

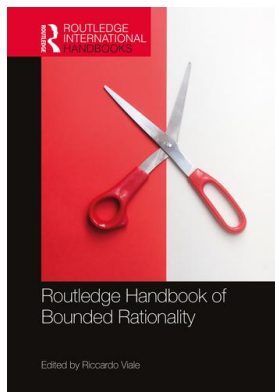
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BOUNDED RATIONALITY, SATISFICING AND THE EVOLUTION OF ECONOMIC THOUGHT

Diverse concepts

Clement A. Tisdell

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, e.g., prediction of price changes as a result of alterations in the market supply or demand conditions for commodities. Furthermore, the assumption of unrestricted rationality optimization is stronger than is required for perfect decision making of the type assumed in neoclassical economics (Tisdell, 1975). Nevertheless, there are many economic situations in which the presence of bounded rationality is a significant influence on economic behaviour, and is consequential for the evaluation of this behaviour 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 various meanings of the concepts of rationality and bounded rationality. Attention is paid to the evolution of economic thought taking into account the diversity of these concepts. Subsequently, the analysis considers satisficing behaviour as a reaction to bounded rationality. Simon (1957, 1961) stressed the importance of this type of behaviour. His emphasis on satisficing behaviour contrasts strongly with the central assumption of unbounded optimizing behaviour 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 of limited space.

An initial sketch of bounded rationality in economic thought

Some questioning of the applicability of the neoclassical model of economic behaviour 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 behaviour 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 behaviour. Alternatively, it might be employed as a rule of thumb because many firms lack the capacity to determine their profit-maximizing level of pricing. 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 Behavior* (von Neumann and Morgenstern, 1944). It highlighted limits to the exercise of unrestricted individual rationality as a means for providing solutions to group behaviour involving conflict. In addition, it helped to explain failures to achieve socially optimal group outcomes, such as Pareto optimality (Tisdell, 1996). For example, it indicated that under omniscient conditions for decision making, economic behaviour 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 of the theory of games prompted Simon (1955) to doubt the applicability of the unrestricted neoclassical rationality assumption as a determinant of economic behaviour, and he further developed 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 behaviour, Herbert Simon proposed a satisficing theory of decision making and economic behaviour. The cost of obtaining information, of retaining it, and of reasoning, was seen as an important restriction on the ability of individuals to make absolutely optimal (perfect) decisions of the type assumed in neoclassical economics. The assumption of satisficing behaviour was subsequently applied to consumer behaviour 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 insights into how much information gathering, the amount of its retention, and the extent of reasoning in decision making are likely to be economically optimal. They pointed out that the use of some rules of thumb (such as those employed by some firms in adopting cost-plus pricing) could be rational from an economic optimization perspective.

The type of modelling of Baumol and Quandt (1964) belongs to the class of modelling 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 involving serial sampling by producers and are relevant to other types of sampling. However, Gigerenzer and Selten (2002, pp. 4–5) question whether this type of optimization modelling captures the essence of the occurrence of bounded rationality. This issue will be considered in the discussion section.

Tisdell (1963; 1968; 1996; 2013) emphasized that, as a result of bounded rationality (and other factors), economic behaviours can be expected to be diverse and that this diversity had been neglected in neoclassical theory. Nevertheless, diverse behaviours 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 behavioural 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, the benefits of engaging in flexible or less flexible types of decision making. The more flexible type of decision making may, for example, 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 central tendency predictions, for example, predicted central values of the uncontrolled variables (or approximations to these) (Tisdell, 1971).

Friedman (1968) pointed out that following rules rather than engaging in discretionary zig-zag or fine-tuning behaviour 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 the impeded operations of markets due to the asymmetry of information of market participants (Akerlof, 1970). These phenomena were shown to be a source of potential economic loss.

Neoclassical economic theories of behaviour were mostly based on introspection but also obtained empirical support from observations of 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 (unbounded) rationality. This led to an upsurge in the development of behavioural economics and psychological economics and to increasing attention being paid 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 they 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 different meanings of the word "rational" as specified in English dictionaries. This will provide scope for some discussion of additional theories of economic behaviour which have been associated with bounded rationality as well as consideration of the concept of ecological rationality.

Different meanings of rationality and the further development of economic thought, including the concept of ecological rationality

The word “rationality” can have several different meanings in English, according to English dictionaries. Two relevant different meanings, as stated in the Australian *Macquarie Dictionary* (Delbridge, 1981) are:

A decision or behaviour is rational if it involves reasoning (Type 1 rationality).¹

A decision or behaviour can be judged to be rational if it is reasonable or sensible (Type 2 rationality).²

The *New English Dictionary and Thesaurus* (Anon, 1994) gives the same interpretations of the word “rationality”. Given the first interpretation, a behaviour that does not involve reasoning would not be a rational form of behaviour. Nevertheless, it could be effective for particular purposes, such as instinctive behaviour is in particular circumstances and is judged to be rational in the second sense of the word. The second meaning involves judgement about whether a behaviour is reasonable. Whether or not a behaviour is judged to be reasonable or sensible can depend upon the circumstances surrounding the behaviour (that is, the environment). Given the second meaning, behaviour 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 is irrational.

Not all decisions and behaviours which are effective in achieving a desired outcome are based on reasoning. For example, some instinctive and emotional behaviours 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 behaviour can vary in degrees. Moreover, the presence of rationality in the second sense outlined above is subject to personal judgement. For example, much of the study of ecological rationality is focused on non-optimizing behaviours which are sensible (given bounded rationality) and behaviours that are effective for some particular purpose given the surrounds in which they occur. Gerd Gigerenzer is a prominent advocate of this approach which concentrates on type 2 rationality.

Gigerenzer and Selten (2002, p. 38) describe ecological rationality as “the match between heuristics and environmental structures” and indicate 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 behaviours to be rational which do not involve heuristics or rules of thumb. These can include some forms of intuitive and emotional behaviour as well as various social norms. These behaviours are considered to be rational if they are effective in achieving a desired end or purpose.³ 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 behavioural 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 behaviour 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 behaviours – 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 behaviours to restrict global warming “adequately”. Theoretically, there is no guarantee that selective evolutionary processes will result in the prevalence of “optimal” decisions or even socially satisfactory ones (Tisdell, 2013).⁴

Another approach to considering the consequences of bounded rationality in economics is based on the unearthing biases in economic behaviour. 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) demonstrates 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 paid much attention by contributors to behavioural 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 behaviours 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 the demand for changes in the supply of public goods, particularly environmental goods, can be problematic.

Satisficing and bounded rationality

Simon (1957; 1961) stressed that, because of the presence of bounded rationality, individuals and organizations often adopt satisficing behaviours or rules rather than optimizing. In principle, satisficing behaviours which occur because of bounded rationality can take several different forms. Some such behaviours 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 behaviours 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 more effective rules of thumb, heuristics and cues, especially if the environments in which decisions are to be made alter. The adaptive rationality of heuristic decision making is important.

Not all satisficing behaviour 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.⁵

Baumol's theory of behaviour of an imperfectly competitive corporation assumes that the company tries to maximize the value of its sales subject to ensuring that its shareholders receive a satisfactory level of return on their capital (Baumol, 1959).⁶ In this instance, bounded rationality is not involved in this constrained optimization theory. Sahlins' theory of the affluence of some ancient societies supposes that members of these societies were completely satisfied with their low level of consumption of material goods (Sahlins, 1972). It does not rely, per se, on any assumptions about bounded rationality (Tisdell, 2018). 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). Such constructs may but need not involve bounded rationality.⁷ These types of models are of particular interest because they raise questions about how aspiration levels are determined and adjusted.

Another relevant rationality aspect of satisficing goals is the extent to which possible failure to achieve these goals should be foreshadowed and when and in what depth plans ought to be drawn up to address this possibility? To what extent is delay in decision making a result of bounded rationality or due to other factors such as social embedding? These two types of behaviours are, for example, highlighted by Tisdell and Svizzero (2017) in their discussion of the transition of ancient societies from hunting and gathering to agriculture.

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 reveals the distortion that the concept of bounded rationality has suffered.

Gigerenzer and Selten, 2002, p. 4

However, the first set of models is relevant to the study of bounded rationality because 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 behaviours under conditions of restricted rationality. As for the second class of models (which include behavioural 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 behavioural economic ones) do demonstrate some of the limits to unrestricted rationality and can have predictive value.

One of the important consequences of bounded rationality is that it gives rise to variations or differences in the behaviours 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 behavioural (economic) theories do not pay enough attention to differences in human behaviour. Differences and changes in behaviours 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, Chapter 5). Where decisions may have to be made at short notice, it can be rational to prepare for these 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, 1970, 1996, Chapter 5). 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 judgement 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 may be made in order 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 from increased flexibility.

Gigerenzer and others have emphasized the importance of fast and frugal heuristics and the use of selective cues as a guide to behaviour. Presumably, the usefulness of these as reasonable guides to behaviour depends on the economic situation that is being responded to. Considerable use of these types of heuristics appears to be made in trading in financial markets, for example, trading on the stock exchange. Identifying the types of cues that traders use for exchange in these markets (and other markets) is also important for predicting and evaluating their consequences. 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 behaviours of market participants as well as alterations in the diversity of these behaviours can be important for the operation of markets (Lasselle et al., 2005; Tisdell, 2013).

Conclusion

Neoclassical economic theory pays no attention to the costs and other restrictions on rational decision making and has therefore developed optimizing models of economic behaviour 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 behaviour and for providing a guide to how some markets work. On the other hand, it is a mistake to assume that all economic behaviour 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 determine how reasonable or sensible decisions made and behaviours observed under conditions of bounded rationality are, that is to go beyond the empirical determination of the impact of bounded rationality on behaviours 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 are more effective in achieving desired goals? 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 behaviours and in responses to elicitation of values (see, for example, Tisdell, 2017, Chapter 4, especially Table 4.1; as well as Tisdell, 2014). The

challenge now is to determine what use can sensibly be made of these results for the purpose of social economic valuation.

Notes

- 1 A problem with this meaning is that not all decision making and behaviour involving reasoning would normally be regarded as rational. For example, illogical reasoning, failure to assess the environment appropriately, excessive or insufficient reasoning may be sources of irrationality. Also, this meaning seems to imply conscience deduction but, as mentioned in the text, some behaviours that do not involve reasoning could (in particular circumstances) be rational.
- 2 This meaning enables a wider range of behaviours to be regarded as rational than the previous one. It leaves open the question of who is to judge whether a decision or behaviour is sensible or reasonable. A reviewer of the draft of this chapter suggested that this should be mainly judged by the decision maker. However, in most societies, others are mainly called on to judge the rationality of decisions or behaviours of individuals or groups. For instance, a clinically insane person may believe that he/she is asking rationally but others may judge otherwise.
- 3 A problem here is that some of these behaviours may only be effective for a limited period of time and they trap individuals in a long-term situation which is unsatisfactory. Furthermore, some behaviours could be effective by chance for a limited period of time, e.g., forms of gambling or risk-taking. Even though they may be effective for a while, they are not rational from a long-term point of view.
- 4 Social embedding of various kinds can result in societies being unable to take advantage of the mistakes or errors of earlier societies or groups. See, for example, Tisdell (2017, Chapter 5). Also, as societies evolve and become larger, their proneness to prisoner dilemma-type problems may increase, as is illustrated by a number of sustainability issues including those associated with human-induced climate change.
- 5 While satisficing behaviours are only one of the many ways of responding to bounded rationality, not all satisficing behaviours are a consequence of bounded rationality. Satisficing behaviour, for example, occurs if there are thresholds in preference functions and uncertainties are absent.
- 6 The level of this satisfactory return from the point of view of shareholders is the prevailing rate of return on capital in the capital market.
- 7 Weckstein does not include uncertainty and bounded rationality in his modelling of decision-making. For further discussion of Weckstein's model, see Tisdell (1983) or Chapter 14 in Tisdell (1996). Although Weckstein does not incorporate bounded rationality into his type of modelling, it can be allowed for in these types of models. For instance, the difference between what is aspired to and what can be achieved is often uncertain. Consequently, a dynamic interplay is frequently observed between these two behavioural components with adjustment being made to aspirations in the light of learning about what it is possible to achieve.

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