported Hayek’s ideas (Damasio 1995; Fuster 1997; Paller 2001).

our proposal with reference both to the concept of rationality and to the definition of economic agents. We then summarise the main results.

2. IMAGE THEORY

2.1 A Quick Glance

Image Theory was proposed by the psychologists Beach and Mitchell in the middle 80s as a descriptive theory of human decision making in which individual knowledge is represented through mental images. When faced with a decision problem, the decision maker refers to four images:

1. the *self image* which consists of personal values, beliefs, ethics that guide one's adoption (or rejection) of goals and contribute to the generation of potential new ones;
2. the *trajectory image* which is a mind picture of one's desirable future, given the self image;
3. the *action image* which basically consists of the plans (intended as sequences of actions) currently used by the subject to achieve his goals;
4. the *projected image*, which mirrors the expected future (in terms of the anticipated results of plans), if one persists in the plans currently adopted.

A decision consists of adopting or rejecting new candidates as constitutive elements of one's images ("adoption decision"), or of evaluating whether progress towards goals has been made or not ("progress decision"). Decisions are made according to two evaluative criteria, one based on compatibility and the other on profitability. As a result of the compatibility test, a candidate is rejected for adoption if the number of its violations of the relevant images constituents exceeds a subjective rejection threshold: in other words, it is rejected if its compatibility turns out to be too low in the personal evaluation of the decision maker. Among the compatible candidates, the one which maximizes the chance to reach the desirable goals is selected: it is in fact the potentially most profitable candidate.

The main contention of Image Theory is that the foundation of individual decision making has to be found in the compatibility desire with one's self-image; this desire causes human actions as much as the attempt to avoid self conflict acts as a guideline².

The basic ingredients of a choice problem include individual images and the problem frame. The latter is not regarded as exogenous or external to the subject's mind, nor it is seen as an ad hoc conceptualisation built to face the decision at hand. Its constitutive elements are already included in

² "Whatever one's principle may be, they are the foundation of one's decisions (...). Our contention is that the motivation for profit, for gain, for advancement, and the values of outcome that contribute to them derives from the degree to which those outcomes promote and comply with the decision maker's principles. It is compatibility that is the key" (Beach 1998, p.9).

the decision maker's mind as parts of his images and undergo a process of selective recalling and exploitation. In this phase of creative re-thinking, previously unseen connections among them arise: as a result they are reorganized in the new narrative texture which best fits the decision context, according to individual interpretation. The endogenous frame which is so generated originates from the images and becomes an instrument that endows the external situation with meanings.

2.2 The Image Theory Subject: a Fuller Inquiry

In Beach and Mitchell's analysis³ (1987) many isolated attitudes of the decision maker are underlined but a synthetic portrait of his abilities and cognitive features is not explicitly developed. According to our interpretations, the "Image Theory's subject" could be described as follows.

- He has personal beliefs and basic values that are organised in a network of connections and built up over time; those principles are time dependent variables in two main respects, first because they appear to be a product of the individual history and, as such, they exhibit path-dependence⁴; secondly because they can be regarded as dynamic and continually exposed to change. Their structure in a specific time point is like a photograph which, from the history flow, extracts an instantaneous description of the developmental stage reached by individual evolution.
- He uses his imagination at least as much as his rationality.
- He has reasonable expectations on his future but also desires and dreams about the life he would like to be his own one.
- He has an innate ability to build imaginary scenarios and to regard himself as a part of them.
- He is able to change his self image throughout time.
- He needs "stories" more than single data. In taking a decision he does not examine a list of disconnected information but imaginary plots embedded with emotions and affective dispositions.
- He tries to avoid conflict and to act in coherence with his personal living.

³ An interesting extension to organization theory was proposed by Mitchell, Rediker e Beach (1998) stemming from the idea that each organization has its own "identity" and acts to preserve it. From this point of view they share Selznick's following opinion: "The study of institutions is in some ways comparable to the clinical study of personality. In both personality and institutions, "self-preservation" means more than bare organic or material survival. Self-preservation has to do with the maintenance of basic identity, with the integrity of a personal or institutional "self"."(1957, p.141). Organizational identity, as well as individual identity, can be described with reference to four images: the organizational self-image, the organizational trajectory image, the organizational projected image and the organizational action image. A relevant meaning is attributed by the authors to the mechanisms of resistance to change, as much as to the role played by "doubt" and its appropriate expression in organizational contexts.

⁴ Path-dependency is a conceptual category which refines the intuitive idea that "history matters"; it was first found in natural history and then extended to social sciences and mainly to economics (David 1985; 1990; 1997; Arthur 1988; 1989). "This concept implies that every successive act in the development of an individual, an organisation, or an institution is strongly influenced by, and dependent on, the path (experience and evolution) previously covered" (Rizzello 1997).

2.3 Tests and Experimental Results

As already mentioned, decisions are made on the base of two evaluative criteria, the compatibility between candidates and already adopted principles, and the potential profitability expected from each of the compatible candidates. Both these criteria are implemented through computational tests. The compatibility test can be applied both in the case of an adoption decision and in that of a progress decision. In the first situation it evaluates compatibility between the desirable future (as mirrored in the trajectory image) and the future expected as a consequence of the selected plan. The logic of the test is the same in both cases and consists in computing the candidate violations to the existing images; violations are defined as contradictions, inconsistencies and more generally interference with the image's constituents. The test can be formalized in the following way (Beach 1998):

$$I = \sum_{t=1}^n \sum_{c=1}^m W_c V_{tc}$$
$$V_{tc} = \begin{cases} -1; \\ 0 \end{cases}$$

where compatibility I is 0 in the case of no violations and decreases as the number of violations increases; t is a candidate feature regarded as significant; c is an element which characterizes the image; V is a violation of c by attribute t ; W is the weight attached to the element c in consideration of its subjective relevance. Violations are in the form all-or-one (-1; 0) and then cannot be graded, nor can one violation be compensated by another one.

When more than one candidate survives screening, the decision maker will select the one which offers the highest expected profitability. This second evaluation recalls the traditional choice procedure based on the maximization of expected utility but, differently from the latter, it takes place only at a second stage of the decision process, among those candidates which fulfilled compatibility.

3. IMAGINATION: A NEW TOOL IN ECONOMICS?

If we look back into the history of economic thought in search of "old roots" for "new interpretations" we find that imagination has been included among the basic ingredients of economic decisions for more than one century by theorists of world fame (Boulding, March, Schackle), although almost completely neglected in the traditional decision-making theory. In a recently published article Augier and Kreiner (2000) include imagination among the cognitive categories which are relevant in the choice process and analyse its relation with the concept of

rationality in Schackle's, March's and Simon's work. Their investigation has the remarkable merit of bringing back an important theme into the debate, but also indicates that many aspects of its link with decisional behaviour are still unclear or only intuitively grasped. One author that Augier and Kreiner do not take into account is Kenneth Boulding who dedicated an entire book to the topic. In this section we would like to sketch briefly his main ideas and also those of Schackle.

3.1 Time and Imagination in Schackle's Thought

“Reason unfolds the meaning of the premises. It can do no more” (1972)

According to Shackle, human knowledge is structurally bounded⁵: the most significant duty of consciousness unfolds in its enrichment, while imagination makes up for its permanent insufficiency. In this first meaning, imagination concerns the unknown future or the partially known present; we will point out that, as a modality involved in the creation of “visions”, it also concerns the past⁶, for example when an agent looks back to happened events and organizes them in his own picture of “how things have gone”. An analysis of time as an important theoretical concept is the main foundation of Shackle's (1972) critique of neoclassical economics; if the future cannot be fully known and foreseen, instrumentally rational choice turns out to be nonsense⁷, as we take decision options whose consequences are not predictable into consideration. Therefore, to my knowledge choice does not imply the selection of a predetermined scenario among the many accessible, *“it consists in first creating, by conjecture and reasoned imagination on the basis of mere suggestion offered by visible recorded circumstances, the things on which hope can be fixed.(...) Only when novelty is eliminated and all is known can reason be the sole guide of conduct”* (Shackle 1972, p.96). This “constructive” approach to choice options is rooted in continuous feedback between external (with respect to the decision maker's mind) data and individual expectations, as far as the actual realization of each future event is influenced by its previous expectation (Shackle 1972, p.231).

Although choices mainly take place among imagined experiences, imagination cannot be mistaken with pure fantasy, as it is constrained by individual knowledge and individual perception of what

⁵ “ This insufficiency of knowledge is permanent and part of the nature of things, for consciousness consists precisely in the continuous gaining of knowledge. (...) The history-to-come which will flow from men's decisions is non-existent until those decisions themselves are made. What does not exist cannot be known. The future is imagined by each man for himself and this process of the imagination is a vital part of the process of decision” (Shackle 1972, p.3).

⁶ “Imagination of the future, like imagination of the past, are devices for living in the present” (March 1995, p.427).

⁷ “The paradox of rationality is that it must concern itself with choosing amongst things fully known; but in the world of time, only this is fully known which is already beyond the reach of choice, having already become actual and thus knowable. Rational choice, it seems, must be confined to timeless matters” (Shackle 1972, p.245).

may be possible⁸. The imaginative process can be broken down into two phases: the first includes the whole flow of thoughts (mainly represented in a visual form) while the second is based only on those “visions” regarded as being *deemed possible* (Shackle 1983).

In his analysis Shackle develops a concept which appears to be analogous to that, more popular among economists, of “*bounded rationality*”, and that could be defined as “*bounded imagination*”⁹. In fact he acknowledges that imagination is a constrained cognitive activity, whose boundaries mainly derive from subjective elements, such as knowledge of external reality, personal principles, values and more generally, individual consciousness.

The choice process can be thought as being structured into the three following steps: at the first, sequences of potential actions are imagined; at the second, they undergo a screening process which tests their chance to become “real” in the decision maker’s vision of the world (“*must be tested for possibility*”); at the third, each deemed possible sequence is evaluated on the basis of its desirability. At that last step, emotions and affect are deeply involved and function as choice criteria: among the anticipations of future emotions “attached” to each deemed possible scenario, the one which offers “*a good state of mind*” is selected¹⁰.

The following aspects of Schackle’s ideas seem of particular relevance to the topic of this paper.

- Choice is among imagined options.
- Imagination is bounded.
- It is used to build choice options.
- It is constrained by subjective knowledge and interpretation of external reality.
- It has emotional and affective roots.

3.2 Kenneth Boulding¹¹: “The Image”¹²

⁸ “For what does the act of choice do for the chooser? It gives to some, by denying to others, of his work of imagination a seriousness, an epistemic standing of a particular kind and quality, it gives them *possibility*, freedom from known obstruction” (Shackle 1983, p.29).

⁹ “There are degrees in which imagination can be constrained. With total absence of constraint it is mere fiction, fantasy or daydream, claiming no essential relation with the world observed (...). To play its part in decision, imagination must be constrained to be congruous with what the decision-maker knows of things in general and of human nature” (Shackle 1961, p.11).

¹⁰ In Shackle’s words: “A good state of mind, in relation to choice, must be a good state of imagination, a fabric of thoughts achieving present, immediate, and synchronous beauty, a whole that satisfies criteria that we must call aesthetic” (1979, p.24).

¹¹ Kenneth E. Boulding (1910-1993) was born in Liverpool but spent most of his life in the United States. His scientific experience originated in the natural sciences, when he was awarded a fellowship in chemistry at New College, Oxford. After one year of graduate study he shifted to economics. At first, he worked within the framework of orthodox economics, but by 1948 he had dissociated himself from mainstream theories by integrating economic analysis with biology and the study of complex systems. Apart from his brilliant academic career, he is author of three books of poetry and was fourtimes nominated for the Nobel price for peace.

¹² For a deeper analysis of this text and its economic implications see Patalano e Rizzello (2000).

In 1956, after spending eleven months at the Centre for Advanced Study in the Behavioral Sciences at Stanford University, Boulding wrote "*The Image*". This book conceives the role of mental images as a filter for perceptual data and mostly as an interface between human perception and knowledge. The author's reflections are referred to biology, economics, political philosophy, organization theory, history and sociology, with a chapter devoted to each of those disciplines. As a result, the book provides a wide and rich interdisciplinary excursus.

Every man has a self-image which includes a picture of his location in space, his acknowledgement of being part of a time flow, the perception of the universe around him as a world of regularities and his feeling of being part of a human relational network. He then has an image to evaluate reality ("*value image*") which intervenes in his relationship with the external environment embedding information with meanings, an "*affectional or emotional image*" which provides him with feelings, attitudes and motivations, and an image concerning the reality degree of his own perceptions. Then he has a public image in which he compares his images with collectively shared images at different levels of consciousness.

Knowledge is built up through a process of subjective selection and interpretation of external data, whose organizing principle is represented by the image; in this sense it functions as an interface between input and output, where the latter can be either new knowledge or action¹³. Boulding's interdisciplinary excursus points out some identifying regularities of the image, apart from the conceptual context in which it is analysed, mainly its plasticity, its path-dependence and its resistance to change. These constitutive features express both its temporary stability and its dynamic potentiality at the same time; it contains elements which enhance its evolutionary tendency as much as internal obstacles to its own development. According to Boulding's ideas, for example, in a price system that is characterised by an asymmetrical and incomplete information structure, stickiness phenomena can be created by the lack of a clear and widely understandable image of what goes on in the market¹⁴.

In the meanwhile, individual imagery has a relevant social function because it enables collective sharing of values and meanings. From this point of view the image has cohesive power, which may acquire a strategic value in organizational contexts and in cooperative interactions. At the same time

¹³ "...between the incoming and the outgoing messages lies the great intervening variable of the image. The outgoing messages are the result of the image, not the result of the incoming messages. The incoming messages only modify the outgoing messages as they succeed in modifying the image" (Boulding 1956, p.28).

¹⁴"The buyer or seller in an imperfect market drives on a mountain highway where he cannot see more than a few feet around each curve; he drives it, moreover, in a dense fog. There is little wonder, therefore, that he tends not to drive it all but to stay where he is. The well-known stability or stickiness of prices in imperfect markets may have much more to do with the uncertain nature of the image involved than with any ideal of maximizing behavior" (Boulding 1956, p. 85-86).

it may enhance the building of collectively shared expectations about future market performance, to the extent to which a society is provided with a widespread informational structure that is able to reach a large number of market niches. Those phenomena of cohesion at the imaginative level can, however, consolidate existing images thus making them more stable through self-enforcement processes, also if they are not adequate to interpret external reality.

To explain the evolutionary trajectory of the stock of images that exists in society an analysis of those factors which exercise their influence on individual imagery is required, as much as an understanding of the channels through which they act (e.g. learning processes). This approach figures out to be particularly relevant in economic contexts because *“the process of reorganization of economic images through messages is the key to understand economic dynamics. The great overall processes of economic life – inflation, deflation, depression, recovery, and economic development - are governed largely by the process of reorganization of economic images through the transition of messages.”* (p.90). It is not the quantity of information which matters at most, nor the speed of its circulation, but the existence of images that are able to get incoming messages without strongly resisting to change¹⁵. For example, in the case of technological change the innovator takes advantage from the ability to modify his current “vision” of the productive system by the introduction of new instruments and tools: not accidentally, the presence of unconventional social groups, ethnic minorities, diversified educational systems are generally correlated with an increase of the innovative potential.

The presence of regularities and constitutive elements in the image underlines its unifying power as a concept. In order to develop an interdisciplinary perspective on its meanings and potentialities Boulding suggests founding a new science, *Eiconics*, to be intended as a conceptual space for cross-field connections.

4. DECISION-MAKING MODELS COMPARED

In the neoclassical paradigm, choices are intended as results of a computational process which maximizes the expected utility of outcomes that are weighted by their probabilities. As well known,

¹⁵ “If a totally new image is to come into being, however, there must be sensitivity to internal messages, the image itself must be sensitive to change, must be unstable, and it must include a value image which places high value on trials, experiments, and the trying of new things” (Boulding 1956, p.94).

this approach involves an axiomatic concept of rationality, according to which rationality is a behavioural rule and consists of selecting that strategy which best solves the maximization problem. Mathematical foundations of this theory, that we define as “traditional”¹⁶, were provided by von Neumann and Morgenstern (1944), Debreu (1959), Arrow (1963).

With the label “non traditional” we rather identify those branches of decision theory that have been developed as an alternative to the neoclassical one, both starting from experimental research programs and in relation to Herbert Simon’s work and legacy.

The neoclassical approach to choice processes has been challenged on empirical grounds since the axioms of expected utility theory were found to be systematically violated in Allais’s (1953) and Ellsberg’s experiments. The major contribution to this field of investigation came from Kahneman and Tversky’s work on heuristics (1973, 1974) which led to Prospect Theory (1979). A starting point of this model is the detection of systematic departures from instrumental rationality in experimental situations, while the inclusion of perception among the basic ingredients of choice and the consequent relevance of frame in orienting the decision maker’s behaviour are of great theoretical importance.

It was Simon’s work however to introduce a new building block in the analysis, through the concept of bounded rationality. Beyond that, and among the numerous achievements of his theoretical work in many fields, from artificial intelligence to organizational theory, from problem solving to economics, he brought the distinction between external and internal environment into being: the former is conceived as a dynamic structure involved in a network of feedback with each individual, while the latter is rather the mind space in which information is subjectively elaborated.

Although very interesting, it is not our present goal to discuss those contributions in depth; in the following section we will compare traditional, non traditional and image-based approaches, in order to suggest a fuller understanding of their theoretical implications.

¹⁶ The successive advancements of the theory are not relevant to our discussion in this paper. In fact they left the assumptions that we take in consideration substantially unmodified, mainly the strong informative requirements and the anonymity of the agents.

4.1 Conceptual and strategic differences

The most significant difference between the image based approach, IT, traditional decision-making, TDM, and non traditional decision theories, NTDM, may be found in the decision maker's description. To support our hypothesis we will compare these approaches with reference to five main conceptual categories: decisional mechanisms; choice criteria; context influence; relevance of past experiences; space for individuality.

1. Decisional Mechanisms

TDM: the representative agent is provided with an abstract decisional mechanism, maximization of utility, and with the "instruments" needed to apply it: perfectly distributed information, instrumental rationality and unlimited computational abilities. When the maximization procedure is used, it leads to an optimal choice whose subsequent translation from the abstract model to the external environment is identified with taking the best possible action.

NTDM: the decision maker has incomplete information, limited computational abilities and bounded rationality. He is influenced by the modality and channels of information transmission, and starting from external data, develops his knowledge through a personal and context dependent mental process. His choices are sub-optimal but "satisficing", in accordance with a subjective and changeable aspiration threshold.

IT: the decision maker hasn't got any abstract decisional rule, but only a bunch of principles that are developed through learning and personal experiences regarding his own living and are stratified over time in his self-image. He works on external data by including them in mental representations; through this adaptation process of already existing cognitive structures to new incoming messages he builds up his knowledge; his own network of goals, plans and beliefs that can be recalled either by external stimuli, e.g. a new option to act, or internal ones, e.g. the perception of a discrepancy between expected and effective achievements of his performed plans. From this recalling, a search for the solution which best fits his images begins.

2. Choice Criteria

TDM: constrained maximization of expected utility.

NTDM: search mainly based on heuristics; breakdown of the original task into sub-problems that can be solved independently; exploitation of already experimented routines or attempts to develop new ones.

IT: two criteria are subsequently applied: according to the compatibility rule those principles, goals and plans that are most compatible with existing images are selected, while the profitability test leads the subject to choose the candidate from which the greatest closeness to desirable goals is expected among compatible ones.

3. *Context Dependence*

TDM: the maximization procedure is abstract and independent from the decision content, it can be used in every situation and can be perfectly transferred from one context to another.

NTDM: the behavioural routines are selected case by case, according to the decision-at-hand requirements, and then they exhibit strong context dependence; the chance of partial transfer is due to their adaptability from experimented situations to analogous ones.

IT: each situation may activate different *working images* or connections among them, and so choices appear to be strongly dependent on context and weakly transferable.

4. *Past Experiences*

TDM: personal history has no relevance at all because the decisional mechanism does not depend on individuality, is completely anonymous and does not change over time. Experience already acquired is not linked to decisional skills, it could exist in somebody else's mind and be transmitted to the decision maker in the form of new information.

NTDM: external stimuli are subjectively interpreted and the building up of knowledge is essentially based on the interaction between mental schemes and experience. This explains why, also if provided with the same information, individuals would come to diversified knowledge: decisions are strongly path-dependent as much as the mental schemes are and so are even the neural maps which contribute to them.

IT: personal experience represents the cognitive and affective background in which the image generation is rooted: the whole decision process depends on it.

5. *Space for Individuality*

TDM: the link between choices and personal values is not a direct one, it reveals itself through individual preferences which are however considered as exogenous. Agents can be totally replaced by each other and their subjectivity has no place if not as a list of data.

NTDM: information processing, choice of heuristics and frame building are embedded with individuality as are the choices which follow from them.

IT: images are an individual resource and their generation also involves unconscious elements which are subjective; on the other hand, image components are mainly connected by affective and emotional links. The theory makes explicit reference to personal beliefs, desires, motivations and goals. Relationships among those constitutive elements are strongly endogenous.

5. HOMO OECONOMICUS CAN BUILD UP IMAGES: WHAT ELSE MAY CHANGE IN THE “THEORY”

5.1 Imagination and Rationality

According to Schakle we choose among images because it's always too late to choose among facts. As a consequence of the impossibility of knowing the future in advance, choices take place among expected experiences. On the other hand imagination is a bounded activity and is constrained by the agent's knowledge, principles and desires. The concept of “*bounded imagination*” has an intriguing affinity with the decisional criteria that are provided by the *Image Theory*; according to this, decisions are taken through a process of screening and evaluation of imagined scenarios. The main claim of this theory is that individual decision-making is guided by the desire of compatibility with one's own principles and by the attempt to minimize conflict with one's self-image that is built up over time and always exposed to change. The concept of “*bounded imagination*” suggests integration with that, much more famous, of “*bounded rationality*”. Along this line of thought, *Image Theory* leads one to reconsider the concept of rationality by outlining the close link that exists between rationality and imagination, when the former is intended in a sense broader than that which is traditionally in fashion among economists. From this point of view, the introduction of imagination among the basic ingredients of decision-making does not drive us to a setting that is populated by fantasy-drawn agents, instead of rational subjects, but rather it suggests a broadening of the cognitive substrates on which logic can exert its influence. It does this by including a set of imagined scenarios in the “traditional” list of informational data. Upon this set that is built up by the agent, logic intervenes to select one among the possible choice options. Far from discharging the cognitive value of rationality, the analysis of imagination stresses the theoretical significance of its reevaluation, by making the limits of a concept that is bent over itself and inadequate to express the multifunctional meaning of human thought evident, such as that of instrumental rationality, evident. It's not the necessary however to create a new ad-hoc category which eventually suits decision-making theories, but rather to enforce the communication channels between economics and other

disciplines, such as psychology, where wider concepts of rationality are commonly used (Galimberti 1999). We consider this to be an important challenge for economic theory which deserves more investigation.

5.2 “Cognitive” Agents

The exploration of the cognitive dimension at the roots of decision-making is a fascinating research topic that has widened, and still promises to increase, our knowledge of the channels through which mind and society interact. In non-traditional decision theories, much effort has been devoted both to the analysis of information representation and to its processing, elaboration and retrieval.

Our claim is that the discovery of specific roles for mental images, in addition to those played by other representational formats –such as schema, scripts, mental models-, adds substantial clarification to our notion of a “cognitive” agent. By the term “cognition” we make general reference to the mechanisms of mind functioning, both conscious or unconscious ones. Therefore many different psychic phenomena can be included among its “objects”, in particular perception, imagination, motivation, learning, creation of new knowledge, emotions, intentionality, but also reactions that are performed out of awareness.

A “cognitive” agent can be identified with a subject that is endowed with mental representations that guide his behaviour. More specifically:

- he builds up representations of the world in which he lives and of his desires and his intentions, by using means and formats which include propositions, schemas and images;
- he has personal beliefs that are partially organised into coherent systems, his theories;
- he acts on the basis of his mental representations in a double sense. Both because his goals and plans are influenced by the contents and the format of his representation, and because his behaviour is oriented towards the achievement of goals that have been pre-represented in his mind (“*representation-driven behavior*”, Castelfranchi 2002);
- he acts in contexts which exhibit structural uncertainty.

In this conceptual framework, Boulding’s idea that “behaviour depends on the image” acquires a clearer meaning, and can be connected to the relationship between images and actions that are postulated by the Image Theory. On the other hand the mind of Homo Oeconomicus gains a wider description, in which rationality and imagination deeply interact.

5.3 Some Methodological Implications

The inclusion of mental images among the representational formats of economic agents has some methodological implications which seem to be very remarkable. A first interesting topic is the one

connected to the existence of different levels of reality; this is not however a “new” and unexpected discovery. Hayek (1952) drew a clear distinction between the microcosmos, specifically our mind environment, and the macrocosmos, e.g. the external reality, and stressed the necessity of investigating their relationships. Simon (2000) spoke even more explicitly of an “inner environment” that is crucial to understanding decision-making, at least as much as the external one. Both those positions make a distinction between the psychic and neurofisiological reality of the subject, and the world in which he performs his actions. As mentioned above, this conceptualisation is relevant to our definition of a “cognitive” agent and endows the attempt to discover cognitive foundations for economic phenomena with meaning.

The debate on the possible degrees of realism in economic analysis is structurally connected to the existence of different reality levels. In the famous Friedman’s words “...*the more significant the theory, the more unrealistic the assumptions*” (1953, p.14); as it is well known, this position is based on the idea that the success of a theory derives from its predictive power. To make successful predictions we do not need realistic hypothesis but subjects that behave “as if” they were such. In the economic literature the expression “as if” has been the centre of a wide debate that we cannot consider in this paper. We simply aim to outline on which methodological approach an extension of Image Theory to economics could be based, and in which sense it may differ from Friedman’s position.

If realism is meant in the sense of hypotheses that sharply reflect effective individual behaviour, we do not think that a realistic theory does exist; each model is in fact an abstraction, needs simplification, and cannot trace a true picture of the way reality is. A more interesting problem concerns which aspects of reality are judged to be relevant in a specific research program and which are not¹⁷.

Our methodological position widely recalls Hayek’s (Carabelli e De Vecchi, 2000):

- we don’t assign any priority to empirical observation: each theory is in fact a thought product and, as such, cannot be founded on the simple detection of empirical regularities;
- the main “instruments” with which economists work are not rough data nor physical objects but rather beliefs, expectations and mental dispositions of the agents about themselves and others, that lead to specific actions;

¹⁷ “The issue is not about realisticness versus unrealisticness in the abstract; each of the rival approach produces theories and models that are inescapably unrealistic. The issue is rather about the functions of unrealisticness in the orientation of theorizing (...); we need principles for assessing theories on the basis of how close they come to capturing the essential aspects of the economy for given explanatory purposes” (Mäki 1994, p.253).

- scientific research, and then economic analysis, aims at predicting events on one hand and at increasing our comprehension of phenomena at different depth levels on the other (Popper 1969; trad. it. 1991, p.57-59).

Unlike the traditional approach, the extension of Image Theory to decision making in economic contexts is not normative; it does not aim at building an abstract model of choice in ideal conditions, nor at constructing a theoretical benchmark with reference to which eventual deviations could be measured. From this point of view, it turns out to be rather inefficient when meant as an instrument that predicts economic behaviour. However we do think it can represent something else and something more.

An important clue originates from the surprisingly restricted interpretation that the concept of “prediction” seems to have undergone in the literature on economic methodology. Its meaning could be enriched if we consider that, besides predictions of events included in well known categories, there also exists a prediction of new categories of events. If we mean theories as predictive instruments in Friedman’s sense, we limit their potential influence to predictions of the first kind; to predict new classes of events in fact they need to be instruments of discovery. Image Theory cannot be used to measure the expected values of numerical variables nor to predict their future trend in statistical terms, but it can help to understand which phenomena are NOT likely to happen if a subject is endowed with certain images. In this sense, the object of prediction is shifted from numerical values to those connections between events which cannot be reasonably expected. If interpreted as a source of “negative” predictions, e.g. knowledge concerning what is not likely to happen, the theory is “open” to discoveries and can help to detect novelties.

6. CONCLUDING REMARKS

The economic literature on decision-making has recently contributed in integrating achievements made in different disciplinary fields, experimental economics, cognitive psychology, neurosciences, artificial intelligence, within a unique approach that is known as cognitive economics. Its research program aims at finding foundations for individual and collective behaviour in the functioning mechanisms of the mind.

Within this approach, however, an analysis of the roles played by imagination is still missing. Such a topic is surprisingly neglected although it was once largely investigated by well known economists, such as Boulding and Schackle. In Simon’s work on problem-solving, imagination is conceived as an instrument which helps to fill the informative gaps about the unknowable future. In

our opinion this way of dealing with the topic is too restricted; as highlighted by Image Theory, imagination has much more substantial functions, most of all that of minimizing cognitive and emotional conflict.

In keeping with this result, our extension of Beach's and Mitchell's (1987) model to economic theory indicates that solutions to problems, research paths and obstacles to their detection are "hidden" in the individual and collective images. Only those solutions which show that are compatible with existing images are selected and evaluated on the grounds of their expected profitability. This situation in which each individual tends to make the choices which appear to be the most compatible with his personal history can be assimilated to a sort of temporary equilibrium. In the long run, the feedback with the external environment and the structural plasticity of the human mind may sharply modify the existing images, and eventually, individual perspectives on external world may evolve in a direction which cannot be predicted in advance. Such a representation of the choice process is not normative, does not aim at producing an ideal picture of the decision-maker, but tends to describe which variables are most likely to constrain his behaviour and through which channels they can exert their influence.

With reference to the two main paradigms traditionally taken into account by the literature, both the neoclassical one and the one originated by Simon's work, an image-based approach may significantly change the representation of the decision-making processes, but it also suggests a development of a richer theoretical perspective on the concepts of rationality and economic agent. The first one can better qualify the multifunctional meaning of human reasoning when seen in dynamic connection with the concept of imagination. From this point of view, economics could largely benefit from conceptual exchanges with other disciplines in which extended concepts of rationality already exist, such as psychology.

The analysis of imagining also allows a deeper understanding of the concept of a differentiated cognitive agent, as initially shaped by Hayek. Among the mental representations that drive his behaviour we can in fact include images as cognitive substrates which possess their own symbolic autonomy and enable a further modality of knowledge representation. As a consequence of image pathdependence, the individuality of the economic agent is then enriched and actually represents a crucial endogenous element of the choice process.

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