Experimental Economics

Introduction

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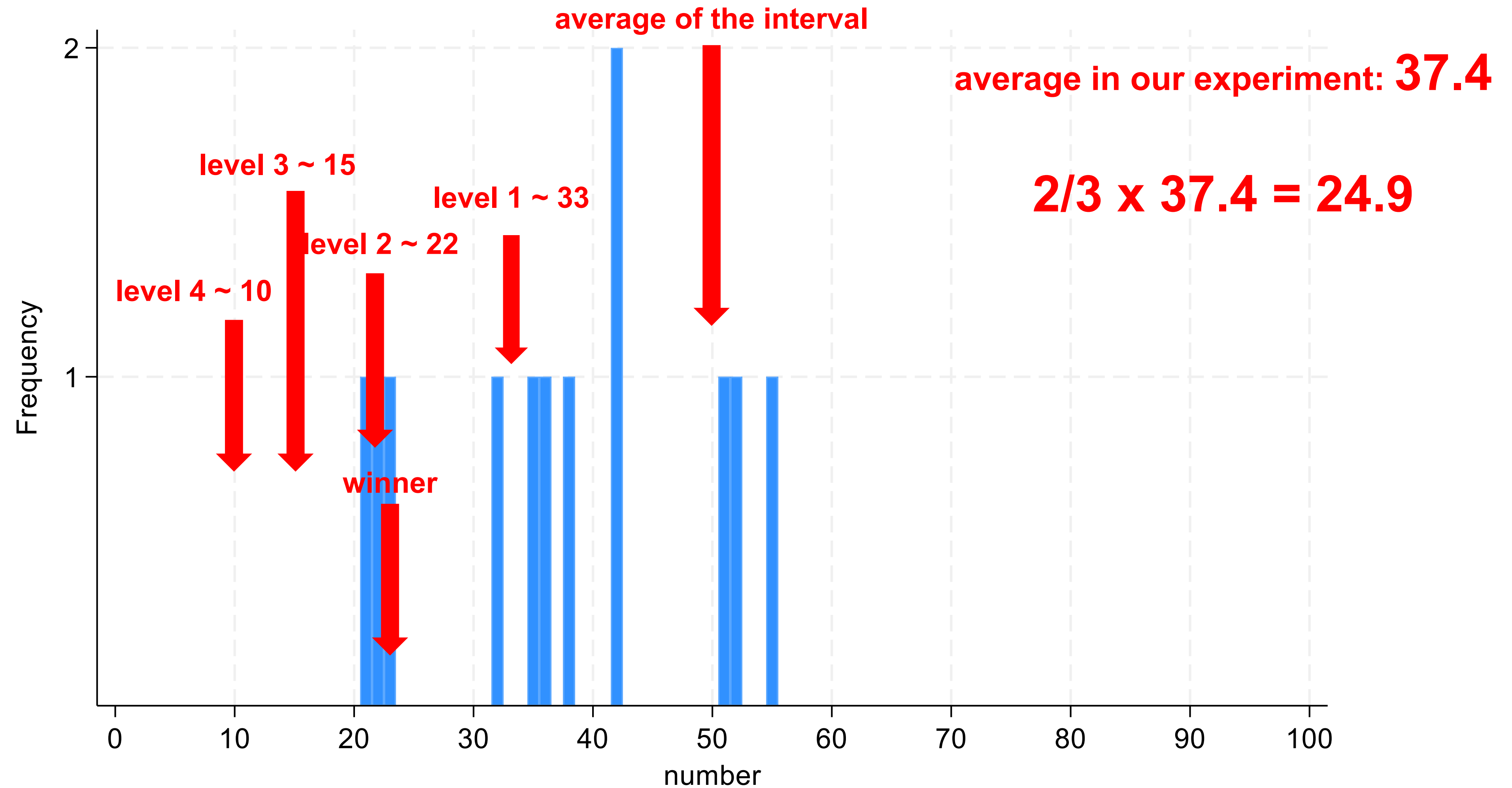Universidade de Lisboa

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Last lecture: guessing game

and the winner is…

- Guess an integer from the interval 0 to 100.

- The winner is whose guess is closest to 2/3 times the average of all guesses.

- If there are multiple winners, the price will be shared equally.

Guessing game: analysis

average of the interval

average in our experiment: **37.4**

2/3 x 37.4 = 24.9

level 3 ~ 15

level 1 ~ 33

level 2 ~ 22

level 4 ~ 10

winner

Frequency

number

Outline for today

- Brief history of Experimental Economics

- Experimental vs. Behavioral Economics

- Purpose of economic experiments

- Experiments: Economics vs. Psychology

Brief history

Individual choice experiments

- Daniel Bernoulli (1738) – St. Petersburg paradox
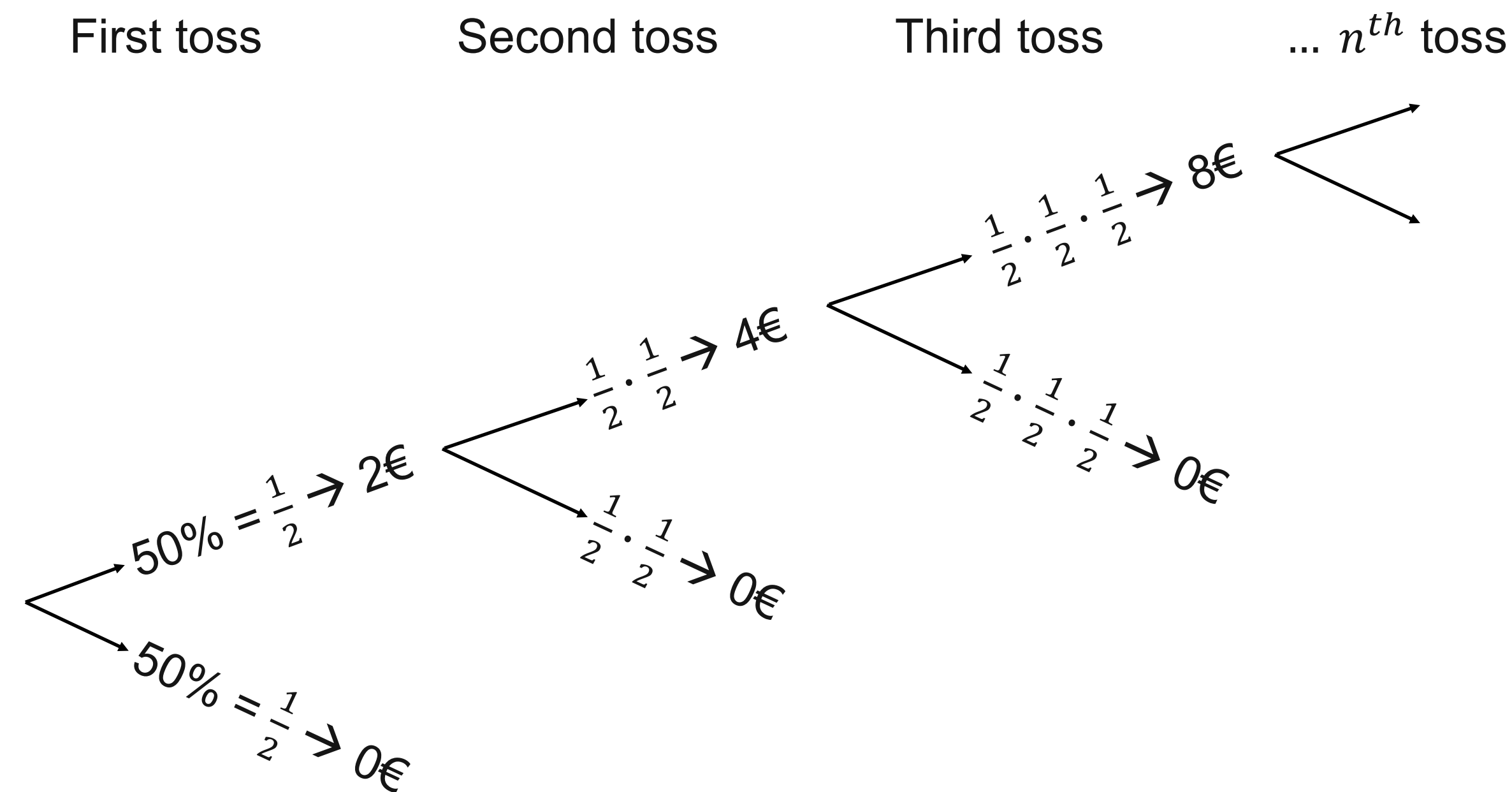
St. Petersburg paradox

Toss a fair coin

- How much would **you** pay to play?
- What is the expected value (EV)?

$1 \text{ x} \rightarrow 2 \ €$

$2 \text{ x} \rightarrow 4 \ €$

$3 \text{ x} \rightarrow 8 \ €$

$n \text{ x} \rightarrow 2^n \ €$

End of the game

First toss   Second toss   Third toss   ... n^{th} toss

$50\% = \frac{1}{2} \rightarrow 2€$

$\frac{1}{2} \cdot \frac{1}{2} \rightarrow 4€$

$\frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \rightarrow 8€$

$\frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \rightarrow 0€$

$\frac{1}{2} \cdot \frac{1}{2} \rightarrow 0€$

$50\% = \frac{1}{2} \rightarrow 0€$

- $EV = \frac{1}{2} \cdot 2€ + \frac{1}{4} \cdot 4€ + \frac{1}{8} \cdot 8€ + \cdots + \frac{1}{2^n} \cdot 2^n €$

$= 1€ + 1€ + 1€ + \cdots + 1€ = \infty$

Brief history

Individual choice experiments

- Daniel Bernoulli (1738) – St. Petersburg paradox
  - → <u>classical solution</u>: *diminishing marginal utility of money*

- Neo-classical theory

  - von Neumann & Morgenstern (1944):
    → Expected utility theory (EUT)

  - *homo economicus* → utility maximization
    - purely self-interested
    - fully rational

- Maurice Allais (1953) – Allais paradox

  - Nobel prize winner in Economics (1988)
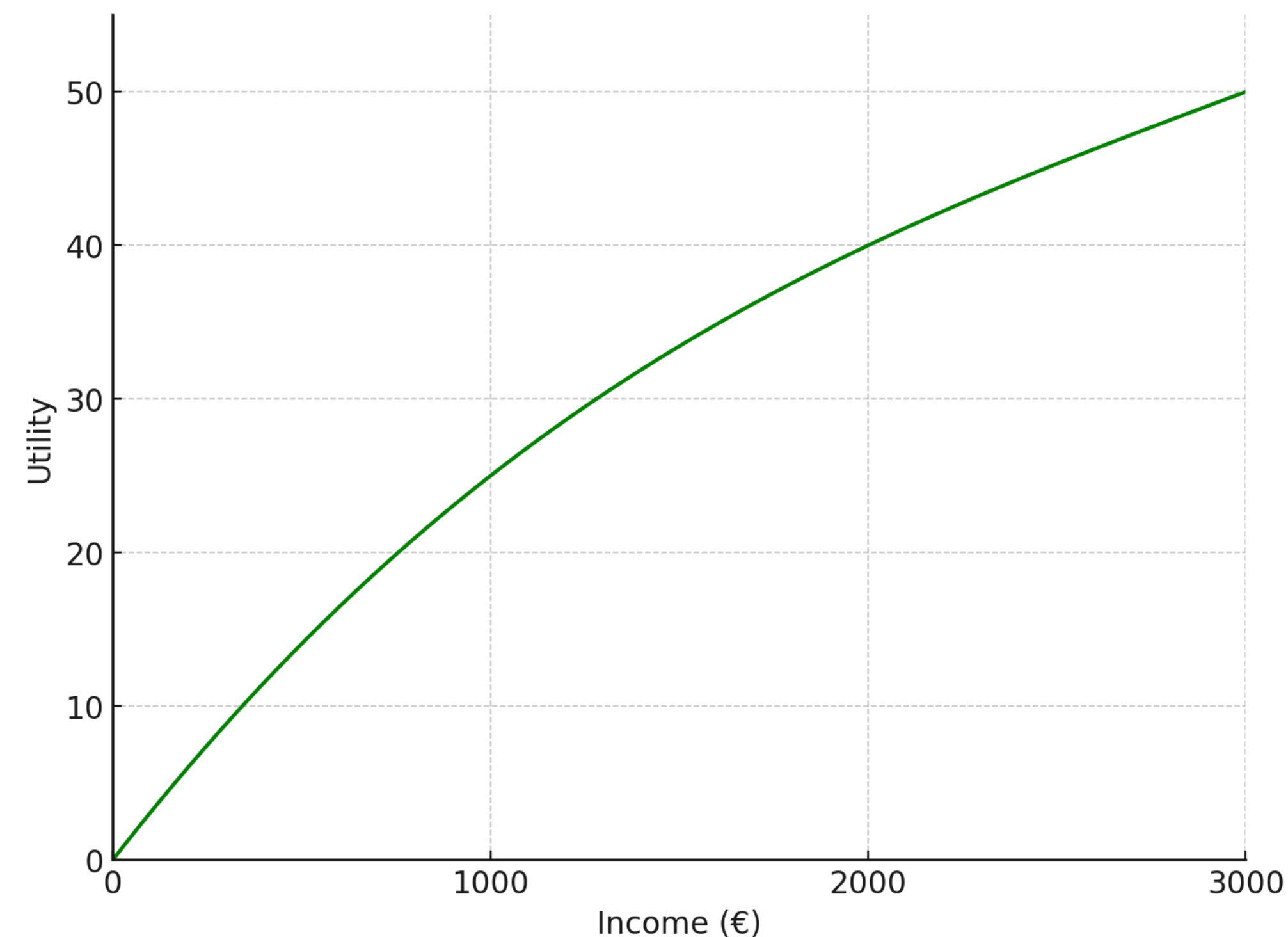
Allais paradox

A violation of Expected Utility Theory (EUT)

Treatment 1	Lottery A	Lottery B
	1 million € with 100%	5 million € with 10%
		1 million € with 89%
		0 € with 1%

Treatment 2	Lottery C	Lottery D
	1 million € with 11%	5 million € with 10%
	0 € with 89%	0 € with 90%

Allais paradox

A violation of Expected Utility Theory (EUT)

Treatment 1 → 2	Lottery A → C	Lottery B → D
	1 million € with 11%	5 million € with 10%
	~~1 million € with 89%~~	~~1 million € with 89%~~
		0 € with 1%

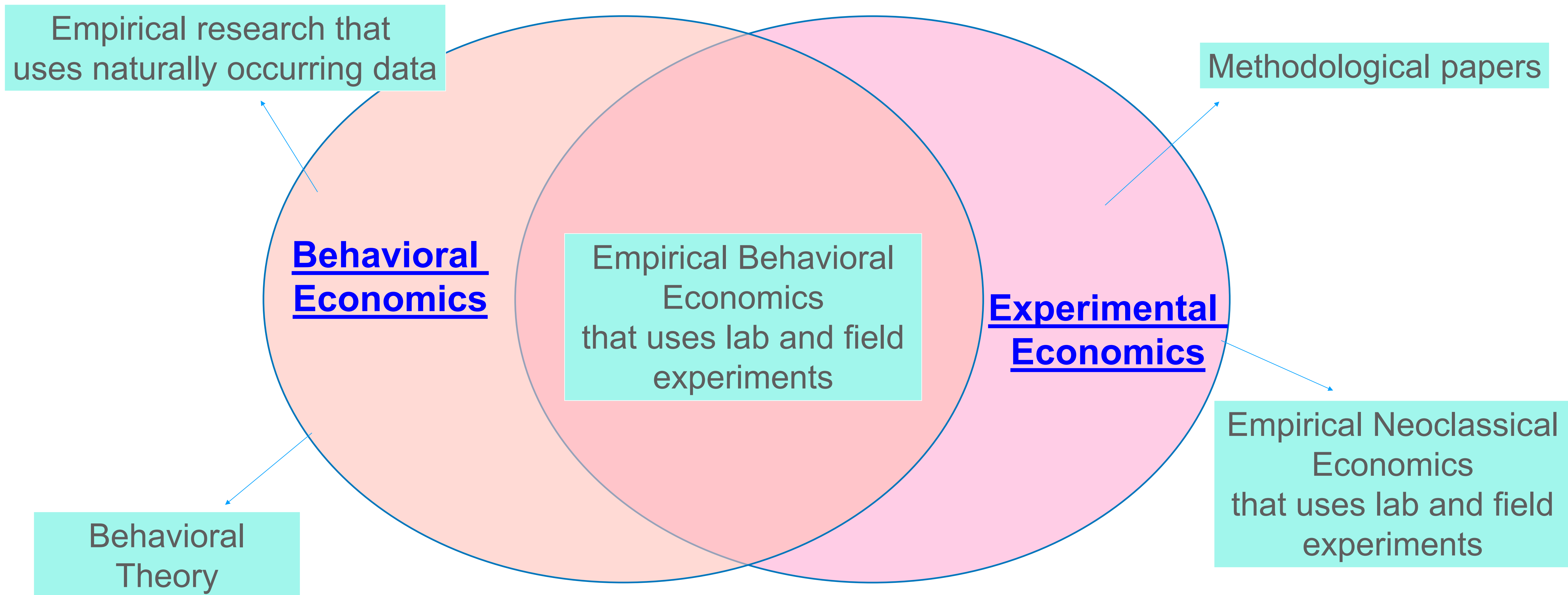| Treatment 2	Lottery C	Lottery D
	1 million € with 11%	5 million € with 10%
	0 € with 89%	0 € with 90%

➢ Deviations from EUT and homo economicus gave rise to **behavioral economics**

What is Behavioral Economics?

The study of economic decision-making by individuals and institutions **assuming that the individuals are influenced by social, cognitive, and emotional factors.**

- **Goal:** compare the behavior of agents with economic theories based on the principle of utility maximization

- **Basis:** insights from Philosophy, Psychology, Sociology, Neuroscience (more recently),…

Behavioral vs. (and) Experimental Economics?

Empirical research that uses naturally occurring data

Methodological papers

Behavioral Economics

Empirical Behavioral Economics
that uses lab and field experiments

Experimental Economics

Behavioral Theory

Empirical Neoclassical Economics
that uses lab and field experiments

Experimental Economics

- Application of **experimental methods** to study **economic questions.**

- Empirical tool that allows the study of how individuals' or group decisions and behavior are affected by various (testable) factors in a **controlled** environment in which individuals make decisions according to certain **rules** that determine their **payment**.

The importance of control

- Does one (independent) variable influence another (dependent) variable?

- <u>Example:</u> effect of different incentive schemes on firm productivity
    - **independent variable:** incentive-compatible or flat salary
    - **dependent variable:** productivity of firm

- Direct observations from the real world – **naturally occurring field data** – may suffer from
    - selection effects
    - unobservable variables

Brief history

Market experiments

- Decentralized markets

- Chamberlin (1948) – competitive equilibrium using induced values

- Vernon Smith (1962, 1988) – *double auction*
  - Nobel prize winner in Economics for Experimental Economics (2002)

- Game experiments
  - Prisoner's dilemma – originally by psychologists/sociologists

Prisoner's dilemma

Experimental Economics

Experimental Economics

- Industrial Economics
- Law Economics
- Gender Economics
- Information Economics
- Public Economics
- **Game Theory**
- Macro Economics
- …

The purpose of experiments

Test theory:

- Expected Utility - Allais paradox

- Minimum wage theory (Card and Krueger, 1994; Akerlof, 1982)

The purpose of experiments

Equilibrium selection:

Observe behavior in cases where theory makes **unclear predictions**

Game Theory: games with multiple solutions… what is the solution that is chosen?

→ **Battle of the Sexes**

The purpose of experiments

Find empirical regularities

Search and establish "stylized facts" as a basis for new theory:

Subjects switch in a choice between two options if the choice menu features a third (dominated) option that they would never choose.

$\rightarrow$ development of the theory of selective attention

Observe behavior in cases where theory makes **no predictions**

The decoy effect

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The purpose of experiments

Stress testing (test effect sizes):

Contributions to a public good are around 30% above the Nash prediction in many experiments using groups of 4 subjects.

Stress test: Do contributions converge to the equilibrium if group size increases?

The purpose of experiments

Accurate measurement of variables of interest:

Use experiments to **measure risk and time preferences** and test whether these measures explain saving decisions in the field.

The purpose of experiments

Orient/advice policy-makers:

Use experiments to study the effect of different forces in complex situations where theory is impractical or non-existent.

- Test performance of different auctions in order to sell spectrum rights.

- Test employment implications of minimum wage

- Test ways to regulate a privatized electricity market.

- Test the effects on worker motivation of various compensation schemes.

The purpose of experiments

Replication of previous work:

Replication is important to check **internal** and **external validity**

The purpose of experiments

Teaching economics:

- Interactive experiments get the whole class involved and push students to think actively rather than passively.

- Help to learn better certain economic concepts

Experimental methodology:

Difference in Economics and Psychology

The use of financial incentives

Economists:

- Financial incentives are vital to ensure that participants behave in the same way as they would in real life (in the market)

- Are vital to ensure that participants pay proper attention to the experience.

Psychologists:

- Often use hypothetical situations

- May skew the results because extrinsic motivation of the participants may not be activated.

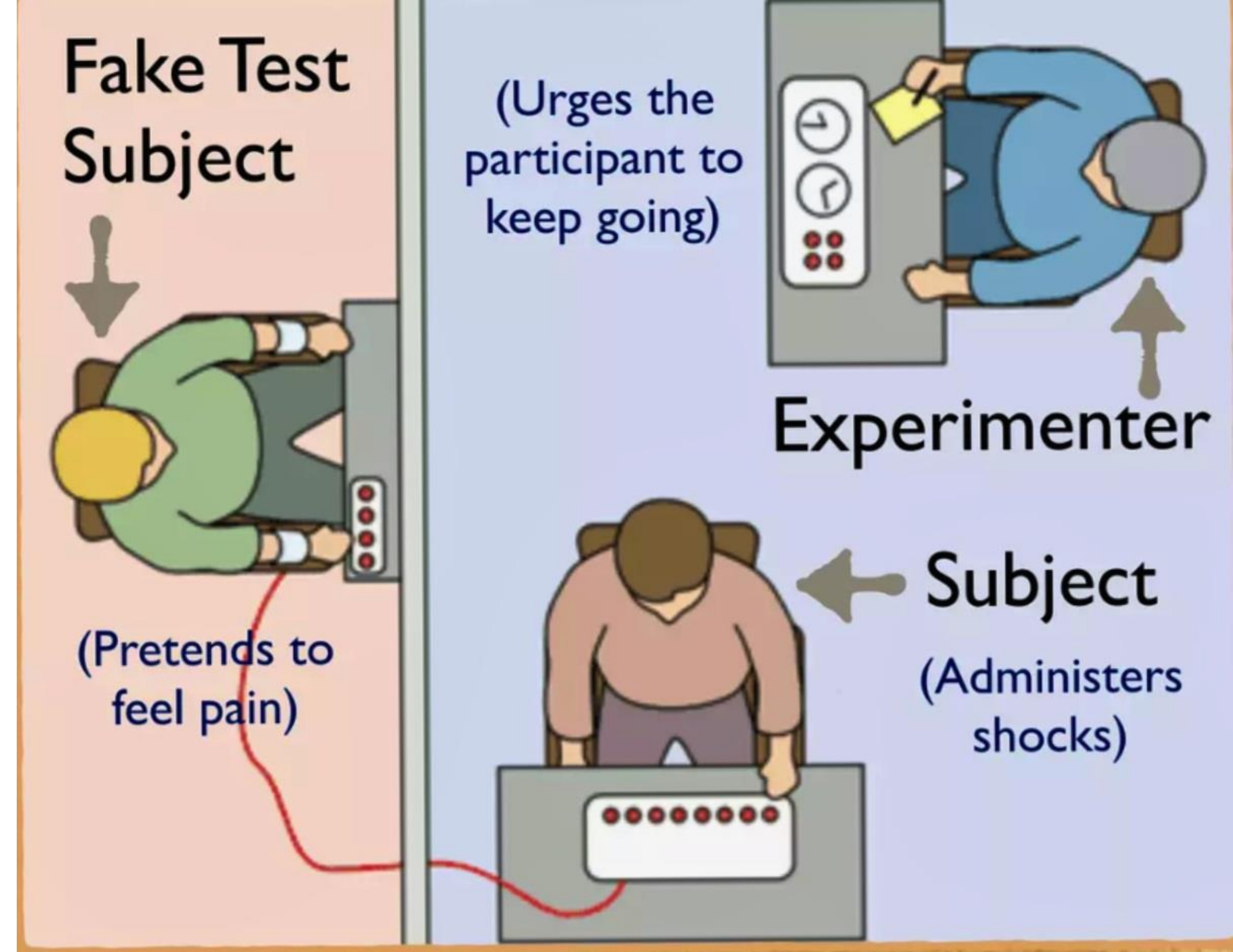# The use of "deception"

Economists:

- Deception is not allowed!

- Why? → next time we cannot be sure that people state their real preferences

Psychologists:

- Deception may create situations that would otherwise be difficult to observe.

- Examples:

    - How do people react in emergencies?

    - Or in morally difficult situations → Milgram experiment (1961)

Milgram experiment

- Adolf Eichmann trial in Jerusalem (1961)

- Psychology of genocide

- just following orders?

- "Study of memory & learning with punishment"

- Manipulated role assignment

- Strapped to chair with electro-shock 15-450 Volt

- Standard prompts for continuation

- 65% of subjects → max. Volt (fatal)

- Ethical debates about psychological harm → ethical committees

The use of "deception"

Economists:

- Deception is not allowed!

- Why? → next time we cannot be sure that people state their real preferences

Psychologists:

- Deception may create situations that would otherwise be difficult to observe.

- Examples:

  - How do people react in emergencies?

  - Or in morally difficult situations → Milgram experiment (1961)

- Certainly serves to disguise the purpose of the experiment

→Art of experimental economics to find clever designs without "deceiving" subjects

Where does truth end and deception begin?