

ECONOMIC THEORY, APPLICATIONS AND ISSUES

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Bounded Rationality, Satisficing and the Evolution of Economic Thought

Abstract

Provides a sketch of the development of the concept of bounded rationality in economic thought. The concept of rationality has several meanings. These different meanings are taken into account in considering the further development of economic thought. Different views of ecological rationality are critically examined in the light of these concepts. Whether or not various theories of behavioral economics can be classified as exhibiting bounded rationality is discussed. Satisficing behavior is commonly associated with bounded rationality but as demonstrated, it is not the only reason for adopting such behavior. The idea of some authors that optimization models under constraints are of little or no relevance to bounded rationality is rejected. Bounded rationality is an important contributor to the diversity of (economic) behaviors. This is stressed. Whether or not a behavior is rational depends to a considerable extent on the situation (the constraints) that decision-makers or actors face. The time-constraint is very important as an influence on the rationality of decisions. Aspects of this are covered.

Keywords: Behavioral economics, bounded rationality, cues, ecological rationality, discretionary behavior, precautionary principle, rules of thumb.

JEL Codes: D21, D22, D81, D83, D91, G11, Q01

1. Introduction

Neoclassical economic models are based on the absence of any constraints on the exercise of rationality and most rely heavily on optimization goals in order to predict economic outcomes. This is particularly evident in traditional microeconomic theory. Most theories presume that both consumers and producers are omniscient and not hindered in any way in making decisions needed to achieve their optimization goals. As is well known, these assumptions are too stringent to reflect reality and have probably become more so as the economic world has evolved to become more complex.

This does not mean that neoclassical economic theories have no value for understanding the operation of economic systems, especially market systems. Many do have predictive value, even if it is sometimes only of a qualitative nature. Furthermore, the assumption of unrestricted rationality is stronger than is required for perfect or near-perfect economic decision-making (Tisdell, 1975). Nevertheless, there are many economic situations in which the presence of

bounded rationality is a significant influence on economic behavior, and is consequential for the evaluation of this behavior and economic valuation.

In this chapter, an initial sketch will first be provided of the influence of the concept of bounded rationality on the evolution of economic thought. It is then argued that it is imperative to clarify the meaning of the concepts of rationality and bounded rationality. Further attention is paid to the evolution of economic thought taking this into account. Attention subsequently turns to considering satisficing behavior as a reaction to bounded rationality. (Simon, 1957, 1961) placed considerable emphasis on this type of behavior due to the presence of bounded rationality. His emphasis on satisficing behavior contrasts strongly with the central assumption of unbounded optimizing behavior in neoclassical economic theories. Before concluding, an overall assessment of the place of bounded rationality in economics is provided. Note that the coverage of this chapter is very selective because only limited space has been allowed for it.

2. An Initial Sketch of Bounded Rationality in Economic Thought

Some questioning of the applicability of the neoclassical model of economic behavior had begun already in the 1930s. For example, in relation to macroeconomic theory, Keynes (1936) emphasized the importance of “animal spirits” as an influence on the behavior of investors and the effect of this on the level of economic activity. Hall and Hitch (1939) came to the conclusion that cost-plus pricing was prevalent in several sectors of the economy. This was attributed to two different possible causes: it could be a result of oligopolistic market behavior. Alternatively, it might be employed as a rule of thumb because many firms lack the capacity to determine the level of pricing which will maximize their profit. Hall and Hitch (1939) found the latter to be very important. This publication subsequently sparked debate about whether this cost-plus procedure might, in fact, maximize a firm’s profit and whether all firms are profit-maximizers.

Another important development in the evolution of economic thought about bounded rationality was the publication of the theory of *Games and Economic Behaviour* (von Neumann and Morgenstern, 1944). It highlighted limits to the exercise of unrestricted individual rationality as a means for providing solutions to group behavior involving conflict. In addition, it helped to explain failures to achieve socially optimal group outcomes, such as Pareto optimality. For example, it indicated that under omniscient conditions for decision-making, economic behavior cannot be precisely determined, as in the case of zero-sum games where the solution relies on mixed strategies and in empty-core games involving the possibility of

transactionless coalition formation. This development prompted Simon (1955) to doubt the applicability of the unrestricted neoclassical rationality assumption as a determinant of economic behavior, and he developed further his concept of bounded rationality as being more relevant. It is, however, pertinent to note that Morgenstern was aware of limits to the applicability to economics of the neoclassical concept of unlimited rationality (Morgenstern, 1964).

As an alternative approach to economic behavior, Herbert Simon developed a satisficing theory of decision-making and economic behavior. The cost of obtaining information, of retaining it, and of reasoning, were seen as important restrictions on the ability of individuals to make absolutely optimal decisions of the type assumed in neoclassical economics. The assumption of satisficing behavior was subsequently applied to consumer behavior and to the theory of the firm, particularly to the latter.

Another significant but embryonic development was the publication of an article by Baumol and Quandt (1964) outlining a theory of optimally imperfect decisions. This provided an insight into how much information gathering, the amount of its retention, and reasoning in decision-making is likely to be economically optimal. They pointed out that taking into account the adoption of some rules of thumb (such as those employed by some firms in adopting cost-plus pricing) could be rational from an economic perspective.

The type of modeling of Baumol and Quandt (1964) belongs to the class of modeling of bounded rationality sometimes described as optimization under constraint, that is, optimization which takes into account the cost of decision-making. An earlier example of this was the stopping rule of Stigler (1961) for searching for the purchase of a used car, namely, stop searching when the extra cost of searching equals the extra expected benefits. Similar sorts of stopping rules have been adopted for quality control serial sampling by producers and are of relevance to other types of sampling. However, Gigerenzer and Selten (2002, pp. 4-5) question whether this type of optimization modeling which incorporates decision-making costs captures the essence of the occurrence of bounded rationality. This issue will be considered in the discussion section.

(Tisdell, 1963, 1968, 1996) emphasized that as a result of bounded rationality (and other factors) economic behaviors can be expected to be diverse and that this diversity had been neglected in neoclassical theory. Nevertheless, diverse behaviors have predictable economic consequences. Empirical investigations are needed to determine the extent of that diversity and

its other attributes such as its variation with the passage of time. Studies in behavioral economics, experimental economics, and psychological economics are all relevant to exploring this aspect of economics.

Another area of economic thought which has advanced as a result of giving attention to the occurrence of bounded rationality is whether it is more desirable to follow rules rather than discretion in decision-making, that is, engaging in flexible or less flexible types of decision-making. The more flexible type, for example, may involve adjusting controlled variables based on short-term predictions of uncontrolled variables in an attempt to achieve a particular objective. The size and nature of the divergence between the predicted and actual values of controlled variables may be such that greater benefit can be obtained by ignoring short-term predictions and acting on long-term predictions such as predicted central values of the uncontrolled variables (or approximations to these).

Friedman (1968) pointed out that following rules rather than engaging in discretionary zig-zag or fine-tuning behavior could result in a more desirable type of monetary policy. Tisdell (1971, 1974), in criticizing Muth's theory of rational expectations (Muth, 1961), came to a similar conclusion and pointed out that this also applied to other areas of economics as well.

Rapid development of other areas of economics associated with the concept of bounded rationality occurred in the 1970s. Considerable attention was paid to how the transaction costs involved in economic organization resulted in participants in economic activity having incomplete knowledge (see, for example, Williamson, 1975). Issues such as the following were highlighted: principal-agent problems, the incompleteness of contracts and the importance of trust in exchange (Williamson, 1975, 1979) and the possibility of market collapse or inferior operations of markets due to the asymmetry of information of market participants (Akerlof, 1970).

Neoclassical economic theories of behavior were mostly based on introspection but also obtained considerable empirical support from observations on the operations of markets. This was partly because the assumption of unrestricted rationality is stronger than necessary for qualitative predictions about how many markets work (Tisdell, 1975). Nevertheless, it became increasingly clear that not all economic phenomena could be understood or predicted by relying on the assumption of unrestricted rationality. This led to an upsurge in the development of behavioral economics and psychological economics and increasing attention to experimental economics. However, questions have been raised about whether many of the advances made in

these fields of inquiry are consistent with the theory of bounded rationality. For example, Gigerenzer and Selten (2002, p. 4) claim they are not, and also argue that optimizing theories based on decision-making under constraints do not reflect the essence of bounded rationality. In order to help clarify this problem, it is helpful to consider the meanings of the word “rational”. This will provide scope for some discussion of additional theories of economic behavior which have been associated with bounded rationality as well as consideration of the concept of ecological rationality.

3. Meanings of Rationality and the Further Development of Economic Thought Including the Concept of Ecological Rationality

The word “rational” has several different meanings in English (Delbridge, 1981). Two relevant different meanings are:

1. A decision or behavior is rational if it involves reasoning (Type 1 rationality).
2. A decision or behavior can be judged to be rational if it is reasonable or sensible (Type 2 rationality).

Given the first interpretation, a behavior that does not involve reasoning is not a rational form of behavior. Nevertheless, it could be effective for particular purposes, such as instinctive behavior in particular circumstances. The second meaning involves judgment by an observer about whether a behaviour is reasonable. Whether or not it is judged to be reasonable or sensible can depend upon the circumstances surrounding the behavior. Given the second meaning, behavior that does not involve forethought or reasoning can be rational. Moreover, given this meaning, “excessive” forethought or reasoning in decision-making is not reasonable and therefore it is irrational, as is faulty reasoning.

Not all decisions and behaviors which are effective in achieving a desired outcome are based on reasoning. For example, some instinctive and emotional behaviors are effective in particular circumstances for achieving desired ends. They are not a result of type 1 rationality, but may satisfy type 2 rationality.

Given the two meanings of “rationality” outlined above, it is clear that the extent to which rationality is present in decision-making and behavior can vary in degrees. Moreover, the presence of rationality in the second sense outlined above is subject to personal judgment. Much of the focus of the study of ecological rationality is on non-optimizing behaviors which are sensible (given bounded rationality) and behaviors that are effective for some particular

purpose but which have been developed or occur without recourse to reasoning. Gerd Gigerenzer is a prominent advocate of this approach.

Gigerenzer and Selten (2002, p. 38) describe ecological rationality as “the match between heuristics and environmental structures” and indicates that this requires paying particular attention to satisficing behaviours as part of search and decision-making and the adoption of fast and frugal heuristics, for example, involving the use of cues in making decisions. However, this ecological approach is even wider than this because it judges some behaviors to be rational which do not involve heuristics or rules of thumb. These include some forms of intuitive and emotional behavior as well as various social norms. These behaviors are considered to be rational if they serve a particular end or purpose. Also, the Gigerenzer group of ecological rationalists is aware that the amount of thought it is rational to give to a decision depends on the time-constraint faced by decision-makers. However, this group rejects the relevance of economic models of optimization based on constrained decision-making and even more strongly rejects the neoclassical model of unbounded rationality (Selten, 2002). They also cast doubts on the relevance to bounded rationality of behavioral psychological studies, such as those associated with Kahneman (2003) (Gigerenzer and Selten, 2002, p. 4).

An overlapping but narrower view of ecological rationality is adopted by Vernon Smith (2003). He describes ecological rationality as “an emergent order based on trial-and-error cultural and biological evolutionary processes” (Smith, 2003, pp. 499-500). His primary concern is with group rationality in economics. He rejects the relevance of constructivist rationality, namely that social mechanisms are as a rule thoughtfully created to serve a perceived intended purpose (Smith, 2003, p. 470). In general, he believes that evolutionary processes and trial-and-error processes are effective in developing optimal social rules of behavior and social norms that are beneficial in promoting desirable social ends. However, his view is too sweeping. In the past, some societies developed social norms and religious beliefs which did not promote desirable social ends. Examples of this have been proposed by Diamond (2011). These include the deforestation of Easter Island (Rapa Nui in the Pacific Ocean) by its original inhabitants and the Mayan collapse. Several other societies have engaged in persistent irrational behaviors – some as a result of their religious beliefs or their adoption of forms of unsustainable economic development – which eventually proved to be catastrophic from their point of view, for example, early producers of copper and bronze in central Europe (Tisdell and Svizzero, 2018). Today there are concerns that we may not be able to establish effective norms and behaviors

to restrict global warming “adequately”. Theoretically, there is no guarantee that selective evolutionary processes will result in the prevalence of “optimal” decisions (Tisdell, 2013).

Another approach to considering the consequences of bounded rationality in economics is based on the development of psychology for behavioral economics. This type of approach to bounded rationality was initially developed by Amos Tversky and Daniel Kahneman. Kahneman (2003, p. 1449) explains that this type of research about bounded rationality explores “the systematic biases that separate the beliefs that people have and the choices they make from optimal beliefs and choices assumed in rational-agent choice models”. These biases are mainly identified by relying on experiments but may also be discovered by considering observations from non-experimental situations (Camerer et al., 2003).

One of the significant results from this line of enquiry which has extended the findings of Thaler (1980) has been to show the importance of loss aversion, endowment or status quo effect as an influence on several types of economic decision-making. Kahneman (2003, p. 1457) explains that this effect is present when “the value of a good to an individual appears to be higher when the good is viewed as something that could be lost or given up when the same good is evaluated as a potential gain”. Examples are given by Kahneman (1990), Tversky and Kahneman (1991) and Kahneman et al. (1991). Bandara and Tisdell (2005) found evidence of the importance of this effect in relation to willingness to pay for the conservation of elephants in Sri Lanka. The status quo effect is not allowed for in traditional economic theory. There can be several reasons for the occurrence of this effect, for example, a psychological desire to keep valued items which one already has (possessiveness), transaction cost considerations, and the possibility that the consumption or enjoyment of the commodity alters the taste of the possessor. These aspects require further investigation.

Another aspect of bounded rationality which has been given much attention by contributors to behavioral economics is the importance of frames in shaping decisions (Kahneman, 2003). The emphasis, in this case, is on how individuals perceive alternative possible states of nature, or more generally, possibilities. Both the selective nature of perceptions and their distortions are studied. These aspects of perception are relevant for predicting economic behaviors and also for assessing the worth and limitations of economic valuation studies, particularly those valuing alterations in the supply of public and quasi-public goods, especially environmental goods. Results from these investigations (and other types of studies) demonstrate that economic

valuation (reliant on the assumptions of neoclassical economics) of changes in the supply of public goods, particularly environmental goods, can be problematic.

5. Satisficing and Bounded Rationality

Simon (1957, 1961) stressed that one of the consequences of the presence of bounded rationality is that individuals and organizations often adopt satisficing behaviors or rules rather than optimizing. In principle, satisficing behaviors which occur because of bounded rationality can take several different forms. Some such behaviors may be based on aspiration levels or targets for performance. These are usually not optimal in the neoclassical sense. The degree to which these targets are adaptive is liable to vary. Other behaviors of a satisficing type may rely on rules of thumb or heuristics and limited cues about states of nature. If they give satisfactory benefits, their use may persist. However, this is not always so. Searches may continue for superior rules of thumb and cues, especially if the environments in which decisions are to be made alter, even though initially inferior rules and cues are utilized.

Not all satisficing behavior is a result of bounded rationality, even though some forms are at odds with the underlying assumptions of neoclassical economic theory. Bendor (2015, p. 774) states, for example:

“Bounded rationality should not be confused with a theory (e. g., of satisficing), much less with a specific formal model (e. g., Simon 1957). It is best considered a research program: a sequence of theories with overlapping sets of assumptions, aimed at solving similar problems.... In principle, the program’s empirical domain is vast—it is as imperialistic as the rational choice program—and so its set of possible theories is also very large.”

For example, Baumol’s theory of behavior of an imperfectly competitive corporation assumes that the company tries to maximize the value of its sales subject to ensuring its shareholders receive a satisfactory level of profit return (Baumol, 1959). In this instance, bounded rationality is not involved. Sahlins’ theory of the affluence of some ancient societies supposes that members of these societies were completely satisfied with a low level of consumption of material goods (Sahlins, 1972) and does not rely, per se, on any assumptions about bounded rationality. Some theories also exist which suppose that the utility obtained by individuals is a function of the difference between the level of the income to which they aspire (or some other economic variables) and the levels achieved. This is, for example, a component of Weckstein’s

model (Weckstein, 1962). No element of bounded rationality is involved. These types of models are of particular interest because they raise questions about how aspiration levels are determined and adjusted. Another relevant aspect of satisficing goals is the extent to which failure to achieve these goals is foreshadowed and results in decisions to address this emerging failure or action is delayed until the satisfaction goal is violated. Is the former behavior more rational than the latter? To what extent is the latter a result of bounded rationality? These two types of behaviors are, for example, highlighted by Tisdell and Svizzero (2017) in their discussion of the transition of ancient societies from hunting and gathering to agriculture.

6. Discussion

Gigerenzer and Selten (2002) suggest that two sets of models that are often discussed under the banner of bounded rationality have not been appropriately classified. They state:

“Bounded rationality is neither optimization nor irrationality. Nevertheless, a class of models *known as optimization under constraints* is referred to in the literature as ‘bounded rationality’, and the class of empirical demonstrations of ‘so-called’ errors and fallacies in judgment and decision-making has been labeled ‘bounded rationality’. The fact that these two classes have little if anything in common reveal the distortion that the concept of bounded rationality has suffered.” (Gigerenzer and Selten, 2002, p. 4)

However, it can be argued that the first set of models are relevant to the study of bounded rationality. They highlight limits to the neoclassical vision of unrestricted rationality. While their knowledge and rationality assumptions are still too strong, they can help to identify factors that ought to influence behaviors under conditions of restricted rationality. As for the second class of models (which include behavioral ones), most (but not all) identify limits to perceptions of states of nature and common faults in reasoning, both of which can be considered to be a consequence of bounded rationality. These classes of models (mostly behavioral economic ones) do demonstrate some of the limits to unrestricted rationality.

One of the important consequences of bounded rationality is that it gives rise to variations or differences in the behaviors of individuals and groups. Individuals differ in the perception of states of nature, in the estimates of probabilities and risk, and in their willingness to take risks. This aspect has been stressed by Tisdell (1963, 1968) and in some of his later publications. These variations have predictable economic consequences but they have not been given enough

attention in the economic literature. Bendor (2015, p. 774) mentions that behavioral (economic) theories do not pay enough attention to differences in human behavior. Both regularities, differences and changes in behaviors all have important economic consequences.

The time available for decision-making limits the scope for the gathering of information and reasoning, as stressed by Selten (2002). Sometimes, there is a definite end-point by which a decision must be made and action taken. In extreme cases, there may be little or no time available for rational decision-making involving data collection and thought. In these cases, action may be dictated by instinct or learned reactions. In other cases, a final decision may be delayed, resulting in both benefits and costs. Some of the factors that influence the optimality of delayed decisions have been examined by Tisdell (1970, 1996, Ch. 5). Where decisions may have to be made at short notice, a rational way to allow for these can be prepared in advance of their possible occurrence. However, the amount of rational preparation can be expected to vary.

The value of the strategy of delaying decisions to gain extra information depends on the environmental scope for responding to this information, as does the ability of decision-makers to take advantage of changes in economic information (Tisdell, 1996, Ch. 5, Tisdell, 1970). Therefore, apart from collecting more information, a rational response to bounded rationality can be to alter the environment in which decisions can have effect, for example, it may be possible to change existing environments to allow greater flexibility for responding to decisions. Examples of this include the adoption of production processes (techniques) that exhibit greater adaptability than otherwise in the production of different commodities (Tisdell, 1963, 1968) and an increasing liquidity of assets to take advantage of varying investment opportunities which are subject to uncertainty. However, changing economic environments in this way usually comes at a cost. Therefore, analysis and judgment are necessary to decide whether acting in this way is worthwhile.

A related concept in environmental economics is the precautionary principle (Tisdell, 2010, 2015). If unrestricted rationality occurred, this principle would be irrelevant. Because the environmental future is uncertain, it becomes relevant. One of the manifestations of the principle is that in view of uncertainty, it is often desirable to keep options open, for example, conserve biodiversity. This permits advantage to be taken of new information which may become available in the future. Once again, environmental variation is made to provide greater

flexibility in available decision-making strategies. This may come at a cost, and how sensible it is depends on attitudes to the bearing of risk or uncertainty and the anticipated net benefits.

Gigerenzer and others have emphasized the importance of fast and frugal heuristics (rules of thumb) and the use of selective cues as a guide to behavior. Presumably, the usefulness of these as reasonable guides to behavior depends on the economic situation that is being responded to. For example, greater use of these types of heuristics may be made in trading in financial markets (for example, trading on the stock exchange) than in trading in fixed assets. Identifying the types of cues that traders use for exchange in these markets (and other markets) is also important. This opens up a large area for empirical economic research. This is particularly so because different individuals and groups may employ different rules of thumb and cues. Mixed behaviors can be important for the operation of markets as well as alterations in the diversity of these behaviors (Lasselle et al., 2005, Tisdell, 2013).

7. Concluding Comments

Neoclassical economic theory pays no attention to the costs and other restrictions on rational decision-making and has therefore developed optimizing models of economic behavior which assume unrestricted rationality. These models are, in fact, special cases. Nevertheless, they do have some predictive value because their assumptions are stronger than is necessary for forecasting or explaining some types of economic behavior and for providing a guide to how some markets work. On the other hand, it is a mistake to assume that all economic behavior reasonably accords with that assumed in neoclassical economic theory. The realization of this has resulted in substantial progress in economic thought in recent decades and has created a new academic environment in which further progress is being facilitated, for example, as a result of joint contributions by psychologists, economists and others. In this short chapter, it has not been possible to consider all the advances in economic thought which have stemmed from research on bounded rationality. Much of this research is based on examining particular situations. We are now challenged to determine whether general principles can be distilled from these studies. It is also important that greater attention be paid analytically to how reasonable or sensible decisions made and behaviors observed under conditions of bounded rationality are, that is to go beyond the empirical determination of the impact of bounded rationality on

behaviors and decision-making. For example, to what extent can the rules of thumb used for economic decision-making be improved or replaced by ones that give superior results? To what extent are decision-makers cognisant of the factors which ought to guide their decisions when they are acting under bounded rationality and is there scope for them to improve their decisions by paying greater attention to such factors?

The presence of bounded rationality has also created complications for methods derived from neoclassical economics of valuing public goods and experiential goods, especially environmental commodities. Results from the application of these methods (both revealed and elicited preference methods) need to be treated with caution given the presence of bounded rationality and the occurrence of biases in observed behaviors and in responses to elicitation of values. The challenge now is to determine what use can sensibly be made of these results for the purpose of social economic valuation.

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