

PREDICTION AND PRESCRIPTION IN ECONOMICS: A PHILOSOPHICAL AND METHODOLOGICAL APPROACH

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BIBLID [0495-4548 (1998) 13: 32; p. 321-345]

ABSTRACT: "Prediction" and "prescription" are crucial notions for economics. This paper offers a philosophical and methodological approach and takes into account the connection with the problem of science and values. To do this, two steps are followed: firstly, prediction in economics -its characteristics and limits- will be examined and, secondly, the role of prescription in economics (and its relations with internal and external values) will be studied. Thus, the underlying aims of this paper are to make explicit the characters of economic prediction, to show its nexus with the economic prescription and to point out the links of both -especially, the latter- with the specific values of "economic activity" and the values of "economics as activity" (i. e., values of economic undertaking as an activity interconnected with others in the social context).

Keywords: Prediction, prescription, economics, philosophical and methodological approach.

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During the last decades economics has received increasing epistemological and methodological attention. As has happened with other sciences in the past, this philosophical interest appears as a consequence of the development of economics, which has enlarged its area of research and seems to be

looking for a clear progress in a more intense way than any other social science in recent times. Many factors intervene in this development, among them is the econometric turn¹, which should be emphasised due to its special weight for the epistemological and methodological discussions in this discipline.

Economics is a science which receives a visible influence from internal and external values and this makes it a complex science. In spite of its complexity, the role of economic method goes beyond the economic science and has a clear incidence on other disciplines². This preference for the economic dimension when studying human and social phenomena can lead us to what M. Blaug calls "economic imperialism"³, as exemplified in G. Becker, who -as is well known- researches social realities, such as families or prisons, from a purely economic view⁴. But economic criteria, beginning with the insistence on the correlation between cost and benefit, have also been applied to research methods in natural science⁵, as well as connecting with a key concept in methodology of science: scientific progress.

Within this general scope as intellectual horizon, the emphasis here will be on the notions of "prediction" and "prescription", which are crucial for economics. The approach will be philosophical and methodological, taking into account the connection with the relevant problem of science and values. In this regard, the study will follow two steps: firstly, prediction in economics -its characteristics and limits- will be examined and, secondly, the role of prescription in economics (and its relations with internal and external values) will be analysed. Thus, the underlying aims of this paper are to make explicit the characters of economic prediction, to show its nexus with the economic prescription and to point out the links of both -especially, the latter- with the specific values of "economic activity" and the values of "economics as activity" (i. e., values of economic undertaking as an activity interconnected with others in the social context)⁶.

1. Prediction in economics

From a philosophical and methodological point of view, the characterization of *prediction* in economics is not entirely clear: the existing approaches to its task are far from coincident and, even worse, the concept itself of "prediction" is understood by economists in different ways. This divergence can be found in very influential economists, among them four Nobel laureates: Milton Friedman, John Hicks, James Buchanan y Herbert A. Simon⁷. The first of these addresses the issue directly, because in his famous

paper on *The Methodology of Positive Economics*⁸ he focuses the methodological discussion on the role of prediction in this science and its incidence for the duality "positive economics"-"normative economics"⁹.

1.1. *The predictivist thesis*

Milton Friedman expresses a *predictivist thesis*: a conception of economic prediction rooted in an instrumentalist methodology of science. For him, prediction is the goal of science as a whole. Thus, it is a constitutive feature of economics as scientific enterprise: "the ultimate goal of a positive science is the development of a 'theory' or 'hypothesis' that yields valid and meaningful (...) predictions about phenomena not yet observed"¹⁰. From the perspective of substantive hypotheses, "theory is to be judged by its predictive power for the class of phenomena which is intended to 'explain' (sic). Only factual evidence can show whether it is 'right' or 'wrong' or, better, tentatively 'accepted' as valid or 'rejected'"¹¹. This *predictivist thesis*, where what is important is the success in making predictions, does not demand the realism of the assumptions. Friedman thinks that

the only relevant test of the validity of a hypothesis is comparison of its predictions with experience. The hypothesis is rejected if its predictions are contradicted (...); it is accepted if its predictions are not contradicted; great confidence is attached to it if it has survived many opportunities for contradiction¹².

Due to Friedman's enormous influence, this approach has had a strong impact on the debates on the methodology of "descriptive economics" and also a repercussion in "normative economics". (In fact, he was prepared to countenance the use of positive economics to inform policy). Friedman sees his position in convergence with physics, because -for him- the task of economics is

to provide a system of generalizations that can be used to make correct predictions about the consequences of any change in circumstances. Its performance is to be judged by the precision, scope, and conformity with experience of the predictions it yields. In short, positive economics is, or can be, an 'objective' science, in precisely the same sense as any of the physical sciences¹³.

Therefore, economics would be similar to natural sciences with respect to the quality of predictions, and both would have as a relevant test the comparison of their predictions with experience.

In spite of its influence, Friedman's predictivist thesis is too radical: neither scientific theories, in general, nor economic theories, in particular, can be reduced to the single goal of making predictions. The language, structure and knowledge of science are not *eo ipso* mere instruments to develop a methodology of prediction; they also seek to grasp the real facts, trying to give them either an "explanation" or an "understanding". Making predictions is then a relevant task which should be accompanied by other aspects, such as the description of human activity in the economic field or the evaluation of the result which it is convenient to obtain. Furthermore, to test a theory through its predictions is, frequently, a difficult task¹⁴: firstly, part of the pertinent information might not be available and the control of the observational process is sometimes a problematic issue; and, secondly, so-called "crucial experiments" -not only the "predictive", but also the "explanatory" ones- can raise a wide debate dealing with the available data (as is usual in issues related to unemployment or economic crisis, such as the famous one of 1929).

1.2. *The quasi-scientific option*

Another Nobel Prize laureate in economics -Sir John Hicks- argues in a very different vein, with manifest discrepancy to Friedman: (i) Hicks rejects that the ultimate goal of economics is to predict, because this subject is more influenced by its past -its history- than its future; (ii) he does not accept a convergence between natural sciences -especially, physics- and economics, because he considers both sharply separated by the problem of prediction; (iii) he asseverates that economics is not, strictly speaking, a "science": he thinks that it is a "discipline" that is on the edge of science; and (iv) the scientific test of economic prediction should be abandoned, due to his conviction that it is not a kind of prediction of a genuine science.

The starting point of this *quasi-scientific option* is in the insistence on two separate levels: on the one hand, Hicks considers that economics as a discipline cannot be incorporated into the sphere of science, because -for him- it has no genuine scientific status¹⁵; and, on the other hand, he thinks that the confluence of economics and physics is not possible: they belong to completely different domains of reality. Thus, regarding the first aspect, he points out that economics is a discipline

on the edge of science, because it can make use of scientific, or quasi-scientific, methods; but it is no more than on the edge, because the experiences that it analyses have so much that is non-repetitive about them¹⁶.

And, with respect to the second factor, he considers that there is a gap between physics and economics: "the facts which we study [in economics] are not permanent, or repeatable, like the facts of natural sciences; they change incessantly, and change without repetition"¹⁷.

Hicks assumes that the prototype of science is physics and that economics is always involved in changeable phenomena, making only weak predictions. In my judgement, he goes too far in denying economics a scientific character, because in economics there are foresights, predictions and forecastings¹⁸, and therefore, not all economic predictions are *eo ipso* essentially weak predictions. Even though scientific knowledge is, generally, more difficult in economics than in physics, we should take into account that it is a science of a different kind: it is of human and social nature, and the model of the Newtonian mechanics is not valid for economics. The phenomena studied by economics are within the sphere of events influenced by human action and contain specific conditions which the economists need to incorporate into their models.

1.3. *The dualist posture*

Methodologically, James M. Buchanan -another Nobel laureate- adopts a posture which is quite different from the predictivist thesis and the quasi-scientific option. He maintains that there exists two economic realms: on the one hand, there is an objective sphere which has predictions and, furthermore, possesses a scientific character; and, on the other hand, there is a subjective area and, in this second case, we have no scientific knowledge. Thus, in his book *Economics: Between Predictive Science and Moral Philosophy*¹⁹, he deals with the scientific character of this discipline, splitting it in two branches.

J.M. Buchanan accepts the existence of a "subjective economics" whose domain is "defined precisely within the boundaries between the positive, predictive science of the orthodox model on the one hand and the speculative thinking of moral philosophy on the other"²⁰. This subjective economics cannot be predictive. Thus, the role of prediction would be restricted to a part of economics and only that part could be "scientific". Consequently, he assumes a coincidence with the predictivist thesis: there is at least a branch of economics that makes scientific predictions.

For Buchanan, there are two kinds of economic discourse: the positive or predictive economics, which studies primarily what is more obvious in the human interaction, and the subjective (or non-predictive) economics, which

"can offer insights into the dynamics through which a society of persons who remain free to choose in a genuine sense develops and prospers"²¹. Therefore, he accepts a *methodological dualism* within economics; moreover, that distinction (objective/predictive and subjective/non predictive) is seen as *necessary* in making the history of economic doctrines.

That methodological dualism is like a *tertium quid* between Friedman's predictivist thesis and Hicks's quasi-scientific option. In spite of their differences, these three positions endorse the idea of prediction as an *aim* of economics, but they disagree about its role as the scientific *test*²². Two of them agree on the existence of a realm -positive economics- where this discipline is an objective science, capable of predicting future economic phenomena in a reliable way. This can be reinterpreted in terms of predictability of "economic activity", i. e., when the variables which are studied can be separated or distinguished ("isolated") with respect to other activities, or when they can be seen in an ideal context (such as some econometric theorems). In this case, the economic model can be precise, as a mere mathematical calculation, but it can put aside the usual variables which interfere in the real case. From this point of view, prediction (or, even, foresight) of future phenomena can turn out viable, because it is possible to take into account the variable involved in the event and, thus, to have a precise knowledge of the outcome.

1.4. *The wary attitude*

There is in Simon -Nobel laureate, 1978- a different conception of the status of prediction in economics. This approach can be seen in the context of two central problems: on the one hand, the possibility of prediction as the *main goal* of this discipline and, on the other hand, the role of prediction as the *test* of economics as *science*. Regarding the first problem, he feels uncomfortable with the assumptions of economic models, especially in the case of Friedman²³, which require substantive rationality and which emphasize reliable predictions as decisive. *De facto*, Simon rejects prediction as the main goal of economics and he cannot accept that prediction could be the single aim of science. Thus, he criticizes the methodological primacy of prediction in economics.

Regarding the second issue -the role of prediction as the *test* of economics as *science*-, the problem requires its diverse facets to be taken into account. An initial approach reveals that Simon considers that prediction does not belong to the set of characteristics which make economics a sci-

ence. In fact, he suggests abandoning prediction as the test to ascertain whether economics is a science: "we should be wary of using prediction as a test of science, and especially of whether economics is a science, for an understanding of mechanisms does not guarantee predictability"²⁴. His interest is in *understanding* the processes that explain past and present phenomena rather than in the predictability of economic behaviour.

Simon's scheme interconnects uncertainty, bounded rationality and economic prediction²⁵. 1) Economic prediction cannot be made on the basis of a "perfect rationality", because there are limitations: uncertainty about the consequences in each alternative when a decision is made, where the information on the set of alternatives would be incomplete, and the complexity of situations can prevent us from making the necessary calculations to solve the problem²⁶. 2) Insofar as the consequences of human behaviour continue in the future, we need to correct the predictions to objectively rational choices. But on the basis of the realism of assumptions, prediction is not a pure inference based on optimal conditions²⁷, because human decision making is rooted in processes which seek the strategy of *satisficing* rather than of optimising. Thus, in order to make an adequate economic prediction, we need to know some things which belong to the natural environment (e. g., the weather), others related with the social and political sphere beyond economics (e. g., a revolution), in addition to the behaviour of other economic actors (consumers, competitors, suppliers, etc.) who can have influence in our own behaviours²⁸. 3) In spite of their limitations, economic predictions based on a structure of bounded rationality *fit* with a great number of events²⁹, because that framework looks for the reality of economic behaviour as it can be observed in economic life³⁰. 4) Besides the assessment of the probabilities of predicted events, we need to use *feedback* to correct unexpected phenomena. For Simon,

a system can be steered more accurately if it employs feedforward, based on predictions of the future, in combination with feedback, to correct the errors of the past. However, the formation of expectations to deal with uncertainty creates its own problems³¹.

If we compare this scheme -the interconnection of uncertainty, bounded rationality and economic prediction- with the main trend of neoclassic economy (the expected subjective utility), the balance tilts in favour of Simon in several aspects³². (i) It is better off with respect to the realism of *assumptions*, because the stress is on reflecting the economic reality as it is,

avoiding drawing strong conclusions from few a priori assumptions. The emphasis on uncertainty and bounded rationality is completely pertinent to the problem of economic predictions, and the attempt to predict economic behaviour from a deductive inference based on an irrefutable set of premises is a failure³³. (ii) The nexus between economics and psychology makes sense not only for the case of a rational choice but also for predicting the results of the interactions of economic actors³⁴, because economics is above all a *human activity*. Explanation and prediction of economic movements are related to the actions of the members of society and the interaction of their activities³⁵. (iii) Prediction has a incisive role in economics: the development of economic activities requires anticipation and, if possible, the control of future events. However, not all economics is related to prediction. In fact, Simon has emphasised the need of *prescription* in system modeling³⁶, which directly affects the characterization of economics. (iv) The crucial point in evaluating economic predictions is the reliability of the *method* used to make predictions rather the precision of the result. Thus, prediction based on bounded rationality avoids the problems of the instrumentalist position (held, among others, by M. Friedman)³⁷.

1.5. *The underlying general methodology*

Until now, within the methodology of economics there is no general characterization of "prediction" which is approved by all economists: there does not exist *de facto* a general methodological framework about prediction which could be shared by the main experts in this discipline. In fact, as D. Hausman has pointed out³⁸, it is possible to distinguish prediction as (a) testable implications regarding the future; (b) testable implications whose truth is not already known; and (c) testable implications. Both (b) and (c) disconnect prediction from temporality and in (b) the prediction can be about any time. The view of prediction as disconnected from temporality and, therefore, separated from the future, is adopted by some authors, such as Herbert Simon or Frank Hahn³⁹.

If prediction were the mere drawing of testable implications independent of the time factor, then it could be the case that scientific prediction were almost indiscernible with respect to scientific explanation because explanation cannot exclude a priori the bringing about of some consequences. Moreover, it is not the most frequent sense of "prediction" in economics, which tends to see prediction as testable implications regarding

the future. This use -(a) in Hausman's presentation- is more characteristic of what prediction is in science (reflecting better the ordinary language than do the others) and it fits with two different problems: on the one hand, prediction of those phenomena which, while known, are affected by uncertainty (such as the economic activity as a whole); and, on the other hand, prediction of *novel facts* whose truth could be difficult to assess at the moment of making the economic prediction⁴⁰.

Both uses conjoin with the constitutive features of prediction recognized in the general methodology of science. 1) Prediction establishes a connection with an event which can happen in the *future*, with it being almost a redundancy to asseverate that link between "prediction" and "future", but some authors do consider the possibility of "prediction of the present"⁴¹, or -like Friedman- even accept the "prediction of the past"⁴². 2) There is a *reasonable basis* on our present knowledge to state in advance what will happen; so, in principle, the prediction is essentially corrigible if new knowledge appears that modifies the earlier situation. Some predictions are better than others, because they are right in a greater number of cases. 3) Predicting implies something *possible* and, therefore, a kind of knowledge which includes uncertainty. What is predicted is a reality which is expected rather than a reality that we are experiencing now or have experienced in the past. In this way, the predictive knowledge is less certain or definitive than the knowledge about the past or the present: generally, there is -in some way- an incomplete knowledge about the phenomenon or event; when the knowledge is "complete", the level is more "explanation" than "prediction". 4) Prediction is open to the possibility of "unobservable things" (i.e., a phenomenon not yet observed will occur) as well as to "novel facts" (i.e., facts discovered only as a result of testing some already articulated theory)⁴³.

2. Prescription in economics

It is difficult to find a *definition* of "prescription" in economics in the papers of influential economists (including those awarded the Noble Prize) or among those authors who develop the philosophy and methodology of this science. However, it is easy to put forward arguments in favour of economic prescription. In fact, even the staunchest defender of the predictivist thesis -M. Friedman- acknowledges such a necessity, but he seems to subordinate prescription to prediction, because he considers that normative economics

cannot be independent of positive economics. Any policy conclusion necessarily rests on a prediction about the consequences of doing one thing rather than another, a prediction that must be based -implicitly or explicitly- on positive economics"⁴⁴.

2.1. Insufficiency of prediction and the need of prescription

To circumscribe economics to the predictive task would be an unnecessary limitation, because prediction does not cover the whole field. In effect, as A. Sen has pointed out,

prediction is not the only exercise with which economics is concerned. Prescription has always been one of the major activities in economics, and it is natural that this should have been the case. Even the origin of the subject of political economy, of which economics is the modern version, was clearly related to the need for advice on what is to be done in economic matters. Any prescriptive activity must, of course, go well beyond pure prediction, because no prescription can be made without evaluation and an assessment of the good and the bad⁴⁵.

Along with this objection, it is possible to add another regarding the criterion itself chosen by Friedman -that of *success* in predicting-, because a very frequent criticism of economic predictions is their unreliability. Thus, what has been predicted by the economists should be compared with what happens in fact (i. e., what is achieved by evidence). And, in consonance with the results obtained by this instrument, it is possible to argue in the way which "Professor R. Clower has written: 'If successful prediction were the sole criterion of a science, economics should long have ceased to exist as a serious intellectual pursuit'"⁴⁶. Consequently, the methodological instrumentalism of the predictivist thesis is *de facto* very problematic.

But, as A. Sen has emphasised, some of economics stresses

evaluation as such, without being explicitly involved with either prescription or prediction. For example, in examining whether the British standard of living has been rising or falling over the last few years, the object of enquiry is assessment of what has been happening, without being directly concerned with predicting what will happen, or prescribing what should be done. Other economic exercises are concerned with more clearly descriptive problems, e.g., measurement of the extent of unemployment, or construction of an index of inflation. Although implicit value elements may be present in these exercises, the primary purpose is to describe what has been happening in a way that relates to our interest in the matter. Any act

of description does, of course, involve choice, but that does not make the act of description necessarily prescriptive or predictive⁴⁷.

Thus, neither prediction nor prescription can seek to cover the economic field as a whole.

Nevertheless, the insistence on the predictive character of economic theory as a guarantee of its scientific makeup raises some problems, which are not concerned only with economics but also to other sciences. In effect, it is not always the case that the *predictive success* is sufficient guarantee for having "science". In this regard, U. Mäki has pointed out that

a classical example of this is, in the sixteenth century, the predictive superiority of Ptolemaic geocentric astronomy over its young challenger, Copernican heliocentrism, even though the latter was decisively closer to revealing the fundamental structure of the planetary system. The difference between Copernican theory and economics, however, is that the former has indicated predictive progress, while the occurrence of such progress is controversial in the case of economics⁴⁸.

The evaluation of economic theories should not be reduced to its mere predictive capabilities, because there are other aspects which must be taken into account, among them, prescription.

2.2. From the predictivist instrumentalism to the possible primacy of prescription

Following a line opposed to Friedman's predictivist methodological instrumentalism, H.A. Simon has adopted a critical attitude towards the primacy of success in prediction, stressing instead the "understanding" of real economic phenomena. Furthermore, in tune with other economists, such as P. Samuelson⁴⁹, he has criticized the absence of the realism of assumptions of the instrumentalist approach. Nevertheless, his position chooses ways which are different from Friedman's.

On the one hand, Simon considers that prediction is neither the single aim of economics nor the main task of this science⁵⁰; and, on the other, he seems to give more importance to prescription than to prediction insofar as the predictive analysis *serves* the prescriptive endeavour:

we construct and run models because we want to understand the consequences of taking one decision or another. Predictive models are only a special case where we seek to predict events we cannot control in order to adapt to them better. We do not expect to change the weather, but we can take steps to moderate its effects. We predict

populations so that we can plan to meet their needs for food and education. We predict business cycles in order to plan our investments and production levels⁵¹.

Both cases -prediction and prescription- a good *understanding* of steady states can be more important -in his view- than drawing time series, either predictive or prescriptive ones, and this affects microeconomics and macroeconomics as well.

Consequently, Simon seems to change Friedman's priorities: on the one hand, economics can be tested by a judgement on the *correction of the assumptions*, instead of examining it through the probation of the empirical correctness of its predictions; and, on the other hand, the elaboration of models of complex systems is generally to *serve the policy*⁵², because he seeks the adaptation of economic behaviour, which is a task of economic planning. Hence, Simon combines insistence on the attention to the *facts*⁵³, beginning with the understanding of human behaviour in the decision making, and the existence of *specific goals* when the models of complex systems are built⁵⁴. In this regard, it is striking that an author so deeply involved in the theory of decision making in the economic sphere (especially, in economic organizations) as Simon only takes into account, *de facto*, the instrumental rationality⁵⁵. Thus, due to his avoiding a *rationality of ends* (or evaluative rationality), the economic prescription seems in a precarious situation, since it requires a *delimitation of aims* according to rational criteria.

Simon keeps his distance towards the purely econometric views: "when our goal is prescription rather than prediction, then we can no longer take it for granted that what we want to compute are time series"⁵⁶. And he seeks to *prescribe* human economic behaviour, but not by means of a deductive inference from a small group of premises:

our practical concern in planning for the future is what we must do *now* to bring that future about. We use our future goals to detect what may be irreversible present actions that we must avoid, and to disclose gaps in our knowledge (...) that must be closed soon so that choices may be made later. Our decisions today require us to know our goals, but not the exact path along which we will reach them⁵⁷.

Again the problem of the *nature* itself of economics appears here. In this regard, Lionel Robbins's idea of economics as the science which studies human behaviour as a relation between ends and scarce means with alternative uses is still in good shape⁵⁸. As Ronald H. Coase -Nobel Prize in economics, 1991- maintains, Robbins's conception makes economics the

science of human choices, even though most of economists restrict their work to a set of options narrower than that suggested by that view⁵⁹. Thus, although that position leads to carrying out a major relation of economics to *prescriptions* (which are a direct fruit of the decisions on choices), it seems that in economics the epistemic interest in favour of prediction prevails more than the practical dimension oriented to establish prescriptions.

When prescription predominates, there is a methodological shift in comparison with prediction, because prescription requires a methodological framework of an *imperative-hypothetical* kind whereas prediction is usually within a hypothetical-deductive structure. In effect, prescribing needs to indicate an end to be achieved, and this aim demands the adoption of several means which should be used, otherwise the action which has been made cannot be considered as *rational*. The hypothetical imperatives seek to guide the economic activity and, hence, to orientate the decisions which have been taken -the choices made- to implement the adequate means of obtaining the ends sought. The problem arises when the *unforeseen consequences* appear.

Through the incorporation of imperative-hypothetical methods, an approach is produced between the prescriptive facet of economics (which is then an applied science) and the normative character of social technology, which is also oriented towards *aims* and considers that some *means* should be applied, otherwise it would not be a rational technological behaviour⁶⁰. Thus, normative economics can be connected with technologies of social nature, either of a *piecemeal* kind -such as that proposed by K. Popper⁶¹- or of a holistic class, such as the technologies for emancipation of the Frankfurt school. The nexus between them could be *planning*, which leads to making operative the prescriptive criteria to direct the economic agency in a specific direction. Both -the applied science of normative economics and the social technology chosen- could be seen as ontologically different but causally interdependent, and their limits would be drawn, basically, by extrinsic evaluations (in principle, ethical, social and political)⁶².

2.3. Economic prescription and values

From the point of view of the scientific character of economics, a difficulty arises when prescription prevails (i. e., the normative dimension, which is more connected to *evaluations* than to predictions), because it can introduce the "value judgements" in economics. In this issue, as O. Morgenstern has suggested,

economists have been admonished time and time again to leave their political and other value judgements out of their theories and outside their classrooms or, at least, to make it clear when they speak as scientists, and when as citizens, politicians, religious persons, etc. This advice is well taken and should be scrupulously followed, no matter how difficult⁶³.

When the problem of *values in science* is studied rather than the *evaluations on science*, the issue is no merely a discussion of the personal, subjective difficulties, in separating his (or her) scientific attitude from the influences shaping his (or her) value judgements⁶⁴. Nowadays it seems clear that there are values in scientific *activity*. And, in the present case - economics- it is easy to appreciate that *prescription* carries out values in a more explicit manner than prediction. It does so in a dual form: on the one hand, the internal values, which can be cognitive values -those of a neatly economic character- or methodological values (the sphere of the "economy of research") and which usually evolve around the cost-benefit ratio; and, on the other hand, there is a set of external values, especially social values (those related to the nexus between that activity and other human activities which have economic incidence) and political values: both are particularly influential in the decision making process regarding the aims to be obtained. For economic prescriptions and their planning in time (the short, medium and long run) are not unfamiliar to the diverse factors which influence in the economy as an activity interconnected with others, which puts aside the perspective of economics as a completely autonomous activity (or even as isolated from the others) which would be entirely predictable (and, hence, easy for prescriptions).

To accept that economics has a double side as human activity (as an activity regulated by its own rules -*economic activity*- and as an activity among others -*economics as activity*-, interconnected therefore with social, cultural, political, etc., activities) supposes our assuming that there are or can be internal as well as external *values* in economics. Thus, instead of a human ongoing marked by variables which are totally quantifiable and mathematically expressible, from which the most strict econometric rigour can follow⁶⁵, we have a human undertaking where the economic aggregates do not move on their own, untouched by the human agents. Hence, the presence of qualitative elements in economic models -as happens in welfare economics- or the existence of cultural and social factors (such as in Germany on the mentality of saving or in Japan with the loyalty to the firm)

mean that the prescriptions cannot be guided by purely econometric patterns which only have internal variables of the economic process.

This assumption of values in economics gives a turn with respect to an influential tendency in methodology of economics, defended among others by Josep Schumpeter and Robert Solow -another Nobel Prize laureate-, which insists on the methodological line of a *value-free* discipline. In this approach, economics -as well as the other social sciences- has no more connection with values than any other science which studies nature. The difference would be in the level or repercussion, which is greater in economics than other fields insofar as it has influence in policy, because normative economics provides the information relevant for political activity.

Against this conception there are, nowadays, several philosophers of economics, such as Michael McPherson and Daniel Hausman⁶⁶, who have pointed out the limitations accompanying to this view of normative economics which converts it into "purely technical" or of a technological character: a mere practical knowledge which should be implemented in the domain of political economics. Both authors think that the influence of social theorists, especially the economists, goes beyond the mere providing of "technical" knowledge to those who make the decisions, experts who had formulated the aims previously. They consider that the economists also intervene in (or help in the task of) *determining the goals* to be achieved. Thus, the picture of the economist as a mere supplier of technical or specific information does not match the fact, present in the last two centuries, of social philosophers who have found in economic theory ideas to their social design.

Underneath the economic prescriptions there are -in my judgement- a set of issues on the existence of an *evaluative rationality* with respect to ends; a rationality different from the instrumental rationality of means (which is the dominant both in the neoclassical authors and in H.A. Simon). Rationality of ends would take charge of drawing the aims of economic prescriptions. This includes several levels: firstly, the selection of possible aims; secondly, the elaboration of priorities, either in terms of a hierarchy of ends within a delimited field or through a consideration of the realms which are or should be priorities; thirdly, evaluation of the consequences which derive from those aims (in economic terms or in other terms: social, cultural, political, etc.).

A theory of economic prescription should include -in my judgement- several elements, among them the following. 1) According to the rationality of ends, economic agents are neither mere searchers of maximisation of

subjective expected utilities (these are frequent in the methodological individualism of neoclassical economics), nor are they subjects whose full task is *satisficing* -in the sense of Simon-, because the maximisation is an ideal feature, not a real one, of economic agents (who have, in fact, a bounded rationality) and *satisficing* does not require that the aims are already given; moreover, the process of *satisficing* can be carried out following different ways, which can modulate the orientation towards the ends sought. 2) Incorporation of more qualitative factors at the moment of drawing the economic aims of prescriptions, since economic agents have not as a single goal the obtaining of the maximum economic benefit: economic activity is linked to other economic strategies within the social world, which has its repercussion -as A. Sen has pointed out- in "the deep interdependence in the achievements of people's respective goals"⁶⁷. In addition, the publication of papers on the cooperative aspects in the domain of this discipline⁶⁸, and the recent research line about altruism in economics⁶⁹, allow us to asseverate the existence of a break in the traditional neoclassical scheme of a utilitarian rationality of a noticeable individualistic kind. Furthermore, against the one-dimensional methodology of this orientation, it should be emphasised that the economic activity itself is interconnected with other social and cultural elements (familiar, ethnical, national, international, etc.) which influence the prescriptions to be given (in a similar way as the social rejection to a motorway motivates the modulation of a technology which is well oriented from the technical point of view).

The *internal values* of prescriptions depend, to some extent, on the knowledge provided by economic predictions, because, like any other conception which supposes the direction of human activity, it requires a possible aim that should also be achievable. Thus, some of the components of internal evaluations of economic prescriptions can be the simplicity of the goal, the consistency of means, the adequacy with respect to the agents, the ratio between cost and benefit,... Regarding the *external values* the list is wider: they go from evaluations of ethical and social character (repercussion to social groups, especially the labour dimension -i. e., in terms of employment: social discrimination versus social cohesion; integration in the working place versus emigration; labour dignity versus "junk contract", etc.-) or of a social and cultural kind (i. e., social settling versus creation of minorities) to components of a different class (political, ecological, etc.).

Looking at the problem from a methodological angle, the complexity of economic reality seems more patent. In effect, the present general proposal assumes that the applied science which emerges -the normative economics-combines several things: (a) it is backed up by the predictive information of the descriptive or "positive" branch of economic science; (b) it should adopt a method different from the dominant methodological individualism of neoclassical economics; and (c) that method will follow a position which is divergent with respect to the holistic methodology of narrow kind, such as that derived from the economic systems with prescriptions in terms of social planning, systems guided by a voluntarism regarding the economic aims (which do not contemplate that the rationality of means is not restricted to the mere economic activity but which is clearly affected by its character of being one *human activity* among others and, therefore, linked to ethical, social and political factors which eventually affect productivity itself). To look for that *tertium quid* between methodological individualism and holistic methodology can lead us to stress the role of economic activity as *social action*, distant from the maximisation of subjective expected utilities and different from the search of impersonal collective aims, planned extrinsically to the economic agents.

A possible enumeration of *internal* (or endogenous) *values to economic activity* as such is the following: satisfactory relation between cost and benefit; efficiency and effectiveness, with predominance of the first; search of certainty, and consequently a diminution of uncertainty; adequate correlation between means and ends, with the decrease of risk; profitability; competitiveness;...

Regarding *external* (or exogenous) *values to economic activity* as such (extrinsic to economic knowledge and method) an important feature is the wide diversity of their possibilities, according to the human or social facet correlated with the economic undertaking: (i) on its socio-psychological dimension (trust, credibility, viability,...); (ii) as a socio-cultural phenomenon (to satisfy the needs, to cover the expectations, to syntonize with the social patterns, social welfare,...); (iii) insofar as it is a human activity capable of ethical valuation (dignity of the person, honesty, integrity,...); (iv) on the basis of its political scope (to reduce the inequalities, to increase freedom,...); (v) as it has a repercussion on the environment facet (protection of the milieu, to avoid ecological dangers,...);...

This taxonomy of values, as well as any other which could be offered, depends on a previous theoretical problem: the status itself of *values*. For modulation of the problem varies notably if an objectivity of values is

defended (or, at least, some of them) instead of considering that all values are intersubjective (or, even, merely subjective) and then under the acknowledgement by a collective (or, it is the case, by an individual) within a concrete framework of space and time. The way of characterization of the values influences in how to configure the axiology of inquiry⁷⁰, because this marks the ends (in this case, economic ones) which will require adequate means. Thus, the reflection on the economic prescription exhibits several philosophical and methodological problems which are not easy to resolve: 1) the way of relating the values internal to economic activity and those external to economic knowledge and method but with repercussion in the economic science; 2) the status itself of the values involved and their incidence in the priorities to be established by an axiology of inquiry; 3) the form of evaluating the results of economic prescriptions taking into account the internal and external values assumed.

2.4. *Prediction and prescription: a kind of conclusion*

In order to take stock of the complex task of articulate economic prediction with economic prescription⁷¹, several elements which are relevant from a philosophical and methodological perspective should be emphasised in my judgement. Firstly, prediction is not the leitmotif of economics insofar as the aims sought by this discipline go beyond the range of descriptive tasks to go into the prescriptive functions of the axiology of economic research. Secondly, prediction can be distinguished from the mere *testable implications* of a economic model established, because it includes the factor of temporality: it looks at the future that, in principle, starts with the mark of uncertainty. Thus, the prescriptions can reduce the margin of uncertainty insofar as they select attainable aims and they associate the available means to them.

Economic prescription combines, basically, the following features: (i) in a form clearer than prediction, prescription takes place on a teleological horizon, because it appears directly related to *ends sought*; (ii) it exceeds the epistemological level which supports the predictive methodology and becomes a concept connected to the *direction of action*, an aspect which is more obvious when a planning of economic activity takes place; (iii) insofar as it leads towards an adaptation of the future of economic undertaking, prescription is supported by *the base of predictions* given by the economic science in its face "positive" or "descriptive"; (iv) there is an *asymmetry* between "prediction" and "prescription", because not all economic predic-

tion is accompanied by the possibility of a viable prescription, due to the fact that it is possible to predict economic phenomena which we cannot control (i. e., predictions of economic cycles in the long run) and the economic prescriptions themselves are assessed with respect to their plausibility -as better or worse off economic policies- according to predictions, and thus predictions can be used to evaluate prescriptions⁷².

Acknowledgement

A previous Spanish version of this paper was delivered in a seminar held at the Consejo Superior de Investigaciones Científicas (Superior Council of Scientific Research), Madrid, in June 1997. Later on, an English version was presented in the conference of the *International Economics and Philosophy Society*, congress held at the University of New South Wales, Sydney, in September 1997.

I am indebted to Daniel Hausman and Nicholas Rescher for the suggestions on this paper. I also thank Bruce Caldwell for his comments on this article.

Notes

- 1 The turning point can be located in 1944, when T. Haavelmo publishes his paper 'The Probability Approach in Econometrics' in the supplement of *Econometrica* 12, 1-118. On the evolution of Econometrics, cf. Morgan, M.S.: 1990, *The History of Econometric Ideas*, Cambridge, Cambridge University Press. From the methodological point of view, Poirier, D.J. (ed.): 1994, *The Methodology of Econometrics*, Aldershot, E. Elgar, 2 vol., should be emphasised.
- 2 Cf. Radnitzky, G., Bernholz, P. (eds.): 1987, *Economic Imperialism: The Economic Method Applied Outside the Field of Economics*, N. York, Paragon House.
- 3 Cf. Blaug, M.: 1980, *The Methodology of Economics: Or How Economists Explain*, Cambridge, Cambridge University Press, p. 248.
- 4 Cf. Becker, G.S.: 1976, *The Economic Approach to Human Behavior*, Chicago, University of Chicago Press, and Becker, G.S.: 1981, *A Treatise on the Family*, Cambridge, Harvard University Press.
- 5 Cf. Rescher, N.: 1978, *Scientific Progress. A Philosophical Essay on the Economics of Research in Natural Science*, Oxford, B. Blackwell, and Rescher, N.: 1996, *Priceless Knowledge? Natural Science in Economic Perspective*, Savage, MD, University Press of America. Moreover, this philosopher has also used the economic perspective to characterize the theory of knowledge: Rescher, N.: 1989, *Cognitive Economy. The Economic Dimension of the Theory of Knowledge*, Pittsburgh, University of Pittsburgh Press.

- 6 On this distinction, cf. Gonzalez, W.J.: 1994, 'Economic Prediction and Human Activity. An Analysis of Prediction in Economics from Action Theory', *Epistemologia* 17, 205-246.
- 7 Cf. Gonzalez, W.J.: 1996, 'On the Theoretical Basis of Prediction in Economics', *Journal of Social Philosophy* 27/3, 201-228.
- 8 Friedman, M.: 1953, 'The Methodology of Positive Economics', in Friedman, M.: *Essays in Positive Economics*, Chicago, University of Chicago Press, (6th print., 1969), pp. 3-43.
- 9 This distinction is presented frequently as "positive economics" versus "political economy". As T.W. Hutchison has pointed out, the explicit attempts to distinguish the "positive" propositions of economic science with respect to the recommendations on the economic policies to be implemented, according to concrete aims to be achieved, began in the first half of XIX century with John Stuart Mill and Nassau William Senior. Hutchison notes that the distinction has not been always clear and not all economists consider that methodological duality as well oriented, cf. Hutchison, T.W.: 1964, *"Positive" Economics and Policy Objectives*, London, Allen and Unwin.
- 10 Friedman, M.: 'The Methodology of Positive Economics', p. 7.
- 11 *Ibid.*, p. 8.
- 12 *Ibid.*, p. 8-9.
- 13 *Ibid.*, p. 4.
- 14 Cf. Caldwell, B.: 1994, *Beyond Positivism: Economic Methodology in the Twentieth Century*, (London, Allen and Unwin, 1982), rev. edi., London, Routledge, p. 174.
- 15 Cfr. Hicks, J.: 1983, "A Discipline not a Science", in Hicks, J.: *Classics and Moderns. Collected Essays on Economic Theory, v. III*, Cambridge, Harvard University Press, pp. 364-375.
- 16 Hicks, J.: 1986, 'Is Economics a Science?', in Baranzini, M. and Scazzieri, R. (eds): *Foundations of Economics. Structures of Inquiry and Economic Theory*, Oxford, B. Blackwell, p. 100.
- 17 Hicks, J.: "'Revolutions' in Economics", in Hicks, J.: *Classics and Moderns. Collected Essays on Economic Theory, v. III*, p. 4.
- 18 Cf. Gonzalez, W.J.: 'On the Theoretical Basis of Prediction in Economics', pp. 215-216.
- 19 Buchanan, J.M.: 1987, *Economics: Between Predictive Science and Moral Philosophy*, College Station, Texas A & M University Press.
- 20 Buchanan, J.M.: 'The Domain of Subjective Economics: Between Predictive Science and Moral Philosophy', in Buchanan, J.M.: *Economics: Between Predictive Science and Moral Philosophy*, p. 68.
- 21 Buchanan, J.M.: 'The Domain of Subjective Economics: Between Predictive Science and Moral Philosophy', p. 70.
- 22 It is convenient to emphasise that "the question of prediction in Economics involves, or brings together, most of the main questions as to what sort of subject Economics is",

- Hutchison, T.W.: 1977, 'On Prediction and Economic Knowledge', in Hutchison, T.W.: *Knowledge and Ignorance in Economics*, Oxford, B. Blackwell, p. 8.
- 23 Cf. Friedman, M.: 'The Methodology of Positive Economics', in Friedman, M.: *Essays in Positive Economics*, pp. 3-43.
- 24 Simon, H.: 'The State of Economic Science', in Sichel, W. (ed.): 1989, *The State of Economic Science. Views of Six Nobel Laureates*, Kalamazoo, Michigan, W.E. Upjohn Institute for Employment Research, p. 100.
- 25 Cf. Gonzalez, W.J.: 1997, 'Rationality in Economics and Scientific Predictions: A Critical Reconstruction of Bounded Rationality and its Role in Economic Predictions', in Ibarra, A. and Mormann, Th. (eds.): *Representations of Scientific Reasoning. Contemporary Formal Philosophy of Science in Spain*, Poznan Studies in the Philosophy of Science, v. 61, Amsterdam, Rodopi, pp. 205-232; especially, pp. 216-217.
- 26 Cf. Simon, H.: 'Theories of Bounded Rationality', in McGuire, C. B. and Radner, R. (eds.): 1972, *Decision and Organization*, Amsterdam, North-Holland, p. 169.
- 27 "Human beings (and other creatures) do not behave optimally for their fitness, because they are wholly incapable of acquiring the knowledge and making the calculations that support optimization" (Simon, H.: 1993, 'Altruism and Economics', *American Economic Review* 83/2, p. 156).
- 28 Cf. Simon, H.: 1981, *The Sciences of the Artificial*, 2nd ed., Cambridge, M.I.T. Press (7th print., 1992), p. 43.
- 29 Cf. Simon, H.: 1992, 'Colloquium with H.A. Simon', in Egidi, M. and Marris, R. (eds): *Economics, Bounded Rationality and the Cognitive Revolution*, Aldershot, E. Elgar, p. 18.
- 30 Cf. Simon, H.: 'Introductory Comment', in Egidi, M. and Marris, R. (eds): *Economics, Bounded Rationality and the Cognitive Revolution*, p. 3. "Because game theory is intrinsically unable to make specific predictions of behaviour from the postulates of rationality, in order to understand behaviour we must look at the empirical phenomena to see how people actually play games" (Simon, H.: 'Colloquium with H.A. Simon', p. 25).
- 31 *The Sciences of the Artificial*, 2^a ed., p. 44.
- 32 Cf. Gonzalez, W.J.: 'Rationality in Economics and Scientific Predictions: A Critical Reconstruction of Bounded Rationality and its Role in Economic Predictions', pp. 217-218.
- 33 Cf. Simon, H.: 'From Substantive to Procedural Rationality', in Latsis, S. (ed.): 1976, *Method and Appraisal in Economics*, Cambridge, Cambridge University Press, p. 146.
- 34 Cf. Simon, H.: 'Economics and Psychology', in Koch, S. (ed.): 1963, *Psychology: A Study of a Science*, vol. 6, N. York, McGraw Hill, pp. 715-752. Reprinted in Simon, H.: 1982, *Models of Bounded Rationality, vol. 2: Behavioral Economics and Business Organization*, Cambridge, M.I.T. Press, pp. 318-355.
- 35 Cf. Sen, A.: 1986, 'Prediction and Economic Theory', in Mason, J., Mathias, P. and Westcott, J.H. (eds): *Predictability in Science and Society*, London, The Royal Society and The British Academy, p. 14.

- 36 Cf. Simon, H.: 1990, 'Prediction and Prescription in Systems Modeling', *Operations Research* 38, 7-14.
- 37 On the methodological instrumentalism on scientific prediction, cf. Gonzalez, W.J.: 1995, 'Reichenbach's Concept of Prediction', *International Studies in the Philosophy of Science* 9/1, 35-56; especially, 43-50.
- 38 This distinction is drawn by D. Hausman in a personal communication (21.1.96) and clarified recently (20.1.98).
- 39 "It is important recognise that not all predictions involve the future", Hahn, F.: 1993, 'Predicting the Economy', in Howe, L. and Wain, A. (eds.): *Predicting the Future*, Cambridge, Cambridge University Press, p. 79. Regarding the topic of "Prediction without the time dimension", cf. Hahn, F.: 'Predicting the Economy', pp. 79- 81.
- 40 According to this characterization of prediction, to state that the rate of inflation in the first half of 1910 in USA was 3,5% is not to make a prediction of a "novel fact": that is not a future event. The position held here is open to a Lakatosian sense of "novel fact": it includes the possibility that "Newtonian scientists predicted the existence and exact motion of small planets which had never been observed before. Or (...) Einstein's programme (...) made the stunning prediction that if one measures the distance between two stars in the night and if one measure the distance between them during the day (when they are visible during an eclipse of the sun), the two measurements will be different. Nobody had thought to make such an observation before Einstein's programme" (Lakatos, I.: 1978, 'Science and Pseudoscience', in Lakatos, I.: *The Methodology of Scientific Research Programmes*, edited by J. Worrall y G. Currie, Cambridge, Cambridge University Press, p. 5).
- 41 Cf. Mellor, D.: 1979, 'The Possibility of Prediction', *Proceedings of the British Academy* 65, p. 207.
- 42 "The 'predictions' by which the validity of a hypothesis is tested need not be about phenomena that have not yet occurred, that is, need not be a forecast of future events; they may be about phenomena that have occurred but observations on which have not yet been made or are not known to the person making the prediction. For example, a hypothesis may imply that such and such must have happened in 1906, given some other known circumstances. If a search of the records reveals that such and such did happen, the prediction is confirmed; if it reveals that such and such did not happen, the prediction is contradicted" (Friedman, M.: 'The Methodology of Positive Economics', in Friedman, M.: *Essays in Positive Economics*, p. 9).
- 43 These traits are dealt with by Gonzalez, W.J.: 'On the Theoretical Basis of Prediction in Economics', p. 207.
- 44 Friedman, M.: 'The Methodology of Positive Economics', in Friedman, M.: *Essays in Positive Economics*, p. 5. "Normative economics is concerned with 'ought to be', but it is not entirely independent of positive economics (see Friedman 1953, p. 5). At first sight the positive-normative distinction may appear to resemble a demarcation criterion between science and pseudo-science. However, this is not the case - as just noted, positive and normative aspects are frequently interrelated. This is the case when we wish to make 'normative' judgements as to the most appropriate economic policy to pursue and

- such judgements will always be underpinned by positive economics. Friedman's advocacy of strict monetary control is a good example of this and he argues, normatively, that monetary authorities ought to control the rate of growth of the money supply if they wish to control inflation. However, such advice, as far as Friedman is concerned, is founded upon positive economics which has 'established' the primacy of money supply increases in 'causing' inflation" (Pheby, J.: 1988, *Methodology and Economics*, London, Macmillan, p. 85).
- 45 Sen, A.: 'Prediction and Economic Theory', in Mason, J., Mathias, P. and Westcott, J.H. (eds.): *Predictability in Science and Society*, p. 3.
- 46 Hutchison, T.W.: 'On Prediction and Economic Knowledge', in Hutchison, T.W.: 1977, *Knowledge and Ignorance in Economics*, Oxford, Blackwell, p. 12.
- 47 Sen, A.: 'Prediction and Economic Theory', p. 3. Cf. Sen, A.: 1980, 'Description as Choice', *Oxford Economic Papers* 32, 353-369. His position is not accurate from the point of view that it seems rather obvious that "description" is quite different from "prescription" and that prediction has its roots in the descriptive realm although it can be used in a prescriptive context.
- 48 Mäki, U.: 'Reorienting the Assumption Issue', in Backhouse, R.E. (ed.): 1994, *New Directions in Economic Methodology*, London, Routledge, p. 254. Before the publication of Th.S. Kuhn's methodological essays, the insistence on prediction as an evaluative criterion was common among the economists: "an emphasis on prediction as the criterion by which to evaluate economic theories was also characteristic of the group of economists centred on [R.G.] Lipsey and [G.C.] Archibald working at the LSE around 1960. Their aims were the quantification and the testing of economic theory. As with the economists just mentioned, they started with a view of the nature of science, which was assumed to apply with minimal modifications (greater reliance on the law of large numbers) to economics (see Lipsey 1963: ch. 1 [Lipsey, R.G.: 1963, *An Introduction to Positive Economics*, Londres, Weidenfeld])" (Backhouse, R.E.: 'The Lakatosian Legacy in Economic Methodology', in Backhouse, R.E. (ed.): *New Directions in Economic Methodology*, p. 183.
- 49 Cf. Samuelson, P.: 1963, 'Problems of Methodology-Discussion', *American Economic Review* 53/2, 231-236; Samuelson, P.: 1964, 'Theory and Realism: A Reply', *American Economic Review* 54, 736-739; Samuelson, P.: 1965, 'Professor Samuelson on Theory and Realism: A Reply', *American Economic Review* 55, 1162-1672; and Samuelson, P.: 1965, 'Economic Forecasting and Science', *Michigan Quarterly Review* 4/4, 274-280.
- 50 Cf. Simon, H.: 'The State of Economic Science', in Sichel, W. (ed.): *The State of Economic Science. Views of Six Noble Laureates*, pp. 97-110.
- 51 Simon, H.: 'Prediction and Prescription in Systems Modeling', pp. 10-11. "The inaccuracy of the predictions [of the Club of Rome] was irrelevant to the significance of the message conveyed" (Simon, H.: 'Prediction and Prescription in Systems Modeling', p. 9). In several cases, such as *models of competitive, confrontational situations*, or in *other models of international relations*, prediction seems unfeasible: "it may be impossible to obtain answers to our predictive questions, and we may be well advised to ask a different set of questions instead" (Simon, H.: 'Prediction and Prescription in Systems Modeling', p. 10).

- 52 Cf. Simon, H.: 'Prediction and Prescription in Systems Modeling', p. 10.
- 53 "The faith in *a priori* theory, uncontaminated by empirical observations, has been weakened -even among 'rational expectationists'. More and more economists are beginning to look for the facts they need in actual observation of business decision making and in laboratory experiments on economic markets and organizations" (Simon, H.: 'Introductory Comment', in Egidi, M. and Marris, R. (eds.): *Economics, Bounded Rationality and the Cognitive Revolution*, p. 7).
- 54 Cf. 'Prediction and Prescription in Systems Modeling', p. 7.
- 55 "We see that reason is wholly instrumental. It cannot tell us where to go; at best it can tell us how to get there. It is a gun for hire that can be employed in the service of whatever goals we have, good or bad" (Simon, H.: 1983, *Reason in Human Affairs*, Stanford, Stanford University Press, pp. 7-8). Cf. Gonzalez, W.J.: 'Rationality in Economics and Scientific Predictions: A Critical Reconstruction of Bounded Rationality and its Role in Economic Predictions', pp. 205-232.
- 56 Simon, H.: 'Prediction and Prescription in Systems Modeling', p. 11.
- 57 'Prediction and Prescription in Systems Modeling', p. 11.
- 58 Cf. Robbins, L.: 1935, *An Essay on the Nature and Significance of Economic Science*, London, Macmillan, 2nd ed., p. 16.
- 59 Cf. Coase, R.H.: 1988, *The Firm, the Market and the Law*, Chicago, University of Chicago Press, first chapter.
- 60 Cf. Gonzalez, W.J.: 1997, 'Progreso científico e innovación tecnológica: La "Tecnociencia" y el problema de las relaciones entre Filosofía de la Ciencia y Filosofía de la Tecnología', *Arbor* 157, n. 620, 261-283; especially, 263-264.
- 61 Cf. Popper, K.: 1957, *The Poverty of Historicism*, London, Routledge and K. Paul.
- 62 From a general point of view, this problem is studied in Niiniluoto, I.: 1993, 'The Aim and Structure of Applied Research', *Erkenntnis* 38, 1-21; Niiniluoto, I.: 1997, 'Límites de la Tecnología', *Arbor* 157, n. 620, 377-390; and Niiniluoto, I.: 1997, 'Ciencia frente Tecnología: ¿Diferencia o identidad?', *Arbor* 157, n. 620, 285-299.
- 63 Morgenstern, O.: 1972, 'Descriptive, Predictive and Normative Theory', *KYKLOS* 25, p. 711.
- 64 Cf. Morgenstern, O.: 'Descriptive, Predictive and Normative Theory', p. 711.
- 65 On the different econometric conceptions, in general, and on the determinist position, in particular, cf. Morgan, M.S.: *The History of Econometric Ideas*, passim.
- 66 Cf. Hausman, D.M.: 1994, 'Introduction', in Hausman, D. M. (ed.): *The Philosophy of Economics. An Anthology*, 2nd edition, Cambridge, Cambridge University Press, pp. 1-50, especially, p. 27; Hausman, D.M. and McPherson, M. S.: 'Economics, Rationality, and Ethics', in Hausman, D.M. (ed.): *The Philosophy of Economics. An Anthology*, 2nd edition, pp. 252-277; and Hausman, D.M. and McPherson, M.S.: 1996, *Economic Analysis and Moral Philosophy*, Cambridge, Cambridge University Press.
- 67 Sen, A.: 'Prediction and Economic Theory', p. 17.

- 68 Cf. Thaler, R.H.: *The Winner's Curse. Paradoxes and Anomalies of Economic Life*, N. York, The Free Press, 1992.
- 69 Cf. Simon, H.A.: 1990, 'A Mechanism for Social selection and Successful altruism', *Science* 250, 1665-1668; and Simon, H.A.: 1993, 'Altruism and Economics', *American Economic Review* 83/2, 156-161.
- 70 This expression is used in the sense now frequent after the publication of the book of Laudan, L.: 1984, *Science and Values The Aims of Science and Their Role in Scientific Debate*, Berkeley, University of California Press. The difference with Laudan is the approach: he analyses epistemic values, whereas here the realm is wider (it includes practical values).
- 71 In this analysis, *prediction* is a generic term insofar as it is open to a different level of control of the variables regarding the future and can be diversified into "foresight", "prediction" and "forecasting" (cf. Gonzalez, W.J.: 'On the Theoretical Basis of Prediction in Economics', pp. 215-216). It means that is not eo ipso a deterministic notion. Thus, on the one hand, the realm of prescription (policy, planning, practical measures,...) can be based on prediction (e. g., in the case of a crop failure due to a drought, the practical measures that the authorities can sensibly take); and the prescriptions need not be based on a strict prediction as to *what will happen*, because it can be based on judgements about *probability* (what is likely to happen) or even be based on judgements about mere *possibility* (what may conceivably happen). In other words, rational action need not be predicated on actual prediction (it could be on the basis of a forecasting) insofar as it can rest in judgements of probability and possibility.
- 72 In this regard, F. Hahn seems optimistic: "What occurs when we pass to the more distant future is that economics provides a fairly powerful tool for evaluating alternative policies" (Hahn, F.: 'Predicting the Economy', in Howe, L. and Wain, A. (eds.): *Predicting the Future*, p. 93).

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