The cognitive turning point in economics: social beliefs and conventions

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Introduction

The concept of belief is not commonly used in economics. The reason is simple: by definition, homo œconomicus does not believe in anything. He is a fundamentally opportunistic being, always acting in pursuit of his own interests. In all circumstances, his conduct conforms strictly to the dictates of rationality. In this kind of framework, beliefs are considered in an essentially negative way, i.e. as an obstacle to the free reign of rational opportunism, which can lead an individual to take ill-considered decisions. This conception, which defines homo œconomicus by abstracting him from all particular beliefs, away from the norms and conventions that structure social life, has played and continues to play a fundamental role in the establishment of economics as an autonomous science, standing separate from all the other social sciences. It has allowed the creation of what has been called a "pure economics", devoted entirely to the principle of rationality. Here, the "disembeddedness of economics", a concept used by sociologists and anthropologists to refer to the increasing autonomy of economic relations from any type of social logic, finds its most complete formal expression. Free from the burden of beliefs, economic individuals act without the restraints of community bonds and moral traditions, recognising only the authority of instrumental rationality. It is only when we consider the importance of individual

or collective representations in other social sciences that we can really appreciate the extreme singularity of economics.

We propose the word 'fundamentalist' in order to characterise this paradigmatic conception which orients, nourishes and structures most of contemporary research in economics. In this approach, because the economy is considered as an efficient and opportunist adaptation to objective constraints of scarcity, as determined <u>ex ante</u> by the fundamental variables, i.e. individual preferences, techniques of production and available resources, individual cognition is reduced to simple rational calculation. It follows that this paradigm leaves no space for beliefs or representations, apart from those required for the pursuit of rational calculation itself. In such a framework, economic evolution can ultimately be explained purely in terms of the fundamental variables. This is the central thesis that defines the fundamentalist paradigm in economics. The Arrow-Debreu general equilibrium model presents us with the most refined expression of this approach, in that it provides a complete analysis of market economies without ever referring to beliefs. We can imagine the astonishment and fascination produced by such a result, which also partly explains its status as a reference model. This brings to mind Laplace's famous reply when Napoleon asked him about the role of God in his system: 'Sire, I had no need for that hypothesis'.

This article makes the case for a paradigmatic revolution, that economics must break away from this fundamentalist conception by integrating individual and collective representations into its analytic framework. To put it differently, we argue that economics must take into account what we call a 'cognitive turning point'. The thesis underlying our case is that economic reality cannot be understood in terms of fundamentals alone, for it also depends on beliefs. We should point out that this thesis in itself is not particularly original. If we consider the literature of the last couple of decades in the field of economics, we find it present in a number of works, including some which in other respects are deemed to be perfectly

'orthodox'. For example, we can mention 'signalling equilibria' (Spence 1973), 'rational bubbles' (Blanchard and Watson 1982), 'sunspot equilibria' (Azariadis 1981), 'bank runs' (Diamond and Dybvig 1984) and other 'self-fulfilling prophecies' (Farmer 1999). All this research makes the role played by the beliefs of agents in the determination of economic variables clear at the outset. Despite this, it appears that economic theory has not taken this result fully into account. For example, we find no empirical studies attempting to account for these representations, to specify their nature and their evolution. Similarly, no original theoretical elaboration has explored the manner in which this calls traditional conceptions of value into question. Everything continues as if, in the absence of an adequate analytical framework, this reality remained invisible, relegated to the margins of theory, like a curiosity of no great significance or a pure mathematical artefact of no real content. Because economists continue to rely on a fundamentalist epistemology, they are incapable of seeing what their own results show. This paradoxical situation appears to us to be damaging. Economic theory has everything to gain from this conceptual expansion.

In order to convince the reader, we will proceed in two steps. In a first section, we will consider expectations. Once we situate ourselves within the framework of monetary or sequential economies, expectations are imposed on us as an essential given. For example, in a sequential context, an individual trying to maximise his utility, must consider at the outset what future prices will be. His demand for goods at time t depends on his expectations on the prices that will prevail in the periods to come. In what sense does taking into account this particular type of belief (i.e. expectations), lead to a questioning of the fundamentalist paradigm? For the majority of economists, expectations are revisable conjectures that have no other purpose than that of allowing optimal adaptation to circumstances. In other words, they are a simple means of calculation, a pure instrument that in fine must allow the individual to obtain maximum utility. Even when expectations are required to conform to reality (as they

often are), the objective of truth is never perceived as an autonomous objective requiring the mobilisation of specific resources, but always as a means at the service of individual interests. With regards to this first conception, we must consider expectations as a form of belief which is entirely subject to the jurisdiction of instrumental rationality and as such does not contradict fundamentalist analysis in any way. It is precisely in this way that we should interpret the concept of 'rational expectations' put forward by economists following Muth's article (1961). This notion is the basis of a theory of individual cognition limited strictly to the criteria of instrumental rationality.

Is such a project possible? Are the fundamental constraints sufficient unambiguously to determine individual expectations in a universe of perfectly rational actors? The fundamentalist position, which has found its most perfect and rigorous formalization in the modern concept of rational expectations, has been criticised time and again by many economists, and by quite important ones at that, well before Muth's work was published. In particular we can think of Keynes who insisted extensively in both the General Theory and in the 1937 Quarterly Journal of Economics article, on the fact that rational calculation is inadequate in situations of uncertainty. He considered this statement to be the cardinal thesis that distinguished his approach from that of his contemporaries: given that probability is powerless when we consider the distant future, as required by any reflection on the accumulation of wealth, the 'methods of classical economics' are no longer applicable (Keynes 1937, p. 213). This critical position towards the possibility of constructing a pertinent analysis of expectations on the sole basis of instrumental rationality is shared by a number of theorists and is not only limited to Keynes. This position lies at the heart of the 'cognitive turning point' in that it considers the predictive activity of economic actors to be a specific kind of activity that cannot be reduced to instrumental rationality, an activity requiring a different set of principles in order to be conceptualised. Although many authors

share this critical conception, they differ as to the precise definition of these alternative principles. We shall use the generic term 'cognitive rationality' to describe the set of principles whose objective is to study individual expectations. The assertion that there exists a cognitive rationality, quite distinct from instrumental rationality, is the very foundation of the 'cognitive turning point' in economics.

In our first section, we adopt the same critical view, highlighting the incompleteness of instrumental rationality. However, the reasoning by which we arrive at this position is quite different from that proposed by Keynes. Our point of departure is not a reflection on individual choice in situations of uncertainty where probability cannot be calculated, but the notion of rational expectation. We highlight a point that we believe to have been neglected: - the fact that models that make use of rational expectations tend to present multiple equilibria. In other words, these models show that there are a great number of expectations and representations that, when shared by the mass of agents involved in the process of exchange, are self-fulfilling. If one takes this result seriously, it is tantamount to admitting that the criterion put forward by instrumental rationality, in practice the <u>ex post</u> conformity of observed variables to their expected level, is insufficient to determine individual expectations in practice. Contrary to an often defended point of view, the criterion of instrumental rationality applied to representations is neither too strong nor too demanding, it is in fact too weak, what we have called the incompleteness of instrumental rationality (Orléan 1994). Other, more specific criteria are therefore required if we want to obtain a true analysis of individual cognition. This is what is studied in the second section.

In this second section, we abandon the critical stance and focus on coordination games and their multiple equilibria. These situations are interesting to the project we are pursuing given that, since Thomas Schelling (1960), we know that economic actors are able to coordinate themselves much more efficiently than standard theory would predict. Reflecting on the way

in which these results come about (by focusing on certain specific equilibria) will allow us to expose certain fundamental cognitive mechanisms in the selection of equilibria. In order to highlight them we will put forward the concept of 'social belief'. This concept, which lies at the heart of the second section, is our specific contribution to cognitive economics. By this term we refer to those individual beliefs that take the following particular form: individual i believes that 'the group believes that proposition P is true', in other words beliefs about the beliefs of the group itself. We show that these beliefs play a strategic role in situations of coordination. The study of social beliefs highlights two interesting properties. On the one hand, social beliefs are strongly dependent on the specific contexts in which they were created. We will also say that they are the product of a 'situated' rationality, in other words, a cognitive rationality based on the explicit elements of the actor's environment, beyond what the fundamentalist analysis would have justified. On the other hand, we will show that social beliefs are partially disconnected from individual beliefs. This autonomy of social beliefs is our strongest result, because it is the most enigmatic, in that it undermines the intuitive idea that the opinion of a group is simply the 'sum total' of individual opinions, and because it produces the notion of the independence of the group in relation to individual data. We have come to this hypothesis by analysing a number of configurations in which all individuals believe P, usually on the basis of a fundamentalist analysis of the context, and in which, simultaneously, all individuals believe that the group believes Q. These situations prove to be perfectly stable. There is no mechanical restoring force to make the social belief converge towards individual beliefs. If this is the case, we must recognise that the level of social representations possesses its own logic, a logic that is partially disconnected from private opinions, which calls into question the individualist, bottom-up model in which collective opinion is seen as the sum of individual opinions. This has considerable theoretical and empirical consequences. On the one hand, the analysis of social beliefs as we have defined

them, leads to a strong conception of the collective which cannot be reduced to its constituent elements. In our approach, the collective must first and foremost explain itself by the collective and not by the individual. On the other hand, to say that social beliefs are autonomous is to attribute them the status of a third mediator, overhanging individual interactions. In this sense, the 'cognitive turning point' leads to the need for a renewed dialogue between economics and the other social sciences.

The indeterminacy of rational expectations

From the moment we abandon the Arrow-Debreu general equilibrium model and its restrictive assumptions in order to deal with monetary or sequential economies, the manner in which economic actors interpret their environment and project themselves into the future is imposed on theorists as a decisive question which can no longer be avoided. However, taking expectations into account is not without danger for the fundamentalist paradigm because it confronts economic discourse with a new object, individual cognition. We must therefore ask ourselves whether traditional economic tools are capable of proposing a meaningful and complete analysis or whether a deep transformation of fundamentalist discourse must take place in order to open it up to new principles. Is instrumental rationality still pertinent or should we admit the existence of a specific rationality that we shall call 'cognitive'?

In order to face these serious challenges, fundamentalist thought has elaborated a strong response that hinges on the notions of informational efficiency of prices and rational expectations. The central idea consists in proving that although the economic actor certainly acts on the basis of a particular representation of the economy, this representation is unique, in this case the 'true model', and that, on the basis of this unique model, knowledge of the

prices is sufficient to determine individual action perfectly. We find a typical illustration of these theses in Hayek (1945), who emphasises the ability of prices to incorporate all useful information and thus to enable coordination of the actions of the many different separate economic agents. This analysis gives credit to the idea of a spontaneous order which, starting from private interests, produces social outcomes, in this specific case equilibrium prices, without the need to postulate any common space of representation other than that of prices. We refer to this as a type of <u>bottom-up</u> logic, where equilibrium values result from the mechanical aggregation of private evaluations.

Hayek takes as an example the way in which an economy that is unexpectedly faced with a sudden shortage of tin evolves and adapts. According to his analysis, efficient adjustment to the new situation does not mobilise any global representation of the phenomenon, but a series of local adaptations as a function of private interests in their respective spheres of competence. In this respect, the process considered is of a fundamentally decentralised nature, at the opposite end of what a planned response would involve. The model thus constructed presents us with a set of individual neighbourhoods interconnected by prices and leading to a global adaptation of the economy despite the fact that no agent has global knowledge of the process itself. Hayek writes: 'The whole acts as one market, not because any of its members survey the whole field, but because their limited individual fields of vision sufficiently overlap so that through many intermediaries the relevant information is communicated to all' (1945, p. 526). The simple observation of prices allows each agent to make the right decision. Thus, prices enable fantastic savings to be made in knowledge and intelligence. It is thanks to this property that they derive their essential regulatory quality. Prices are responsible for the miracle by which strictly local knowledge is aggregated into a global price, leading, what is more, to the efficient management of resources.

This vision of market adaptation through the play of informationally efficient prices stumbles on a central difficulty that seems to have totally escaped Hayek in the context of his 1945 article: the difference between relative prices and monetary prices. Given that individuals observe an increase in the price of tin, they must ask themselves whether this observed increase is or is not the consequence of a general increase in prices. Depending on the answer they give to this question they will act differently. It is for this reason that in a monetary economy prices cease to be, strictly speaking, informationally efficient: they do not, in themselves, enable economic agents to make the right decision. This depends on their representations of the behaviour of the Central Bank. We thus recognise the fundamental fact that agents cannot determine the efficient action on the basis of prices alone; they also need to interpret the way in which the economy is operating. As we know, this consideration has played a central role in the emergence of the new macroeconomics. Indeed, it is to the credit of the school of rational expectations to have fully understood that no serious analysis was possible without considering the way in which agents perceive government policy and the workings of the economy. This is a considerable transformation in that it fully recognises the importance of individual cognitive activity, which we can no longer simply limit to the mere observation of prices. Rational expectations theorists can no longer be placed in the framework of objectified mediations, leading to a kind of parametric rationality, as in the Arrow-Debreu model. On the contrary, they fully recognise the central role of 'the principle of strategic interdependence, which holds that one person's pattern of behaviour depends on the behaviour patterns of those forming his environment' (Sargent 1986, page x). Thus, the analysis that each protagonist makes of others becomes an important element in the interaction dynamics and of the model that describes it.

Initially, this conceptual revolution was not fully perceived, because the new classical economists reasoned within a fundamentalist framework, leading them to believe that there

was only one economic model. Thus the question of the economic model was already solved the moment it was raised: the model to take into account was the 'true' economic model, in other words the one put forward by the new classical economists themselves. In this perspective, rational expectations have been defined as 'the application of the principle of rational behaviour to the acquisition and processing of information and to the formation of expectations' (Maddock and Carter, 1982, p. 41). The theory of rational expectations presented itself as an economic theory that took individual cognitive activity into account, but which maintained that the criteria of instrumental rationality alone were sufficient in order to reach complete intelligibility. Thus, there was no need to appeal to an autonomous concept of cognitive rationality.

This position was criticised shortly after it was put forward by those who, taking the idea of agents interpreting their economic environment seriously, emphasised the absurdity of the unique model postulate and the identification of the unique model with the very same model used by the new classical economists. This was the case of David Laidler (1986) analysing an empirical study that Robert Barro had dedicated to the influence of money on unemployment, production and prices in the USA during the period 1945-76. David Laidler noted that 'agents inhabiting the economy at that time are treated by Barro as believing in the equilibrium competitive model of the new-classical economics, and as using this model for forming their expectations. However, if, in the 1945-76 period agents really had held new-classical beliefs, there would have been no need for a new-classical revolution' during the 1980s. He added that during the 1970s, private economic actors such as those in charge of economic policy, believed firmly in the principles of Keynesian economics, in particular in the existence of an inverse relationship between inflation and unemployment. In these conditions 'logical consistency requires new-classical economics to model the economic history of the period in

question by postulating that agents operating within US economy used an erroneous Keynesian model to form their expectations'.

In other words, once one begins to examine the way in which agents consider their environment and analyse it, one must leave the sphere of pure instrumental rationality because it then becomes necessary to take the historical context into account and in particular the exact states of knowledge prevailing at the moment under consideration. Although Laidler's argument appears perfectly convincing, the decisive critique against the hypothesis of a unique model came from different quarters, namely from the rational expectation models themselves, once they proved the possibility of the self-realisation of a multiplicity of expectations. In order to understand their logic, one needs to return to the primary idea on which the notion of rational expectation is based, namely a strictly instrumental approach to cognition.

Indeed, the simple application of instrumental rationality to individual representation leads to an analysis that maintains no other evaluation criterion than the consequentialist performance criterion, namely, the quality of the forecasts these representations allow. Every other type of consideration, such as the search for 'justice' and 'truth' (Boudon, this volume) is excluded by definition. We want to emphasise that the term 'representation' is used here in a broad sense that includes three types of content: (1) a unique variable, for example, when individuals anticipate a return (Weil 1989) or a future price; (2) a real economic model where relations between variables are taken into account, for example the sunspot model (Azariadis 1981); (3) the behaviour of another agent, as for example in the Cournot or Bertrand type conjectures. Moreover, a representation is rational when the ex post observed result validates the initial belief: (1) the return or the price is equal to the anticipated return or price; (2) the observed relations conform to the ones postulated by the hypothetical model; (3) the agent has acted in line with the conjecture. Although this is not always stated explicitly, the fact that we

generally assume a situation in which all agents share the same representation is equally understood to be a consequence of rationality. The surprising result of rational expectation models consists in the fact that large numbers of representations are self-fulfilling. Moreover, we also obtain a great number of possible equilibria. This is a troubling result for the fundamentalist approach because it means that beliefs have a real impact, in line with the arguments developed by the American sociologist Robert Merton (1949) who wrote that 'collective beliefs engender their own realisation'. In other words, the constraints of scarcity alone are not sufficient to model the economy, because this also depends on the way in which agents interpret it. The idea of a unique model has to be abandoned: many models are possible, far more than we could imagine a priori. As Chiappori (1994, p. 75) writes: 'the hypothesis of the rationality of expectations is perfectly compatible with the indetermination of equilibrium.'

This essential role played by the a priori representations of agents leads rational expectations models away from the initial ideas defended by the new classical economists towards Keynesian results (Bryant 1983). Philippe Weil's model (1989) is a typical example of this apparent paradox. In a two period model, he showed that there are multiple rational expectations equilibria, by introducing the assumption that returns on savings are positively correlated to total savings. Confronted with this result, Weil had to appeal to Keynesian 'animal spirits', which gave the title to his paper, in order to 'determine' the equilibrium that would effectively prevail: whether economic actors form optimistic or pessimistic expectations on the expected return on capital, we will observe a high or low equilibrium. As in Keynes, the psychological attitudes of individuals become an independent variable on which the entire system depends. Weil wrote: 'the equilibria are dependent on the optimism or the pessimism of the consumers' (p. 889).

We believe that this massive indeterminacy of rational expectations is the most striking expression of the inadequacy of instrumental rationality as a tool for considering individual and collective representations. If we want to take economic discourse out of this crisis situation where anything or nearly anything is possible,[1] we need to move towards a better understanding of cognitive activity. This becomes an essential task for the economist and is the goal of the 'cognitive turning point'. Economists have spontaneously mostly turned towards psychology. This was the case for Keynes as it is for the contemporary stream of thought called 'behavioural finance' (Thaler 1993). For our part, we have assigned a primal place to the analysis of collective cognitive activity.

Towards a theory of Social Cognition

To begin with, it is useful to give a precise definition to what we mean by 'collective belief'. Economic theory suggests two definitions, 'shared belief' and 'common belief'. In order to clarify this central point, we will introduce the notation C_iQ that reads: 'individual $\underline{i}$ believes that proposition Q is true'. We then say that Q is a shared belief of group G if we have C_iQ for all individuals $\underline{i}$ belonging to group G. We say that Q is a common belief for group G when the following set of propositions is true: C_iQ; C_jC_iQ; $C_kC_jC_iQ$ ... to an infinity of crossed beliefs, for all $\underline{i}$s, for all $\underline{j}$s, for all $\underline{k}$s in the group. The notion of common belief is much more restrictive than that of a shared belief as it implies not only that everyone believes Q, as in the case of the shared belief, but also that everyone believes that everyone believes Q, and so on to an infinite order of crossed beliefs.

As we can see, these two notions of collective belief refer strictly to individual beliefs. They are only collective except in the sense that <u>all</u> individuals, one way or another, have

adopted them. Thus, these concepts are quite distinct from another concept, which can be written in the form C_GQ: 'group G believes that proposition Q is true'. In this case, we attribute the beliefs to an abstract entity, namely, the group itself. On the face of it, this notation is absurd, because properly speaking the group as such has no belief, as it is not a human being. However, empirical analysis reveals that in many coordination contexts, individuals are led to make use of this kind of enigmatic cognitive object, for example when they say: 'the market believes that this currency is undervalued'. How can we explain this strange fact? The object of this section is to provide an answer to this question. More broadly, we will show that social beliefs play a central role in coordination situations. Let us start by clarifying the meaning that individual i gives to the proposition C_GQ.

Definition of social belief

A priori, we can conceive of two definitions. According to the first interpretation, denoted (i1), individual i believes that the group believes that proposition Q is true if he believes that a large part[2] of the group believes proposition Q to be true. We are close to the notion of shared belief, but only in the eyes of individual i. According to (i1), a 'group belief' is just a way of saying that a large number of individuals of a group believes in a particular proposition. According to the second interpretation, denoted (i2), individual i believes that the group believes in Q to the extent that he believes that a large part of the group also believes that the group believes in Q. This definition is essentially self-referential in that in the end it leaves indeterminate what the meaning of 'believes' in the expression 'the group believes that proposition Q is true' is. It simply assumes that all the individuals of the group attribute to other individuals the ability to accept or refuse the proposition according to which 'the group

believes that proposition Q is true'. It follows that proposition Q is the object of a group belief for the individual if he believes that a great number of individuals accept this proposition as the answer to the question: 'what does the group believe?'. Put differently, we have C_iC_GQ if and only if $C_iC_jC_GQ$ for approximately all the individuals $\underline{j}$ of the group. It follows that C_GQ is close to the notion of common belief in the eyes of individual $\underline{i}$.

The difference between these two interpretations is very important. According to the first interpretation, in the eyes of $\underline{i}$, it is the proposition Q itself that is put forward as shared belief; in the second case, in the eyes of $\underline{i}$, it is the 'belief' C_GQ, rather than Q, that is put forward as a common belief. In this latter case, the precise nature of what it means that a group 'believes in something' remains indeterminate, whereas for (i1), group belief is defined easily as the belief of a large number of individuals of this group. If we go back to our example of an individual $\underline{i}$ who believes that the market believes that a given currency is undervalued, these two hypotheses correspond to the following two interpretations: (i1) the individual in question believes that almost all the other agents operating in the market, taken one by one, believe the currency to be undervalued; (i2) the individual believes that almost all of the other agents operating, taken one by one, believe that 'the market believes that the currency is undervalued'.

The two interpretations (i1) and (i2) appear to us <u>a priori</u> to be equally interesting in that both bring to the fore a particular cognitive task which aims to grasp the group as a group and attribute a belief to it. We believe this to be a fundamental property. It seems to us that it is very precisely through the indirect medium of this cognitive capacity, which attributes beliefs to the group <u>as such,</u> that the collective acquires an effective <u>de facto</u> existence. It is through the social beliefs to which it gives rise that it proves capable of shaping individual behaviours, and thus establishes itself as an autonomous force that must be taken into account. Put in a different way, in accordance with an analytical perspective developed by Mary Douglas

(1986) following Émile Durkheim, cognition is for us a privileged place of social expression (Orléan 1996). We shall see in the series of examples presented in what follows, that interpretation (i2) should be considered as the proper way of defining what a 'social belief' is, in particular with respect to the idea of autonomy in relation to individual beliefs. This assertion will be confirmed from an analysis of pure coordination games, a particularly appropriate configuration for those attempting to think about situations with multiple equilibria (Orléan 1994). We will begin by proving that what is called the 'Schelling salience' constitutes a prime example of social belief in the sense of (i2).

An example of social belief: Schelling salience

Thomas Schelling (1960) dedicated a large part of his book to the analysis of two-player pure coordination games. If every player has to choose his strategy in a set {1,2,…,i,…,n}, the payoff for both players is equal to 1 if they both choose the same strategy and 0 if they do not. Each player therefore tries to copy his partner in order to maximise his payoff. Schelling noted that individuals coordinated themselves a lot more efficiently than standard theory would have predicted. According to the latter, if there are n possible strategies, the probability of coordination is equal to $1/n$ because each strategy is perfectly indistinguishable from every other.

In all the experiments Schelling realised, he noted that the players coordinated a lot more efficiently than $1/n$. This occurred for a very simple reason: because the players used the wording of the choices available to them. In this way they were able to recognise 'salient' equilibria. We are thus faced with a double peculiarity. On the one hand, in the classic situations considered by game theorists, the way in which strategies are named is of no

pertinence. It is not a part of what we could call the 'fundamentalist' description of the game, which is generally constituted by the matrix of payoffs and the assumption of player rationality, in the sense of common knowledge. It is solely on this basis that the researcher seeks to characterise the equilibria. From the point of view of fundamentalist rationality, the labelling of the strategies is not to be used. We suggest the term 'situated rationality' (Orléan 1994) to designate the form of rationality that draws on contexts that go beyond what would be justified by fundamentalist analysis. On the other hand, individuals actually prove to be able, on the basis of the wording, to select certain equilibria. Let us examine this form of doubly enigmatic rationality starting from the empirical work carried out by Mehta et al. (1994).

These authors considered a particular pure coordination game consisting in choosing a natural number $n \geq 1$. More precisely, a group G of individuals was first put together and individuals were paired randomly, in such a way that each individual knew nothing else about their partner except that they were drawn at random from group G. In order to better interpret the results obtained, Mehta et al. began by selecting a first group, denoted P. P was then asked to choose a natural integer equal or greater to 1, in the absence of any coordination task. The authors thus obtained information on the distribution of the 'personal opinions' of the population tested. In the second group, denoted C, the coordination game was played according to the rules outlined above. What were the results?

In control group P, answers 7 (11.4%), 2 (10.2%), 10 (5.7%) and 1 (4.5%) came top. In group C, on the other hand, number 1 received most votes, and by a large margin: 1 was preferred in 40% of cases, followed by the number 7 which took 14.4%. According to the authors, the choice of the number 1 constitutes an example of what they call a 'Schelling salience', namely the ability to determine a single, prominent equilibrium capable of obtaining a large number of votes.

They noted that the choice of the number 1 by group C was the result of a very specific and enigmatic cognitive elaboration, in that it did not consider the 'personal' preferences of the players with regards to numbers, which would have lead to the choice of numbers like 7 and 2, but, instead, sought directly to determine the number that could plausibly be the result of a unanimous choice by the group when each individual analysed the problem from the same angle.

This appears clearly in the fact that 1, the final choice, was only in the fourth position of the primary choices for control group P. It was not because it was the players' preferred number that it was chosen by group C. The reasoning was completely different. If the individuals utilised the rule of 'choosing the first number', it was by virtue of the following property: when all the players follow this rule, it allows the unambiguous design of a unique response and leads to a successful coordination. This is exactly what Schelling had revealed. He spoke in this case of a 'focal principle', a principle which, when employed by all, allows the determination of a unique strategy. This is a case of the principle 'select the first number' and not of the principle 'choose a number that you like'. In the coordination situation experienced by group C, individuals do not start from their individual beliefs, nor by asking themselves what the personal beliefs of the others are (which would have led to the selection of number 7), but, by placing themselves in a more general level of abstraction, in such a way as to determine a principle which is able to produce, in the eyes of all, a unique equilibrium. Cognitive activity is thus turned towards the group as a separate entity in the attempt to produce a common ground on a non-cooperative basis.

We find here a first example of a 'social belief' in the sense of (i2). Let us remember that, by definition, Q is a social belief in the sense of (i2) for an individual i, if he thinks that it is a social belief for (nearly) all the individuals in the group. Such is the very nature of the cognitive activity that leads certain individuals to select the number 1: the players of group C

choose 1, because they see in it the choice capable of attracting the choice of the others, when the others consider the problem from the same perspective. The cognitive activity that this mobilises is turned fully towards the group as such and not towards the individual preferences of the players.

Indeed, if the latter were the case, we would obtain what we have called a social belief in the sense (i1), which leads to choosing the number 7 when all the players are well informed of the personal opinions of the group members such as the ones revealed by control group P. The strength of definition (i2) depends on the fact that it totally abstracts from the variability of the intrinsic preferences of individuals to devote itself to the definition of a belief proper to group C <u>as a group</u>. This is a strength because, in a large number of situations, social belief in the sense (i1) is very uncertain due to the very fact that the nature of individual tastes is variable and as such, is ineffective. When individual <u>i</u> asks himself about the belief shared by others, a large number of plausible answers come to his mind. In interpretation (i2) this fact is of no significance because, by definition, each individual tries to determine what is capable of being the social belief for (nearly) all the others. Nevertheless, in those particular cases where a choice is clearly a majority choice, the definition (i1) of the social belief effectively allows scope for good coordination. In this case, we would say that we are dealing with a 'stereotype'. Nevertheless, note that the stereotypical preference is equally a social belief in the sense (i2) and is of such a nature that this particular case does not weaken the generality of the hypothesis according to which we must retain definition (i2) in order to think of a "Schelling salience".

Situated Rationality and the role of contexts

In his analysis, Schelling insists on the role that contexts play in the elaboration of focal principles. The preceding example does not allow one to go too far in this direction to the extent that the context is strictly limited to the wording of the choices and nothing else is specified about group C. The following example that we owe to David Kreps (1990, p. 120) allows us to go a bit further in showing that the equilibrium selected depends directly on the manner in which the players analyse the identity of the participants in the game. Depending on the way in which the definition of group C varies, the social belief is modified.

Kreps considered the coordination game[3] consisting in dividing the 10 letters A, B, C, D, H, L, M, N, P, S into two sub-groups that should not intersect, or should do so as little as possible, given that the first team [denoted 1] must necessarily choose the letter B and the opposing team, [2], the letter S. Amongst the 256 possible partitions of the 8 remaining letters which form as many equilibria in this game, the focal point equilibrium, when nothing specific is said about the group of players,[4] is according to Kreps, the one which gives team [1] the first five letters, i.e. A, B, C, D and H and team [2] the last five, i.e. L, M, N, P and S. This is a new illustration of a Schelling salience. Kreps nevertheless added: 'Note that the rule applied here is entirely dependent on the context.' In order to demonstrate this, he considered a variation of the game in which team [1] is made up of Harvard students and team [2] is made up of Stanford students and where this fact is brought to the attention of the players. 10 towns are proposed to them Atlanta, Boston, Chicago, Dallas, Houston, Los Angeles, Miami, New York, Philadelphia and San Francisco. Team [1] must necessarily choose Boston and team [2] San Francisco. From the perspective of fundamentalist rationality, the two game situations are strictly equivalent. Yet, in approximately 75% of the cases, Kreps noted (p. 121), the Harvard students chose Atlanta, Boston, Chicago, Miami, New York and Philadelphia while those of Stanford retained the rest, i.e. Dallas, Houston, Los Angeles and San Francisco. The focal point here was a geographical division of the USA according to

what lies east or west of the Mississippi. This case is different from the focal equilibrium in which players are not capable of dividing player group G in groups of distinct geographical origin.

We see here in full the effect of context in the determination of a social belief. This depends strictly on the group under consideration, on what we know about it, and not only on the intrinsic content of the question as such. Thus, if this list of towns was given to players that were not American, who were ignorant of the geography of the USA but who knew the Latin alphabet, they would go back to the first solution for they would not be able to assume that each player knew American geography. In these conditions, taking into account the first letter may emerge as the 'focal principle'. Even more paradoxically, this could also be the case when all the players are American but do not know it. In this case, each player can no longer assume that the geographical partition on the basis of the Mississippi is a social belief of the group. We can see here that the way in which the players conceive 'the collective identity of the group' is an essential element in the problem, playing a determining role in the formation of social beliefs in the sense (i2). Whatever belongs to the common past of the group, be it historical precedents or cultural values, is utilized. The example considered by Kreps allows us to see the effect of a cultural context, but the same result could be obtained with a historical 'precedent.'

Financial markets provide a good example of the role played by historical precedents in the determination of social beliefs. More precisely, we can refer to the work that Shiller (1991) has devoted to the crash of 19 October 1987, the day in which the New York stock exchange suffered its sharpest ever slump, with a dizzying plunge of 508 points, representing a 22.6% fall. How can we explain a fall of such magnitude? Analysts agree that no fundamental information can provide the explanation. One has to look elsewhere, in the inter-subjective and self-referential dynamic on which the stock markets are based. Shiller had the idea of

sending out a questionnaire to individual and institutional investors to discover their motivations. The results he obtained highlighted the role that the 1929 crisis played in these events, serving as a reference model for investors attempting to decipher events and adapt to them.

He noted in fact that the 1929 crisis was strongly present in the minds of investors when the October 1987 crash began. 35% of individual investors and 53% of institutional ones answered 'yes' to the question 'Do you remember having thought or spoken of the events of 1929 in the course of the few days which preceded 19 October 1987?' For Shiller, the 1929 crisis imposed itself on all minds as the relevant salience, in other words as the model that allowed them to understand how a stock market crash unfolds. Let us remember that on the Wednesday, Thursday and Friday that preceded the crash, the stock market had already experienced three significant price drops. Moreover, investors were nervous during the weekend and on Monday morning. The substantial 200-point drop that took place on Monday 10 October when the stock market opened bewildered investors, who found themselves faced with events of a most unusual nature. How were the market and the other investors going to react? In these circumstances, what could one expect of the market? Investors interpreted the events of 1987 in the light of those of 1929. Clearly, the comparison did nothing to reassure them. It provoked an anticipation of further drops and contributed to the climate of panic that the stock exchange experienced during the 19th and 20th of October 1987. According to Shiller, we cannot understand the overreaction of the market without taking into account the role played by the salience '1929 crash' as the prototype of a stock market crisis. It is the adoption of this reference model during that period that explains the excessive character of the sales and the price drops. This analysis forcefully illustrates the role played by historical precedents in the determination of the collective expectations of the market.

The autonomy of social beliefs

The analysis of the role of contexts, whether historical or cultural, in the production of social belief allows us to see the strange absence of any connection to individual beliefs. It seems that individuals are somehow powerless because the legitimate interpretations that determine the coordination equilibrium are imposed upon them regardless of their own opinions.

The origin of these social beliefs lies in the multiplicity of common historical and cultural reference points that define the group's identity. Because the past imparts habits, narratives and legitimacies, individuals, whatever their opinions may be, are not free to propose legitimate collective representations. Moreover, equilibria that they may well not have wished for will impose themselves upon economic actors, as we saw in the example of the 1987 crisis.

This autonomy of social beliefs reveals itself forcefully in the fact that situations may exist in which all the individuals believe in proposition P and, simultaneously, all individuals believe that the group believes proposition Q, which is different to proposition P and where neither of the beliefs is wrong. As they are not based on any error, these situations can therefore persist without any need being felt to modify beliefs, on one level or another. In other words, this means that we can have C_iP for all individuals $\underline{i}$ of the group and at the same time C_iC_GQ for all individuals $\underline{i}$ of the group, without the appearance of restoring forces to reduce the divergence between personal and social beliefs. Let us note that it is an entirely different case when we consider social beliefs according to definition (i1).

In this case, there is no autonomy of the social belief, in the sense that the divergence between individual beliefs and social beliefs cannot exist, except in the hypothesis of false beliefs. Once again it is confirmed that definition (i2) provides the most innovative and rich

conception. Thanks to the property of autonomy that characterizes it, the way in which we understand interactions in the economic sphere is profoundly modified. It highlights a logic of a new type, which breaks away from the classical individualist model that views collective representation as the sum total of individual opinions. Hereafter, two levels and two logics coexist whose articulation we have to analyse.

The analysis of coordination games allows us to fully understand why things are so. Effectively, it has shown that we must carefully distinguish between what the individual really thinks and his collective choice. This holds for the very nature of the interaction under consideration, which rewards, not those who are 'right' and who answer the question posed 'correctly', but those who are more successful in predicting the movements of the majority opinion. This distinction, when applied to financial markets allows one to avoid premature judgements of irrationality which are frequently attributed to financial investors, for example when we see a significant discrepancy between a quoted price and what the community of economists considers the valuation based on fundamentals to be.

Let us take the case of a currency that is already undervalued, but which nevertheless continues to be sold heavily in the currency market, leading to a further fall in value. We would reproach traders for being irrational, in the sense of having poorly evaluated the fundamental value of the currency in question. Such a hypothesis does not stand to reason and, in any case, is not even necessary. Traders, like everybody else, may know very well that the currency is undervalued and nonetheless continue to sell. Effectively, what matters for them when they intervene on the market is not what they think the real value of the currency is, to the extent that they can estimate it correctly, but what they anticipate the market will do. In a market, agents make a profit when they succeed in correctly predicting the evolution of the opinion of the group. This is the rule of the game. We do not require the agents involved to be right and to estimate the fundamental values correctly. From this point of view, the

quote reproduced below, which comes from a trader interviewed during the major fall of the euro in September 2000, is revealing of the dichotomy between fundamentalist personal evaluation and investment choices. We witness an individual thoroughly convinced of the undervalued character of the euro, who nonetheless explains that he must sell it if he is not to lose money: 'The financial operator in me can well believe in a particular evaluation of the euro, but this has no weight when one sees all the others who intervene on the currency market selling the euro. Even if I estimate that the euro deserves to be priced higher than the dollar, I will still hesitate to buy the European currency. Practically speaking, if I am the only buyer of euros facing 50 sellers, I am dead. I do not necessarily do what I really believe, but rather what I believe the market will do, as this is what will prevail in the end. The job of the financial operator is to attempt to evaluate as precisely as possible the sentiments of the currency market'.[5]

Despite his personal conviction that the euro is undervalued, this trader plays along with the selling, and his behaviour is perfectly rational: if he bought euros he would do so at a loss! A first way of considering this situation consists in following the interpretation proposed to us by the trader himself. He contrasts two assessments, the fundamentalist evaluation and the belief of the market as defined by (i1), i.e. as being the belief of the largest number of traders. Against this background, the individual questioned justified his uncritical following of the crowd by the fact that a large number of investors were selling, to be precise there were '50 sellers' and they determined the belief of the market. According to this analysis, these '50 sellers' sold because they thought that the euro was overvalued. From a fundamentalist viewpoint, it is this mistaken conception that led them to sell. Faced with this situation, our trader had no choice. He had to bow before the dictates of the majority opinion.

If we stick to this interpretation, we will not observe what we have called the 'autonomy of social beliefs', in other words a situation where, for all the players, there is a divergence

between their personal opinions and their social beliefs. In fact, according to the interpretation offered by the trader, the personal and social beliefs of all the '50 sellers' converged perfectly when predicting a future drop in the price of the euro. Only our trader stated that there was a divergence between his fundamentalist evaluation and the belief of the market. There is nothing surprising about this lack of autonomy. It is a consequence of the fact that we have considered that the interpretation of the trader is based on an interpretation (i1) of the belief of the market.

This interpretation is not necessarily wrong. It may well be that in some or other financial situation there are investors who are naïve, poorly informed or irrational. This is a fact. If so, the bearish euro bubble is easily interpreted by the fact that there are a large number of ignorant investors. Nonetheless, we must clearly see that this interpretation leaves a central point unanswered: why are the '50 sellers' making this mistake? What mechanism can explain how the same error is propagated throughout the market? Moreover, it is interesting to explore an alternative analysis that abandons the suspect asymmetry between our perfectly rational trader and a market consisting of obtuse operators. According to this new interpretation, the '50 sellers' operated exactly like our trader: they acted in a self-referential manner, starting from their own social belief with respect to the functioning of the market. However, in line with our previous analysis, the social belief that we must consider corresponds to definition (i2) and not (i1): 'each seller believed that the market believed in a drop in the price of the euro.' From this perspective, each seller was equally rational, acting on the basis of the same belief with regards to the behaviour of the others. What we have is not 50 fanatical sellers, but 50 traders who, after reflecting on what the other traders were going to do (including the trader interviewed by Libération), anticipated that they were going to sell. If we had asked them, they would have commented that it is of no use to go against a market that is so determined in its short sightedness. And they would be right. The true belief

here does not concern the value of the euro, but the fact that 'each trader believes that the market is on a downward trend.'

Then we see a divergence between private beliefs on the undervalued nature of the euro and the social belief in the (i2) sense that the market expects the euro to drop further. We have C_iP for all individuals $\underline{i}$ of the group, where P is the proposition 'the euro is undervalued' and at the same time C_iC_GQ for all individuals $\underline{i}$ of the group, where Q is the proposition 'the euro is overvalued.' If they all believe that 'everyone believes in fall', then they will all be sellers and the market will plummet, effectively validating the initial belief ex post. Once again we encounter the phenomenon of the self-fulfilling prophecy. Thus, a bubble emerges without us having to assume the presence of irrational actors. Each actor is perfectly rational in his private evaluations and in his evaluation of the market. Indeed, there is no need to assume any incorrect evaluations. It is enough to have all actors assuming a certain market model in making their choices, conceived of as expressing a distinct logic. Investors who believe they are simply reacting to this market model, confirm their idea of a market autonomy, because despite their generalised belief in an overvalued euro, this continues to fall. This autonomy appears to them all the more undeniable since the evolution observed cannot be coherently explained through a fundamentalist analysis. Also, far from producing an adjustment of the social belief to the private opinions, this situation leads to the further reinforcement of the social belief that imposes itself as the only plausible explanation. The experience of the market confirms the hypothesis of the autonomy of the collective evaluation.[6]

At all levels then, beliefs are confirmed: the fundamental evaluation of the euro suggests this is undervalued; the market believes it will fall further; the market acts autonomously, in other words it is disconnected from fundamentalist evaluations.

Conclusion

The concept of cognitive rationality is now prompting a great deal of research, as is amply demonstrated in this volume. This can only be welcome. The field is vast and has been neglected for too long by traditional economic theory. For our part, we have sought to demonstrate why the concept of social belief is an indispensable element in the economic analysis of many important situations. This kind of research can serve two convergent purposes: on the one hand, it can give a new balance to cognitive approaches that have traditionally been centred on individual cognition to the detriment of social cognition; on the other hand, it opens up a channel of dialogue between economics and the other social sciences, such as sociology, anthropology and history, which have a lot to teach us on these subjects.

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[1] The idea that 'the hypothesis of rationality is in itself weak' is defended by Kenneth Arrow (1987, p. 206). Sonnenschein's theorem provides him with an exemplary illustration of this point. However, there are plenty of examples. We can think of the article by Boldrin and Montrucchio (1986) where it is shown that intertemporal dynamic optimisation is compatible with all types of dynamic paths for the economy, without exception, including chaos. In other words, assuming that individuals are rational in no way limits the total number of possible economic paths!

[2] The fact of using a term as vague as 'a large part of the group', or even 'approximately the whole group' or 'approximately all the members of the group', will have to be rendered more precise in later work. In the context of this article, we will deliberately remain imprecise on this point. The rest of the article can be read by replacing 'a large part of the group' by 'all the group members'.

[3] The game effectively proposed by Kreps is slightly different and significantly more complicated. In what follows I present a simplified version that leads to the same conclusions but avoids an unnecessarily long presentation.

[4] In fact, in most situations, each individual knows or assumes a certain number of common characteristics, such as speaking the same language as that in which the experiment takes place.

[5] Libération, 8 September 2000, p. 24.

[6] This enigmatic configuration in which private information do not succeed in modifying the collective choice is not without an equivalent in the theoretical literature. In situations such as the one exemplified in the 'electronic mail game' (Rubinstein 1989), we observe similar hindrances in the sense that the exchange of messages between two individuals, regardless of the number of players, does not manage to engender the common knowledge necessary for the two players to take a particular course of action. Information cascades also share this characteristic.