Behavioral and experimental economics

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A hitchhiker's guide through behavioral and experimental econ I

The lecture focuses on how psychological insights and experimental methods have been influencing economic thinking. We will discuss several selected topics in microeconomics and public economics, most of which involve situations with strategic interaction.

- Aims
- Methods
- Prerequisites

A hitchhiker's guide through behavioral and experimental econ III

Moi

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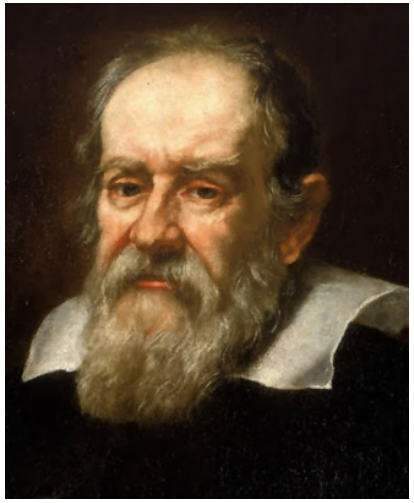
The starting point I

„Economics unfortunately cannot perform the controlled experiments of chemists or biologists because [it] cannot easily control other important factors. Like astronomers or meteorologists, [it] generally must be content largely to observe.“

[Samuelson and Nordhaus (^{12}1985), Economics]

The starting point II

- Experimental versus non-experimental sciences: physics and chemistry versus meteorology and astronomy.
- Introduction of experimental methods to former non-experimental sciences: e.g. Galileo Galilei and Gregor Mendel



An introduction to the ‘villain’

- Unbounded rationality (e.g., common knowledge)
- Pure self-interest
- Complete self-control
- Fixed preferences and variable restrictions (De gustibus non est disputandum)

… *homo oeconomicus*

What are the ‘basic’ principles of economics?

http://www.youtube.com/watch?v=VVp8UGjECt4

What is BE and EE?

- EE and BE are concerned with the empirical testing and modifications of traditional postulates in economics.
- Two historically distinct (but converging) traditions: (i) studies on human decision-making in cognitive psychology, and (ii) tests of predictions from economic theory through laboratory experiments.
- Most important starting point: Are potential deviations from the assumptions small or purely idiosyncratic or not? If not, BE and EE are important.
- Feedback channel: New experimental findings suggest new theories and new theories suggest new experiments.

Structure of approach

Deviations from the standard model in economics:

1. Deviations from rationality (bounded rationality)
2. Deviations from selfishness (fairness or social preferences)
3. Deviations from perfect self-control

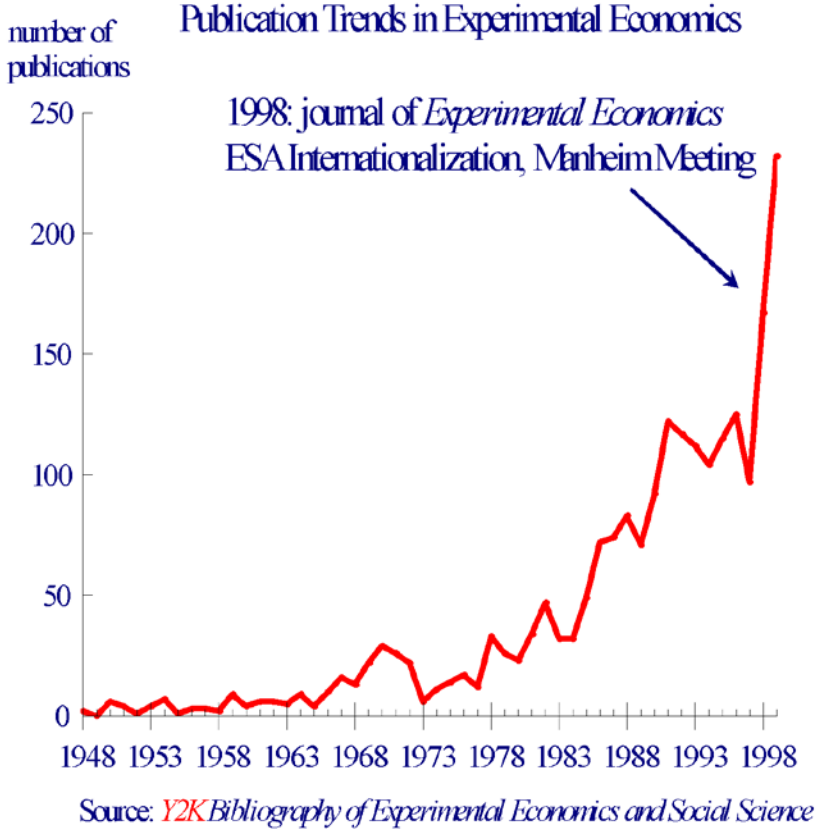
The aim is to

1. Document systematic deviations (theory testing) and develop new theories
2. Analyze the structure of the deviations (e.g., socio-economic characteristics)

Workhorses (and interesting in itself): auctions, public goods games, bargaining games,…

Advances in terms of wider recognition

„Experimental Economics is an exciting new development.“ [Samuelson and Nordhaus ([14]1992), Economics]



EE becoming mainstream

Nobel Prize to Vernon L. Smith ...

„... for having established laboratory experiments as a tool in empirical economic analysis, especially in the study of alternative market mechanisms.“

[Press release: The Bank of Sweden Prize in Economic Sciences in Memory of Alfred Nobel 2002]

BE becoming mainstream

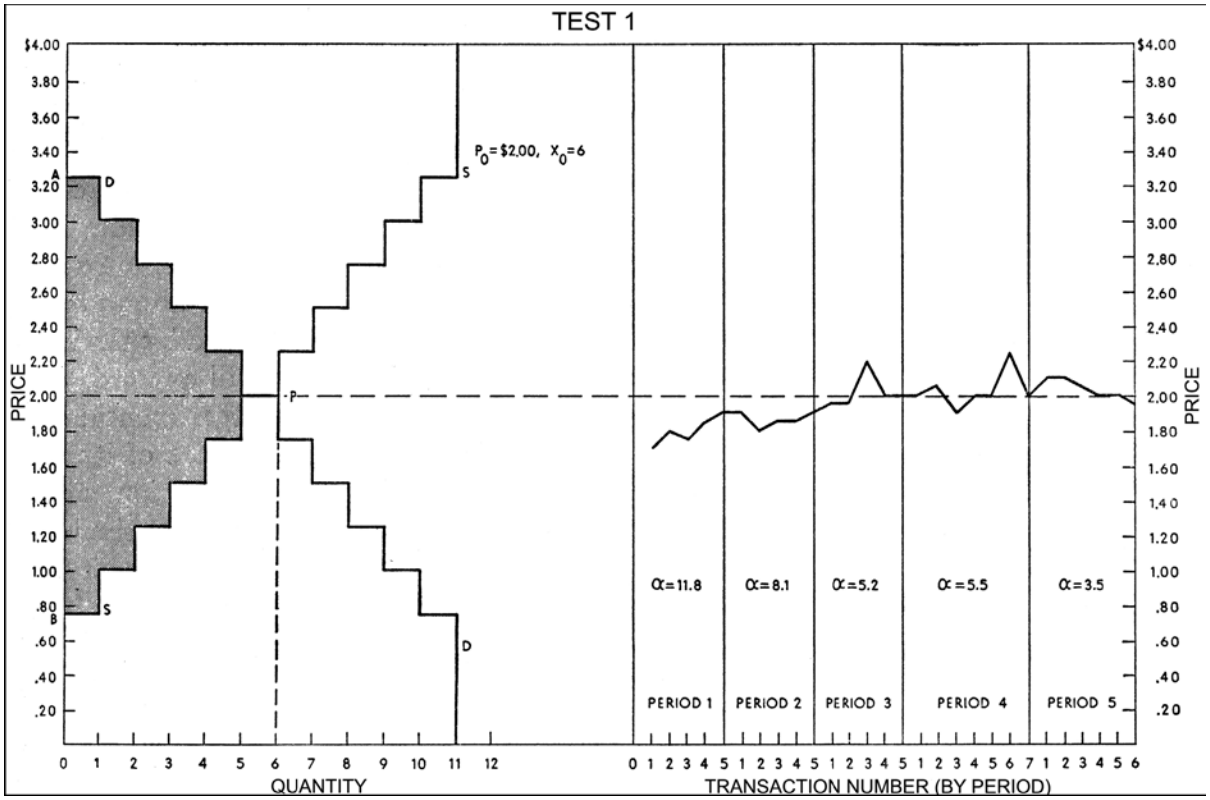
Nobel Prize to Daniel Kahnemann ...

„... for having integrated insights from psychological research into economic science, especially concerning human judgment and decision-making under uncertainty.“

[Press release: The Bank of Sweden Prize in Economic Sciences in Memory of Alfred Nobel 2002]

EE Nobel prize for confirming theory

Funnily the Nobel prize was not awarded for what EE is well know for now (documenting deviations from traditional economics) but rather for confirming traditional theory.



A brief history of (mainly) EE I

- ‘What is important about Columbus’ discovery of America is not that it was the first, but that it was the last. After Columbus, America was never lost again.’ (Roth and Sotomayor, 1990).
- Difficult to speculate about the first experiment in economics: Bernoulli (1738) on the St. Petersburg paradox? What about the Greeks (hypothetical experiments)?

A brief history of (mainly) EE II

Early individual choice experiments (1930-1960):

- Thurstone (1931; indifference curve determination)
- Several papers testing expected utility theory (e.g. Allais, 1953) after Neumann and Morgenstern's 'Theory of Games and Economic Behavior' (1944)
- 1950: The start of the 'interactive' period: the prisoner's dilemma: Melvin Dresher and Merrill Flood (January 1950 at the Rand Corp.) ran the first experiments (independently and unpublished: Howard Raiffa); the story came later, namely from Tucker (1950)

A brief history of (mainly) EE III

- 1954: Kalisch, Milnor, Nash and Nering published a small-scale negotiation experiment which turned out to be important in terms of design questions: formalization of the interaction structure, one-shot vs. repeated interaction, fairness vs. game-theoretic predictions and monetary incentives – results provided mixed support for the theoretical predictions.
- IO: Chamberlin (1948) – pit market with hypothetical payoffs; Hoggatt (1959), Sauermann and Selten (1959, 1960) and Siegel and Fouraker (1960) – oligopoly experiments.

A brief history of (mainly) EE IV

- Siegel and Fouraker took some effort to ensure anonymity and discussed the issue of the curvature around the optimum.

1960s to the present:

- About a hundred experimental papers published in economics in the 60s.
- 1964: Becker, DeGroot and Marschak
- 1962: Smith testing robustness of Chamberlin (1948)
- Germany: Sauermann, Selten, Tietz
- U.S.A.: Vernon Smith and Charles Plott
- Further fragmentation of the field.
- 1988: Noble Prize for Maurice Allais, 1994: Nobel Prize for Reinhard Selten

Foundations of BE I

- Edwards (1954) introduced decision-making as a research topic for psychologists
- Allais (1953) outlined a theory of choice under uncertainty (based on psychological methodology)
- Simon (1956) published an approach to information processing and decision-making (foundations of bounded rationality)
- Kahnemann/Tversky: boost to the field
- Kahnemann/Tversky (1979): among the highest citation counts of all *Econometrica* articles

Foundations of BE II

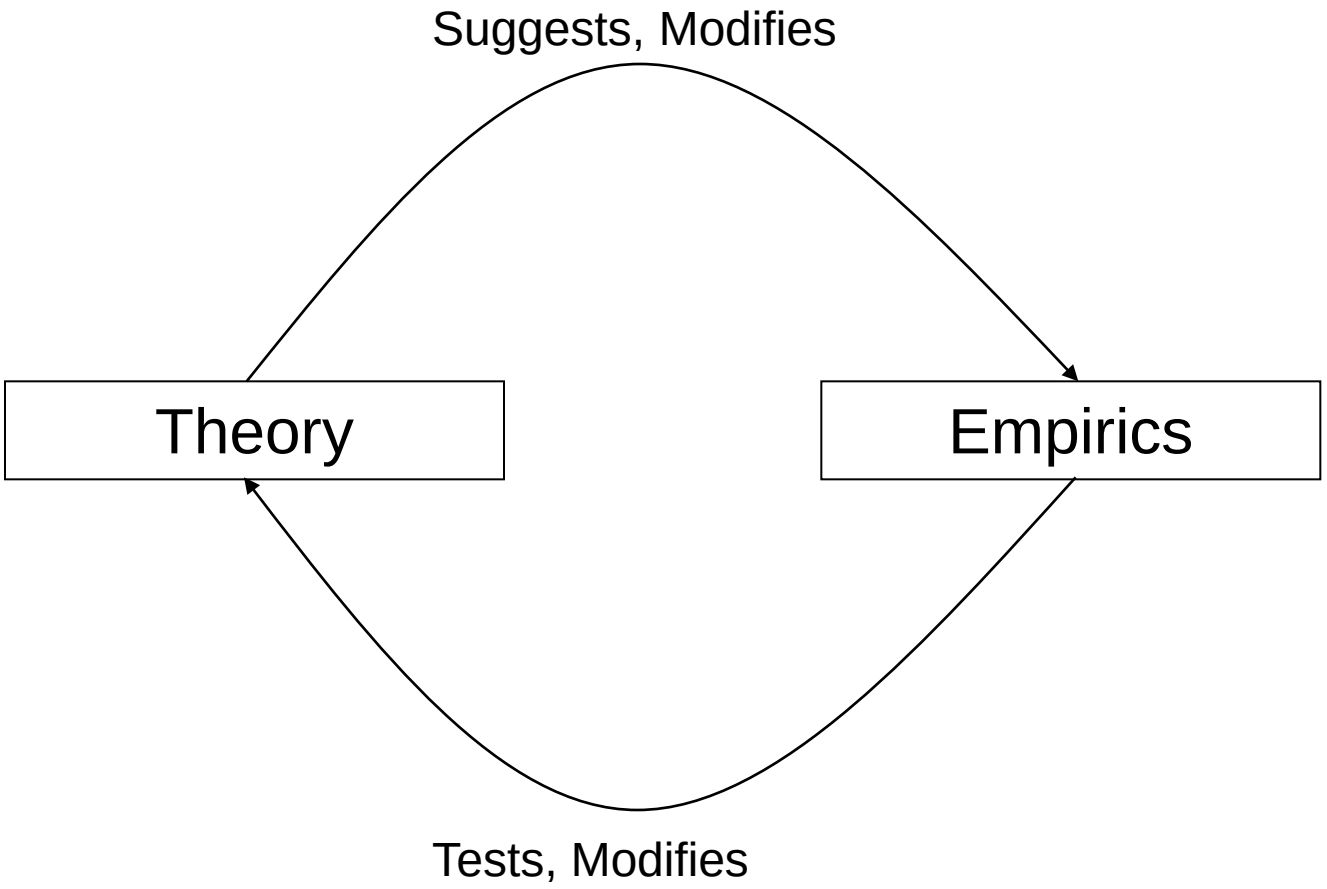
- Extrinsic incentives shape economic behavior.
- Intrinsic incentives also shapes human behavior – introduced by BE
- Many important concepts of modern economics: perception (framing), mental models, emotions, attitudes, aspiration levels, memory of previous decisions etc.
- Distinction between generalized behavior and context-specific (adaptive) behavior
- More later on when we discuss the relevant topics

EEs vs. BEs

- BEs are methodological eclectics.
- EEs share methodological features to a much greater extent than is true of experiments conducted by psychologists.
- EEs' roots lie mainly in market analysis and BEs' roots lie mainly in individual decision-making.
- EEs prefer experiments with clear theoretic predictions from economics, while BEs have a stronger interest than EEs in more explorative kind of studies.

But the boundaries get more and more blurred.

The scientific process



Data sources

	Happenstance	**Experiment**
Field	Household consumption data	Different incentive mechanisms
Laboratory	Discovery of penicillin	Laboratory public goods games

The huge advantage of experiments

- Under a controlled variation of independent variables (treatments) and
- A truly random assignment of experimental participants to treatments

it is possible to clearly and causally attribute differences in the behavior of the experimental groups to the differences in treatments.

Examples for the importance of causality: horse, Indian

Validity of experiments – the old discussion

- Internal validity: Do the data permit correct causal inferences? A matter of control, design and data analysis.
- External validity: Is it possible to generalize inferences from the experiment to the real world? Most of the concerns can be studied experimentally (parallelism).

Purposes of experiments

- Testing theory and (external validity or descriptive validity of the assumptions) and laying the foundations for theoretical improvements; distinguishing between theories or equilibrium selection
- Testing the boundaries of theory
- Exploring empirical regularities in areas without economic theory (heurism)
- Test-bed, wind tunnel for institutional designs
- Pedagogical use
- Consulting

Important principles of economic experiments I

- Controlled economic environments (including agents, institutions, information, (game-theoretic) interaction protocol)
- Induced value theory (Smith 1976) with three main ingredients: (i) monotonicity, (ii) salience, and (iii) dominance.

Induced value theory: monotonicity

Subjects must prefer more reward medium to less and must not become satiated. If $V(m,z)$ are a subject's unobservable preferences over the reward medium (m) and everything else (z), then the monotonicity requirement implies: $\frac{\partial V(m,z)}{\partial m} > 0$

Money as the standard reward medium.

Induced value theory: salience

The reward Δm received by a subject depends on the action of the subject (and those of other agents) as defined by the design (institutional rules) of the experiment. Fixed payments are not salient.

Payments in a pre-determined and fixed exchange rate for any point of profit earned are salient.

Induced value theory: dominance

Changes in subjects' utility from the experiment come predominantly from the reward medium used, and other influences are negligible. Possible problems with dominance: experimenter demand effects, desire to win (gambling), social status (social distance) if not double blind (all difficult to observe components of *z*).

What can be controlled for in experiments?

- Preferences, motives, moods, expectations,…
- Restrictions, institutions
- Kind of presentation (frame)
- Experience, knowledge, learning
- Socio-economic, psychological and even physiological factors

Important principles of economic experiments II

- Anonymity of subjects
- No deception of subjects
- Replicability of experiments

These five principles (partly) distinguish economic experiments from survey studies and psychological experiments (the latter often lack monetary incentives, do not comply with induced value theory and naturally involve deception of subjects; also the focus may be different).

Be careful with results – a joke

Question: Are all odd numbers prime?

Answer of a mathematician: Let's see … 3 is prime, 5 is prime, 7 is prime, and the rest follows by induction.

Answer of an experimental economist: Let's see … 3 is prime, 5 is prime, 7 is prime, 9 is – oops experimental error, 11 is prime, 13 is prime,…

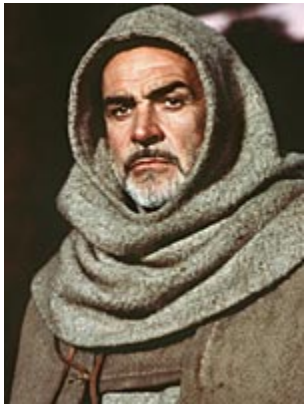
Answer of a partisan economist: Let's see … 2 is prime, 4 is prime, 6 is prime,…

Experimental design issues

- Examples for treatments and *m* x *n* factorial designs.
- 'Within-subject' and 'between-subject' designs.
- Repetition vs. one-shot interaction (avoid the 'Groundhog Day'-phenomenon)
- 'Single treatment' vs. 'paired treatment'
- Matching protocols and reputation ('partner', 'stranger', 'perfect stranger' matching)
- Order effects
- The concept of independent observations
- Controlling for social preferences and risk attitudes

Practical advice for running experiments I

- Pay in cash, pay privately and pay enough (how much?).
- Choose the appropriate subject pool.
- Ockham's (Occam's) razor: *Entia non sunt multiplicanda praeter necessitatem*. Choose the simplest possible environment that enables you to answer your research question. Different in psychology?



The character William of Baskerville in Eco's 'The Name of the Rose' is partly based on the medieval scientist William of Ockham (who btw. died 1349/50 in Munich).

Practical advice II

- In the interest of dominance avoid loaded words in experimental instructions.
- Keep control over as many factors as possible.
- Use written instructions (and take enough time to draft and re-check them carefully).
- Do not forget your hypotheses/expectations before you start with the experiment.
- Compare with other methods and use the most appropriate.

Note that the rules are not ironclad but usually deviations have to be justified.

Practical advice III

- Try to avoid confounds because subjects know each other (experiments in class; breaks; interaction before and after the experiment).
- Try to avoid fatigue and boredom.
- Use quizzes and control questions to make sure that subjects understand the task (more problematic: dry runs, examples and frame).
- Avoid any selection biases on the subject side.
- Plan enough independent observations.

Practical advice IV

- Interpret treatment differences and not absolute levels whenever possible.
- Choose variable levels in a way that make treatment effects possible (but do not fine-tune treatments with many pilot sessions). Mind Ronald Coase: ‘If you torture the data [design] long enough, Nature will confess.’
- Be sure to have a good justification for all of your design choices.

Practical advice V

Special issues:

- Strategy vector method
- Real effort
- Entitlements
- Questionnaires
- Team experiments
- Scoring rules
- Mixed methods: skin-conductance, heart rate, other physiological functions, fMRI, TMR etc.

Subjects

- Subject pool: university students, professionals, high-school students, kids,… (always consider opportunity costs)
- Effects of different fields of study
- Socio-economic determinants: issues of gender, age etc.
- Rewards: trading commissions, show-up fees, experimental currency units, bankruptcy problems, experiments with losses
- Duration of an experimental session
- Recruitment and maintaining subject history

Laboratory

- Computerized vs. ‘paper and pen’
- Laboratory facility issues to be discussed during laboratory excursion
- Computer programs: z-tree, rat image, several other programs.
- Random number generator

Chronology of a typical experimental project I

1. Research question
2. Design idea (Occam's razor, treatment variables etc.)
3. Related literature
4. Check appropriateness of method and originality of research question (Final check: Does the design boil down to a test whether subjects can read and calculate properly or is there more to it?)
5. Details of the design (Be as specific as possible here and mind all the issues discussed thus far).

A typical experimental project II

6. Theoretic solutions, predictions, expectations, hypotheses
7. Plan dates, financial issues and make a check-list for all necessary preparations
8. Present your design to other students or in a design workshop
9. Instructions
10. List of procedure for the experiment (detailing the plan of action during the experiment)

A typical experimental project III

11. Pilot session(s)
12. Recruit subjects (recruiting lists)
13. Preparations directly before the experiment: lab setup, test equipment (Murphy's Law), distribute instructions, pencils, calculators, dice, money, envelops, identification of subjects (with paper and pen), seat numbers, lots etc.
14. Registration of subjects upon arrival (also use a lab log)
15. Role of experimenters ('single blind' vs. 'double blind'): conductors, monitors

A typical experimental project IV

16. Welcome participants (use the same wording in all the sessions) and enforce silence
17. Reading instructions
18. Handling queries from subjects
19. Start experiment (dry runs?)
20. Instructions for different parts of the experiment, record data
21. Termination of experiments (with infinite horizon)
22. End of experiment: Save data, pay out subjects, do not forget receipts

A typical experimental project V

23. Debriefing, update recruitment lists
24. Data analysis (see later)
25. Writing a paper
26. Presenting the paper
27. Publishing it, e.g., in the *AER*
28. Document your data to be able to provide the raw data and instructions to editors in an organized way.

Do not forget to have emergency plans (e.g., if you run out of money, if the network breaks down etc.).

Game theory and experiments

- Benchmark solutions
- Indispensable for deriving predictions in interactive situations
- Was the starting point for many economists to decide to go to the laboratory.
- Does not imply selfishness and full rationality (although sometimes implicitly)
- Will be important throughout the course (you might want to refresh equilibrium concepts)

Experimental data vs. happenstance data

- Problems to control for motives, preferences and individual decisions with happenstance data
- Experiments as complements (to field data)
- Mixture: artificial field experiments, experiments with unusual subject pools, natural field experiments

Typical concerns against experiments in economics

- Used subject pools are special.
- Subjects do not take experiments seriously; money at stake is too small.
- Not enough observations.
- Participants are inexperienced (compared to decision-makers in the real world).

Most concerns are related to issues of external validity.

They can be addressed empirically (see bargaining games).