

# Approaches to economic science

## Introduction

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## Outline of the course

1. Introduction: examples of controversial economic reasoning (Kirchkamp)
2. What is social science? (Pasche/Freytag)
3. Economic methodology - what is constitutive for economics? (Fritsch)
4. Typical assumptions economists make (Cantner)
5. Types of economic analysis (Lorenz)
6. A brief history of economic thought (Lorenz)
7. Controversies in economic science (Examples) (Freytag/Pasche)

## Assignments:

- Either two assignments from two different sections + 2 questions from the exam at the end,
- or one assignment from one section + 3 questions from the exam at the end.
- Examples of controversial economic reasoning
  - What do you find controversial about economics?
  - Do markets work?
  - Der deutsche Ökonomenstreit 2009
  - What can we learn from neuronomics?
- Assignment: Poster presentation

## Contents

### 1 Methods of economics reasoning

**3**

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<sup>1</sup>The picture on the titlepage shows a portrait of Adam Smith based on an etching of somehow unclear origin. The etching is either by Cadell and Davies (1811), John Horsburgh (1828) or R.C. Bell (1872).

<b>2</b>	<b>Do markets work?</b>	<b>5</b>
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## 1 Methods of economics reasoning

- Exegesis
- Speculation
- Speculation based on stylised facts
- Field data (often aggregate)
- Surveys (often individual data)
- Lab experiments
- Neuronomic lab experiments

Some of these methods are more, some are less established. New are, in particular, the last two: Lab experiments and neuronomic lab experiments. It helps to understand the purpose of the other methods if we explore the limits of the last two methods a bit:

### **Samuelson and Nordhaus (1985) Principles of Economics, p. 8:**

“...One possible way of figuring out economic laws ... is by controlled experiments ... Economists [unfortunately] ... cannot perform the controlled experiments of chemists or biologists because they cannot easily control other important factors. Like astronomers or meteorologists, they generally must be content largely to observe.”

## Blanchard (1997) Macroeconomics:

“... When an engineer wants to find out how the temperature affects material’s conductivity, she builds an experiment in which she changes the temperature, makes sure that everything else remains the same, and looks at the change in conductivity. But macroeconomists who want to find out, for example, how changes in the money supply affect aggregate activity cannot perform such controlled experiments; they cannot make the world stop while they ask the central bank to change the money supply”

Apparently, Samuelson and Nordhaus, and also Blanchard were not entirely convinced that we can learn something from experiments in economics. Were they right?

## Misunderstanding:

- physicists do not really move planets in their experiments
- economic experimenters do not really have to change ...
  - central bank policy
  - labour market policy
  - foreign trade policy
  - :

to find out how these policies work.

- Both build a model in a laboratory situation

## Trust

- model of a bridge in an engineer’s lab → real bridge !
- model of the labour market in an economist’s lab → real labour market ?

In both cases model and reality differ. Things that work well in the lab may not work in real life. If something already fails in the lab, it might fail in real life, too.

Winners of the Nobel prize who study economic behavioural rationality:

- 1988: Maurice Allais
- 1994: Reinhard Selten
- 1998: Amartya Sen
- 2000: Daniel L. McFadden
- 2001: George A. Akerlof
- 2002: Daniel Kahneman and Vernon L. Smith
- 2004: Edward C. Prescott
- 2005: Robert J. Aumann and Thomas C. Schelling
- 2009: Elinor Ostrom
- 2012: Alvin E. Roth, Lloyd S. Shapley

The example of the experimental methods show that often the focus of economic analysis is on something that is simpler than the real world.

- Theoretical models simplify
- Econometric models simplify
- Lab experiments simplify

Let us have a look at a simple way to study an essential question:

## 2 Do markets work?

### 1st welfare theorem

Each Walrasian equilibrium is weakly Pareto efficient.

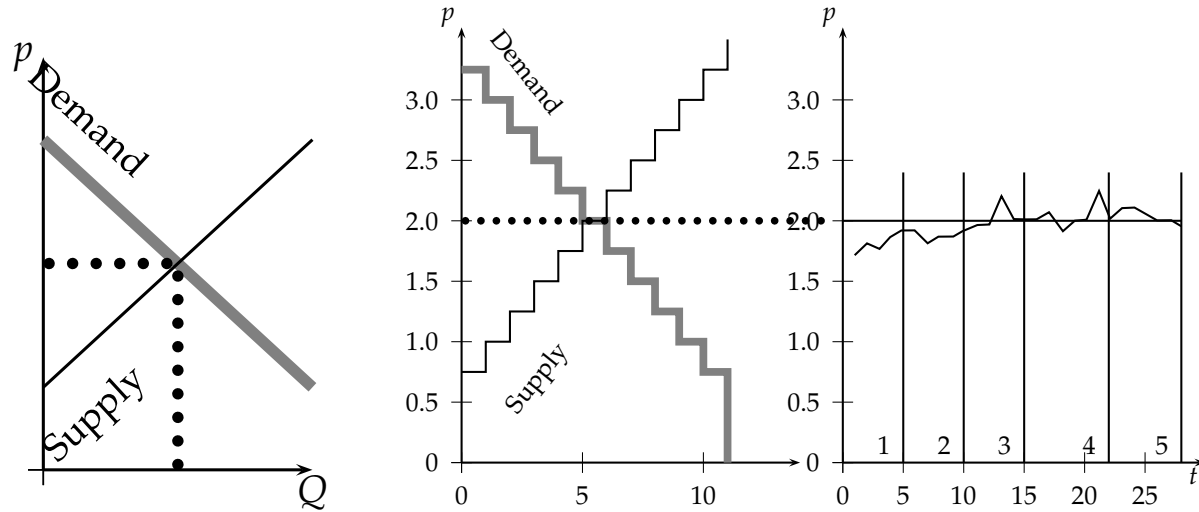


Figure 1: Market equilibrium with perfect competition

**A simple market experiment**

You are **buyer [2]**: At the beginning of the game you do not own any objects. During the game you can buy objects. Objects that you own at the end of the game have a value according to the following table

	Value	Price	Profit	Partner
1.	300			
all remaining	0			

You are **seller [4]**. At the beginning of the game you own an object. During the game you can sell this object. Objects that you own at the end of the game have a value according to the following table

	Value	Price	Profit	Partner
1.	150			
all remaining	0			

**Example 2 - market equilibrium with perfect competition** (See figure 1)

Assumptions of this theory?

→ efficient allocation, trade at equilibrium prices, equilibrium quantity

- should a theory be close to the real life?
  - no: too difficult to analyse, we have real life already
  - example: Frankfurt stock exchange — we can duplicate this, but why simplifying theories → allows to understand structure
  - e.g., only one asset, only 2 traders...

### 3 Der deutsche Ökonomenstreit 2009

- May 2009: Roland Vaubel: “Rettet die Wirtschaftspolitik an den Universitäten” (save economic policy at the universities)
- Response: Rüdiger Bachmann, Dirk Krüger, Harald Uhlig “In tiefer Sorge...”

Schools of thought:

- Walter Eucken, Wilhelm Röpke, Alfred Müller-Armack: “ordoliberalism” — economic issues are discussed verbally.
- Paul Samuelson, Milton Friedman: Formal models as a tool to analyse economic phenomena.

The issue:

- economists should rather discuss the “relevant problems of economic policy” and not waste time with theory and mathematics.
- theory and mathematics is pointless, only good for the own career.
- German economic policy is not interesting for an international audience, thus, researchers who publish internationally neglect German economic policy.
- ↑ back to the stone age? ↑ provincial protectionism?
- German economic research has to follow international standards.

**Streams in economic research we have mentioned so far**

- Ordoliberalism/Freiburger Schule (1930): Eucken, Böhm,...
- Neoclassical economics: Walras (1870), Marshall (1890), Hicks (1939), Chamberlin (1933), Samuelson (1947), Debreu (1959), Arrow (1971).
  - Criticism 1: (Veblen, 1900) “[a neoclassical decision maker is] a lightning calculator of pleasures and pains, who oscillates like a homogeneous globule of desire of happiness under the impulse of stimuli that shift about the area, but leave him intact.”

- Criticism 2: (Sonnenschein-Mantel-Debreu theorem, 1972-1974) Does it make sense to assume that the economy is in equilibrium?

Let us have a closer look at Criticism 1. What are the preferences of a decision maker anyway? Can we learn something from neuronomics?

## 4 Neuronomics

### 4.1 A brief overview

Usual approach in Economics: Black-box models:

- Good to predict aggregate behaviour.
- Underlying mechanisms are not modelled.

Idea:

- Relate structures in the brain to economic concepts.
- hope: → discover new structure in economic concepts.
- Bilateral anterior insula, anterior cingulate cortex
  - emotions
  - Insula: disgust, anger
- Dorsolateral prefrontal cortex (DLPFC)
  - understanding, control, aims

### Effects of injuries

- uncontrolled injuries
  - Phineas Gage
    - \* change in behaviour after an accident
  - language
  - Amygdala: meaning of emotions
  - Hippocampus: long term memory



- controlled injuries
  - removal of the amygdala in rats:
    - \* rat becomes docile, sexually inactive, not scared by enemies
  - measure the potential of single neurons of primates

### **brain activity and electricity**

- Luigi Galvani (1783): tissue of (dead) frogs
- Eduard Hitzig, Gustav Fritsch (1870): brain of (living) dogs (no anesthetization), brain of injured soldiers
- Electroencephalography (EEG)
  - temporal resolution: good
  - spatial resolution: bad

### **Magnetoencephalography (MEG)**

- measure the magnetic field of neural activity
  - spatial resolution: good
  - measurement only at the surface of the brain, not in interior parts of the brain

### **Positron Emission Tomography (PET)**

- inject participants with radioactive substance
- measure radioactivity in the brain
  - more radioactivity—more blood—more activity
- temporal resolution: minutes or more.

## fMRI (Functional Magnetic Resonance Imaging)

- idea: neuronal activity uses oxygen
- magnetic properties of haemoglobin change depending on the oxygen level
- a strong magnetic field shifts the protons in the haemoglobin
- when the protons return to their equilibrium state a small magnetic field is generated.

→ measure oxygen level in the blood: temporal resolution:  $\sim 1$  second.

## Different methods

- injuries
- EEG Electro-encephalogram
- MEG Magnetoencephalography
- PET (Positron Emission Tomography)
- fMRI (Functional Magnetic Resonance Imaging)
- TMS Transcranial Magnetic Stimulation

## 4.2 An application to labour economics

Fließbach K.; Weber B.; Trautner P.; Dohmen T.; Sunde U.; Elger C.E.; Falk A.:  
“Relative comparison affects reward-related brain activity”, Science 2007.

How does relative comparison enter our preferences?

- The traditional way to answer this question: Survey data
  - how can we measure relevant incomes and relevant reference groups?
  - how do we measure subjective well being?
- Idea of Fließbach, Weber, Trautner, Dohmen, Sunde, Elger and Falk:
  - fMRI study of a behavioural experiment.

## Why is it relevant to study relative comparisons?

- to understand social preferences
- to understand consumption and saving behaviour (Carroll, 2000)
- to understand labour supply (Boskin and Sheshinski, 1978; Neumark and Postlewaite, 1998)
- to understand incentives in firms (Bewley, 1998)
- ⋮

## The experiment

- 2 fMRI scanners
- 33 male participants, in pairs
- within subject  $2 \times 3$  factorial design:
  - absolute payment (high/low)
  - relative payment (higher/same/lower than other player)
- 300 rounds of the game, one was selected randomly for payment.

## In each round:

- Participants see dots for 1.5 seconds
- Question (1.5 seconds): fewer than 24 dots? / more than 24 dots?
- Feedback about own response (0.25 seconds)
- Delay (0.2... 1.7 seconds)
- Feedback about payment:

Payoff of the other:	60 €
Your payoff	120 €

- (Note: about 81% correct answers, this is good, since “both right” is the condition of interest)

**Conditions:**

A	B	relative reward	absolut reward	payoff A	payoff B	condition
wrong	wrong			0	0	C1
right	wrong		high	60	0	C2
right	wrong		low	30	0	C3
wrong	right		high	0	60	C4
wrong	right		low	0	30	C5
right	right	1:2	high	60	120	C6
right	right	1:2	low	30	60	C7
right	right	1:1	high	60	60	C8
right	right	1:1	low	30	30	C9
right	right	2:1	high	120	60	C10
right	right	2:1	low	60	30	C11

**Details**

- payoff were varied by  $\pm 10\%$
- pay conditions were chosen randomly
- participants knew that tasks were identical
- participants knew that payoffs could vary independently of their performance.

**Hypotheses**

- Brain regions that are engaged in the prediction and registration of rewards include **ventral striatum** (O'Doherty JP, 2004; O'Doherty JP, Deichmann R, Critchley HD, Dolan RJ, 2002; Breiter HC, Aharon I, Kahneman D, Dale A, Shizgal P, 2001)
- Standard economic model: no differential activation in response to different relative payments
- Social comparison model: activation varies with varying relative payments

## Results of $2 \times 3$ Anova

- blood oxygen level-dependent (BOLD) response **depends** on the **relative** amount of money earned.
- BOLD response does **not** seem to depend on **absolute** amount of money earned.
- BOLD response does **not** seem to depend on **interactions** of absolute and relative amounts of money earned.
- BOLD response does **not** seem to depend on **side of activation** or **scanner type**.

## 5 Conclusion

### Methods in economics we mentioned so far

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