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789X.2015/8-1/16**

## THE DECISION-MAKING PROCESS BETWEEN CONVENTION AND COGNITION

**Abstract.** The main research on the cognitive foundations of the economy has claimed for many years that there is a clear separation between the theory of economic rationality and the psychology of reasoning and economic decision. More recently, the relationship between the two disciplines has become increasingly tight and cross-fertilizing. While Economics proposes normative theories about what it means to decide rationally, Psychology provides an explanation as to why individuals frequently make irrational decisions. The role of intuition in decision-making, as well as the effect of emotions, are also relevant. The issue of rationality should then be tackled by finding appropriate restrictions of the definition of the term ‘rational’, which in its common usage stands for ‘reasonable’ and/or ‘acceptable to reason’. Economics and psychology can then find a common and useful ground of discussion by focusing on coherence rather than on substance. (Legrenzi and Girotto 1996). As acknowledged by the mainstream theory, the notion of Bounded Rationality (Simon 1972) is central in explaining the failures of human decision making processes. Therefore took this concept as our starting point in the analysis of the complexity behind the individual choices, taking into account the cross-fertilizing relationship between economics and psychology.

**Keywords:** Coordination, Decision, Economics, Psychology, Rationality

**JEL Classification:** B4, D81, D83

### Introduction

The discovery of the existence of social preferences, understood as positive and/or negative predispositions towards the social and economic conditions of others, complicates in a decisive way the theory of economic rationality. The latter binds the decision only to reasons of individual utility, without any interest in the plight of others. To be changed radically by these are also the models of strategic interaction. Insights and emotions frequently violate all the principles of rationality, but certainly do not eliminate them. One has the sensation of a cognitive duplicity where rational logic and emotions are forced to cohabit. What determines the prevalence of intuition over reasoning or vice-versa? It is conceivable that the context with the factors conditioning it assumes a decisive role. But because the contexts cannot all be summarized in a theoretical model, what follows is the awareness of the extreme complexity and

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non-linearity of the phenomena that are often the result of the interaction of different economic agents. What arises is an extreme difficulty to develop models with a comprehensive predictive capacity and the holistic impossibility of explaining economic phenomena, abolishing the role of individual economic action and its cognitive genesis.

In addition to that criticism to unlimited rationality does not rely only on the awareness of the reduced computational capacity and of calculating the conscious and intentional part of the human mind. In reality, such a limiting condition pairs with the influence of intuitive, emotional, affective, tacit factors that characterize the intuitive mind (as opposed to the conscious reasoning mind). Therefore, the choices and decisions of *homo oeconomicus* are moving on a strongly connected cognitive duplicity, with the prevalence of one or the other of the components that is heavily dependent, typically on the situations and contexts; but also on the different attitude compared to emotional categories such as regret (Loomes and Sugden 1982) or disappointment (Gul 1991). This leads to the necessity of building the decisional context, one that incorporates information from the “environment” and of the mental and behavioural model of the individual actor. The conclusion that follows that is that the “decision” has nothing axiomatic to it, being the final act of a previous and complex process that involves objective and subjective conditions (as, moreover, already generally contained in Simon’s concept of bounded rationality, 1972). It is on this path that we allow an analysis of decisions to shift the focus from the decision in itself to the representation of the alternatives, by opening the way for a series of empirical studies on the construction of strategies on *problem solving* and learning (although the clear distinction between mental representation and decision emerges from the empirical analysis of individual rationality in its relation to work - Allais 1953).

The job in question is geared towards the quest of downsizing of the invisible hand, with its formidable virtues under coordination and adjusted to the collective results sorted, starting to think about the possibility of having an organizational and institutional system able to achieve the coordination of the economic system. The beginning of a fundamental change in the way we think, observe and model decisions in every context.

### Reference variables

The relationship between economy and psychology and the interaction proposed by behavioural economics is not without problems. Given the symbiotic relationship between psychology and economics, it is believed that we should not only focus on the role of the target-function, as in the case of behavioural economics, nor on constraints, as does sociology. According to Camerer (2003), it is precisely the strategic interaction between these two references (psychology-context) that has characterized all of neoclassical economics and which must be safeguarded, however, even when complex variables are introduced. The road chosen by this line of thought originates from the assumption that individual rationality depends on the social context. What follows is the emergence of possible temporal inconsistencies in individual decisions, as well as marked differences between rational and real behaviour and in some cases strategic, as the *game of the ultimatum*. An example comes from Rubinstein (2003), who shows that in some cases, using the traditional utility functions, the discount factor is not consistent in the relationship between today and tomorrow and future, longer periods. Therefore, while in the classical model, the replacement between  $t$  and  $t+1$  is always constant and equal, regardless of the value of  $t$  (between 1 and  $\infty$ ), in the theory introduced by Rubinstein (with almost hyperbolic discount factor), the inter-temporal flow of goods, evaluated using a traditional utility function, differs significantly in choosing between  $t$  and  $t+1$ . An older hypothesis, which sparked the de-

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bate, comes from Laibson (1997)<sup>1</sup>; the latter has the merit to fit easily into the nearly hyperbolic discount model that has gained wide credit among behavioural economists. The basic idea is to include in the formulation of the discount rate two different parameters,  $\delta$  and  $\beta$  rather than a single parameter as in the classic economic model:  $\delta$  it possesses the properties of the classic discount rate, marked by the constant  $\delta/1$ , where  $\beta$  it is a multiplier coefficient with decreasing effect  $0 < \beta < 1$ ; therefore, the discount rate used implicitly to estimate future emotions is expressed with  $\delta\beta$ . Labson's model describes the neural activity of the different areas of the brain which, thanks to examinations with imaging techniques, appear to be involved in choices on distinct horizons (McClure *et al.* 2004). Activation of the limbic region follows a temporal profile corresponding to parameter  $\beta$  and gives rise to a behaviour that in its pathological version assumes a characteristic of addiction. The pre-frontal and parietal regions observed are activated in time following a profile similar to the parameter  $\beta$ , which translates the logical formulation of the discount rate considered into classical economic models.

A simpler example would be: the presence of a non-constant discount rate leads the individual to procrastinate until tomorrow those things of tomorrow that he/she would have wanted to get done today. But, what appears useful beyond the examples is a problem with the method of analysis, in which empirical evidence is not taken as final arbiter between theories. In addition, new models can be considered useful only if they are able not only to clarify all that the criticized theory explained, but even new and different facts and phenomena. Lastly, it is necessary that the new theories be not constructed arbitrarily, but that they rely on the same insights contained in the models they seek to replace.

The issue, therefore, is to accept the idea of a sort of cognitive progression, whereby the behavioural economics, with its wealth of psychology-related tools, allows us to conduct a more successful study of better the economic consequences that accompany individual decision-making behaviours.

If we wanted to attempt to divide, albeit partially, neoclassical orthodoxy from behavioural innovation, we could say that orthodoxy: 1) generates predictions about the behaviour of agents by changing environmental constraints; 2) tries to explain the anomalies in terms of incomplete or asymmetric information; applies these principles to every social phenomenon.

Instead, the core of behavioural economics moves the focus from the environment to the individual, from the constraints to the function we want to maximise.

As such, in the orthodox context, each actor must identify what is desirable and what is feasible, and consequently choose what is most desirable from what is feasible. The underlying assumption is the stability of preferences as the feasibility constraints change or, again, that the identification of feasible choices is independent of the specification of preferences.

In the behavioural framework, instead, we proceed by processes of adaptation: 1) we attempt to identify the behavioural assumptions that are most used in orthodox models; 2) we examine whether the empirical evidence confirms those behavioural assumptions; 3) using any inconsistencies as inspiration for more realistic behavioural assumptions; 4) rebuilding economic models based on these assumptions to explain facts that before were unexplainable.

This path does not represent a contrast to orthodoxy, but rather, the effort concentrates on completing it.

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<sup>1</sup> For a more recent review of the hyperbolic discount, see Shane *et al.* 2002.

**Type of rationality and economic context**

Orthodox economics and behavioural analysis are unable to ignore the issue of rationality, therefore the debate focuses not so much around the notion of rationality as it does on the type of rationality to be used in the specific economic reality it examines.

There is the problem of the rational representation of reality; a coherent theory examines the rational actions and decisions; the actions must originate from rational preferences.

The decision, therefore, must encompass the rationality of the system of preferences. The latter, in turn, requires that the preferences be based on the awareness of the consequences of the actions and consists, in turn, of three further conditions of rationality: rational expectations about the consequences of actions; a model that connects the system of preferences about the actions with the preferences about the consequences and expectations of the actor-decider. It follows that while the rationality of agents is subjective, the rationality of preferences depends on the model and context it suggests. On the rationality of the theory there is little to add to what generally accepted (Simon 1987). The rationality of the actors and their actions is the core argument of neoclassical orthodoxy.

The traditional argument of the general competitive equilibrium, even in conditions of uncertainty (Arrow and Debreu 1954), is based on rational decisions guided by the market information system and therefore, by prices. Individual rationality leads to decisions that are consistent with the axiom of revealed preferences. The system of preferences rationalizes the criteria behind choices by qualifying its coherence.

The representation of the criterion of choice through a regular system of preferences allows the introduction of a continuous and ordinal utility function and the determination of the choice through the maximization of utility on the set of possible actions. That calculation, in general, is not attributable directly to the agent, but is rather an instrument of the theory. The actor limits himself to expressing the preferred choice through his decision. It is possible, of course, to disprove the axiom of revealed preference by repeating the experiment and by confronting the actor with subsequent choices. But, in fact, the succession of choices is not a proper method to verify the axiom of revealed preferences, both because this axiom does not define a principle of immutability of tastes and because, as mentioned, disappointment and regret are categories that affect rational choices, not limiting rationality but, on the contrary, invigorating it.

**The rationality of preferences**

We have highlighted that the theory of competitive balance ties rationality to the consistency of the criteria of choice, parametrically specified by the values expressed by the prices. Other theories take as reference the rationality of preferences, imposing the same special characteristics in relation especially to the link between actions and consequences. Indeed, the rationality of preferences is quite relevant in decision and game theory, i.e. in cases where no actions are directly related to consumption plans or production allocations. These depend, in effect, on the moves and decisions of others. Thus, in decision theory, actions are random outcomes and in game theory they are strategies; the actual consequences are the result of overall strategies put in place by all players. Therefore, a system of preferences on actions is defined as rational if it is based on the consistent assessment of the consequences of actions.

This type of approach leads, however, to analyse not only the system of preferences about consequences, but also the relationship between actions and their possible consequences, as well as the relationship between the system of preferences about actions, on the one hand, and the system of preferences about consequences and the expectations towards them, on the other.

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Ultimately, the rationality of preferences implies the consideration of as many as three conditions of rationality: 1) the existence of a regular system of preferences about the consequences; 2) the rationality of expectations about the consequences of actions; 3) the rationality of the function that determines the system of preferences about the actions, based on the expectations about the consequences of the actions and the system of preferences about the consequences.

Under conditions of uncertainty, it is very likely that the three criteria are not all satisfied simultaneously.

The first of the three conditions that we have indicated requires no particular specifications, since it only requires the existence of a regular system of preferences about the consequences. Secondly, expectations may be defined as rational if they are formed on the basis of a correct model of the economy, by virtue of which we can say that an agent has rational expectations whether or not these are compatible with the predictions of the model (Miller, 1994).

The interpretation of these conditions is not, however, that simple. In fact, a subjective and an objective one are both possible. With the subjective interpretation, preferences based on objectively wrong opinions can also be rational. According to the objective interpretation, it is assumed that there is a real model, in which it is perceived as such, and expectations that are consistent with that model are defined as rational. The rationality of preferences and of the theory end up being the same, as in the Allais Paradox (1953): the preferences of agents that do not follow the expected utility model are irrational. After all, the choice is true to the nature of the model. If it is assumed to be prescriptive, it is inevitable that the preferences about actions are as strongly linked to preferences as to their consequences. This is not necessary if the model and the theory behind it are descriptive in nature.

### **The relationship between economics and psychology**

In the relationship between theoretical models and individual preferences on the one hand we have the argument in favour of the competitive balance, which is based on economic welfare theorems involving the introduction of individual preferences; on the other hand, in economics, individual choices often have a subordinate role with respect to the study of social interaction. To specify the meaning of individual behaviour, it is necessary to indicate the preferences and not assume that they only configure a regular system. However, this rationality is sufficient to provide relief to the competitive market in the sense that it nonetheless allows to prevent a pareto-efficient allocation, whatever the individual preferences are.

It is clear that any further information on the types of preference and their frequency would help to avoid the arbitrariness contained in the balance models with individual preferences not better specified. The relationship between economics and psychology fits into this context, where the rationality of preferences represents the privileged ground of this relationship. In opposition to orthodoxy the main trend of research on the cognitive foundations of the economy, dominated by the neo-positivist dogma of the distinction between logic and psychology has for years claimed a clear separation between the theory of economic rationality and the psychology of reasoning and economic decision. As is to be traced in the works of Simon (1990).

The relationship between the two disciplines is becoming increasingly stringent and contaminant. The economy proposes regulatory theories on what it means to decide rationally. Psychology offers explanations as to why in everyday life the individual often decides irrationally. Another topic that is quite relevant concerns the role of intuitions in decisions, as well as that of affective or emotional components.

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The theme of rationality, having to embrace economics and psychology at the same time, must be addressed by limiting the current definitions of the term rational that in common usage stands for reasonable and/or acceptable to reason. Economics and psychology may agree in a perspective of coherency rather than substance (Legrenzi and Girotto 1996).

Therefore, we need to put aside the idea that the current economy is the place of normative theories (Savage 1954), which tells us what we should do and what decisions to take, while psychology is limited to analysing the actual behaviours that may diverge from the paradigms of rationality. It is easy to come to conclusion that psychology is a context typical of decisional “deviance” in the economic realm. The starting point is a little more complex and originates in an awkward dichotomy. In fact, as a rule, every individual thinks she adopts, in her daily life, behaviours in line with principles of transitivity and dominance, true to rational choice. Experimental data<sup>2</sup> suggests, however, that in reality, the actual behaviour of individuals differs more or less systematically from these precepts. Since the 1940s, for example, a heated debate developed around the notion of expected utility, which cyclically went from pseudo-solutions in favour of the predictive power of traditional decision theory, through the introduction of increasingly sophisticated restrictive conditions, to increasingly obvious destructive attacks (Allais 1953), based on the systematic violation of some of the axioms of orthodox theory. The response to such attacks was to loosen some feature or axiom of the orthodox model.

In general, there are at least two types of factors at the origin of the alleged failures of human decision processes as opposed to the assumptions underlying orthodox theory.

The first concerns the contents of limited rationality (Simon 1972). The reference is to the natural limits of attention, memory or computing capability that force us to exemplification processes whenever we face realities not fathomed in our acquired cognitive protocols.

In the relationship between psychology and economics of greater importance is the case of failures that are undetectable through the limitations of our memory and attention span. Even when confronted with simple problems, specific factors may arise, such as the sudden variation of the contexts of presentation, which trigger decision-making processes that can lead to unexpected decisions. Consider the works of Kahneman and Tversky (1979) regarding the failures of invariance. We are dealing with decisions and choices that are mutually inconsistent: problems that have the same regulatory structure (and in this sense are invariant) and that produce different responses in different contexts. And in some cases the same deciding subjects, faced with the inconsistency of their answers, are astonished by the fact. Thereby recognizing the assumptions of rationality they just violated. It thus can occur through experimentation that there are several issues which lead to the individual's decisions to diverge from the different assumptions encompassed in axiomatic theory.

As mentioned above, individuals may at times realize in retrospect some of these failures of invariance, when reflecting on their decisions. In other cases, the cognitive procedures processed and employed remain silent and decision-makers are unaware of the rationality/irrationality of their decisions.

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<sup>2</sup> Experimental data has challenged economists to explain the relationship between reciprocity (the mechanism that governs pro-social behaviours in the trust game) and equity, focusing especially on the role of intentions. For example, see a simple experiment conducted by Charness and Rabin (2002); see also Tversky and Kahneman (1981). Representing the logic of reciprocity in a formal model presents certain difficulties, but progress has been made thanks to the development of the “theory of psychological games” (Geanakoplos, Pearce and Stacchetti 1989).

**Rationality of behaviour**

The most recent research has been conducted in an attempt to clarify the mechanisms of self-representation that lead to failures of invariance. Attempts that should respond to questions about the conditions in which the principles of rationality can be considered a useful approximation.

But it is likewise necessary to understand if individuals realize the validity of the principles of rational choice and, more importantly, how come under certain conditions they distance themselves more or less systematically. At the core of social sciences, we find the actors' behaviour (Viale 1997), and therefore, a sort of actor's theory that seeks to identify and define the characteristics of individuals who, through their actions or decisions, give rise to collective phenomena of social and economic type.

Why do we behave in a given way? What are the effects of the context on the choices and decisions? Each action refers to a theory of the mind, even if in economics we recover it only deductively from the principles of choice attributed to the actor by the postulates of economic theory. But in many cases this approach, in sensitive segments such as those represented in the financial economy, blurs the criteria deemed essential for a rational decision that must be taken based on the knowledge of the consequences of the various options available, such as for instance, the most convenient expected value. It is a known fact that very often the investor triggers choice strategies designed to evaluate only if information about an investment allows him to exceed a certain threshold of appreciation. A phenomenon amplified, in the example of financial markets, by two additional behaviours. The first concerns the orientation of attention towards the mean values expressed by the market. The second concerns the mechanism known as "focalisation" (Thaler 1994), where decision-makers focus on short-term data to the detriment of information over longer periods.

It is clear that the mechanism of focalisation (and therefore of concentration) on some of the variables affecting the decision-making dilemma can be useful in contexts marked by excessive complexity, to exemplify the decision. But it is also clear that all of this can lead to sub-optimal choices. In fact, focalisation and concentration can give rise to the phenomenon of asymmetric information. Let us think of the representation of information about the true/false dilemma. Normally we are likely to represent the contents of the true content and overlook false content (Legrenzi 2003).

Further asymmetries are detectable in relation to decisions under conditions of uncertainty. In fact, every individual applying common sense will claim to prefer to avoid the risk in uncertain conditions. In reality, this is a widespread stereotype, experienced as true only if we are confronted with the category of earnings. This is demonstrated through the usual and verifiable fact of bullish expectations in the financial markets that have gone disappointed. In these cases, one either immediately exits the market or is brought to an ever-increasing propensity to risk in the hope of payback. That these are optimal choices is not plausible, and that they are choices of little prevalence is not equally true.

Another reason for reflection is linked to the prevalence that we assign to the change factor as an alternative to the status factor. It is based on change that we often tend to represent ourselves the conditions, whether the status is physical or economic. We focus on what "changes our lives" or that we suppose will, depending on the context in which we express judgements and make decisions, and in reference to the imagined context, based on the judgement and/or decision.

**Axioms to consider**

At this point, it appears that the bulk of theoretical studies on rationality that intertwine economics and psychology does not afford a straightforward approach and requires the adoption of a set of tools that we can demonstrate through the use of: 1) a regulatory analysis of rational behaviour prescribed in that scenario; 2) the analysis of the genesis of the failure of rationality; 3) the attempt of tracing these local cognitive mechanisms back to a general theory of the functioning of the mind.

It follows that the greater the claim of rationality, the lower is the development on the psychological characters of the actor's decision. In orthodox neoclassical theories, in fact, maximum is the tribute to rational abilities and minimum importance is given to the psychological meanders that lead to the decision. On the other hand, it is obvious that unlimited reasoning skills poorly combine with the representation of a mind characterised by limitations and cognitive weaknesses. Utter rationality, however, stifles a priori any contribution of the different expressions of the human psyche.

Neoclassical economics and its axioms transferred to traditional game theory, credited to Von Neumann and Morgenstern (1944), represent the exaltation of the primacy of unlimited reason. By now, the theory of unlimited rationality has made room to research on the paths of human reasoning and on the "fallacy" of some of its logics. An error-proneness that involves all the procedures which lead to the decision. In fact, various research has shown a sort of systematic tendency of the actor to commit errors in logical reasoning. An example for all is the behavioural approach in the analysis of risky choices represented by *prospect theory* developed by Kahneman and Tversky as a cheaper alternative to the theory of expected utility (Kahneman and Tversky 1979; Tversky and Kahneman 1992).

In this regard, there are at least two explanations: 1) the first is that the mind, in reasoning processes, applies a limited number of abstract rules corresponding to a limited use of deductive logic; 2) the second hypothesizes that no logic guides reasoning, since it is based on the development of mental models that respond to the representation of the situation.

With regard to the judgement, it appears plausible that everyone tends to express judgements about the probability of events, which are correct the more evident the importance of the principles underlying the calculation of probability is. Conversely, if the contexts appear very complex, poorly lending themselves to the applicability of regulatory principles, the error in judgement can be systematic. Kahneman and Tversky (1979) link these errors to thought processes called "heuristics". The most important is that of representativeness, according to which the probability of the membership of a person is assessed based on his resemblance to the most representative member. This leads generally to over-estimations or systematic underestimations in judging the probability of an event.

As regards, finally, the choice, it is a known fact that it should be based on coherent preferences, multiplied by the probability of their occurrence. In reality, individuals develop preferences based on the nature and context of the decision, with the result of a inconsistency referred or related to the axioms. Kahneman and Tversky (1979) again show how the odds have a non-linear impact on the decision. The changes (whether gains or losses or, however, on standards of living) have an impact and a greater importance than the stable states of well-being. This significantly affects how we decide in different contexts of choice. It is sufficient to change the decisional reference from a probability of loss to one of gain to obtain contradictory answers, while maintaining the same end result.

It was inevitable that these results about the different and progressive processing stages of the decision would lead to speculation of new models of rationality based on the real characteristics of economic action, freed from the constraints of interpretation of the many "a priori",



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and therefore supported by theories of the mind generated empirically. As already found by Egidi (2004), in fact, the real constraint to a rational decision lies in the necessity of building the context for the decision. To do this, on the one hand, there is a need to guide the search for relevant information, and on the other, to build a mental model that represents, at best, the decision-making context.

It is on these two sides that we see the manifestation of the limits of unlimited rationality and the main assumptions of cognitive criticism tied, moreover, to Simon's intuitions (1990): 1) the real restraints to the computational and processing ability of the actor; 2) the real constraints on the complexity of the environmental structure.

The first scenario can be traced back to the optimization under constraints. Assuming that the potential information is vast, while the resources available to the actors are limited, there is a need to prefigure rules of arrest based on which research is optimized by calculating the costs and benefits associated with each additional segment of research which run aground as soon as the costs outweigh the benefits. It is difficult to understand the contents of optimization if not through arbitrary procedures of exemplification.

The second hypothesis concerns the already mentioned heuristics of judgement, i.e. models of limited rationality and empirically formed. A role is assigned to the non-conscious components and, not least, the rationality that ensues is intentional. Using, in the analysis of choice, a comparative model as opposed to the orthodox axioms, everything that differs from those axioms is defined as irrational. Without evaluating, though, the role of deductive consequentality and of its success not only in terms of problem solving, but also of adaptive responses to the environmental context in which they generate. In this respect, as already noted by Viale (1997), these theories seem more interested in the criticism of the axiomatic "a priori" of limited rationality than in developing a theory of independent action.

The latest assumption is related to the so-called frugal heuristics of Gigerenzer and Todd (1999), which in some ways maximize the objectives of analysis of limited rationality, with reference to cognitive limitations and environmental adaptability. After all, heuristics is a method of judgement that sacrifices the formal rigour and completeness of an algorithm to the values of simplicity and speed (Kahneman D. 2013). Once again we have a prevalence of the regulatory component on over the empirical and descriptive one, making it problematic to build a psychological theory of human action, without taking a further step backwards in relation to the theory of rationality, precisely because of its regulatory and intentional nature.

### **The role of coordination**

In light of the preceding analysis, though, it is essential to remember the pioneering work of Coase (1937), referred to by Williamson (1993), which has highlighted the importance of transaction costs, in other words, costs linked to the coordination of the various activities in production processes.

In his analysis, Coase highlights the lack of realism and the inadequacy of traditional economic theory in explaining the role of the coordination of economic activity. Economists consider the pricing system as the ultimate coordinator of all economic activity, admitting at the same time, the function of the entrepreneur as a coordinator. But the task of coordinator, however, must be linked to a cognitive process of reference. Thus in economic history, we again find the idea that the price mechanism ensures the coordination necessary for a coherent allocation of production factors between the different productive uses. In reality, however, there are many areas where such a mechanistic reasoning cannot be applied. In fact, Coase suggests a famous counter-example: if a worker moves from activity Y to X, as a rule, is not the cause of a change

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in relative prices, but simply because someone ordered him to do so. Therefore, the market and the price mechanism are not the one and only source of coordination of economic activities. There are at least two alternative tools of coordination: the market and the company. The problem is understanding when the one or the other are at work. The main reason which makes the establishment of a company advantageous seems to be the existence of market transaction costs, i.e. the costs of using the price system. These costs can be avoided or reduced through a coordination of the resources within the company. According to Coase, outside the company, fluctuations in prices direct the production that is coordinated through a series of transactions that operate on the market. Within the company, these transactions are eliminated and the entrepreneur-coordinator who heads production replaces the complicated structure of the market and its transactions. The hallmark of the company therefore, has the function of feeding the pricing system used solely in its function as resource allocator. And the organizational form that will prevail is the one that will yield the lowest transaction costs.

Coase distinguishes between two types of use of the price mechanism. It is evident that he contests the classical approach, according to which “all appropriate prices are known to the agent”, considering the hypothesis in the real world as being unrealistic. Transaction costs thus consist in part of the costs of cooperation and search for information on prices. The resemblance with Stigler’s analysis (1961) at this point is evident. In particular, the imperfection of information that gives rise to the advantage of coordination among companies. In the real world, information on prices is not possible without addressing costs. Coase suggests a comparative research to find prices that are suitable to the costs.

The company that helps reduce or avoid the costs of acquisition and comparison of the pricing system replaces the market’s role. It is obvious that this paves the way to specialists who provide this type of information and therefore the existence of companies whose product is selling information, because thanks to this specialization, research costs may be limited (though unable to eliminate them altogether).

Moreover, the similarities with the analysis of Alchian (1969) is clear: specialization increases production in the research of information. It follows that we must take into consideration even the “costs of negotiation and conclusion” of contracts that pass from the transaction. A series of contracts that would be needed if cooperation between agents were to develop on the market are replaced by a single contract within the company. Even these costs related to contracts are part of the costs of information. In fact, concluded the contract, there is need to ensure that they are implemented with monitoring costs and additional information costs.

### **Origins of the action-decision**

Pursuing research in this direction involves the need to deepen the various mental aspects to which to impute the action-decision, without ties to their conscious and intentional character or to the regulatory value compared to some rule or axiom *ex ante*.

As noted previously, the works of Viale (1997) and Gigerenzer and Todd (1999) seem to move in that direction. In fact, their belief is that the actors often form more appropriate judgments, based more on hunches than on reasoning, and that too much information or too sophisticated information can be harmful. These are further building blocks in the reformulation of the concept of “appropriate” as it applies to the decision, knowing that cognition is largely based on the ability to focus on what is important, leaving aside the rest.

Gigerenzer and Todd (1999) assign a major role to factors not attributable to the intentional sphere, both in the search for information and in making the decision. The reference is to the category of emotions that play a role in thrusting the search for information as much as

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it does in stopping and halting it. The role of emotional categories in decision-making seems apparent especially when these spare the excessive cognitive load to the mind that normally follows the explicit awareness of the rule, from its assessment and its selection and application.

What is important is the recognition of the existence of an important segment of human cognition, responsible for decisions, which cannot be represented by the collection of explicit information, research of cognitive completeness and by the conscious application of the decision-making rules intentionally chosen by the actor. What distinguishes the cognitive economy is precisely this awareness in the theory of human decision and action. Taking into account this approach, there are at least two possible contexts of comparison.

The first concerns the relationship between cognitive economy and orthodox economics when it comes to reading the decision and its contents as opposed to the topic of optimization-maximisation.

The second concerns the theme of systemic balance, once the role of axioms and the underlying behavioural rules is clouded.

Those who have accepted the empirical results of cognitive choices as substantial refutation of the principles of rationality of orthodox neoclassical economics, often end up adding to the traditional model new assumptions on cognitive limitations and constraints.

On the contrary, a real acceptance of the contents of the cognitive approach should lead, at least, to the construction-application of a dualistic model of rationality, with the coexistence of two kinds of decisions: the first type is used in the daily practice of intuitive decisions, and tacitly governs the activity of the actor; a second type, explicit in nature, is used to postulate regulatory analyses and judgements (Evans and Over 1996). This seems to be a realistic approach, with immediate insights and more elaborate rationalizations that coexist and integrate into the world of decision through a cognitive duplicity of the mind. In fact, Epstein (1994) speaks of the cohabitation between the intuitive and the reasoning mind.

The same Kahneman (2003) refers to a cognitive architecture, with the first stage that works quickly, almost automatically and with emotional content; and the second that operates more slowly and with greater effort and according to rules. Cognitive economy takes this dichotomy, in the knowledge that a theory of action and the decision appears more realistic if it includes the causal role of the factors typical of the intuitive mind, which inevitably absorbs with immediacy contents of greater emotional impact.

Again, Kahneman (2003) has showed how the phenomenon of emotional-based accessibility is the core and source of a number of heuristics found in many economic decisions. These are prototype heuristics that identify themselves through a common characteristic, namely the representation of a category of phenomena through their prototype. The latter can be defined as characterized by the average values of the most significant properties of members of a given set of objects or events. It is evident that the mental accessibility of the prototype is not represented by the more intrinsic and objectively most relevant properties from the regulatory point of view of a category, but only by those of greater emotional impact from the subjective point of view. As a general rule, it must be said, therefore, that the so-called tacit dimension of the knowledge appears to be of great importance in the decision-making processes, and the intuitive mind qualifies as the proprietor of the cognitive processes that qualify its role.

What seems paradoxical is the major role played by tacit knowledge, the more the decision-making processes in economic life are associated with high levels of knowledge. You would think, at first glance, that the role of intuition should be confined to a simple everyday life characterised by implicit and automatic processes.

It would seem up to the reasoning mind to entertain the decision-making relationship with the complex realities in need of intense cognitive effort. On the contrary, it may happen

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that the actor involved, due to the complexity of the conceptual categories present in the elaboration of the decision, fails to picture them all at once explicitly and comprehensively.

We are, therefore, faced with a reality that requires flexibility of interpretation. If the economic action appears strongly driven by psychological components that belong more to the sphere of the intuitive rather than reasoning mind, it seems, to say the least, simplistic to continue to fit the theory of decision within maximising patterns that are more or less constrained. Cognitive economy knowingly shifts the *core* of the decision-making process from the conscious, intentional and rational aspects to the sub-conscious, emotional and intuitive ones of the insightful sphere of mind. By doing so, it does not reject categorically the rational contributions to economic decision. It does, however, define the role of co-decisive. In this, it differs from the typical approach of different theories concerning limited rationality that remain, however, within a deliberate vision of cognitive activity.

Cognitive theories add restrictions to those limits that are determined by emotional-affective factors. What follows is an integrated cognitive duality that is absolute, so much that even decisions generally ascribable to the sphere of conscious reasoning are nonetheless influenced by the intuitive component, especially in relation to the specific contexts of decision. At this point, it seems at least sensible to consider psychological insights and integrate them in the mainstream. These research proposals are reflected in the recent methodological approach illustrated by Rabin (2013, *portable extensions of existing models: PEEM*), where the models are “portable”, or in other words, use the same independent variables applied in the field of research that the change attempts precisely to extend.

### **Decision and contexts**

Starting from orthodox theories, in the context within which each agent maximizes his or her welfare, there is the need, within the framework of certain assumptions, for the entire social body to reach a situation in which the individual decisions are reconstructed in a coherent aggregate state wherein the system is in equilibrium.

The pressures and the information coming from the market and represented by prices are what turns selfish individual behaviours in desirable and virtuous social outcomes. Faith in the ability of the market to achieve coherent states, where potentially conflicting actions are coordinated, is based on the assumptions of collective and individual rationality and on an equally clear distinction between individual agents and institutional contexts. The whole system rests, however, on the ability of a price to represent and convey the full range of information necessary to the exchange, not only in terms of usefulness of an asset, but especially in terms of the extent of its shortage.

The clear separation between the economic agents and the context in which they interact, and the fact that it is given independently of the interactions, implies that economic agents are already perfectly adapted to their environment and that, conversely, the structures of interaction are perfectly conformed or casually irrelevant.

So that the two decisive factors of the whole argument of general economic balance consist in the ability of prices to reflect all information relevant for the purposes of the exchange and that this takes place in an institutional context that is totally transparent. In reference to the pre-market productive organization, the same argument can be upheld through the claim that market interactions are what follows a productive activity that precedes the exchange, and that it is organized through a division of labour obtained independently in relation to the very interactions. The essential point, therefore, is the representation of the economic actors as indepen-

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dent and anonymous individuals who make decisions independently of one another and interact only through the price system.

In addition, it should be recalled that one of the fundamental assumptions of the theory to prove that such a mechanism is also efficient in terms of allocation, is to avoid carefully that self-manifestation of the inseparability both in production and consumption, so that each agent is an autonomous entity for each set of prices. Thus, the usefulness of each agent is never influenced by choices made by other agents, except by those directly reflected in prices. The aim is to avoid any externalities, namely those situations where the actions of others affect our utility, without being reflected in the prices and therefore, without it being possible for the market to coordinate them.

However, there arises a question relating to the existence of companies organised as an organisational model. If, in fact, the market is a highly efficient institutional structure and if any situation capable of affecting role and function can be reduced to another situation that can be managed more efficiently, it is difficult to understand why businesses exist in addition to the market. But most importantly, we have to ask ourselves why the real economic life takes place through large sets of integrated modules and not as individually independent modules (Dosi, Nelson and Winter 2000). The only explanation seems to be found in the transaction costs associated with the use of the pricing system. Perhaps an even more plausible explanation appears tied on one hand to the sequencing of the production processes and, on another, to the choice of the ideal size of organizational modules. In fact, according to Simon (1991) and Langlois (1986), excessive or insufficient and inefficient integration would automatically be eliminated through two mechanisms: 1) in the absence of transaction costs, the degree of modular integration would be non-existent and each module sized incorrectly would automatically adjust to the ideal level; 2) if the pricing system should lead to higher costs of governance, it would prevail on the basis of greater allocative efficiency.

This approach has been the target of several criticisms since, even from a historical standpoint, it is clear that the market is the consequence of the division of labour and specialisation and not the other way around.

### **Decision, economic organizations and institutions**

A theoretical path has been developed recently aimed at providing an understanding of the nature of businesses and economic organizations, assuming the set of features related to their ability for problem solving to be key, knowing that such an ability is linked to intentional actions aimed at productive outcomes continually adapted to the mutability of the context.

After all, the issue is separating the bond between the division of labour, productive patterns and organizational forms, i.e. a system that emphasizes procedural approach to the detriment of a representation of production, entirely centred on its traditional function.

One of the assumptions of this approach, evolutionary in nature, explains that behaviours are often governed by relatively invariant rules over time, dependent on particular contexts that lead to certain behaviours (Dosi, Marengo and Fagiolo 2004). There is a clear difference compared to the orthodoxy whereby behaviours are to be interpreted as the product of maximization processes, based on the best use of the available information, given the constraints.

Another major theme concerns the concept of balance and an analysis of the necessary coordination among economic agents (Morselli 2013), which is to be identified in the properties emerging from interactions quite extraneous to the balance between heterogeneous agents. Setting aside the invisible hand and its therapeutic virtues of coordination and adjustment to orderly collective results, we start to reflect on the possibility that the same market interactions

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between heterogeneous agents tend to self-organize and lead to collective results that are relatively ordered and coordinated. This assumption postulates that a decisive role is played by specific forms of institutional organization of the various markets (Weisbuch, Kirman and Herreiner 2000). It is organised architectures that are the authors of consistent aggregation of the individual behaviours of the agents. Conversely, it is precisely the latter that continue often to encompass specific and not necessarily consistent beliefs and behavioural standards and therefore to reveal systematically inconsistent performance.

It should be remembered, though, that we are often in the presence of paths through which we see significant invariances in the cognitive processes of accumulation and, therefore, in the specific incorporation of such processes into new products and new manufacturing processes. At the same time, the processes can proceed in reverse order, meaning that the characteristics of specific technological paradigms can exert considerable influence on many economic phenomena, such as the structures of industries or their organizational form, to end with the specificity of the different processes of economic growth.

In this case, starting with the basic principles of the various theories related to Schumpeter (1911), it would be odd to label the new evolutionary paths as novelties, and the role of companies in the processes of growth, as a result of recent technological development. However, the interaction between technical progress and organizational forms has taken, based precisely on evolutionary theories, very relevant content, by having placed at the centre of the debate the field of mutual influence between institutions and scientific and technological learning or between economic agents and specific markets. Step after step, the relationship between institutional set-ups and income distribution or its channelling (consumption-savings-investments) has come to light; ultimately, the inseparable relationship between evolutionary and institutionally oriented analyses. Obviously, such an approach can present gaps or grey areas on a regulatory level.

But, abandoning the “perfect market” and the resulting perfect allocations (Metcalf, 1998), we have the advantage of the confrontation with the real world and its various dynamics and develop an awareness that there is no perfect policy, leading to the possible intervention levels of economic policy. Finally, new space opens up for revisiting the macroeconomic analysis based on a less rational and less stagnant microeconomics, to form economic policy prescriptions that are focused and not antagonistic, given the possibility of influencing variables such as the unemployment rate or price dynamics. In so doing, among other things, we can describe macroeconomic fluctuations through a traditional model of general equilibrium, with the inclusion, though, of an imperfection in the communication between markets (Angeletos and La’O 2013).

And so, economic institutions come into play, with regulative functions when operating through abstract rules which structure the conditions within which the agents produce, trade and consume goods. Thus the “market” organises transactions between agents through supply and demand, while the “hierarchy” governs internal relations and the psychological articulations of the actor through a sort of informational and control structure. Economic institutions assumes an organic role when they become substantial as concrete organizations acting as economic agents providing mediation between producers and basic consumers (the Stock Exchange); instead, they take on an instrumental character when they make divergent interests expressed by offers or demands that are incompatible “a priori” compatible. We are in the presence of cognitive institutions when these promote the integration-homogenization of the most disparate beliefs of agents, usually characterized by a kind of volatility of their expectation about their operating environment.

## Conclusions

According to some economists (such as Heymann and Leijonhufvud 1995), we must be wary of economic theory, because it seems to describe the behaviour of extraordinarily smart people in overly simple situations. However, despite its lack of realism about the cognitive abilities of agents, orthodox theory can prove helpful to understand why the interaction among individuals on the markets sometimes produces incredibly intelligent results. In cases where this happens, it is useful to model the process of social interaction as if it were planned by a representative agent endowed with enormous skill. Of course, social interaction does not always produce a perfectly rational result and at times, the *invisible hand* is not visible anywhere (Morselli 2010). Despite these doubts, standard economic theory has preferred to advocate the postulate that people are rational and act in every situation in the most appropriate manner. The assumption of rationality is itself the explanatory strategy referred to as “situational determinism” (Latsis 1972).

Limited rationality is confined, in the hope of ensuring the uniqueness of predictions starting from the given external situation. Specifically, determinism has allowed economists to ignore developments of cognitive science.

In reality, it is now a known fact that not even unlimited rationality is able to ensure situational determinism, since the dynamic models of general equilibrium present multiple balances. Moreover, the more we climb up the hierarchy of decisional problems in economics, the more we would need to increase the competence attributed to the decision-maker so that, at each stage, it is fully adapted to the greater complexity. In this way, economic theory excludes any question about behaviours that can emerge when the complexity increases, compared to management skills, with routine behaviour. The standard theory is forced, instead, to assume that an increase in complexity is offset by more sophisticated decision-making strategies.

As Heiner (1983) proves instead, the actual behaviour is exactly the opposite: the “normal” agent restores a reliable relationship between the actions and their consequences, trying “not to be too clever”, accepting that is, his limited rationality.

It is from this assumption that we started our analysis, respecting the complexity of economic phenomena and processes that guide the choices of individuals, always keeping in mind the contaminant relationship between economics and psychology; and, also, always keeping in mind the search for a way to stem the tendency to underestimate institutional structures.

The tendency to underestimate the institutional framework, under the pretext that the profit opportunities will be automatically accomplished, is an important part of this inability to build a framework for dynamic analysis, insofar as we convince ourselves that if we enforce barriers, institutional or otherwise, they will end up broken up.

However, this failure could be avoided through the overcoming of the *invisible hand* and the creation of an organizational and institutional system able to coordinate the economic system.

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