

What is an Economic Theory That Can Inform Experiments? ⁺

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Abstract

Economic theories and experiments could and should inform each other. An economic theory is more useful if it is not only an intellectual exercise but also relates to empirical relevant behavior. Experiments that are based on a set of alternative, well defined, hypotheses are more useful. We argue that these theories do not have to be a mathematical model. For example, experiments can help in the understanding and testing of mechanisms that are used in the world, but for which deriving equilibrium behavior analytically is too complicated.

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Economic models abstract from complex human behavior in a way that sheds some insight into a particular aspect of such behavior. This process inherently ignores important aspects of the real world. Similarly, experimental design frequently uses abstraction in order to be able to do comparative statics and reduce the number of possible explanations. Therefore, an important role of both theory and experiments is to shed light on behavior using simplified versions of the world.

Theories and experiments could and should, in many cases, inform each other. An economic theory is more useful if it is not only an intellectual exercise but also relates to empirically relevant behavior. Experiments that are based on a set of alternative, well defined, hypotheses are more useful.

Yet, testing theories is not the only role of experiments. First, it is not clear what constitutes an economic theory. In the current state of the profession, an economic theory is a precise, non-trivial, mathematical model. This is not the case in other social sciences, where theory could come in other forms such as a verbal description or a flow chart. We argue that although mathematical models have dominated the neo-classical economic discussion since the 1950s, we should not restrict ourselves to this form.

Indeed, this was not the case in the past. The founding fathers of economics as an academic profession (e.g., Adam Smith, David Ricardo, François Quesnay) were considered philosophers at the time and used verbal arguments. The concepts of the invisible hand or the theory of the relative comparative advantage are still enormously useful in explaining why competitive markets and specialization work and how trade is generated.

Mathematical formalism has been successful in economics because it unifies scientific approaches, avoiding having different explanations for each possible manifestation of similar economic phenomena. In that sense, Economics has been partially able to avoid the problem of other social sciences, in which often theories are used like a toothbrushes: Everyone has one... and do not like to use anybody else's. Our argument is that economists should take advantage of this unifying approach in order to produce stronger theories but they should not constraint themselves to the limited toolbox of using mathematical models exclusively.

Take, for example, the recent literature on gender and competition (Gneezy, Niederle and Rustichini, 2003; Niederle, this volume). The experimental papers do not contain a single mathematical formula. Yet, they are inspired by theory—Darwin (1871) sexual selection theory, showing that certain evolutionary traits, both physical and with respect to attitudes, can be explained by competition. Later similar theories by Bateman (1948) and Trivers (1972) state that differences in competitiveness may have evolved because of competition for sex, where promiscuity is more valuable to the reproductive success of males than females.

This example shows that economic experiments do not necessarily need to ground their theory in economics, and that theory from other areas, such as biology, psychology or anthropology can be important in explaining economic phenomena. The results of the experimental papers in economics provide a piece of evidence compatible with the theory that women may have a different attitude towards competition than men, which in turn is one of the plausible theories behind gender wage gaps. Notice that the experiment is not discarding other alternative explanations for gender wage gaps, but rather adds an

additional possible one. Of course, the important debate on wage gaps is far from being resolved with the results of a particular experiment. A convergence approach in which laboratory results are compared with other sources (e.g., field data, empirical labor market data, etc.) is, in our view, the most beneficial to our understanding of these phenomena.

Economic experiments create an idealized and simplified version of the real world. It is important to understand the limitation of the tool. First, since theory models and experiments operate with simplified versions of reality, it is highly unlikely that they contain all the aspects of reality which translate into precise estimates of how a particular phenomenon occurs. This is why, in our view, calibrating parameters of a particular theoretical model in the laboratory hardly ever makes sense. Both the model and the experiment should provide a sense of direction on the reasons behind a phenomenon and on the possible ways in which different variables interact (“treatment effect”).

Experiments should also be kept simple in order for the participants to understand what they are doing. This does not mean that the theoretical explanation motivating the experiment needs to be necessarily simple. Varian (1989) justifies the development of economic theory as a result of insufficient data to explain a phenomenon.

Importantly, in some cases the theoretical model gets too complex for theorists to be able to solve it. In the current state of affairs in the literature, it would be hard to publish an experiment for which we are unable to produce a theoretical benchmark. We argue that this is too restrictive. We should not restrict the discussion only to environments that we can solve using analytical models. By expanding the discussion we can study empirically environments that are very relevant to real-world economics.

Auctions are a typical example of a market institution for which theoretical analysis, although extensive and insightful, has limitations. When modeling many of the most commonly used auctions formats, there is either no equilibrium or multiplicity of equilibria, and solving the models or selecting equilibria requires very restrictive assumptions. Still, it is important to compare how individuals behave in different auction formats. A classical example is Smith and Plot (1978) who use the laboratory as a “wind-tunnel” in order to compare market institutions. Auction designers and theorists have benefit from the insight developed from market experiments since then.

Palfrey (this volume) uses a similar approach in more abstract games in which the theoretical analysis is complicated. His experiments, in turn, have inspired new important theoretical concepts, such as the quantal response equilibrium (CITE).

The dialogue between theory and experiments is ongoing. We can only hope that it will be even more constructive than it was in the past.

References

- Bateman, A.J. (1948), “Intra-sexual selection in *Drosophila*”. *Heredity* 2, 349–368,
- Darwin, C (1871) *The Descent of Man and Selection in Relation to Sex*. John Murray, London.
- Gneezy, U., M. Niederle, and A. Rustichini (2003), “Performance in competitive environments: Gender differences.” *Quarterly Journal of Economics*, 1049-74.
- Niederle, Muriel, “Intelligent Design: The Relationship of Economic Theory to Experiments: Treatment driven Experiments” in preparation for “Methods of Modern Experimental Economics”, edited by Guillaume Frechette and Andrew Schotter, Oxford University Press.
- Palfrey, T, “The Laboratory as an Incubator of Theory” in preparation for “Methods of Modern Experimental Economics”, edited by Guillaume Frechette and Andrew Schotter, Oxford University Press.

Plot C. and Smith, V. (1978), “An Experimental examination of two exchange institutions”. *Review of Economic Studies* 45, 133-153.

Trivers, R. L. (1972). “Parental investment and sexual selection”. In B. Campbell (Ed.) *Sexual selection and the descent of man, 1871-1971* (pp 136–179). Chicago, Aldine.

Varian, H. L., (1994). “What Use is Economic Theory?”. *Method and Hist of Econ Thought* 9401001, EconWPA.