

Essays on the Theory and Practice of Strategic Behavior

Introduction

The essays in this collection represent some of my studies in the theory and practice of “games”. The term “games” denotes the various ways in which situations of interactive decision making can be modeled. Theories of games use such models to either prescribe optimal behavior or to predict the behavior of human subjects. It turns out that often optimal behavior, as prescribed by the canonical theory, is at odds with the observed behavior of human subjects in the laboratory (or the field) (see Kagel & Roth 1995; Goeree & Holt 2001). The difference between what ought to be and what is has spawned reflections on the importance of experimental design and implementation (e.g., Hertwig & Ortmann 2001, 2001a, forthcoming) as well as new theories (McKelvey & Palfrey 1995, 1998; Goeree & Holt 1999; Anderson, Goeree & Holt 1998, 2001; Mailath 1998; Ho, Camerer & Chong 2001; Camerer, Ho & Chong, forthcoming.) Arguably the give-and-take between game theorists -- both those taking the eductive and those taking the evolutive approach -- and experimental economists has been one of the most fascinating developments in economics over the past decade or two. In the following I enumerate and briefly contextualize the seven chapters that constitute this collection.

The first chapter of this collection was published in 1995 in the *International Journal of Game Theory* and co-authored by various colleagues at Texas A&M University (Van Huyck, Battalio, Mathur, Van Huyck). Titled “On the Origin of Conventions: Evidence from Symmetric Bargaining Games”, it reports how subjects, matched randomly and repeatedly, played a 3x3 divide-a-dollar bargaining game experiment in which symmetry and efficiency suggested one of five equilibrium. The observed behavior in that experiment, while systematic and replicable, was not at all in line with that prediction: in eleven of twelve sessions, the (efficient) equal-split outcome of the divide-a-dollar bargaining game did not materialize. This motivated us to explore the value of evolutionary models in experimental economics. Indeed, we showed that our experimental results could be reasonably well explained through a dynamical system that employed a replicator model function and a continuous dynamic.

This was one of the first papers, if not *the* first paper, of its kind. While it introduced a model for the behavior of the subjects in our experiment, the model had its problems. For example, there was no rationale for the choice of the particular model function we chose (replicator) and there was no rationale for the choice of the particular dynamic (continuous) that we chose. In fact, typically, experiments are discrete and involve small numbers of subjects whose behavior is surely not error-free. These characteristics of actual behavior were not reflected in the model we used in the *IJGT* article. In follow-up work, I therefore explored jointly with Robert Knapp (then at Bowdoin College, now at Wolfram Research), and by way of computational simulations, the robustness of two model functions (replicator, rate-of-change) and three dynamics (continuous, discrete, stochastic) for various step-lengths and group sizes. It turned out that my concern and intuition about the appropriateness of the continuous replicator dynamic was not unwarranted.

The choice of model function, for example, can significantly affect the partition of the state space into basins of attraction. Step-length, group size, and amount of noise also made quite a difference for the sample trajectories that we computed. In additional experimental work that was the basis for an National Science Foundation grant (Ortmann 1995), I showed that short step-length (which reduces the cost of experimentation for participants) can overcome the inability of subjects to reach the symmetric and efficient equilibrium in the 3x3 divide-a-dollar bargaining game. This work is not represented in this collection. It is noteworthy though that recent work in experimental economics has dealt with these issues (e.g., Berninghaus & Ehrhart 1997.)

The second chapter of this collection represents a recent paper that is a product of the above mentioned NSF grant and currently under revision for resubmission to the *Journal of Economic Theory*. This paper, jointly written with Andreas Blume of the University of Pittsburgh, takes another approach to the issue of the kind of coordination failure that has been observed in classic papers such as Van Huyck, Battalio & Beil (1990, 1991). Specifically, we show that costless pre-play communication in a game with Pareto-ranked equilibria can significantly improve the efficiency of actual play: Messages facilitate both quick convergence to, and participants' initial coordination on, the Pareto-dominant equilibrium.

The third chapter of this collection is titled "It's Not What You Play, It's Whom You Play: Experimental Evidence From Constant-Sum Games." This paper was written with a former student of mine, Jonathan Trend, and is under revision for resubmission to the *International Journal of Game Theory*. It is based on Sobel (1991) which provided an intriguing attempt to incorporate into game theory the obvious fact that some people are more skilled than others at reasoning, strategizing, or the like. Specifically, Sobel analyzed "the idea that differential ability to play a game may be determined by the number of strategies in the game that an individual can effectively use." For constant sum games, modeling differential ability by allowing players to have access to different subsets of the full strategy space yields unambiguous predictions. In our paper, we present the results of an experimental test of Sobel's predictions for constant-sum games of the "Rock-Scissors-Paper" variety. While our results support Sobel's predictions, they also point to the limitations of his approach. I note that the issue of differential reasoning skills has been a major topic in recent experimental as well as theoretical literature (e.g., Nagel 1995; Stahl & Wilson 1995; Stahl 1996; Ho, Camerer & Weigelt 1998; Costa-Gomes, Crawford & Broseta 2001; Camerer forthcoming).

The next two chapters present two explorations of experimental design and implementation issues that are more generally explored in various other recent publications of mine (e.g., Ortmann & Hertwig 1996, 1997; Ortmann & Gigerenzer 1997; Hertwig & Ortmann 2001, 2001a, 2001b, Ortmann & Hertwig 1999, 2001) and current research (e.g., Engelmann & Ortmann 2000; Ortmann, Hertwig & Harrison, in preparation).

The fourth chapter is titled "Understanding Gender Differences in the Laboratory: Evidence from Prisoner's Dilemma Games", was written jointly with another former student of mine, Lisa K. Tichy, and published in the *Journal of Economic Behavior and Organization*. The major purpose of the paper was an exploration of the mixed experimental results on gender differences in laboratory experiments up to that point. Using a double-blind design we find significant gender

effects in the first round but no gender differences in subjects' reactions to their laboratory experiences. While our results do not allow sweeping conclusions, they do suggest that gender effects warrant more attention than economists typically give them. Specifically, we suggest that the gender composition of the subject pool ought to become one of the reporting conventions in experimental economics.

The fifth chapter is titled "Trust, Reciprocity, and Social History: A Re-examination", and was written jointly with another former student of mine, Carl Boeing, and a colleague at Bowdoin College, John Fitzgerald; it was published in *Experimental Economics*. The major purpose of the paper was the replication and stress test of Berg, Dickhaut, & McCabe (*Games and Economic Behavior*, 10, 1995, pp. 122 - 142) who found in an experimental implementation of a trust game significant amounts of trust and reciprocity. After replicating their results, we modified the way information was presented to participants and, through a questionnaire, prompted strategic reasoning. To our surprise, none of our various treatments led to statistically significant reductions in the amount invested. This result prompted me more recently to understand better what priors and rules of thumb subjects bring into the laboratory (Ortmann & Hertwig 1999) - a topic that has also caught other researchers' interest (Harrison & Rutstroem 2001; Henrich et al. 2001). More generally, the question is whether, and if so how, one-shot games can be implemented in the laboratory.

Chapters 1 - 5 test game theoretic predictions by way of experiments and also explore experimental design and implementation issues. In contrast, chapter 6 is concerned with organizational design and implementation issues. Drawing on game theory and industrial organization literature, I have investigated the nature and internal dynamics of higher education institutions, their strategic interaction, as well as the rapid emergence of a for-profit higher education sector in the USA and the implications of this development for traditional institutions (e.g., Ortmann 1997, 2001). The article is reprinted in the sixth chapter is an example of that research.

The article is titled "A Game-theoretic Explanation of the Administrative Lattice in Institutions of Higher Learning"; was written jointly with yet another former student of mine, Richard Squire, and was published in *Journal of Economic Behavior and Organization*. It was motivated by a couple of consulting studies of a real-life college that led us to believe that something was fundamentally wrong with it. Our working hypothesis being that incentives in that institution were poorly aligned, we build a game-theoretic model of academic institutions, focusing on the strategic interaction of prototypical overseers, administrators, and professors.¹ By identifying key principal-agent games routinely played in colleges and universities, we unpacked the black box typically used to conceptualize these institutions. Our approach suggests an explanation for the seemingly inevitable drift of institutions of higher education into such well-documented phenomena as academic ratchet and lattice and builds an understanding of the organizational conditions in which drift would be constrained.

¹ The 1996 working paper on which this article is based (Ortmann & Squire 1996) presents an even more comprehensive model and also discusses at length related literature from management and organization science.

The seventh and final chapter is titled “The Nature and Causes of Corporate Negligence, Sham Lectures, and Ecclesiastical Indolence: Adam Smith on Joint-stock Companies, Teachers, and Preachers”; it was published in *History of Political Economy* and demonstrated that Adam Smith thought long and hard, and very insightfully, about incentive alignment issues. The article was one in a series of articles (many of them co-authored with my former student Steven J. Meardon, formerly assistant professor at Williams College, now at the Inter-American Development Bank) which aim at a game-theoretic re-interpretation of various parts of Smith’s work (e.g., Ortmann & Meardon 1995, Meardon & Ortmann 1996, 1996a; see also Collings & Ortmann 1997). I have also been working on a manuscript (whose basic outline I presented at the AEA meetings 1997) in which I explore “Adam Smith’s Reasoning Routines.” This manuscript explores the deep structure of Adam Smith’s work. Specifically, I argue that Smith, early in his career, developed reasoning routines that he employed as moral philosopher, in *The Theory of Moral Sentiments (TMS)*, and as economist, in *Inquiry into the Nature and Causes of the Wealth of Nations (WN)*. While moving from rhetoric to moral philosophy, Smith looked at the latter through the conceptual lens of the former. While moving from moral philosophy to economics, he also looked at the latter through the conceptual lens of the former. By the chain rule, he looked at economics through the conceptual lens of rhetoric. Identifying his *Lectures on Rhetoric and Belles Lettres*, and *TMS* and *WN* as key products of his academic life, the central contention is that Smith’s thinking was throughout his work informed by his insights into the strategic nature of all things rhetorical, moral, and economic. Furthermore, Smith’s interest in various subject matters was a derived one. Ultimately, his overriding interest was to understand how people reasoned. Smith, in this sense, was an important cognitive psychologist.

The common theme of the research interests documented in this collection is the strategic nature of human behavior and the ways we can theoretically and experimentally better understand and, maybe, constrain it. An underlying theme is, for me too, to understand how people reason. I’m sure I will not any time soon run out of intriguing questions about this topic.

References

- Anderson SP, Goeree JK and CA Holt (1998), A Theoretical Analysis of Altruism and Decision Error in Public Goods Games, *Journal of Public Economics* 70, 297 - 323.
- (2001), Minimum-Effort Coordination Games: Stochastic Potential and Logit Equilibrium. *Games and Economic Behavior* 34, 177 - 99.
- Berninghaus SK and KM Ehrhart (1997), Time Horizon and Equilibrium Selection in Tacit Coordination Games: Experimental Results. *Journal of Economic Behavior and Organization* 37, 231 - 48.
- Camerer, CF (forthcoming), *Behavioral Game Theory: Experiments on Strategic Interaction*. Princeton: Princeton University Press.
- Camerer CF, Ho TH, and JK Chong (forthcoming), Sophisticated EWA Learning and Strategic Teaching in Repeated Games. *Journal of Economic Theory*.
- Collings, D and A Ortmann (1997), Reading *Adam Smith's Discourse*. In: **Biddle J and W Samuels (eds.)**, *Research in the History of Economic Thought and Methodology* 15, 329 - 36.
- Costa-Gomes M, V Crawford and B Broseta (2001), Cognition and Behavior in Normal-form Games: An Experimental Study. *Econometrica* 69, 1193 - 1235.
- Engelmann D and A Ortmann (2000), The Robustness of Laboratory Gift Exchange. Manuscript.
- Goeree JK and CA Holt (1999), Stochastic Game Theory: For Playing Games, Not Just For Doing Theory. *Proceedings of the National Academy of Sciences* 96, 10, 564 - 67.
- (2001), Ten Little Treasures of Game Theory and Ten Intuitive Contradictions. *American Economic Review* 91, 1402 - 22.
- Harrison GW and EE Rutstroem (2001), Doing it both ways - experimental practice and heuristic context. *Behavioral and Brain Sciences* 24, 413 - 14.
- Henrich et al. (2001), "Economic Man" in Cross-cultural Perspective: Behavioral Experiments in 15 Small-scale Societies. Manuscript [submitted].
- Hertwig R and A Ortmann (2001), Experimental practices in economics: A methodological challenge for psychologists? *Behavioral and Brain Sciences* 24, 383 - 403.
- (2001a), Money, lies, and replicability: On the need for empirically grounded experimental practices and interdisciplinary discourse. *Behavioral and Brain Sciences* 24, 433 - 51.
- (2001b), Does deception destroy experimental control? A review of the evidence.

Manuscript [submitted].

----- (forthcoming), Economists' and Psychologists' Experimental Practices: How They Differ, Why They Differ, and How They Could Converge. In: Brocas I and D Carillo (eds), *Economics and Psychology*. Oxford: Oxford University Press.

Ho TH, Camerer CF and JK Chong (2001), Economic Value of EWA Lite: A Functional Theory of Learning in Games. Manuscript.

Ho TH, Camerer CF and K Weigelt (1998), Iterated Dominance and Iterated Best Response in Experimental "p-Beauty Contests". *American Economic Review* 88, 947 - 969.

Kagel JH and A Roth (1995), *Handbook of Experimental Economics*. Princeton: Princeton University Press.

Mailath G (1998), Do People Play Nash Equilibrium? Lessons from Evolutionary Game Theory. *Journal of Economic Literature* 36, 1347 - 74.

McKelvey RD and TR Palfrey (1995), Quantal Response Equilibria for Normal Form Games. *Games and Economic Behavior* 10, 6 - 38.

----- (1998), Quantal Response Equilibria for Extensive Form Games. *Experimental Economics* 1, 9 - 41.

Meardon SJ and A Ortmann (1996) **Self-Command in Adam Smith's Theory of Moral Sentiments. A Game-Theoretic Re-interpretation, *Rationality and Society* 8, 57 - 80.**

----- (1996a) **Yes, Adam Smith was an Economist -- A Very Modern One Indeed. A Reply. *Rationality and Society* 8, 348 - 52.**

Nagel R (1995), Unraveling in Guessing Games: An Experimental Study. *American Economic Review* 85, 1313 - 26.

Ortmann A (1995), NSF Career development grant proposal.
[See <http://home.cerge-ei.cz/Ortmann/careerdp.html>]

----- (1997), How to Survive in Post-Industrial Environments: Adam Smith's Advice for Today's Colleges and Universities. *Journal of Higher Education* 68, 483 - 501.

----- (1999), The Nature and Causes of Corporate Negligence, Sham Lectures, and Ecclesiastical Indolence: Adam Smith on Joint-Stock Companies, Teachers, and Preachers. *History of Political Economy* 31, 297 - 315.

----- (2001), Capital Romance: Why Wall Street Fell in Love With Higher Education. *Education Economics* 9, 293 - 311.

Ortmann A and G Gigerenzer (1997), **Reasoning in Economics and Psychology: Why Social Context Matters.** *Journal of Institutional and Theoretical Economics* 153, 700 - 10.

Ortmann A and R Hertwig (1996), **Is Deception Acceptable?** *American Psychologist* 52, 746-7.

----- (1997), **The Question Remains: Is Deception Acceptable?** *American Psychologist* 53, 806-7.

----- (1999), **Why Anomalies Cluster in Experimental Tests of One-shot and/or Finitely Repeated Games: Suggestive Evidence From Psychology and Neuroscience.** [Manuscript]

----- (2001), **The Costs of Deception: Evidence From Psychology.** Manuscript [submitted].

----- and GW Harrison [in preparation], **Experimental Methods in Psychology: A Challenge for Economists?**

Ortmann A and SJ Meardon (1995), **A Game-Theoretic Re-Evaluation of Adam Smith's Theory of Moral Sentiments and Wealth of Nations.** In Rima I (ed.), *The Classical Tradition in Economic Thought*, Proceedings of 20th HES meetings, Cheltenham: Edward Elgar Publishing, 43 - 61.

Ortmann A and RC Squire (1996), **The Internal Organization of Colleges and Universities: A Game-Theoretic Approach,** PONPO (Yale University) discussion paper #232.

Sobel J (1991), **It's Not What You Play, It's Whom You Play.** In: Selten R (ed) *Game Equilibrium Models II: Methods, Morals, and Markets.* Berlin: Springer Verlag.

Stahl DO (1996), **Boundedly Rational Rule Learning in a Guessing Game.** *Games and Economic Behavior* 16, 303 - 330.

Stahl DO and PW Wilson (1995), **On Players' Model of Other Players: Theory and Experimental Evidence.** *Games and Economic Behavior* 10, 218 - 54.

Van Huyck JGB, Battalio RC and RO Beil (1990), **Tacit Coordination Games, Strategic Uncertainty, and Coordination Failure.** *American Economic Review* 80, 234 - 248.

----- (1991), **Strategic Uncertainty, Equilibrium Selection, and Coordination Failure in Average Opinion Games.** *Quarterly Journal of Economics* 106, 885 - 991.