Lecture Notes

What's Behavioral Economics?

- Behavioral Economics emerged out of a number of empirical and experimental puzzles, ...

  ... which are difficult to explain by conventional standard economic theory.

  - ◇ people engage in charitable giving.
  - ◇ people seem to engage in costly punishment of anti–social behavior.
  - ◇ why are people obese and exercise too little?
  - ◇ most people seem to think that they are above-average drivers, entrepreneurs, lovers, ...
  - ◇ why are returns on equity so high (compared with bonds)?
  - ◇ why do default decisions matter even if transaction costs are low?
  - ◇ people buy insurance against small risks and, at the same time, invest in stock.
  - ◇ why do people borrow on credit cards and, at the same time, hold substantial illiquid wealth?
  - ◇ why are people so reluctant to sell stock at a loss (hang on to losers)?
  - ◇ etc.

- Behavioral Economics is the attempt to shed light on these and other puzzles ...

  ... by enriching standard theory with *psychological realism*.

  - ◇ The (implicit) belief behind this is that assumptions which are psychologically more realistic ...

  ... bring about more accurate predictions of behavior.

A sketch of the standard paradigm

- The bulk of economic models uses, in one way or the other, the following framework:
  - ◇ $t = 0, 1, 2, \ldots$ is the time index,
  - ◇ S_t is the set of possible states at time t,
  - ◇ $p(s_t)$ is the probability with which state $s_t \in S_t$ occurs in t,
  - ◇ X_t are the payoff/consumption opportunities in time t.

- An agent is assumed to ...
  - ... have a utility function $U(x \mid s)$ describing his utility when consuming x in state s,
  - ... discount future utility by a time–independent discount factor δ.
- The agent is assumed to choose his intertemporal consumption path $(x_t)_t$ so as to *maximize* ...

  ... his expected discounted life–time utility subject to the constraint that consumption be feasible, i.e.

$$\max_{x_t} \sum_t \delta^t \left(\sum_{s_t \in S_t} U(x_t \mid s_t) p(s_t) \right) \qquad s.t. \quad x_t \in X_t.$$

- Behavioral economics considers deviations from the standard model in (at least) three respects:
  - non–standard preferences: modifications of "U" and "δ",
  - non–standard beliefs: modifications of "p",
  - non–standard decision making: modifications of "max".

Non–standard preferences

- There are three main types of non–standard preferences
- Reference-dependent preferences
  - Evidence suggests that people care not only about *absolute* levels (of wealth, consumption, ...) ...

    ... but also about *changes* in levels relative to salient reference points.
  - People seem to care more about losses than about gains relative to this reference point,

    ... a tendency called *loss aversion*.
  - Behavioral Economics allows for utility functions $U(x, r \mid s)$ where r is a reference point.
- Time preferences
  - Evidence suggest that many people ...

    ... prefer one apple today over two apples tomorrow ...

    ... but prefer two apples in 101 days over one apple in 100 days.

- ◇ This contradicts standard discounting where discounting does not depend on calendar time.
- ◇ Behavioral Economics considers models in which the one-period discount factor ...

  ... is higher in the near than in the distant future,

  ... capturing impatience, or a "bias for the presence".
- ◇ Moreover, there is evidence that people have self-control problems and are time-inconsistent ...

  ... i.e. they don't stick to plans that are optimal today ...

  ... but require costly action tomorrow (e.g. stopping to smoke)
- ◇ Behavioral economics allows for self-control problems.

• Social preferences

- ◇ Experimental evidence suggests that people not only care about ...

  ... their own well–being but also about that of others.
- ◇ People seem to be concerned with fairness, equity, status, reciprocity, ...
- ◇ Behavioral Economics allows for utility functions $U(x, y)$ where y is consumption of others.

• Allowing for non–standard preferences is the least radical departure from the standard paradigm.

- ◇ the models in this area still maintain concepts of "maximization" or "equilibrium".
- ◇ non–standard preferences are not necessarily non–rational.

Non–standard beliefs

• Evidence suggests that people display systematic biases in forming beliefs and processing information

- ◇ Survey evidence suggests that a large majority of subjects believe they are ....

  ... above-average drivers, judges, or have a below-average divorce probability,
- ◇ people seek for evidence that confirms their first impression (confirmatory bias),
- ◇ people poorly predict their future emotional state (projection bias),
- ◇ people overweigh the evidence from small samples ("law of small numbers"),
- ◇ people hold motivated beliefs which make them feel better ("wishful thinking"),

- ◇ etc.

• Allowing for non–standard beliefs is a more radical departure from the standard paradigm ...

- ◇ ... raises questions as to why people don't learn,
- ◇ ... in the Savage tradition, beliefs are seen as an expression of rationality.

Non–standard decision making

• Evidence and common sense suggests that people don't ...

... *literally* maximize well–defined preferences.

• Instead, people ...

- ◇ ... use rules of thumb and heuristics,
- ◇ ... simplify problems,
- ◇ ... don't quite know what they want, are influenced by impulse, emotions, manipulations,
- ◇ ... are affected by how decision problems are framed.

• Questioning that people maximize is the most radical departure from the standard paradigm

- ◇ ... calls for a completely different approach to individual decision making ...
- ◇ However, often the claim that people don't maximize rests on a misconception ...

... of what the maximization assumption in the standard model really means.

- ◇ It is important to understand this!

Remarks

• The three domains are not strictly separated but overlap.

- ◇ E.g. people have a hard time forecasting their future discount rate, or future emotional states.

• There are other departures from the standard paradigm:

- ◇ preferences over information/beliefs (utility from anticipation or memory),
- ◇ cognitive limitations (limited depth of reasoning, inability to think strategically).

- There are other approaches than the Behavioral approach to relax the standard paradigm.
  - ◇ Bounded rationality (Simon)
    ... acknowledges cognitive, time, informational constraints to decision making,
    ... studies "rational" decision making *procedures* within these constraints.
  - ◇ Evolutionary game theory
    ... models agents as "pre-programmed" to certain strategies
    ... assumes that successful strategies are *selected for* and proliferate.
    ... can uncover why departures from narrow rationality may survive evolutionary pressure.
    ... this is partially complementary to a Behavioral approach.
  - ◇ Decision theory
    ... pursues an axiomatic revealed–preference approach to non–standard preferences.
    ... models of unawareness, ambiguity aversion, unforeseen contingencies, self–control preferences, ...
  - ◇ these distinctions are not always sharp and often overlap.
- Behavioral Economics is controversial
  - ◇ several authors have criticized poor experimental standards,
    (... true, there is bad Behavioral Economics, too ...)
  - ◇ Behavioral Economics has been criticized for departing from the
    ... revealed preference approach.
  - ◇ If there is time in the end, we may come back to this.
- Behavioral Economics raises delicate and difficult *welfare* questions
  - ◇ e.g. people with self-control problems are often modeled ...
    ... as consisting of *conflicting selves*.
  - ◇ Different selves may have different preferences and it is not always clear ...
    ... which self represents the individual's preferences.
  - ◇ Even if welfare can be well–defined, then

... if people don't always do what is best for them, is this a basis ...

... for policy intervention to "help" them improve their choices?

... In particular, policy interventions that *limit* freedom of choice?

◇ *Libertarian Paternalism* describes a school of thought which holds ...

... that interventions are justified so long as they don't constrain the freedom of choice

... of people who don't need help.

This course

- In this course, we will primarily deal with non–standard *preferences*.
  - ◇ if time permits, we will look at other selected topics.
- We take a theoretical perspective.
  - ◇ we occasionally survey experiments but won't cover them in full detail.
  - ◇ you need to know Game Theory.

Reading

- Texts
  - ◇ there is one general text book (but we will look into models more closely)
    - Wilkinson, N. (2008): *Introduction to Behavioral Economics*, New York, Palgrave Macmillan.
  - ◇ there is one book focussing on Behavioral industrial organization.
    - Spiegler, R. (2011): *Bounded Rationality and Industrial Organization*, Oxford, Oxford University Press.
- There are a number of general survey articles, e.g.
  - Camerer, C. (2006): "Behavioral Economics," In *Advances in Economics and Econometrics: Theory and Application*, Ninth World Congress, Vol.2, ed. R. Blundell, W. K. Newey, and T. Persson, 181-214, Cambridge and New York, Cambridge University Press — paper is available on Camerer's webpage.

- DellaVigna S. (2009): "Psychology and Economics: evidence from the field," *Journal of Economic Literature* 47, 315-372.
- Rabin, M. (2002): "A perspective on Psychology and Economics," *European Economic Review*, 46, 657-85.

- There are two anthologies:
  - Camerer, C., G. Loewenstein, and M. Rabin (2003): *Advances in Behavioral Economics*, Princeton, Princeton University Press.
  - Kahneman, D. and A. Tversky (2000): *Choices, Values, and Frames*, Cambridge and New York, Cambridge University Press.

Course Information

- Material: http://www.wiwi.uni-bonn.de/kraehmer/Lehre/Lehre.html
- Contact: kraehmer@hcm.uni-bonn.de, Lennestr. 43.
- Office hours: by appointment.
- Tutor: Paul Schempp, pschempp@uni-bonn.de

1 The standard model

- The traditional, or standard approach to economics assumes that people are *rational*, i.e.
  - ◇ people have well–defined preferences,
  - ◇ among the feasible choices, people pick what is best according to their preferences.
- Formally: let X be a set of actions/alternatives/choices ...
  - ◇ X can be complex: consumption paths over time, lotteries, ...
- Let $\succeq$ be a *preference relation* over X.
  - ◇ $x \succeq y$ means that x is weakly preferred over y.
  - ◇ Aside: $\succeq$ is a binary relation, i.e. is a subset of $X \times X$.
- $\succeq$ is called *complete* if for all $x, y \in X$: $x \succeq y$ or $y \succeq x$.
- $\succeq$ is called *transitive* if for all $x, y, z \in X$: $x \succeq y$ and $y \succeq z$ implies $x \succeq z$.
- A *choice problem* is any subset $A \subseteq X$.
- We identify an agent with a preference relation.

DEFINITION 1.1 *An agent is rational if his preferences are complete and transitive, and if for all $A \subseteq X$ he chooses the element $x^* \in A$ which is $\succeq$-optimal in A (i.e. $x^* \succeq x$ for all $x \in A$).*

- For the purposes of this introduction, let x^* be unique.
- Then we can define a choice function $C_\succeq(A)$ which assigns to each choice problem A ...
  - ◇ ... the agent's optimal choice: $C_\succeq(A) = x^*$.
- Under appropriate assumptions, a preference relation can be represented by a utility function u on X ...
  - ◇ ... so that $C_\succeq(A) = \arg\max_{x \in A} u(x)$. (We won't go into that.)
- The *assumptions* of the standard model appear unrealistic. In reality, ...
  - ◇ ... people don't know what they want/don't have stable preferences,

- ... people lack the skills to compute what is optimal (in particular, in complex environments),
- ... people don't optimize but act according to rules of thumb/heuristics,
- ... people's behavior is partially driven by erratic impulses and emotions,
- ... behavior is affected by how the problem is presented, i.e. two choice problems A and B ...

  ... might be the same, but if framed differently, people may act differently,
- ... etc.

• The standard model can be defended as follows:

- Your objections may all be true, ...

  ... but you must not take the assumption of the standard model *too literally*.
- The standard model does not posit that people *are* rational.
- *Rather*, the standard model assumes that people's ...

  ... **behavior can be portrayed AS IF it was rational**.

• This is the so–called "as-if approach".

• To illustrate, consider the following example from consumer theory:

- A consumer with a budget m faces a choice between good 1 and good 2 at prices p_1 and p_2.
- Suppose that the consumer spends

  ... the share α of his income on good 1, ...

  ... and the share $1-\alpha$ on good 2.
- This behavior might be the result of using a rule of thumb, ...
- ... but it can also be portrayed as if resulting from maximizing the utility function $x_1^{\alpha}x_2^{1-\alpha}$.

• The main justification for the as-if approach is based on the ...

- ... *revealed preference approach to choice*.

• There are other justifications, which are more "ideological".

1.1 The revealed preference approach to choice

- Instead of preferences, the primitives of the approach are ...
  - ... the agent's *observed choices*.
- Imagine that for every choice problem, you observe the actual choice of the agent.
- *The as–if question* is:
  - (When) can the agent's behavior be described as if it was the behavior of a rational agent?
- To formalize, let C be a function which assigns to every A an element in A.
  - $C(A)$ is the agent's (observed) choice in choice problem A.
  - Put differently, $C(A)$ is a record of the agent's choice.
  - In general, C is a correspondence (but we want to keep the argument simple).
- The formal version of the as–if question is:
  - Is there a complete and transitive preference relation $\succeq$ so that $C_{\succeq}(A) = C(A)$ for all $A \subseteq X$?
- The answer is "yes" if C satisfies the following consistency condition:

DEFINITION 1.2 *The choice function C satisfies* independence of irrelevant alternatives *(IIA) if for all $A_1, A_2 \subseteq X$ with $A_1 \subseteq A_2$ we have*

$$If \quad C(A_2) \in A_1, \quad then \quad C(A_1) = C(A_2).$$

- IIA means that a choice should remain optimal if you remove some of the (unchosen) alternatives:
  - If you choose chocolate when also cake and cheese is available, ...

    ... you should still choose chocolate when only also cake is available.
- Example: Let $X = \{x_1, \ldots, x_N\}$ consist of N elements.
  - Suppose there is an number $V_n > 0$ attached to any x_n,
  - Consider the following *satisficing* procedure:

    (a) Fix a number $v > 0$ — the satisficing level.

(b) Given A, go through the elements of A in the order of ascending indices.

(c) Pick the first element which "satisfices", i.e. the first x_i with $V_i \geq v$.

(d) If no element satisfices, lower the level to $V/2$ and begin again.

- The choice procedure satisfies IIA.
- IIA does not seem too implausible; in any case, much milder than rationality, but we actually have:

LEMMA 1.1 *Let C be a choice function. Then there is a complete and transitive preference relation $\succeq$ such that $C_{\succeq}(A) = C(A)$ for all $A \subseteq X$ if and only if C satisfies IIA.*

- The strength of the revealed preference approach is that it is ...

  ... *psychologically agnostic*, i.e. it does *not* rest on substantive assumptions about ...

  ... the agent's mind, psychology, decision making procedures.

  ⋄ instead, it relies only on a consistency condition pertaining to observed choice data.

- The fact that the satisficing procedure meets IIA illustrates that ...

  ... perhaps seemingly non-rational choice procedures may, in fact, be consistent with maximization!

- If you want to reject the standard model, you have to reject IIA.

1.2 As-if as a methodological stance

- Another defense of the as-if approach holds that the realism of assumptions is irrelevant ...

  ... as long as the predictions they deliver are *accurate*.

- Milton Friedman in a 1953 book[1] says that testing a theory's assumptions is

> fundamentally wrong and productive of much mischief ... . It only confuses the issue, promotes misunderstanding about the significance of empirical evidence for economic theory,

[1] Friedman, M., 1953, The Methodology of Positive Economics, in M. Friedman, Essays in Positive Economics, Chicago, University of Chicago Press, 3-43.

> produces a misdirection of much intellectual effort ... . The relevant question about the "assumptions" of theory is not whether they are descriptively "realistic", for they never are, but whether they are sufficiently good approximations for the purpose at hand.

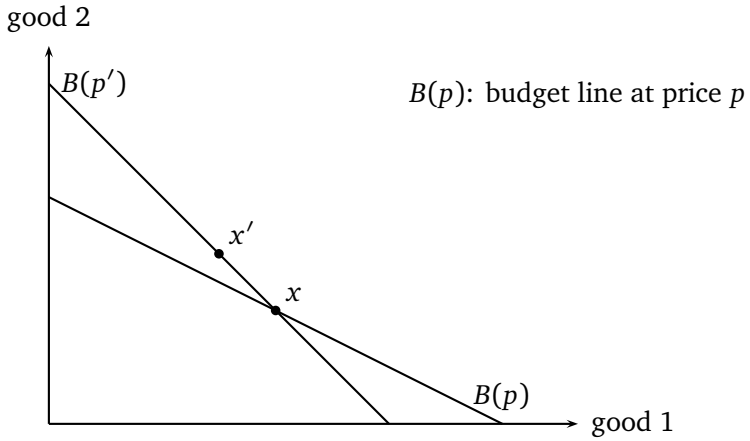
- Many economists presumably share Friedman's view. The debate is then about ...
  - ... when are predictions accurate (what is "sufficiently good")?
    - e.g. what is the role of experiments?
  - ... what is the right "purpose at hand"?
    - Is it the purpose of economics to study individual behavior or exclusively institutions and markets?
- At first glance, it might be surprising how "inaccurate" assumptions could lead to "accurate" predictions.
- A classical argument goes: even if on an individual level, behavior is not rational, ...

  ... on an aggregate level, non–rationalities "wash out".
- Becker (1962)[2] makes the argument (somewhat) more precise.

1.2.1 Becker's aggregation argument

- One of the most fundamental economic laws is the ...
  - ... *compensated law of demand (CLD)*.
- It says that, controlling for income effects, aggregate demand is downward sloping.

[2] Becker, G., 1962, Irrational Behavior and Economic Theory, Journal of Political Economy 70, 1-13.



- Suppose, initially the price is p and consumption is x.
- Consider a price change from p to p' so that at the new price p', the old bundle x is still affordable.
  - ⋄ Because the old bundle is still affordable, the price change is called a "compensated" price change.
- CLD says that the compensated price change ...
  - ⋄ ... reduces consumption of good 1 and increases consumption of good 2
- CLD at the aggregate level is implied by utility maximization at the individual level.
- Becker argues that CLD at the aggregate level is also consistent with ...

  ... non–rational behavior at the individual level.
- Consider a large number of consumers facing all the same budget line and who are ...
  - ⋄ ... non–rational in that they pick a consumption bundle on their budget line *at random*.
  - ⋄ Then *aggregate* demand is at the midpoint of the budget line, and this implies CLD!
  - ⋄ (This is graphically clear and easy to verify algebraically.)
- Becker also discusses the case that consumer pick a bundle ...
  - ⋄ ... at random in the budget *set*.
  - ⋄ Then aggregate demand is the center of gravity, and this again implies CLD.
- Becker also discusses another consumption rule which captures "consumption inertia" and derives CLD

here as well.

- Becker's argument offers an illustration of the view that ...
  - ... individual non–rationality does not contradict "rationality of the market".
- But many details are unspecified (heterogeneous income distribution, *systematic* non–rationalities, ...).
  - somewhat suspiciously, there is also no "modern" version of Becker's aggregation argument.
- Still, Becker's argument is a reminder to keep in mind the question whether individual behavioral anomalies really matter in markets.