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978-0-521-87135-8 - Rationality in Economics: Constructivist and Ecological Forms

Vernon L. Smith

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RATIONALITY IN ECONOMICS

The principal findings of experimental economics are that impersonal exchange in markets converges in repeated interaction to the equilibrium states implied by economic theory, under information conditions far weaker than specified in the theory. In personal, social, and economic exchange, as studied in two-person games, cooperation exceeds the prediction of traditional game theory. This book relates these two findings to field studies and applications and integrates them with the main themes of the Scottish Enlightenment and with the thoughts of F. A. Hayek: Through emergent socioeconomic institutions and cultural norms, people achieve ends that are unintended and poorly understood. In cultural changes, the role of constructivism, or reason, is to provide variation, and the role of ecological processes is to select the norms and institutions that serve the fitness needs of societies.

Vernon L. Smith was awarded the Nobel Prize in Economic Science in 2002 for having established laboratory experiments as a tool in empirical economic analysis, especially in the study of alternative market mechanisms. He is professor of economics and law at George Mason University and a research scholar in the Interdisciplinary Center for Economic Science in Arlington, Virginia. Professor Smith is the president of the International Foundation for Research in Experimental Economics, which he helped found in 1997 to support education and research in experimental economics. He has authored or coauthored more than 250 articles on capital theory, finance, natural resource economics, and experimental economics. Cambridge University Press published a collection of his essays, *Papers in Experimental Economics*, in 1991 and published a second collection of his more recent papers, *Bargaining and Market Behavior*, in 2000. Professor Smith is a Fellow of the Econometric Society, the American Association for the Advancement of Science, and the American Academy of Arts and Sciences; in 1995 he was elected a member of the National Academy of Science. He has received an honorary doctor of management degree from Purdue University and an honorary doctorate from George Mason University, as well as honors from universities in other countries. Professor Smith's current experimental research involves the joint emergence of specialization and exchange under different property right histories; antitrust implications of bundled pricing of commodities; compensation elections for protecting minorities in majority-rule democracies; and demand response and active retail choice in electricity pricing.

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VERNON L. SMITH

George Mason University



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*To my wife
Candace Cavanah Smith*

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When we leave our closet, and engage in the common affairs of life, [reason's] conclusions seem to vanish, like the phantoms of the night on the appearance of the morning; and 'tis difficult for us to retain even that conviction, which we had attained with difficulty. . . .

Hume (1739; 1985, p. 507)

All particulars become meaningless if we lose sight of the pattern they jointly constitute.

Polanyi (1962, p. 57)

We have become accustomed to the idea that a natural system like the human body or an ecosystem regulates itself. To explain the regulation, we look for feedback loops rather than a central planning and directing body. But somehow our intuitions about self-regulation do not carry over to the artificial systems of human society. [Thus] . . . the . . . disbelief always expressed by [my] architecture students [about] . . . medieval cities as marvelously patterned systems that had mostly just "grown" in response to myriads of individual decisions. To my students a pattern implied a planner. . . . The idea that a city could acquire its pattern as "naturally" as a snowflake was foreign to them.

Simon (1981; 1996, p. 33)

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Preface

I began developing and applying experimental economics methods to the study of behavior and market performance in the 1950s and 1960s and started teaching a graduate course in experimental economics in 1963; these early research exercises continued and occasionally started to include experiments that had economic design and “policy” applications in the 1960s. Thus, laboratory experiments in the 1960s examining rules for auctioning U.S. Treasury securities, in confluence with other forces, helped motivate a field experiment by Treasury in the 1970s, consisting of sixteen bond auctions, and this led to changes in policy in the 1980s and 1990s.

At the University of Arizona, along with several of my remarkable students and colleagues, we started to do electronic trading experiments – “E-Commerce” in the lab – in 1976 (Williams, 1980). Primarily these were exercises testing and exploring theoretical and other hypotheses about the performance of markets under controlled laboratory conditions. In the 1980s, these efforts grew naturally through our incremental learning into using experimental economics more systematically as a framework for communication and interaction with business, legal, engineering, regulatory, and other practitioners, in addition to students, and as a test bed for market designs that are applied in the world and used for postimplementation dialogue in ongoing rule evaluation.

All these laboratory experiences changed the way many of us thought about economic analysis and action, as experimental methods took on a life of their own – a fact that I had no conscious awareness of initially, as I was still thoroughly imbued with the prevailing orthodox way of economic thinking. The transformation began in the 1960s, but progressed slowly. There are many reasons for the change, but of unique significance is the discovery that programming myself through the challenging exercises of designing and conducting experiments forced me to think through the process rules and

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procedures of institutional arrangements within which agents interact. Few are as skilled as was Albert Einstein in acquiring new understanding by the device of formulating detailed and imaginative mental experiments – the *Gedankenexperiment*, a concept introduced into German by Ernst Mach. Scientists need the challenge of real experiments to discipline their thinking in the required painstaking detail. This practice is what fuels the development of experimental knowledge in economics and all of science. That knowledge has a life of its own, whose traditions and techniques are distinct from the theory and the test hypotheses associated with each particular science.

Economic theory became, in my thinking, a framework for the prediction of equilibrium prices and allocations, implemented by the rules of extant trading institutions. Experiments provided a way of bridging the gap between equilibrium theory – pencil-and-paper thought models – and economic action by agents governed by market institutions that are complex to the participants but who do not approach their task by thinking about it the way we do as economists when we do economic theory. Experiments constituted a substitute for the missing dynamic process analysis that had not been part of the standard equilibrium tool kit, a kit that had focused only on what might be the equilibrium shadow cast ahead by any such process.

Also important was the early discovery, its replication, and ongoing generalization that humans could quickly learn to function in these private incomplete information environments using the action (property) right rules of extant institutions and their natural cognitive skills to explore exchange opportunities and achieve over time the efficient outcomes predicted by the modeler, alone armed with complete information. Humans functioned well in the heart of that rule-governed dynamic process but were not aware of the shadow ahead. Central to my new awareness was a growing and unsettling realization of the unsolved puzzle of *how* economic agents/subjects acquire the tacit knowledge that enabled them to function so well in socioeconomic environments – a knowledge-acquisition problem little recognized or studied and understood by economics and psychology. Agent actions, however, are not governed by the same mental processes we use to construct the theory. And their quick proficiency in repetitive markets with low asymmetric information is startling and awe inspiring. I think it says much about why these institutions have survived, grown, and daily beget new emergent variations in the communication age.

This was a humbling experience once I realized that in terms of formal modeling, none of us knows much beyond anecdotes about how either subjects in the lab or economic agents perform their task and nothing about how they process messages in time – and neither do they, as becomes evident

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if you interrogate them. This observation has nothing to do with theoretical sophistication; put theorists in the experiment, as I have done, and they cannot articulate an explanation of their own behavior interacting with others through an institution. Moreover, their behavior is no more or less efficacious than the typical student subject in these dispersed private information markets. Repetitive or real-time action in incomplete information environments is an operating skill different from modeling based on the “given” information postulated to drive the economic environment that one seeks to understand in the sense of equilibrium, optimality, and welfare. This decision skill is based on a deep human capacity to acquire tacit knowledge that defies all but fragmentary articulation in natural or written language.

The learning from the discovery and observation of this skill in the laboratory has provided the basis for a productive interaction with managers and policy makers in industry and government. These practitioners relate easily to the experimental framework through hands-on demonstrations followed by presentations and to become quickly immersed in a helpful dialogue from which all who are involved learn together; it’s “we,” not a group consisting of “us” and “them.” To do this, no formal economic background is needed, especially in a design problem too complex to model in accustomed ways. Practitioners are into problem solving and do not relate naturally to discussions driven by economic theory and its “applications” to their world because they do not automatically relate it to their experience, but they can appreciate working models when they see and experience them and become an active part of the design-testing process for new markets and management systems. Experiments provide the means for defining a common language and experiential base for problem solving.

After a couple of decades of laboratory experimental investigations, I realized that static equilibrium theory was gradually taking on a new and more vibrant institution-specific life because standard theory omitted what it was most important for us to understand – how message and allocation rules can affect equilibrium formation in dispersed information environments. Equilibrium theory began with a preference/production framework to support market prices and derived efficiency, ad hoc stability, and distributional properties of that system. The theory, however, contained no price-discovery process based on an articulated message space of communication among agents, the rules governing message exchange, and rules specifying how contracts emerged from that message exchange. It was static equilibrium theory without process, and that mode of thinking continued to dominate with the important new contributions in asymmetric information modeling.

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This book offers an account and development of the details that indicate how my thinking changed and led me to a new appreciation of the classical scholars and of F. A. Hayek. It is true that I had read Hayek (1945) long ago, and its theme even led me to write Smith (1982b), but his other works I had either not read or their significance had escaped me because my mind was not ready to comprehend the enormity of their full meaning. This changed dramatically less than a decade ago – I was surprised recently to find that the collection Smith (2000) contains no references to Hayek – when I “really discovered” Hayek, returned to the classics, and saw in a fresh new light Adam Smith’s (1759; 1982, 1776; 1981) works, those of David Hume, and others in the incredible Scottish Enlightenment. Adam Smith’s (1759; 1982) first book is particularly insightful in the light of contemporary developments in cognitive psychology, but it was his narrower work in economics that would command the most acclaim.

My participation in Liberty Fund conferences based on the classics and their subsequent forms helped me to make these important rediscoveries and new integrations through the lens of my previous experience in the laboratory. The change wrought in my thinking by a lifetime career in experimental economics now enabled me to better appreciate the great depth of the Hayek program and that of his Scottish predecessors, which somehow had been mislaid along the mainstream technical way.

My hope is that with more concrete examples and demonstrations illustrating what Hayek was talking about – he gave us precious few – and what the Scottish geniuses were trying to convey to us, the twenty-first century will be a century of reawakening, a deepening of this intellectual enlightenment, and new inquiries based on new tools of analysis.

Because I am particularly concerned with integrating the experiments and field examples that I examine in the text with the themes of constructivist and ecological rationality, many of the examples are not treated in depth. However, I have tried to provide references that enable the interested reader to pursue a deeper study. In writing the text, many auxiliary, related, or supplemental commentaries were of relevance; I follow the usual style of placing some of these in footnotes, but I have made many of them more accessible by including them directly as shaded text, making it easy for the reader to follow these asides or bypass them to continue with the main text.

In the years while writing this book, there has occurred an explosion of literature on topics relevant to its themes. I have tried in many cases to connect into that rapidly changing literature, but I also needed to invoke

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a stopping rule. Hence, I will not do justice to all those connections, but I urge the reader to investigate them more deeply in response to his or her own intellectual curiosity.

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Anchorage, Alaska

Tucson, Arizona

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Acknowledgments

The subtitle of this book was directly suggested to me by Joel Norman's (2002) paper, "Two Visual Systems and Two Theories of Perception: An Attempt to Reconcile the Constructivist and Ecological Approaches." The term "ecological rationality" has been used fittingly by Gigerenzer et al. (1999) for application to important discoveries captured in the concept of "fast and frugal decision making" by individuals: "A heuristic is ecologically rational to the degree that it is adapted to the structure of an environment" (p. 13). My application of the term is concerned with adaptations that occur within institutions, markets, management, social, and other associations governed by informal or formal rule systems – in fact, any of these terms might be used in place of "heuristic" and this definition works for me. My emphasis is entirely complementary to that of Gigerenzer et al., although I make no attempt herein to integrate the two perspectives. Friedrich Hayek prominently identified both kinds of rationality but did not attach a name to the second.

I am indebted to Sid Siegel for technical and conceptual inspiration in the early 1960s; to George Horwich, John Hughes, Stan Reiter, and the Purdue faculty from 1955 to 1967 for warm, tolerant support beginning with my first experiment; to John Dickhaut, Charles Holt, Charles Plott, Martin Shubik, Shyam Sundar, and others for many significant encounters over the decades on institutional and experimental issues; and to students, visitors, and the current Interdisciplinary Center for Economic Science (ICES) team at George Mason University. In particular, I have benefited from many engaging discussions with Bart Wilson on Hayek, David Hume, Adam Smith, Ludwig Wittgenstein, and Michael Polanyi in attempting to understand the roots of economic behavior in tacit knowing. My debt to my coauthors, who have also been valued colleagues, will be evident in how dependent I have been upon our joint product.

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I have extensively revised and expanded my Nobel lecture, “Constructivist and Ecological Rationality in Economics,” portions of which have survived in Chapters 1 through 4, 7, 9 through 12, and 14. Reproduction has been granted with the kind permission of the Nobel Foundation.

Chapter 6 combines and revises the following two papers:

Banks, J., Mark Olson, David Porter, Stephen Rassenti, and Vernon Smith. 2003. “Theory, Experiment and the Federal Communications Commission Spectrum Actions.” *Journal of Economic Behavior and Organization* 51:303–50. Available online at <http://www.sciencedirect.com>. Reproduction has been granted with the kind permission of Elsevier.

Porter, D., S. Rasseti, and Vernon Smith. 2003. “Combinatorial Auction Design.” *Proceedings of the National Academy of Sciences, September 16*, 100(19):11153–7. Available online at <http://www.pnas.org/cgi/reprint/100/19/11153>.

Chapter 7 is a revised and expanded version of my Herbert Simon lecture:

Smith, Vernon L. 2005. “Behavioral Economics Research and the Foundations of Economics.” *Journal of Socio-Economics* 34(2):135–50. Available online at <http://www.sciencedirect.com>. Reproduction has been granted with the kind permission of Elsevier.

Chapter 8 includes in part sections of the following work:

Smith, V. L., and F. Szidarovszky. 2004. “Monetary Rewards and Decision Cost in Strategic Interactions.” In M. Augier and J. March, eds., *Models of a Man: Essays in Memory of Herbert A. Simon*. Cambridge: MIT Press. Reproduction has been granted with the kind permission of MIT Press.

Chapter 13 is a revised and expanded version of the following:

Smith, Vernon L. 2002. “Method in Experiment: Rhetoric and Reality.” *Experimental Economics* 2:91–110. Reproduction has been granted with the kind permission of Elsevier.