Journal of Economic Behavior & Organization 73 (2010) 62–64

Contents lists available at ScienceDirect

Journal of Economic Behavior & Organization

journal homepage: www.elsevier.com/locate/jebo

Discussion

Lessons from a behavioral economics success story Comment on theory and experiment: What are the questions?

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ARTICLE INFO

Article history:
Received 20 October 2008

1. Introduction

Among the many challenges that Smith (forthcoming) details, one that stands out is that theory and experiments face an incompatibility in the following sense. Theorists propose models which implicitly assume that the situation being modeled is divorced from everything else the individual might encounter, either in the past or in the future. In essence, when they describe the game they preclude consideration of anything outside of the rules. Experimentalists, on the other hand, cannot make this implicit assumption. While they have taken great pains to construct experiments that reflect as closely as possible the games described by theorists, and often these experimental procedures are exceedingly clever, they cannot remove subjects' pasts or futures. Consequently, economic experiments can never test *only* the theory they are designed to test; instead, they must test the theory in conjunction with all of the social, cultural, and historical baggage that subjects bring with them.

Smith, of course, is right, and his paper provides a call for new research to address this problem. There are several directions that this research might go. One is for experimental economists to somehow refine their procedures to isolate the laboratory from the outside world. This, after all, is the technique used in the natural sciences, but one can question whether this can ever be achieved for the social sciences. An alternative direction is for theorists to write models that do not isolate rational actors from the rest of the world. Where the first direction lets theorists hold fast and expect experimentalists to adjust, the second direction does the opposite. Something between these two is probably the right answer, and indeed such a coordinated approach, in which theorists address new modeling questions and experimentalists change their approach to testing theoretical models, was successful in a different part of economics, the study of behavior toward risk. My purpose here is to draw on the lessons from this successful research agenda and use them to develop a new direction for experimental work on games.

2. A success story—behavior toward risk

Dialogues between theorists and experimenters have borne fruit in the past, and one example comes from the study of behavior toward risk. Expected utility theory began as the solution to an empirical problem. Daniel Bernoulli proposed it, in a letter to his brother in 1738, as a means of rationalizing behavior which included purchasing insurance, avoiding

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0167-2681/$ – see front matter
doi:10.1016/j.jebo.2008.10.016

fair bets, and avoiding the St. Petersburg gamble, all of which violated the then-favored decision model of expected value maximization. The usefulness of expected utility theory led to elegant axiomatizations, such as the one by von Neumann and Morgenstern (1947), and these in turn led to new empirical challenges, notably the Allais paradox (Allais, 1953).

The response by theorists was the creation of a number of elegant generalizations of expected utility. For example, Machina (1982) replaced the linear-in-the-probabilities assumption of expected utility with differentiability, and showed that many of the results from expected utility analysis, and most of the intuition, extend to this more general setting. Quiggin (1982) got around the linearity assumption in a different way, by transforming the probability distribution before computing expected utility. This model eventually became rank-dependent expected utility, and to the extent that the contest among non-expected utility models has a winner, this is it.[1]

The new models, in turn, led to implications for how one conducts experiments. Holt (1986) and Karni and Safra (1987) showed that when expected utility fails one must consider the entire set of gambles being faced by subjects, not just the particular choice pair under consideration. Neilson (1992, 1994) showed that the certainty equivalent of a gamble is not fixed, and is instead governed in part by how it is elicited, raising concerns about the use of either the Becker–Degroot–Marschak mechanism or the second-price auction to elicit values of gambles.

3. Behavior toward risk vs. behavior in games

There is an important difference between experiments concerning behavior toward risk and experiments concerning behavior in games. Risk experiments confine their interest to describing subjects' preferences Game theory experiments would like to confine attention to how subjects interact with each other and incorporate information into their decisions, but they cannot help but also reveal something about subjects' preferences, both toward risk and toward each other.

Risk experiments succeeded because they took the subject's preferences as given and then used pairs of choices to make deductions about the suitability of models, with the Allais paradox being a good example. Many game theory experiments, however, are designed to make point predictions, not comparative statics predictions, and while they often provide interesting violations of the predicted behavior, they are poorly designed for determining whether the violations are caused by preferences or failure to "solve" the game.

A closer look shows how a risk experiment is designed. The subject is asked to choose between options *A* and *B*. The theory says nothing about which of these options should be chosen, but it does say that once the subject has chosen *A* over *B*, the subject must also choose *C* over *D*. Subjects instead choosing *A* and *D* violates the theory.

Game theory experiments, for the most part, comprise choice problems of the *A* vs. *B* type without the added information of the *C* vs. *D* choice, and the vast ultimatum game literature highlights the problem. In the ultimatum game the first mover proposes a split of the $10 pot and the second mover accepts or rejects, with both players receiving nothing after a rejection. The selfish subgame perfect equilibrium prediction is that the proposer keeps (almost) all of the $10 and the responder accepts (almost) nothing. However, this is the *selfish* subgame perfect equilibrium prediction, and it follows from the joint hypothesis of selfish preferences and the subgame perfect solution concept. Experimental evidence rejects the prediction, so it rejects the joint hypothesis, but one cannot tell which piece of the hypothesis is rejected.

Auction experiments work in much the same way, testing in many cases the joint hypothesis of risk neutrality for preferences and Bayes–Nash equilibrium as a solution concept. The failure of subjects to behave as predicted suggests that at least one of these hypotheses fails, but not which one, and therefore does not point to a specific gap for theory to fill.

The construction of useful theoretical models requires treatment effects,[2] that is, experiments in which the choice of *A* over *B*, in conjunction with a theoretical model, implies the choice of *C* over *D*. Some good examples of treatment effects can be found. One of the best is Andreoni and Miller's (2002) test of GARP for other-regarding preferences revealed by dictator games. Their results suggest that even though subjects are not selfish, their behavior is consistent with the existence of a well-defined utility function over allocations, and this is an important prerequisite for any model of other-regarding preferences Another good example is provided by McCabe et al. (2003) who compare a trust game in which the first mover has a choice of trusting or not to a trust game in which the first mover has no choice. Their finding that trust is rewarded more when it is voluntary instead of forced helped lead to the theoretical model of Ellingsen and Johannesson (2008) in which agents gain more from being altruistic to someone who is also altruistic. For a third example, Dana et al. (2006) run a dictator game study in which the first treatment is standard but in the second treatment receivers do not know how their payoffs were assigned and, in particular, do not know that they were involved in a dictator game. Neilson (2009) shows how the results can be incorporated usefully into a theoretical model that distinguishes between behavior in public and behavior in private, and links this to mathematical characterizations of shame.

Sometimes treatment effects can be very surprising. Shang et al. (forthcoming) run a field experiment in which subjects are asked to donate to a public radio station. Subjects were told about an earlier contribution by another member of the station. The treatment effect is the use of the statement, "We had another member, he contributed $240," versus the statement, "We had another member, she contributed $240." This simple and extremely subtle treatment difference produced higher

[1] The applicability of Quiggin's formulation extends beyond the realm of behavior toward risk. Schmeidler (1989) applies it to behavior toward ambiguity, and Halevy (2008) shows how it can be used to explain quasi-hyperbolic discounting.

[2] Theorists would refer to "treatment effects" as "comparative statics results."

contributions in the mismatched gender condition than in the matched gender condition. In spite of the subtlety, though, the finding can inform theorists about how they should treat group identity in a model of decision-making.

4. Conclusions

All three of the primary branches of economics – theory, experimental, and traditional empirical – are built around the same idea. In theory we call it comparative statics analysis, in experimental economics it is called treatment effects, and in traditional empirical work it is the use of explanatory variables. In principles courses we call it the *ceteris paribus* assumption. It is also the key to a successful relationship between experimentalists and theorists, as violations exposed by clever treatment effects inform theorists in ways that can lead to new theoretical frameworks. This approach proved fruitful for the analysis of behavior toward risk, and should eventually prove equally fruitful for the analysis of behavior in games.

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