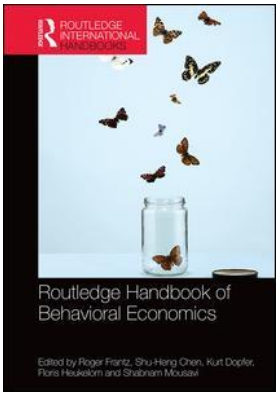

Routledge Handbook of Behavioral Economics

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GERD GIGERENZER AND VERNON SMITH

Ecological rationality of heuristics in psychology and economics

Shabnam Mousavi

An economist who is only an economist cannot be a good economist.

Hayek, 1956

Introduction

Behavioral economists use psychological findings to evaluate and revise economic decision theory, to build models that correspond directly to observations of behavior, and to develop descriptive accounts for deviations from principles of neoclassical rationality. One of the main sources of psychological insight is the heuristics and biases research program. This chapter introduces another source of psychological insights, the ecological rationality of fast-and-frugal heuristics, and is organized as follows. First, this chapter juxtaposes psychological (á la Gigerenzer) with economic (á la Smith) views of ecological rationality, thereby connecting fast-and-frugal heuristics to a major source of inspiration and motivation for behavioral economists, namely experimental economics. Then, it briefly reviews a collection of articles illustrating how the successful use of heuristics in business decision making can be understood by using ecological rationality as an investigative framework. Finally, it locates the field of inquiry for behavioral economics on a continuum of scientific problem solving in the interval that Weaver (1948) called *organized complexity*. Simple heuristics deserve special attention from behavioral economists because they work best in this very interval, where exact methods of optimization are structurally unfitting. Put together, these connections, examples, and arguments suggest that mainstream behavioral economics can gain from integrating this less explored psychological framework. Such integration starts by attempting to formulate effective decision rules as fast-and-frugal heuristics and exploring their ecological rationality.

Although our navigations through daily life involve numerous decisions under vague or changing criteria, most humans are not paralyzed by indecision. To account for this fact, social scientists have developed theories and constructed models that describe and predict behavior and strive to improve judgment. Both field and experimental studies have revealed that the human mind tends to ignore available information systematically and apply simple rules to make decisions in complex situations. Two psychology research programs have set out to accommodate these observations in scientific frameworks: the heuristics and biases program and the study of the

ecological rationality of fast-and-frugal heuristics. For the main body of behavioral economists, the views of the heuristics and biases program inform their empirical and experimental studies. Their formalization techniques have been shaped under the influence of analytical advances in operational research, wherein optimization is the dominant method and where probability theory and logical relationships are the primary tools of investigation and validation. These studies concentrate on revealing deviations from the axioms and principles of the economic theory of rational decision making, and provide descriptions based on the heuristics and biases at work for phenomena considered puzzling from the viewpoint of the subjective expected utility framework. The heuristics and biases program views heuristics as suboptimal strategies arising from less-than-rational judgment. Furthermore, in this approach judgments are considered biased, that is, distorted because the mind is predisposed to making logical or statistical errors in a systematic manner. Accordingly, choice behavior is believed to improve when biases are diagnosed and removed (or diminished)—a process referred to as *debiasing*. However, there is little solid evidence that deviations from rational norms lead to real world loss or inefficiency.

In this chapter, an alternative psychological view of heuristic decision making is introduced that has yet to be adopted by mainstream behavioral economists, the fast-and-frugal heuristics approach. This approach overlaps in its central notion of ecological rationality with the experimental economics research pioneered by Vernon Smith. The next section presents parallels made between the psychological and economic views of ecological rationality. In the third section, an overview is given of a recent collection of articles on fast-and-frugal decision making across domains of business that provides examples of using the framework of ecological rationality. These illustrate the process and conditions of observed successful heuristic strategies made by different agents such as managers and consumers in financial, commercial, and labor markets.[1] The fourth section draws on a categorization of scientific problems with respect to their complexity that was put forward by Warren Weaver in 1948. Political problems and business and governmental economic decisions are areas of complexity where data are limited and certainty is absent. In these situations, scientific problem solving necessarily involves methods beyond optimization, statistical inference, and mathematical or logical truth benchmarks. By combining this view of complexity together with the effectiveness of heuristics' simplicity, the heuristics approach emerges as an efficient scientific method for solving problems of mid-range complexity. Finally, a summary and forward-looking remarks close the chapter.

Ecological rationality in economics and psychology

The very lecture that Vernon Smith delivered for his Nobel Prize (2002) was titled *Constructivist and Ecological Rationality in Economics*, as was the book that he published in 2008, which expanded the themes of that lecture. Therein, he elaborates:

> Ecological rationality refers to emergent order in the form of practices, norms, and evolving institutional rules governing action by individuals that are part of our cultural and biological heritage and are created by human interactions, but not by conscious human design . . . . in hundreds of market experiments, economically unsophisticated and naïve but proficient individuals produce rational outcomes without in fact having any knowledge of rationality and efficiency of the outcomes they produce. Their effectiveness is perhaps less surprising once we recognize that their human forbearers and contemporaries used their cultural and biological inheritance to create the institutional forms that we study in the experiments, but our neoclassical models (since the 1870s) failed to anticipate or even to appreciate this important development as we proceeded to

> construct the concept of an "institution free core" of economic analysis.[2]
>
> *(p. 2)*

The notion of ecological rationality is the junction at which Gigerenzer's and Smith's research programs meet. As Smith puts it,

> Paraphrasing Gigerenzer et al. . . . ecological rationality as it applies across the spectrum that I examine here can be defined as follows: The behavior of an individual, a market, an institution, or other social system involving collectives of individuals is ecologically rational to the degree that it is adapted to the structure of its environment.
>
> *(Ibid: 36)*

Whereas Gigerenzer's research has focused largely on individual aspects of the subject matter, Smith has applied this concept to elaborate on institutions and the market. Table 7.1 juxtaposes Gigerenzer's and Smith's views where they overlap and correspond on the notions of ecological rationality and heuristic decision making. These overlaps open potential venues of exploration for behavioral economics, especially given the fact that ecological rationality has been formalized in models of fast-and-frugal heuristics. Fast-and-frugal heuristics are partially unconscious decision rules that exploit learned or evolved capacities of our mind. One example is the gaze heuristic, which requires following a moving object against a noisy background—a difficult task for a machine but easy for humans, even infants, who can draw on their evolutionarily developed capacity of gaze. A heuristic is ecologically rational when it functionally matches the environment in which it is used.

Economics, as a science, has heavily relied on constructivist rationality, defined by Smith as "the deliberate use of reason to analyze and prescribe actions judged to be chosen" (Ibid.: 2). This form of rationality produces the normative ground for the realm of behavior explored thus far in mainstream behavioral economics. Again, in Smith's words,

> When applied to institutions, constructivism involves the deliberate design of rule systems to achieve desirable performance. The latter include the "optimal design" of institutions, where the intention is to provide incentives for agents to choose better actions than would result from alternative arrangements.
>
> *(Ibid.)*

Notice that constructivist rationality establishes its norms on the basis of statistical validity or logical veracity. In contrast, ecological rationality as a benchmark not only extends applicable notions of rationality to the evaluation of behavior but also suggests acquiring norms that go beyond statistics and logic. Unlike the positive economics norms used in as-if models, whose validity is cross-situational, such norms are sensitive to the context of the decision situation and to the content or wording that describes the particular situation (Mousavi & Gigerenzer, 2011; Gigerenzer, 1996).

Accordingly, the ecological rationality view seeks to enhance judgment not by nudging human beings, who are perceived as subject to cognitive limitations, but by boosting their abilities—for instance, by providing more accessible representations of information pertinent to the choice problem at hand (Grüne-Yanoff & Hertwig, 2015).

Constructing a formal theory of heuristic decision making that complements the existing statistics and logical framework is admittedly a long-term endeavor (Gigerenzer, 2008), and an ongoing one in the study of the ecological rationality of fast-and-frugal heuristics. An appeal

Table 7.1 Ecological rationality in economics (à la Smith) and psychology (à la Gigerenzer)

Subject	*Economic view à la Smith*	*Psychological view à la Gigerenzer*	*Overlap*
Ecological rationality	Ecological rationality is concerned with adaptations that occur within institutions, markets, management, and social and other associations governed by informal or formal rule systems.	A heuristic is ecologically rational to the degree that it is adapted to the structure of an environment. Humans have to adapt to a social and physical world, not to systems with artificial syntax, such as logic.	Smith uses the same definition of ecological rationality as Gigerenzer, wherein heuristics can be replaced by markets, management, or other rule systems
The normative aspect of constructivism and unbounded rationality	Constructivism or reason provides a variety of ideas to try out but often no relevant selection criteria, whereas the ecological process selects the norms and institutions that serve the stability of societies.	Unbounded rationality can generate optimal solutions for simple situations, such as tic-tac-toe; omniscience and omnipotence can also be used for theoretical examination of human behavior, but applying them as a universal standard of rationality is a scientific error.	Norms produced by unbounded or constructivist rationality are not useful as selection criteria in complex situations; the ultimate evaluation comes from the real world, not from theoretical sophistication.
Observation and experiments	Observing how people actually behave reveals unanticipated system rules, for example, the unexpected emergence of hubs (like an equilibrium) when airlines were deregulated.	Experimental games are bound to study social behavior as rule-obeying and not as rule-negotiating or rule-changing.	Rules are to be discovered as they emerge from social behavior. Formal models can be used to provide a possible description of what was observed.
Heuristic rules	Heuristics are a kind of cognitive capacity that we can access without being entirely aware of doing so.	Fast-and-frugal heuristics are strategies triggered by environmental situations and enabled by evolved or learned capacities.	The choice of heuristic strategy is often not fully deliberate. This does not exclude the possibility of training or altering the trigger conditions.

[Adopted with modification from Mousavi et al. (forthcoming). Based on interviews reported in Mousavi & Kheirandish (2014)].

of this pursuit for economists is the fact that heuristic strategies—not at a meta-level but as tools—have organically materialized as successful ways of making decisions in finance and business. Each of these instances can be regarded as a special case for a lower-level analysis of this claim. The next section provides a set of examples, where ecological rationality is used as a framework to study the success of heuristics in business decision making.

Ecological rationality as a framework for teasing out the elements of success

In a collection of studies (special section, *JBR* August 2014), fast-and-frugal heuristics are shown to be successfully used in a number of situations in which their ecological rationality clearly explains their success. Such instances are documented for consumer behavior in credit or goods markets, managerial judgment in pricing products and hiring employees, crisis management, entrepreneurial decisions, and organizational behavior. In each of the papers reviewed in this section, the authors apply ecological rationality as a framework, formulate the observed evolvement of successful strategies as heuristic processes, and argue how ecological rationality can help us understand the whens and whys of successful decision making.

Banks and financial sector

As major financial intermediaries in the monetary system, banks regularly engage in issuing lines of credit. Credit cards, which allow consumers to spend their future income, have been a concern for regulators because it has been shown time and again that repayment of credit card debt is a much more difficult task than perceived by credit card holders or the rational view of human decision making. Many cardholders quickly collect a considerable amount of debt on their credit cards and then pay high amounts of interest on their debt for extensive periods of time. Federal reserve board reports for American households indicate an average of above 15 percent of income being spent on financial obligation payments (www.federalreserve.gov/releases/housedebt/). For low- and middle-class Americans, this ratio can reach half of their disposable income. To protect consumers against this peril, in 2009, American lawmakers passed the credit card accountability, responsibility, and disclosure act (CARD). As a result, many banks hired consultants to implement their obligations. Shefrin and Nicols (2014) report their consulting process for the Chase Bank, where they developed the concept of financial styles for cardholder households. This is part of the Chase Blueprint Program designed to help cardholders better manage their spending and borrowing behavior. They note that "by nature, household decision making is a heuristic enterprise, as most household decision tasks are far too complex to be fully specified, let alone solved through optimization." Moreover, they observe that neoclassical preference ordering and the measurement tools based on it are concerned primarily with the consistency criterion of rational choice rather than "the quality of the decisions." At the same time, they note that their financial literacy questionnaires revealed that only half of those who self-assessed their mathematical skills as "high-level" were able to calculate interest rate and inflation correctly. Given the complexity of household decisions and these limitations of both technical measurement tools and customers' mathematical abilities, Shefrin and Nicols decided to use a fast-and-frugal decision rule to help Chase credit card holders find their personal financial styles, which would then match them with proper financial advice from a menu. After responding to a short series of binary questions, consumers are classified into one of the four categories: low control, minimum payer; high control, minimum payer; full balance paying, multiple cardholder; and full balance paying, single cardholder. This categorization task has four options and three cues, lending itself to an elimination heuristic process. Shefrin and Nicols (2014) report that this financial style categorization heuristic is more accessible to bank customers (especially the 25 percent with self-ranked low confidence in their online skills) and also technically advantageous over cluster analysis.

Let us turn now to another aspect of banking. Banks keep longitudinal and detailed data on their customers' financial choices. Thus, customer relationship management (CRM) in banking appears to be a perfect area for implementation of optimization methods based on

customer lifetime valuation (CLV), which require such data. If this were true, banks should be using CLV routinely, and this should be contributing to improving relationships with their customers. Persson and Ryals (2014) examined the process of CRM at nine of the largest retail Nordic banks, and discovered that although these banks perform CLV calculations their decisions are made based on a handful of simple heuristics that deliberately ignore a large set of technically relevant results available from data analysis. Moreover, they report that customers prefer the banks that practice simple heuristic decision making to those that apply CLV. Providing a list of heuristics that can be applied to CRM, the authors determine their ecological rationality by specifying the conditions under which a certain heuristic succeeds or fails. For example, banks use simple rules to determine the active/inactive status of a customer, somewhat akin to the hiatus heuristic introduced by Wübben and von Wangenheim (2008), that use only one threshold value, such as a fixed number of inactivity months to drop a consumer from the list of active consumers, and ignore all other information.

Seeking financial consulting is prevalent among retail investors. To better understand the investor–advisor interaction and their respective perceptions, Monti et al. (2014) conducted interviews with 20 professional financial advisors and 99 active bank customers at an Italian corporate bank. Because these retailers admittedly lack the expertise for making investment decisions, they delegate financial decisions to the advisors. Interestingly, what they value in their advisors more than past performance record are trustworthiness, clarity, and attention. This is despite the fact that the retailers hold little confidence or trust in the financial system as a whole. Monti et al. (2014) propose a model of trust formation as the main vehicle for delegating financial decisions, which has little or no regard for standard economic metrics for evaluating financial choice. The analysis of their interview data resonates with the *honest signals* phenomenon of Pelligra (2010), where "honest signals are behaviors that are so expressive or so directly connected to our underlying biology that they become generally reliable indicators used by people to guide their own internal psychological production of trust." Thus, it is shown that advice taking is an adaptive behavior and that trust, as a simple heuristic, works well within cooperative environments. Monti et al.'s approach perceives trust as a public good that can in turn be understood as ecologically rational behavior in the complex financial environment. Non-expert retail investors in this study make decisions based on the trust engendered by their advisor's communication style. Moreover, these investors' perceptions of the investor–advisor relationship reflect portfolio decisions better than the risk–return trade-off.

Strategic corporate decision making

Innovation adoption in organizations is a complex strategic process. Nikolaeva (2014) uses a cognitive lens to observe this phenomenon that reveals the dominant use of two popular imitation heuristics, namely, *imitate the successful* and *imitate the majority*. Managers regularly copy predecessors for improving the status quo. The speed of innovation adoption depends on the interaction between the framing dictated by the status quo and the timing of the different imitation heuristics in use. Similarly, Berg (2014) shows that entrepreneurs choose their locations based on a combination of two simple heuristics, satisficing and imitation. When choosing where to locate, successful entrepreneurs form small consideration sets. Satisficing thresholds are set on the basis of imitation and are not updated along the search path.

Focusing on corporate strategic decision making, Azar (2014) specifies conditions under which firms follow the default heuristic, which kicks in when the cost of obtaining information is relatively high or the variation in possible outcomes is low. All in all, whether these decisions involve exploring new frontiers, such as in innovation adoption and entrepreneurial decisions,

or routine choices such as setting corporate strategic policies, heuristic rules appear to guide the thrust of many important decisions.

Human resource and hiring decisions

Human resource (HR) managers routinely make hiring and delegation decisions based on incomplete information. Hu and Wang (2014), who view trust in HR decisions as a risky choice, propose that these decisions are frequently made by using simple heuristics. They investigate the use of four strategies by 120 HR managers, take-the-best (TTB), the minimum requirement heuristic (MR), likelihood expectancy (LE), and the Franklin rule (FR), and specify conditions for the best performance of each strategy. TTB was found to be most effective when the alternative options can be differentiated by the most valid cue. MR is a form of tallying that chooses the option that meets the higher number of minimum requirements and performs best when a limited number of cues are used as a minimum requirement for differentiating between options. By contrast, an LE user chooses the option with the higher LE score, that is, the one with the higher sum total of cues, and examines the space of cues exhaustively. The FR calculates a weighted sum of cue values and selects the one with the higher score. Hu and Wang's joint comparison of these four strategies in the context of HR management shows that the simple heuristics MR and TTB outperform the complex ones, LE and FR, in terms of predictive accuracy. Moreover, MR outperforms TTB overall because differentiation based on the most valid cue becomes more difficult in this environment, where cues often have a similar validity.

When hiring, would more interviewers increase the quality of hired employees? By observing corporate recruiting procedures and analyzing data from the recruitment procedures of several corporations, Fifić and Gigerenzer (2014) pursued a formal answer to this question. They show that in terms of hit rate, two interviewers are on average not superior to the best interviewer. That is, the chance of choosing higher quality interviewees from a pool of applicants by a single interviewer is higher than when more than one interviewer is involved. This finding manifests an instance of less-is-more phenomena and goes against a general consensus in the traditional approach, such as in the Condorcet jury theorem, which associates higher quality with more expert involvement. Furthermore, Fifić and Gigerenzer show that adding more interviewers will not increase the expected collective hit. This result provides additional insight to the free-rider explanation for inferior outcomes from collective choice processes (see, for example, Kerr & Tindale, 2004).

Pricing, marketing, and crisis management

Do managers' pricing choices show patterns and identifiable algorithms? Rusetski (2014) reports that a majority of managers (69%) rely on an identifiable heuristic when making their pricing decisions under limited information. His cluster analysis reveals that brand strength is a dominant input into intuitive decision-making algorithms, whereas product quality seems to play a relatively minor role in pricing. In fact, managers consistently price their products above, equal, or below those of their competitors instead of adjusting prices according to attributes such as quality. Observed pricing heuristics are ecologically rational because they rely on past experience and best practices for a given environment. When pricing decisions, which are typically made in complex environments, have to satisfy multiple criteria and are made under time pressure, frugal intuitive decisions are in fact more effective than those based on a full-fledged analysis.

Facing many products with many features in the markets, consumers use consider-then-choose decision processes with the help of heuristic decision rules. Hauser (2014) names these

Table 7.2 Observed crisis management heuristics formulated as simple decision rules

Heuristic	*Rule form*
Credibility heuristic	If the *conveyor* of the warning message passes a threshold of perceived credibility, then treat the message as being a signal from the target; if not, treat the message as being noise from a distracter.
Precedent heuristic	Search for precedent(s) for the unfolding event (i.e., historical analogue(s)), and if identified, then treat the current event in the same fashion as its precedent was treated.
Facts-trump-speculation heuristic	When faced with conflicting lines of evidence relating to a phenomenon, order them according to a predefined (but possibly implicit) hierarchy of evidence (cue validities), and treat the highest ranked line of evidence as true.

Based on MacGillivray (2014).

processes *consideration-set heuristics*. Marketing management, product development, and marketing communication decisions depend on the ability to identify such heuristics and to react properly to them. This requires understanding, quantifying, and simulating what-if scenarios for a variety of heuristics. Describing consumer choice processes by heuristic rules provides an effective tool for dealing with a broad set of managerial problems, including complex product categories with large numbers of product features and feature levels.

Heuristic rules are not always intuitive; managers can consciously develop and use them for dealing with crisis. MacGillivray (2014) gathers field evidence on crisis management rules in the water supply sector and explores these in the framework of fast-and-frugal heuristics. He highlights "the relations between rule-based reasoning and social, political and organizational structures." As such, he presents heuristic analysis as a powerful tool for understanding and justifying inferences and choices in given contexts, and for developing methods to persuade social actors in certain directions. Three heuristics for fast-and-frugal crisis management are specified: credibility, precedent, and facts-trump-speculation heuristics. As described in Table 7.2, credibility is used as a rule for discriminating between signal and noise, the precedent heuristic uses analogy as a rule for reasoning, and the facts-trump-speculation heuristic implements a noncompensatory approach to weighing evidence.

Observing heuristic rules used across domains of business and economics and teasing out their conditions of success comprises the agenda of studying the ecological rationality of fast-and-frugal heuristics. This method of study shifts the focus from the underlying biases associated with heuristics to exploring heuristic decision making as a legitimate approach to the study of choice under uncertainty alongside the more familiar approaches to this domain of scientific inquiry based on probability theory and logic (Gigerenzer, 2008).

The domain of behavioral economics

As a discipline, economics has been on a quest to become more scientific by mathematizing its methods and practices. The goal has been to make economics to the social sciences what physics is to the natural sciences. McCloskey (1991) argues that economics has moved away from its practical use of solving social, political, and market institution problems by its obsession for "becoming more mathematical":

> The problem is that the general theorem does not relate to anything an economist would actually want to know. We already know for example that if the world is not

> perfect the outcomes of the world cannot be expected to be perfect. This much we know by being adults. But economists arguing over the federal budget next year or the stability of capitalism forever want to know *how big* a particular badness or offsetting goodness will be. Will the distribution of income be radically changed by the abandonment of interest? It is useless to be told that if there is not a complete market in every commodity down to and including chewing gum then there is no presumption that capitalism will work efficiently. Yet that is a typical piece of information from the mathematical frontlines. It does not provide the economic scientist with a scale against which to judge the significance of the necessary deviations from completeness. Chewing gum or all investment goods: it does not matter for the proof.
>
> *(p. 9)*

Behavioral economics as a scientific movement has set out to bring realism back into economic theory and thus to enhance the relevance and applicability of economics to solving societal problems. Gaining sight of where social science stands in the spectrum of scientific inquiry is, therefore, of key importance to the development of behavioral economics. In what follows, a categorization of scientific problems is evoked and placed together with the study of heuristics in a space specified by different types of complexity and the range of variables. This exercise provides a perspective on how behavioral economics problems can be perceived and explored. One reason why heuristics work lies in the fact that their effective simplicity generates robustness, which in turn functions under certain forms of complexity. By demonstrating the power and range of the applicability of heuristics, we refute the misconception that heuristics are inferior to sophisticated optimization methods when it comes to a wide range of interesting practical problems.

The complexity continuum

Warren Weaver (1894–1978) is arguably one of the most influential scientists of the past century and unassumingly so. He also had a knack for spotting talent. In his thirty years of heading the natural science unit of Rockefeller Foundation he funded 15 out of 18 future Nobel Laureates in molecular biology (Sull & Eisenhardt, 2015). In his 1948 paper titled "Science and Complexity," he depicted his view of scientific inquiry and went on to foresee the function of science "in the developing future of man." Weaver views scientific problems in terms of the number of variables involved in solving them and locates them on a spectrum from simple to complex, where complexity can be either organized or disorganized. As he notes, physical science became significantly quantitative in the seventeenth century and since then has discovered the constant relationships between two, three, or four variables and thus almost exhausted *problems of simplicity* characterized by them. Picture this category of problems by one such instance: the motion of two balls hitting each other. Science in the twentieth century aimed at finding relationships that can describe the equivalent of the movement of billions of balls in many directions, where no specific information on an individual variable can be determined except in the form of distributions. To analyze average properties of the orderly systems that characterize these *problems of disorganized complexity*, scientists developed "powerful techniques of probability theory and of statistical mechanics." Such analysis can be easily applied to the financial stability of a life insurance company, but cannot be easily applied to many other economic and financial problems.[3] Weaver argues that the analytical achievements of statistical methods developed for dealing with the problems of disorganized complexity were so impressive that it became tempting to apply them to all sorts of problems with large numbers of variables. However, he cautions scientists about

an ignored vast middle ground, where problems are complex but not disorganized. He keenly observes that these problems require a different approach:

> How can one explain the behavior pattern of an organized group of persons such as a labor union, or a group of manufacturers, or a racial minority? There are clearly many factors involved here, but it is equally obvious that here also something more is needed than the mathematics of averages. With a given total of national resources that can be brought to bear, what tactics and strategy will most promptly win a war, or better: what sacrifice of present selfish interest will most effectively contribute to a stable, decent, and peaceful world?
>
> These problems and a wide range of similar problems in the biological, medical, psychological, economic, and political sciences are just too complicated to yield to the old nineteenth century techniques which were so dramatically successful on two-, three-, or four-variable problems of simplicity. These new problems, moreover, cannot be handled with the statistical techniques so effective in describing average behavior in problems of disorganized complexity.
>
> These new problems, and the future of the world depends on many of them, requires science to make a third great advance, an advance that must be even greater than the nineteenth century conquest of problems of simplicity or the twentieth century victory over problems of disorganized complexity. Science must, over the next 50 years, learn to deal with these problems of organized complexity.
>
> *(pp. 5–6)*

An area characterized by solving these mid-range problems is the study of administrative and organizational behavior, a field pioneered by Herbert Simon (1947). Simon held that "satisficing," which entails setting and achieving an aspiration level, is a major decision tool used in organizations for solving complex problems. It can be applied to a wide variety of complex problems, from well-defined but intractable ones such as a game of chess to ill-defined daily problems that are full of surprises, such as choosing a career or planning a picnic.

Satisficing is one of the heuristics in the "toolbox" of the human mind. The descriptive study of fast-and-frugal heuristics comprises the study of the mind as an adaptive toolbox that contains heuristics, their building blocks, and evolved capacities. With heuristics, both experts and non-experts have tools to solve a vast set of problems with a mid-range of complexity. Figure 7.1 demonstrates an attempt to bring mid-range complexity and heuristic problem solving into one space, wherein the complexity of problems as categorized by Weaver is superimposed on the space of heuristic decision making. Notably, the overlaps and distinctions are not clear-cut. However, the critical role of simplicity captures a central feature of how to successfully deal with complexity in scientific and everyday problem solving.

The conjecture, here, is that discovering the structure of organization for given mid-range problems of *organized complexity*—which characterize most problems addressed in the social sciences, including economics—can reasonably be achieved by pursuing a scientific approach to heuristics. This endeavor entails developing testable models of heuristics and formulating existing observed phenomena as heuristic processes (as was shown in the third section). Using Figure 7.1, one can apply the concept of ecological rationality to Weaver's categorization of scientific inquiry: Mechanistic methods dealing with up to four variables are suitable for the *problems of simplicity*, whereas probability and statistical methods are suited to the investigation of problems with disorganized complexity and can at best generate knowledge of averages, not of specifics or

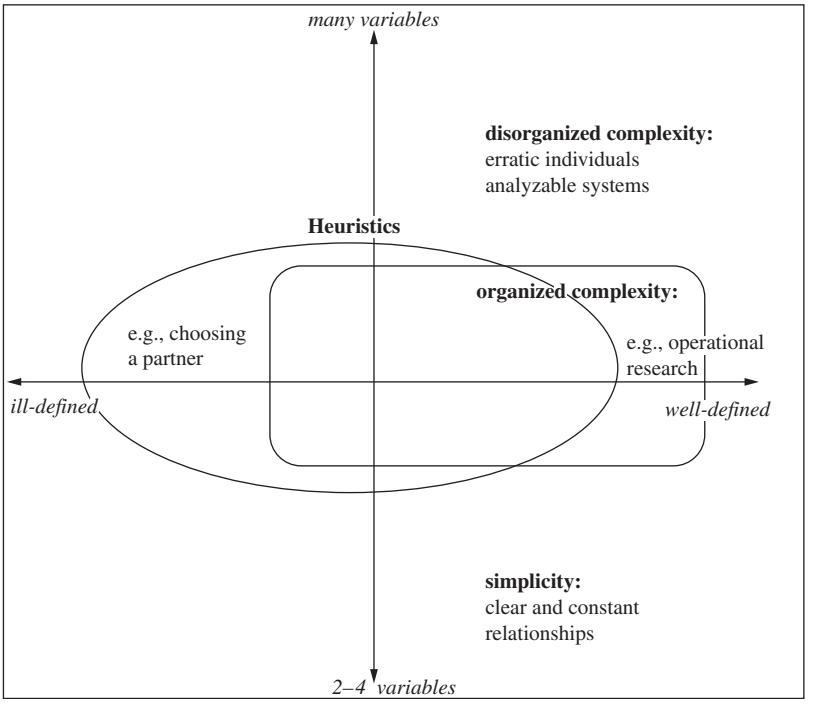

Figure 7.1 Placing heuristics in a space with degrees of complexity on the vertical axis versus the degree of definability of a problem on the horizontal axis

Graphics credit: Anoush Kheirandish.

single events of interest. Bearing in mind the superimposition of complexity over the range of definability as in Figure 7.1, one can view the study of the ecological rationality of heuristics as systematically exploring and revealing the "organization" of generalizable elements and features of many problems of *organized complexity*, from ill-defined to well-defined structures. Rigidly holding on to ideals of optimization and probability theory leaves one at one or the other end of the continuum of complexity and prevents one from *muddling through* a vast middle range of relevant economic and social problems with structured complexity that lend themselves to being modeled with the effective simplicity of heuristics.

Closing remarks

In its search for psychological insight to inform economic modeling of human behavior, behavioral economics has found it primarily in the heuristics and biases program, with which it shares the neoclassical benchmarks of rationality for evaluation of the choice behavior. Another school of thought in psychology, much less explored by behavioral economists, studies the functionality of fast-and-frugal heuristics. This approach evaluates behavior on the basis of its ecological rationality, where success is achieved through a functional match between heuristic strategies and the task environment. In this chapter, the economic and psychological conceptions

of ecological rationality were juxtaposed, and some ways in which ecological rationality can be used as a framework for analyzing economic and business heuristic decision making were presented. The main message is that behavioral economists can benefit from adding the ecological rationality framework to their toolbox of methods and methodologies for the study of human behavior. In closing, a specific limitation of psychology merits attention: "When discussing psychological research, what surprises every economist or physicist is that psychology has no theory. It has many local ones but no overarching theory, not even a provisional one" (Gigerenzer, 2015: 252). By adopting psychological insights from a variety of psychology research programs, behavioral economics has the promising potential of contributing to theory building and theory integration in psychology, which in turn lends itself to the expansion of theory in behavioral economics.[4]

Notes

1 See chapter in this handbook for on overview of the fast-and-frugal heuristics study program.
2 See chapter 14 by Altman in this handbook on institutional economics and how it can inform behavioral economics.
3 Weaver's position agrees, independently, with Frank Knight's (1921) view that what is important to the student of business is not the problem of statistical probability, but those problems that do not lend themselves to the structural configuration of insurance in the market. Connections between Knight's typology of risk versus uncertainty and the study of fast-and-frugal heuristics have been worked out in Mousavi and Gigerenzer (2014).
4 An extensive exchange between economics and psychological views on this approach is presented in Mousavi, Neth, Meder, & Kheirandish, forthcoming, in *Behavioral Economics for Smart People*, Morris Altman (ed.).

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