README

Manuscript title: Bargaining with Indivisibilities
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1. Overview

The package includes the following:
(1) five csv files to use for data analysis
(2) an xlsx file that includes the data in csv files in five tabs and the demographic answers (Tab Survey)
(3) two Rmd files that includes all R codes necessary to run the analyses
(4) a sample HTML file that was produced by the R codes with all figures, tables and test results

2. Data availability and provenance

This paper relies on data, and all data necessary to reproduce the results of the paper are included. Below is a detailed description of how the data was obtained, allowing to reproduce the dataset.

Data provenance description: data was collected from laboratory experiments from 178 subjects (university students). Eight experimental sessions, each lasting about 90 minutes, were conducted between January and July 2023, and October 2025.

3. Variable dictionaries

The Variable info tab of the xlsx file includes the below information.

Bargaining outcomes data (Bargaining.csv)
Session: Session date and time; 230127_1609: 2023/01/27 starting at 16:09
SessionID: Subject's unique ID in the overall experiment
SubjectID: Session number of the experiment (1 = 27/1/2023)
OpponentID: Opponent's unique ID in the overall experiment
Period: Round of the experiment (1 to 9; 0 is practice round)
Phase: Time a treatment appears (1 to 3; 0 is practice round)
Order987: Treatment order; 1=T9-8-7, 0=T7-8-9, 2=T4-T6
Subject: Subject/computer number within the same session
opponent: opponent in the period
unit_me: The assigned unit of the subject
unit_opponent: The assigned unit of the opponent
me_rb: Whether the subject is the RB
deal: Whether a deal was reached (1=yes)
money_me: The final allocated number of tokens to the subject
money_opponent: The final allocated number of tokens to the opponent

SVO_me: SVO measure for the subject
*SVOangle_me: SVO angle for the subject; Calculated SVO angle (svo_angle = atan((mean_to_other - center_of_circle)/(mean_to_self - center_of_circle))*180/pi)*
SVOcat_me: SVO category for the subject; 2 = prosocial, 3 = individualistic
SVO_opponent: SVO measure for the opponent
*SVOangle_opponent: SVO angle for the opponent; Calculated SVO angle (svo_angle = atan((mean_to_other - center_of_circle)/(mean_to_self - center_of_circle))*180/pi)*
SVOcat_opponent: SVO category for the opponent; 2 = prosocial, 3 = individualistic
Grouptype: Combination of RB and FB categories; group 23 = RB prosocial, FB individualistic
Alpha_me: Alpha of the subject
Alpha_opponent: Alpha of the opponent
Beta_me: Beta of the subject
Beta_opponent: Beta of the opponent
Group: Pair number (changing every round)
PlayerID: Player ID within each pair (1= flexible units; 2 = inflexible units)
quit: Whether the subject quit early (1=yes)
opponent_quit: Whether the opponent quit early (1=yes)
money_total: Total number of tokens to distribute
money_total_me: Maximum number of tokens the subject can get
money_total_opponent: Maximum number of tokens the opponent can get
gap: The gap in the final allocation between the 2 subjects (money_me - money_opponent)
deal_time: Number of seconds remaining when an agreement was reached
barg_time: Number of seconds bargaining; 180-deal_time
gender_me: Gender code of the subject; 1 = male, 0 = female, others
gender_opponent: Gender code of the opponent; 1 = male, 0 = female, others
gender2_me: Gender (texts) of the subject
gender2_opponent: Gender (texts) of the opponent
age_me: Age of the subject
age_opponent: Age of the opponent
major_me: Major of the subject; 1 = math intensive, 0 = others
major_opponent: Major of the opponent; 1 = math intensive, 0 = others

Proposals data (Proposals.csv)
Session: Session date and time; 230127_1609: 2023/01/27 starting at 16:09
SessionID: Session number of the experiment (1 = 27/1/2023)
Treatment: 7, 8 or 9
Period: Round of the experiment (1 to 9)
PeriodID: Unique ID of the period, 11 = session 1, period 1
GroupID: Unique ID of the group, 1107 = session 1, period 1, group 7
Groupie: Group within the same session
ProposalID: Unique ID of the proposal, 110701 = session 1, period 1, group 7, proposal 1
propose_money_me_me: The proposed number of tokens for the proposer
propose_money_opponent_me: The proposed number of tokens for the opponent
proposer: Identity of the proposer (in the same session)

ProposerID: Unique ID of the proposer
Proposaltime: Time of proposal (number of seconds left); 179 means the proposal was made at the 1st second and there are 179 seconds left
RB: SubjectID of the RB in the pair
FB: SubjectID of the FB in the pair
SVORB: SVO value of the RB
SVOtypeRB: SVO category of the RB; 2 = prosocial, 3 = individualistic
SVOFB: SVO value of the FB
SVOtypeFB: SVO category of the FB; 2 = prosocial, 3 = individualistic
Grouptype: Combination of RB and FB categories; group 23 = RB prosocial, FB individualistic
Bargainingtime: How many seconds it took to reach a deal
Deal: Whether the pair reach a deal
Payoff_RB: Payoff for RB of the round
Payoff_FB: Payoff for FB of the round
FB_proposer: Whether the proposal on this line is by the FB
NBS: Whether the proposal on this line is an NBS
memore: Whether the proposal on this line is gives the proposer more
ED: Whether the proposal on this line is an equal-division
KSS: Whether the proposal on this line is a KSS
SNBS: Whether the proposal on this line is a second-best NBS
Totalproposals: Total number of proposals for this pair (including the last agreement for deals)
Proposals_left: Number of proposals left including the current one (including the last agreement for deals)
First: Whether the proposal was the first
Agreetolast: Whether the "proposal" was just an agreement to the last proposal (clicking on the same cell); should be excluded in analysis of proposals
IsDeal: Whether the proposal matches the outcome
Last: Whether the proposal was the last

SVO data (SVO.csv)
Session: Session of the experiment (1 = 27/1/2023)
Subject: Subject/computer number within the same session
Profit: Final earnings in points, after reward determination
input_self[#]: Chosen payoff for self, made by the subject in a specific scenario #
input_other[#]: Chosen payoff for the matched recipient, made by the subject in a specific scenario #
chosen_option[#]: Chosen combination number, made by the subject in a specific scenario #
mean_to_self: Average number of points assigned to self by the subject
mean_to_other: Average number of points assigned to the matched recipient by the subject
SVO_parameter: SVO measure
svo_angle: SVO angle of the subject
svo_type: SVO categorization (altruist=1; prosocial=2; individualist=3; competitive=4)
svotypename: Name of SVO type
avgpay: Average pay in bargaining (not counting trial)

rbcount: Number of times as RB (not counting trial)
avg_dist_to_equality: Average distance to the equal division allocation
avg_dist_to_altruist: average distance to the altruistic allocation (maximum gain for the matched recipient)
avg_dist_to_joint: average distance to the allocation that maximizes joint gains
avg_dist_to_indiv: average distance to the individualistic allocation (maximum gain for self)
not_altru_indiv: The Inequality Aversion Score is only calculated for those who are closer to efficiency than to altruist or or equality than to individualist. This variable is to identify such subjects.
inequality_aversion_score: Inequality aversion score, 99 if score cannot be calculated.
payed_slider: The scenario # chosen to determine the reward for the subject as the sender
slider_as_receiver: The scenario # chosen to determine the reward for the subject as the recipient
kept_of_sender: The number of points kept by the matched sender
received_from_sender: The number of points received from the matched sender
my_sender: Subject number of the matched sender
kept_as_sender: The number of points kept by the subject
sent_as_sender: The number of points given to the matched recipient by the subject

IA data (IA.csv)
Session: Session of the experiment (1 = 27/1/2023)
SubjectID: Subject's unique ID in the overall experiment
Subject: Subject/computer number within the same session
Alpha: Alpha measure (envy)
Beta: Beta measure (guilt)
SVO_type: SVO type (in texts)
SVO_parameter: SVO measure of the subject
SVO_angle: SVO angle of the subject
Gender: Gender of the subject

Chat texts data (Chat texts.csv)
Session: Session of the experiment (1 = 27/1/2023)
Period: Round of the experiment (1 to 9; 0 is practice round)
ID: Player ID within each pair (1= flexible units; 2 = inflexible units)
Groupie: Pair number of the chat
Translation: Translation from Japanese to English (numbers written as texts, e.g "seven")
Translation2: Translation from Japanese to English (numbers written as numberi, e.g "7")
chattext: Chat content
Subject_chat: Subject number of the person sending the chat message
Time_ChatMessage: Number of seconds remaining when the chat was sent

4. **Computational requirements**

The code was run on R with the following packages:

For the main analysis (Indivisibility Data Analysis.rmd): tinytex, dplyr, tidyverse, lme4, stargazer, ggplot2, cowplot, ggpubr, psych, dplyr, car, ggpubr, vcd.

For the analysis of chat texts (Chat texts analysis.rmd): tinytex, dplyr, tidyverse, tm, SnowballC, wordcloud.

5. **Programs/Code**

The following code lines should be run in the order listed of the ***Indivisibility Data Analysis new.rmd*** *file. Which codes correspond to which figures and tables in the manuscripts are indicated in each chunk of the code.*

- *Data setup (required for all following figures and tables): lines 38-174*
- *Two-proportion Z-test: lines 175-179*
- *Figure 3: lines 181-302*
- *Table 2: lines 304-532*
- *Figure 4: lines 535-753*

- *Regression setup (required for all following figures and tables): lines 755-773*
- *Table 4: lines 776-812*
- *Table B.1: lines 816-849*
- *Table B.2: lines 852-890*

SVO data:

- *Table 3 (SVO part): lines 894-913*
- *Figure 5: lines 915-920*
- *Correlation test for SVO and genders: lines 922-932*

IA data

- *Data setup: lines 934-956*
- *Figure A.4: lines 958-967*
- *Table 3 (IA part): lines 969-975*
- *Correlation test for SVO and IA: lines 977-981*

Bargaining process

- *Table 5: lines 983-1562*

The entire code in ***Chat texts analysis.rmd*** *file is to construct Figure A.5.*