



The legacy of Herbert Simon in game theory

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Abstract

The paper provides a background to the recent resurgence of interest in bounded rationality modeling in game theory by juxtaposing the histories of game theory and bounded rationality, tracing Herbert Simon's response to the evolution of game theory. Despite the connection between von Neumann and Morgenstern's notion of a solution and Simon's view of organizations, the paper illustrates that Simon and later game theorists share many criticisms of von Neumann and Morgenstern's approach.

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1. Introduction

Starting off in political science and then moving through several disciplinary domains such as management theory, economics, cognitive psychology, and artificial intelligence, Herbert Simon's versatile academic career was focused on understanding human decision-making and problem-solving processes and their implications for social institutions.¹ In the process, this interdisciplinarian served as one of the founding members of the entirely new field of behavioral economics and the completely new discipline of artificial intelligence. In economics, Simon has become known mostly for his razor-sharp criticism of neoclassical economics and for the bounded rationality program he developed in opposition to the neoclassical postulates. In line with his desire to become a mathematical social scientist, this polymath also gained tremendous respect in economics for his mathematical contributions such as the so-called Hawkins–Simon conditions for stability, his findings on certainty

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¹ See Sent (2001a) for a discussion of the permanence in Simon's agenda and Sent (2001b) for a focus on certain discontinuities.

equivalence, his research on size distributions of firms and organizations, and his insights on causality, identifiability, and aggregation. Not surprisingly, economists have tried to employ Simon's insights in an attempt to strengthen neoclassical economics. For instance, game theorist Ariel Rubinstein (1990) "observed a shift of interest toward expanding economic theory to include bounded rationality elements" (p. 18). Moreover, historian Abu Rizvi (1994) noted that "[i]t is interesting that Simon's ideas were not used by mainstream theorists for years but have recently been discovered" (p. 19n).² In addition, the prophet of bounded rationality, Simon (1992b), himself observed: "Readers would not be deceived by the claim that economists flocked to the banner of satisficing man with his bounded rationality. The 'flocking' was for a long time a trickle that is now swelling into a respectable stream" (p. 266).³

Yet some game theorists ignored Simon's role in the invention of bounded rationality for a long period of time. For instance, in the paper that stimulated research on modeling bounded rationality through automata, game theorist Robert Aumann traced his suggestion back no further than Roy Radner's contributions. In particular, Aumann (1981) claimed that "[f]inite memory has some conceptual ties to Radner's bounded rationality" (p. 21).⁴ On another occasion, Aumann (1986) examined how bounded rationality approaches "have evolved over the past 10 or 15 years" (p. 5). Only later did Aumann (1997) make a connection between his suggestion and Simon's work: "To my knowledge, this area was first extensively investigated by Herbert Simon" (p. 3). However, Aumann criticized Simon for leaving bounded rationality in what he considered to be a state of distress: "Much of Simon's work was conceptual rather than formal. For many years after his initial work, it was recognized that the area was of great importance, but the lack of a formal approach impeded its progress" (p. 3).⁵ At the same time, Simon (1955) considered game theory to "be an extremely crude and simplified approximation" (p. 101) in one of the two papers of his quoted by Aumann (1986, 1997).

Surveying the recent bounded rationality literature, John Conlisk (1996), therefore, rightly observed: "Game theorists have recently turned to bounded rationality with enthusiasm" (p. 681). However, whereas Conlisk's survey focuses almost exclusively on the last 15 years,⁶ this paper complements it by providing a historical background for the recent resurgence of interest in bounded rationality, focusing almost exclusively on game theory. It considers these developments in relation to Simon's seminal contributions, for Simon was at a very early stage in the development of his ideas when game theory was also being established. In particular, it shows how early game theorists failed to draw both on Simon's insistence on the evidence of cognitive limitations in the playing of games and on his early analysis of the implications of these restrictions. Moreover, recent developments that do

² See Sent (1997, 1998) for the "discovery" of Simon's ideas by Thomas Sargent.

³ In fact, Simon (1991) had earlier lamented: "My economist friends have long since given up on me, consigning me to psychology or some other distant wasteland" (p. 385).

⁴ Aumann is referring to a 1978 working paper version of Radner (1986).

⁵ Aumann did include a contribution by Simon and Schaeffer (1992) in his *Handbook of Game Theory*, but noted that their discussion of chess-playing computers "is not mainstream game theory" (Aumann and Hart, 1992 (p. xiii)). Simon and Schaeffer agreed that "chess may be described as a trivial game" (Simon and Schaeffer, 1992 (p. 2)).

⁶ See Conlisk (1996, p. 669): "Most references are to the last 15 years . . .".

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