Experimental Design

CMPUT 654: Modelling Human Strategic Behaviour

Mason & Suri (2012)
Kneeland (2015)

Lecture Outline

1. Presentation scheduling

2. Behavioural research on Mechanical Turk

3. Identifying higher-order rationality

Presentation Scheduling

10 slots available, and 10 people registered in the class*

Question: Are there any group projects?

Procedure:

1. *Serial dictatorship:*
   I have constructed a randomized order of students. Each student may claim any slot that has not been claimed by an earlier student.

2. *Ascending auction:*
   Any student may 'steal' a slot by giving up 1% of their presentation mark; if anyone tries this, we'll have an auction denominated in marks for the slot.

Mason & Suri (2012)

Why:
Collects a lot of issues with doing behavioural research together

- Kind of a handbook for conducting **crowdsourced research**, kind of a handbook for conducting research specifically using **Mechanical Turk**

  - Advantages of MTurk

  - Validity of MTurk data

  - Unique issues

Mechanical Turk

- Requester posts **Human Intelligence Tasks**

- Workers select a task from a big list, work on it

  - For a few minutes, typically; tasks are pretty small

- Workers paid base rate, optionally a bonus

  - Amazon takes a cut

- The tasks can be used for **behavioural experiments**

Advantages of MTurk

- **Large** subject pool

- Reliable **availability**

- Subject pool **diversity**

  - Although still not representative of any particular population

- **Inexpensive** (in both time and money)

Logistics

- Random assignment based on worker IDs

- Many assignments versus one assignment per HIT

- How much to pay workers?

Unique Issues

- Spammers

  1. Captcha/verifiable questions

  2. Peer review

  3. Low-entropy response detection

- Attrition

  1. Timeouts, automatic default responses

  2. Just discard entire trial

Synchronous Experiments

- Waiting room

- Build a panel of subjects using a pilot project

  - Notify the night before about specific time

  - Contact $3n$ subjects to get n participants

Ethics

★ **GET APPROVAL FROM RESEARCH ETHICS BOARD BEFORE PERFORMING ANY BEHAVIOURAL EXPERIMENTS**

- It's not as painful as you might fear

- They want you to know exactly what your experiment will look like, but you can usually file amendments

- Equity issues; is it really fair to pay subjects so little?

Kneeland (2015)

Why:

- Example of a clever methodology for a big problem in choice-based studies

- Use of epistemic types in empirical work

- How many steps of higher-order belief in rationality are there?

- **Without** making unreasonably strong **assumptions**

Inference from Choice Data

Two ways to check rationality assumptions:

1. Elicit beliefs and choices, and see if choices are best response to beliefs

   • Problem: Doesn't really work for higher-order beliefs

2. Measure rationality directly from choice data

   • Requires a **structural model** (**why?**)

   • What if the model is too strong?

Choices in Bimatrix Games

- Two players of a bimatrix game are each others' opponents

- That means that it's hard to distinguish low-order beliefs from high-order beliefs (**why?**)

- Solution: ring games

  - Each player is the opponent of the next player

  - So each **level of reasoning** is thinking about a **different player**

Identification Strategy

- Player 4 has a dominant strategy, Player 3 has a best response to player 4's dominant strategy, etc.

- Pairs of games that change only a single players' payoffs (to swap the dominant strategy)

  - Higher-order reasoners will spot the swap, lower-order reasoners will not

  - This is the natural exclusion restriction

  - **Question:** How is this weaker than a structural assumption?

- Players play all 4 roles in each of 2 games

Epistemic Types

- Each player has a set T_i of **epistemic types**

- Each type has a **belief** about the type of its opponents

- A **type** is **rational** if it maximizes expected utility relative to its beliefs

- A type is m^{th}-order rational if it satisfies m^{th}**-order rationality**

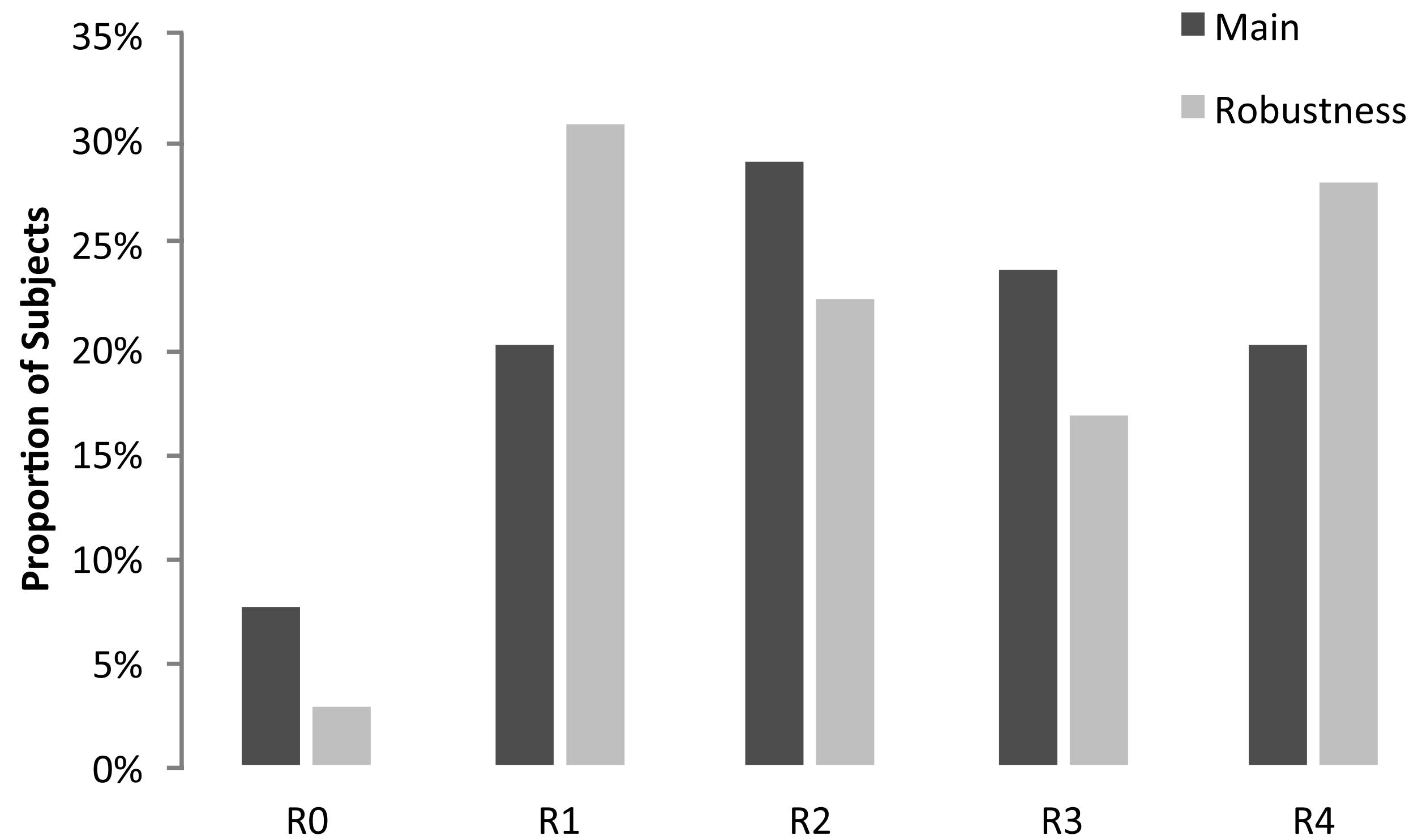- **Question:** Is this the same or different from the types we studied in Bayesian games?

Results

FIGURE 7.—Subjects classified by order of rationality, by treatment.