Preference over Resource Distributions in Intergenerational Dilemmas

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Intergenerational dilemmas and Sequential dictator games

Intergenerational dilemmas

- Climate change and other problems related to temporally diffused goods represent *integenerational dilemmas*
- Gardiner (2011) identifies the peculiar elements of these phenomena: sequential structure, causal asymmetry, ...
- He suggests the adoption of the traditional prisoner dilemma (PD) framework to capture the interaction between generations

Our contribution

- We use a **dictator game** (DG) framework (instead of PD) to remove reciprocity
- and we introduce a **sequential structure**

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Intergenerational dilemmas and Sequential dictator games

Information manipulation

- We focus on the effect of *information* on the action of the dictator player

Two manipulations of information

- **Forward-looking** manipulation: the action of player i (dictator) will be revealed to player $i + 1$ (receiver)
- **Backward-looking** manipulation: before choosing, player i (new dictator) observes the action of player $i - 1$ (previous dictator)
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Literature /1

International treaties

- Barrett & Dannenberg (2012, 2014), Milinski et al. (2008)
- Static public good games
- Relevant but complementary approach to the topic

Access to resources

- Hauser et al. (2014) "Cooperating with the future"
- Mixture of public good and intergenerational availability
- Focus on the outcome of different voting systems, no incentives

Temporally diffused goods (theoretical)

- Rangel (2000) Forward and backward intergenerational goods
- Tradeoff between present cost and future benefits

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Variations on the dictator game

- Cason & Mui (1998)
- Social influence in the SDG (two dictators observe each other)
- Fehr, Fischbacher & Tougarova (2002)
- Fair wage (gift-exchange market)

Social norm

- Falk, Fehr & Zehnder (2006)
- Long lasting effect of minimum wage on reservation wages
- Effects of the policy on the perception of fairness

Based on extensive research, nothing is close to our design.

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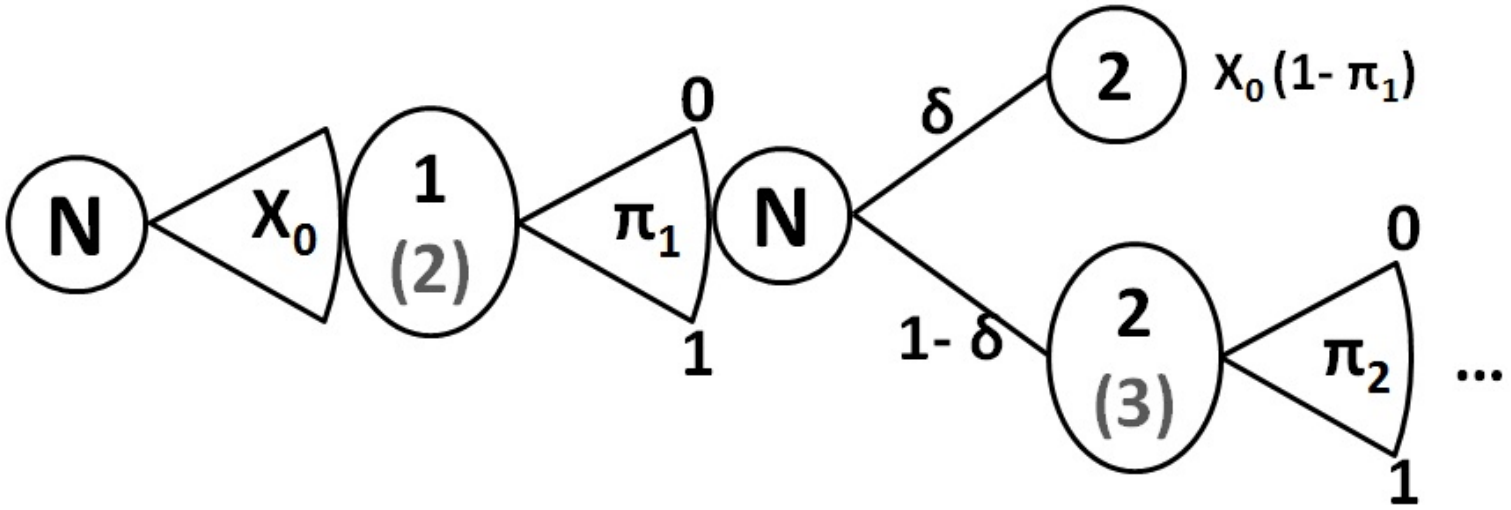
Sequential Dictator Game - Extensive form



- Nature (N) determines initial endowment x_0 and game's end
- Every active participant i receives the selected fraction π_i of the available endowment x_{i-1} and passes the rest to future players
- After each round, the game ends with probability δ
- The last receiver players gets all the rest of the endowment

Sequential Dictator Game - Extensive form

- All the endowment is allocated: no efficiency concern
- This is not a trust game: no role of risk/trust between dictator and receiver
- BUT current dictator beliefs about future dictators play a role (Mark and Pietro's result in mega-correlation table)

- Are we testing preferences over resource distributions? No.
- In order to do so we should offer the dictator a menu of "final" allocations (without sequential interaction)

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Experimental design

Task: select the percentage of endowment to keep (0%,5%,...,100%)

Displayed information

- Current round
- Available endowment, expressed in dollars

Two types of session (information manipulation)

- **History** (H): dictator player i observes the initial endowment x_0 and the anonymous actions of dictators $1, 2, \ldots, i-1$
- **No History** (NH): no additional information

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Experimental design

	Treatment		
	DG	**SDG (High)**	**SDG (Low)**
P(end)	$\delta = 1$	$\delta = 0.5$	$\delta = 0.33$
Avg # of rounds	2	3	4
P(truncation)	0	<0.2%	2.6%
Initial endowment	\$0 - \$16	\$0 - \$24	\$0 - \$32
Trials	20	20	20

Table: Differences between treatments (both sessions).

- DG: run all choices first, then observe the amounts received
- SDG (high and low): always observe the amount received
- Relevant for the analysis (more in a few slides)

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Experimental design

- Number of subjects
  - 10 subjects per session
  - Flexible number (now the code works smoothly)
- Number of trials (tentative)
  - 20 trials per treatment
  - Total time ∼one hour
- Payment structure
  - $ 10 show up fee
  - One rewarded trial per treatment (3 rewards)
  - Average total payment: $ 22
  - Constant expected reward per treatment: $ 4

Pie example (DG) - Used in the instructions

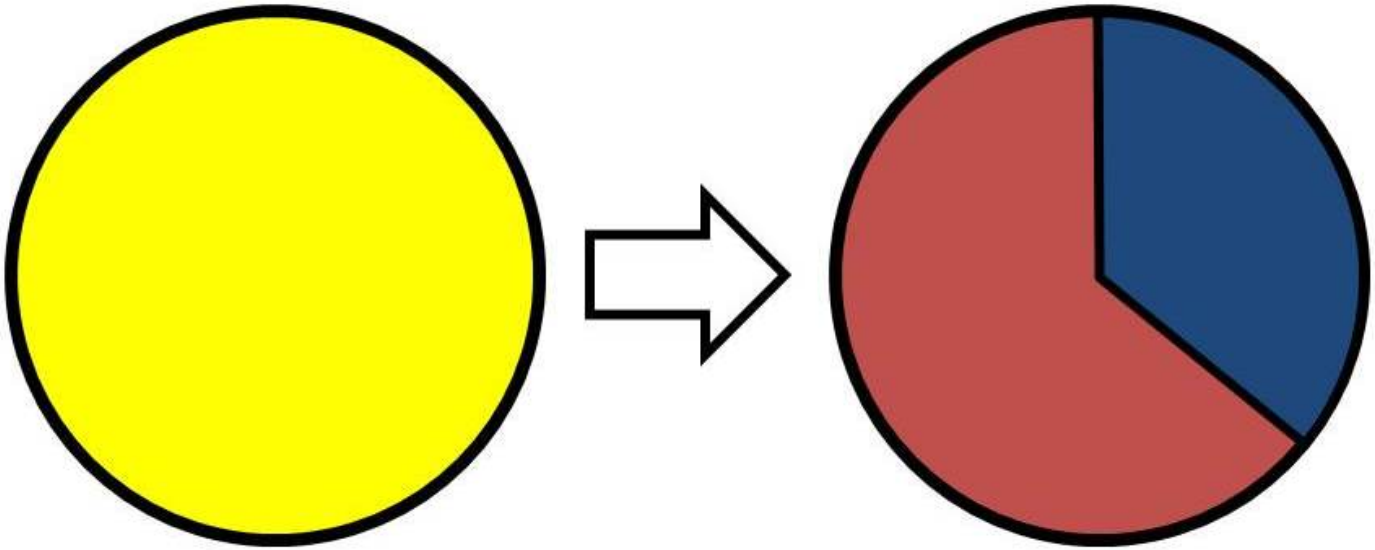

Figure: In the basic DG framework the endowment is divided between the dictator and the receiver

Pie example (SDG)

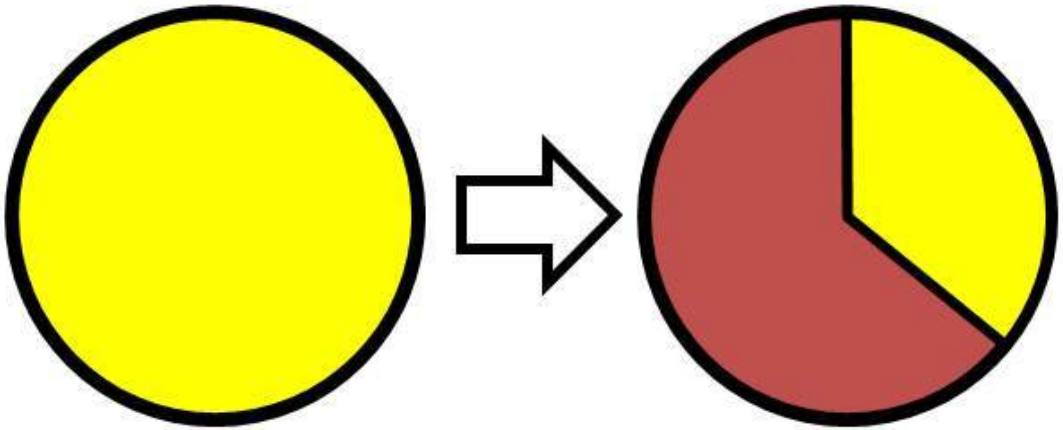

Figure: After each round there is a 50% probability of ending the sequence. If not, the receiver becomes the dictator during the following round.

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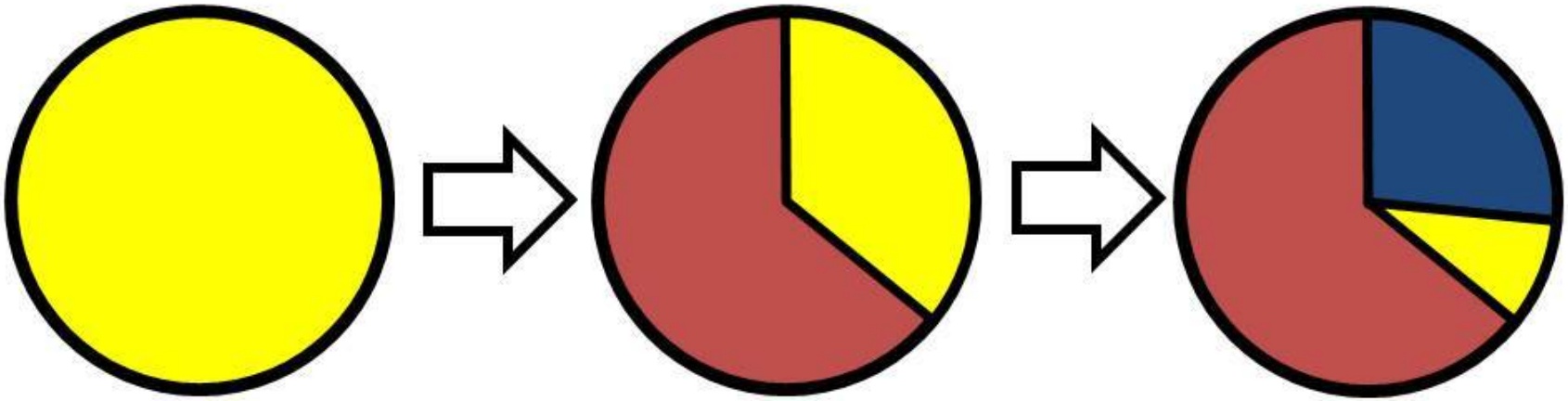

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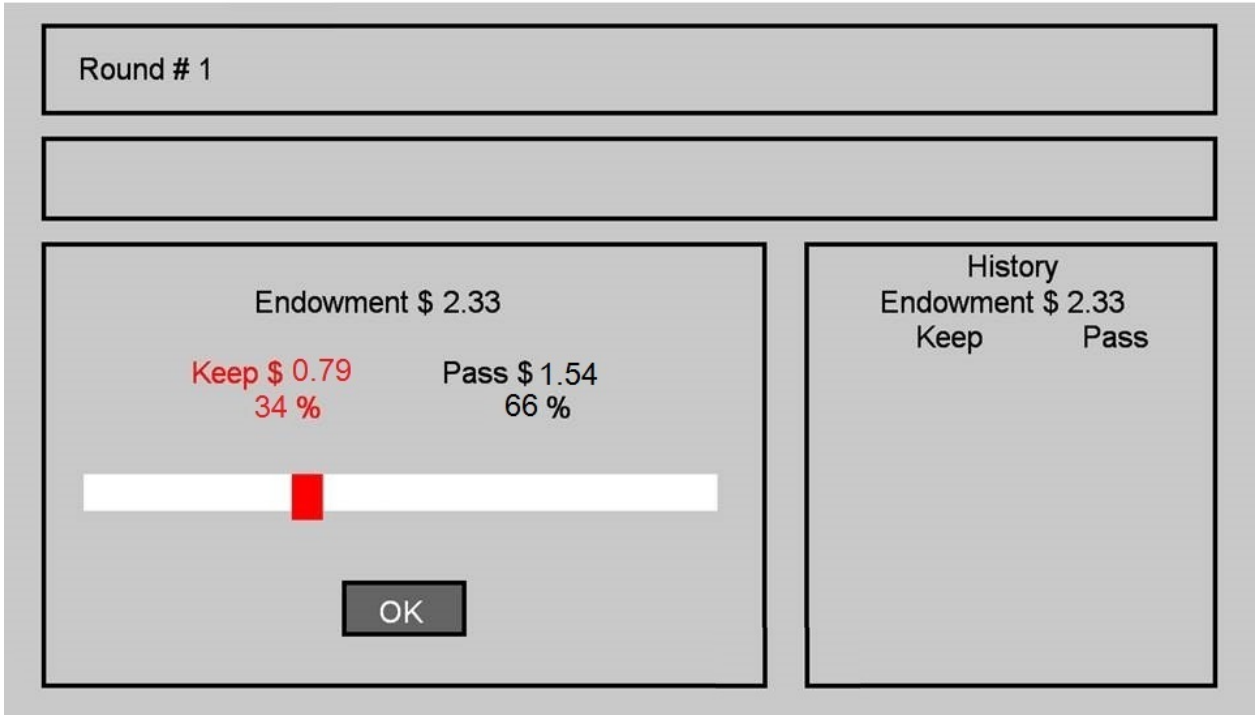
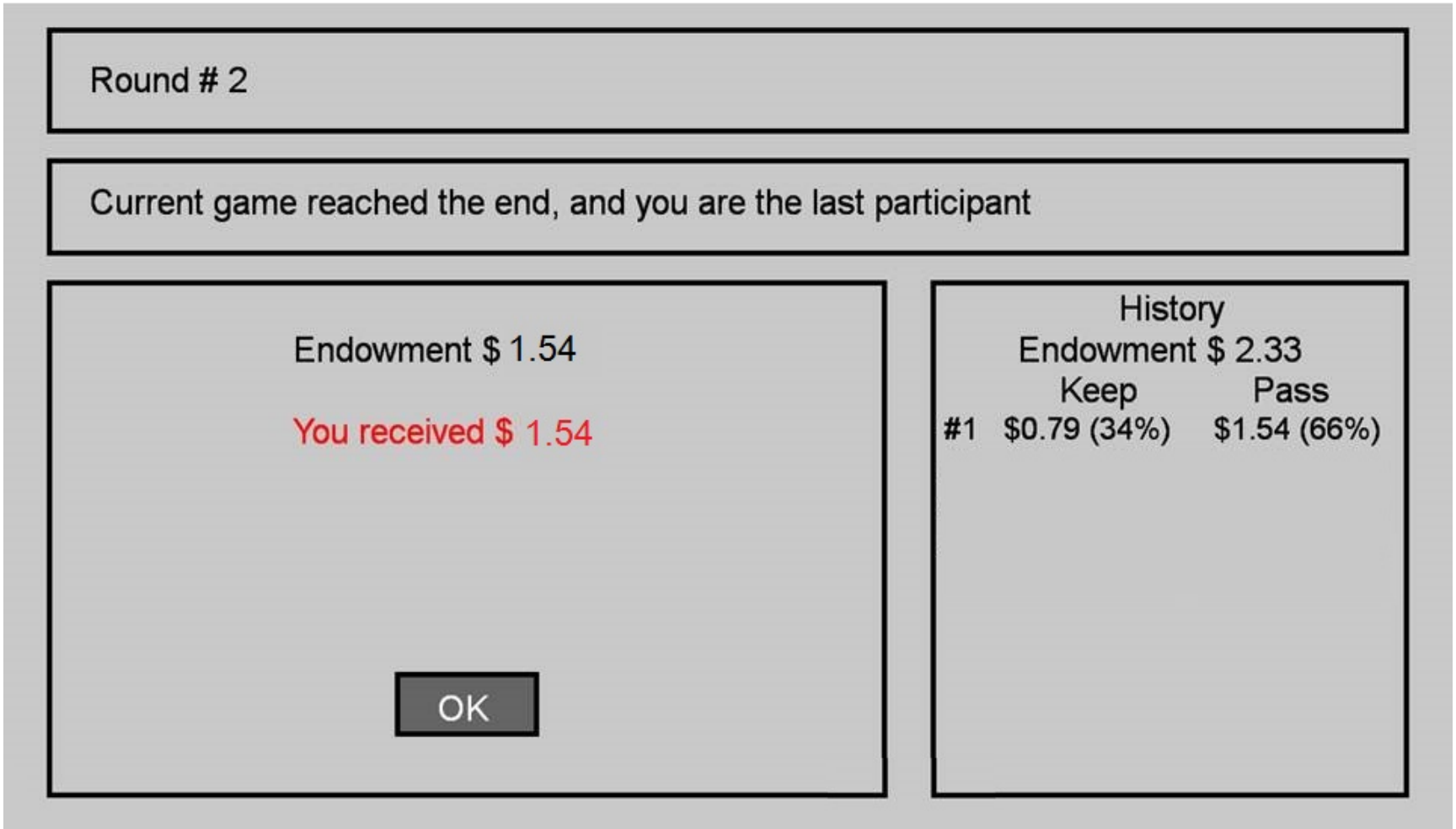
User interface: Round 1



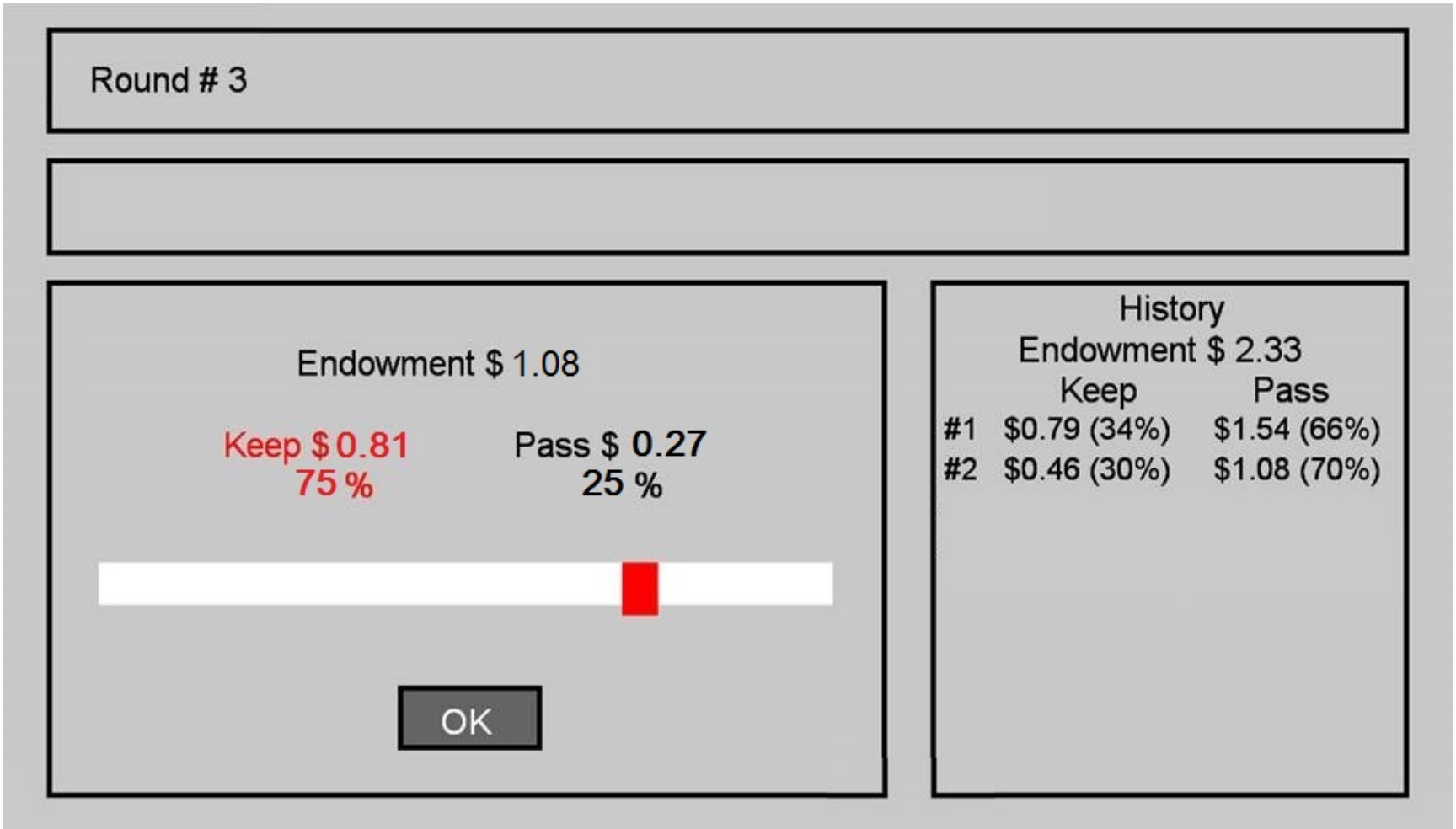
DISCLAIMER: THESE ARE THE OLD SCREENSHOTS. SORRY!

- All the text is black
- Kept amount is staggered: 0%, 5%, 10%, ..., 100%
- Keep and Pass values are now flipped

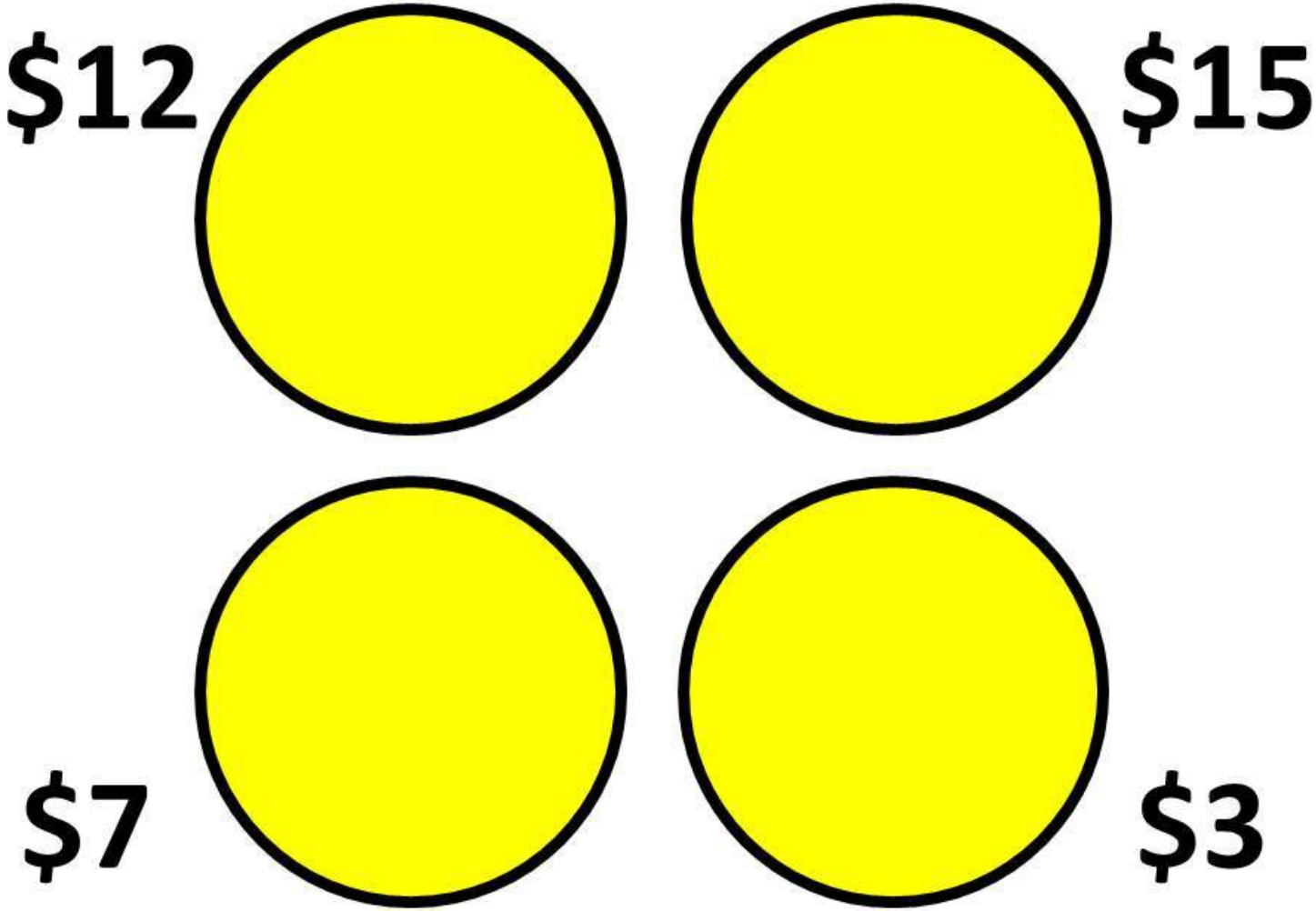
User interface: SDG, Round 2 (end), History session



User interface: SDG, Round 3 (action), History session



Simultaneous games in the lab



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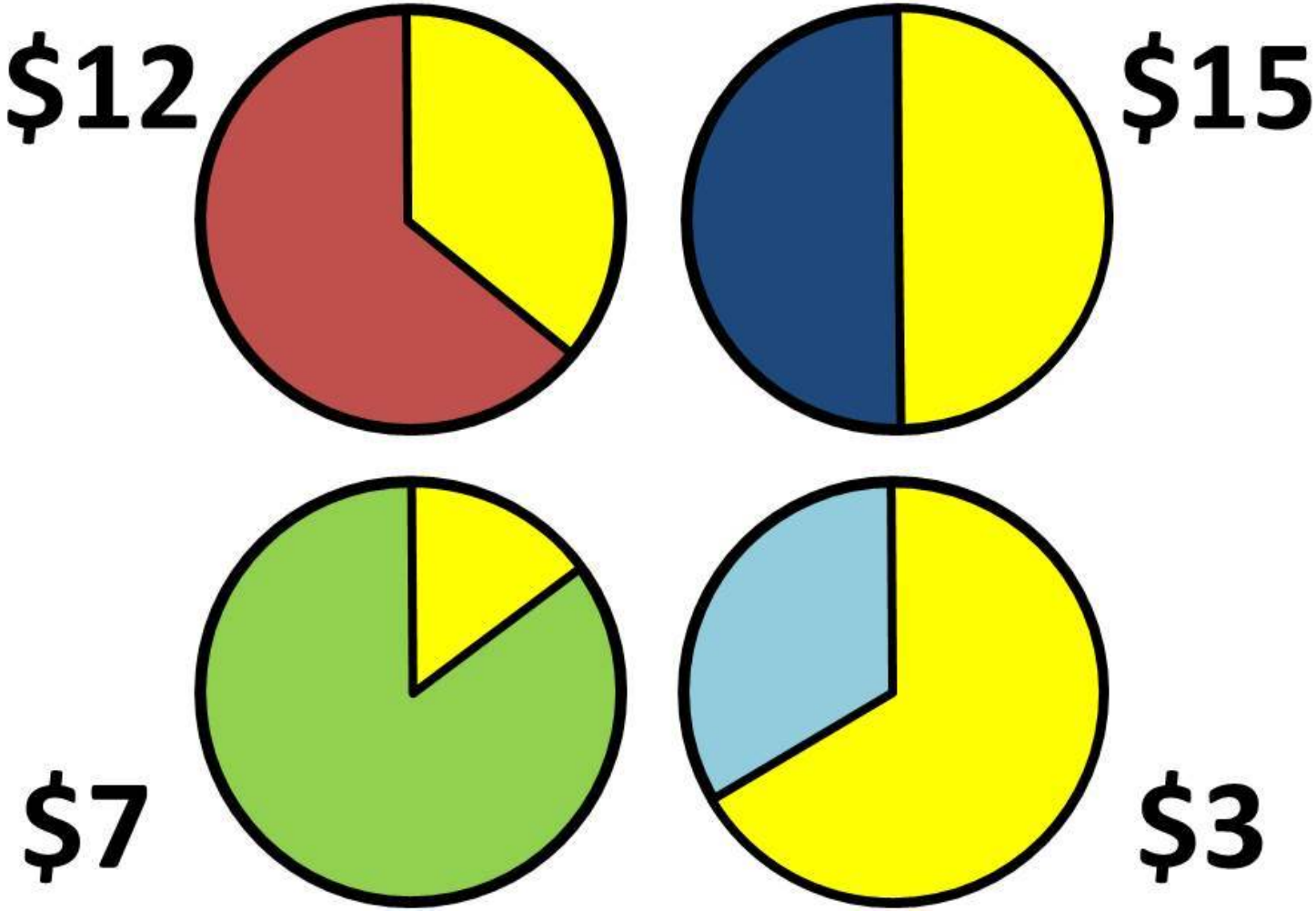

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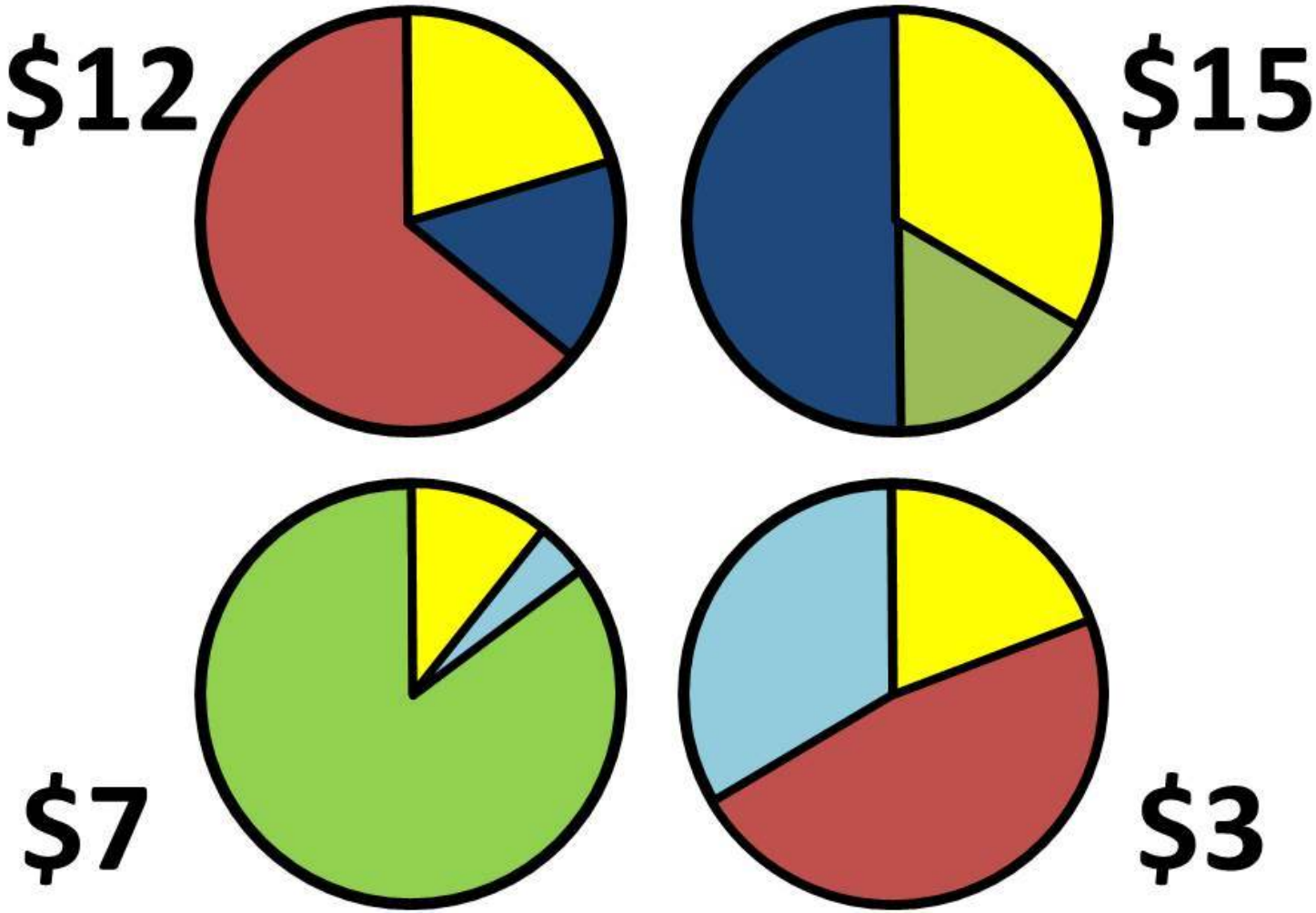

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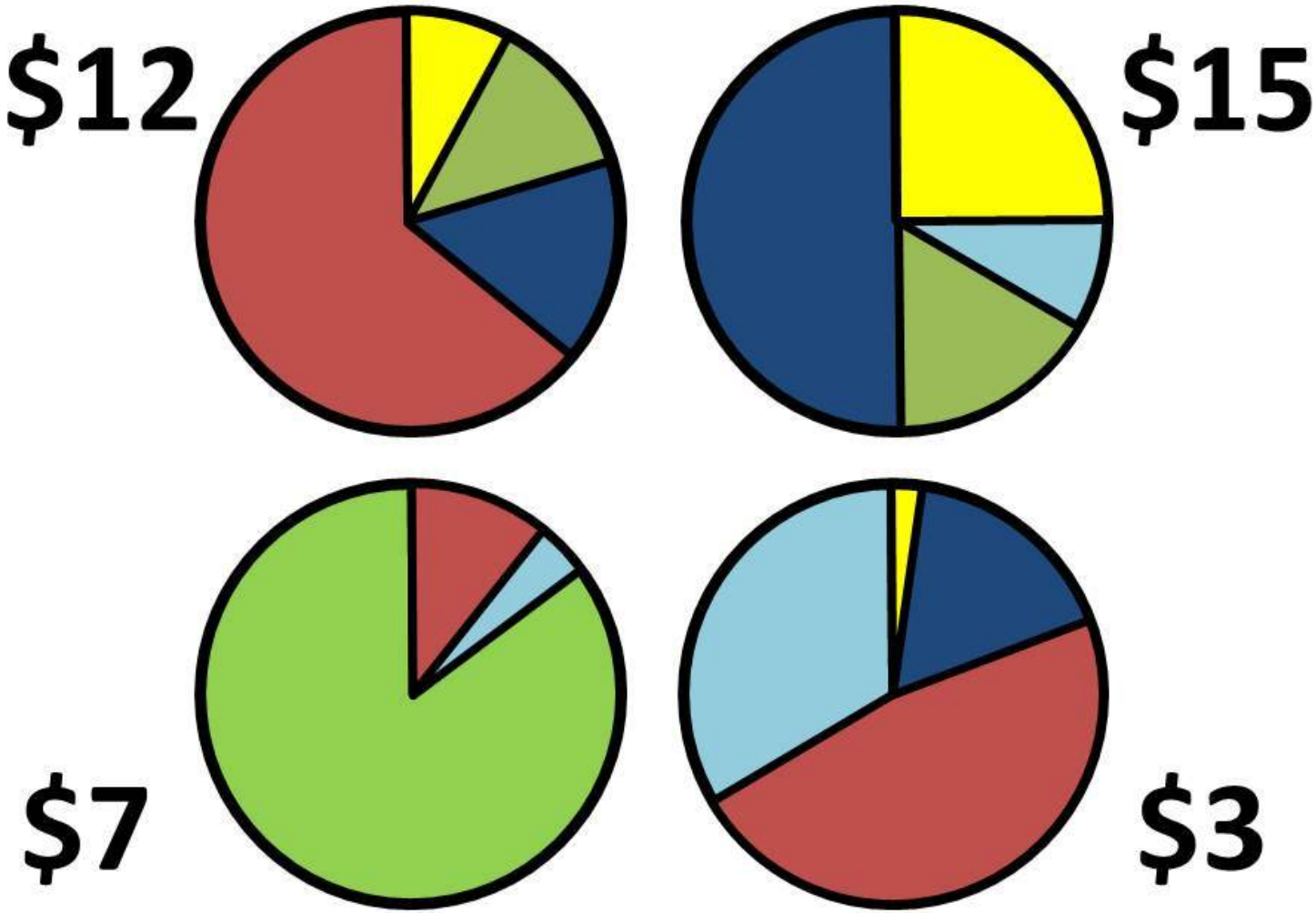

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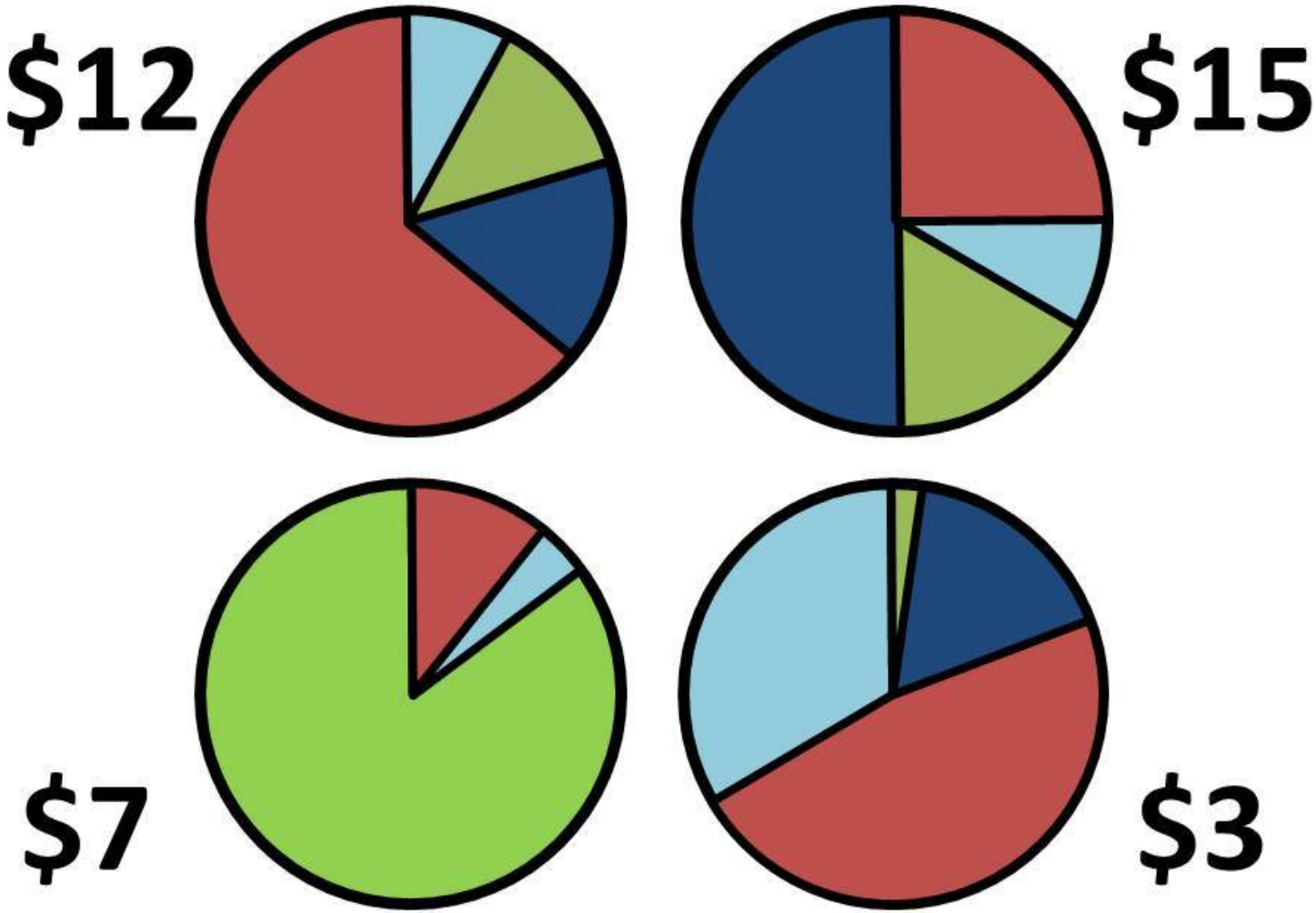

Simultaneous games in the lab

- Get as much data as possible in one hour, avoid boredom
- But this could be confusing: cross-game spillovers
- Feedback from pilot session: history was not salient

- **SOLUTION: display past history round by round**
- History gradually appears at the center of the screen
- Participants are "nudged" to pay attention to it

- **CALL TO ARMS**: collect feedback about this new interface
- Goal: organize a new pilot session next week

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Pilot session

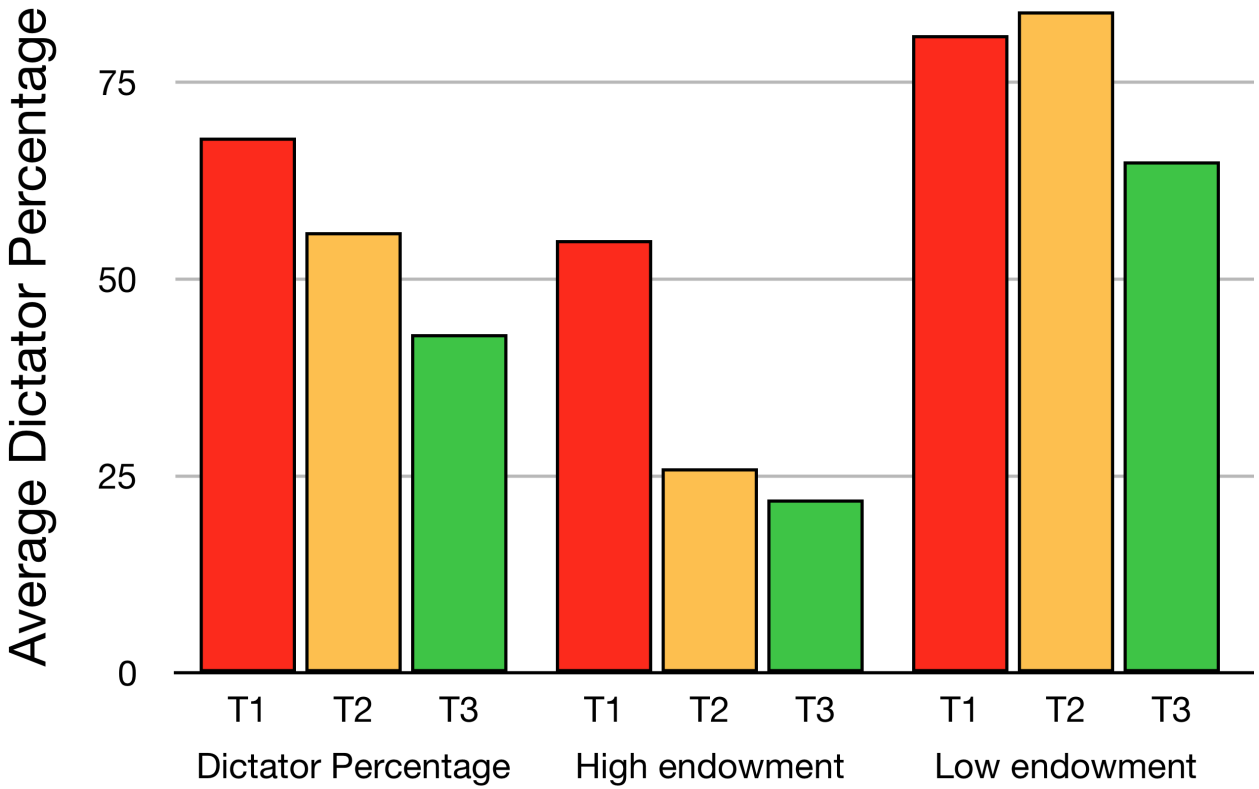

Figure: Average percentage of endowment kept by the dictator player (pilot session). T1=DG, T2=SDG(low δ), T3=SDG(high δ). Display trials separated based on endowment above or below median.

Pilot session

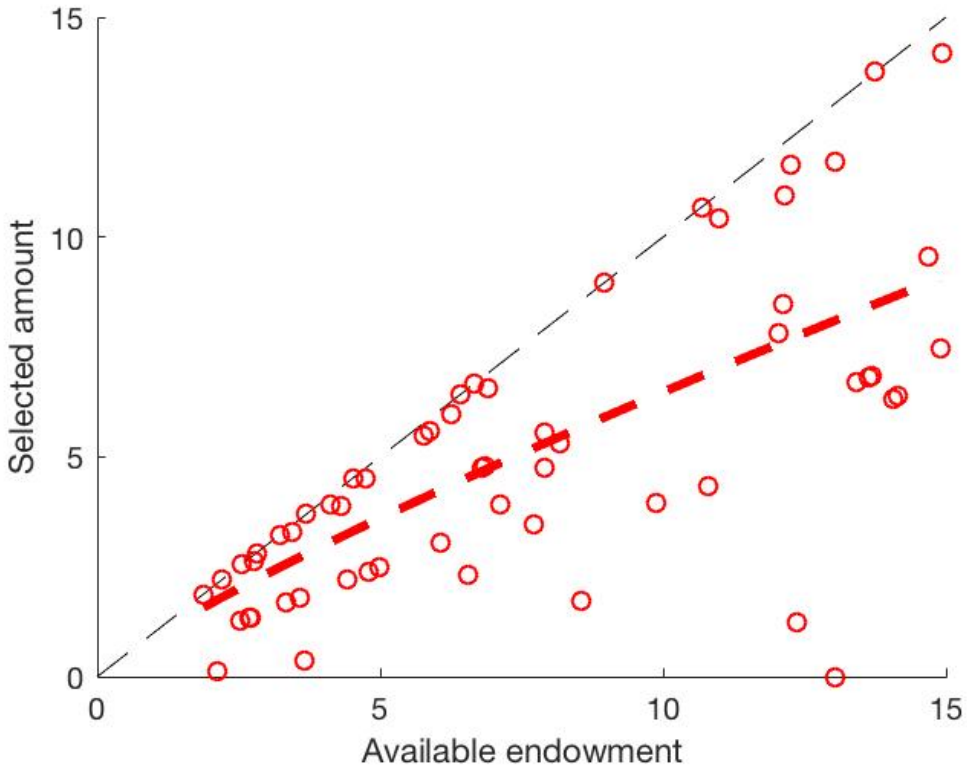

Figure: Fitting curve $\hat{p} = \hat{\beta} \cdot x^{\hat{\alpha}} = 0.925 \cdot x^{0.845}$.

DG treatment: Average selected percentage 68.33, Average std 11.25

Pilot session

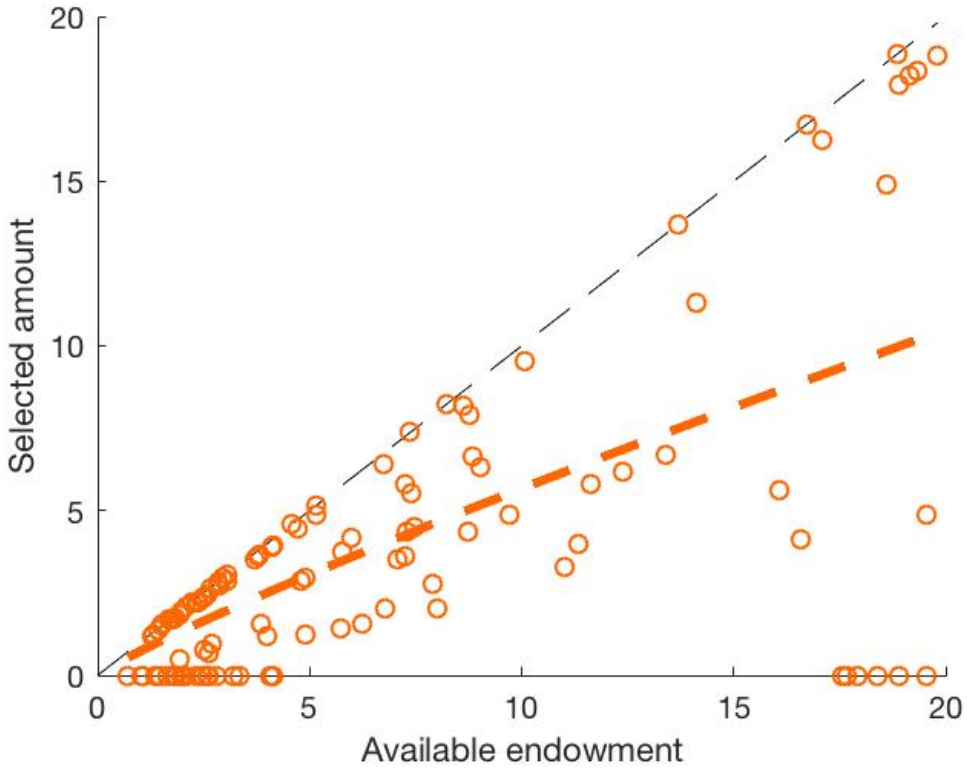

Figure: Fitting curve $\hat{p} = \hat{\beta} \cdot x^{\hat{\alpha}} = 0.73 \cdot x^{0.89}$.

SDG $\delta = 0.5$: Average selected percentage 52.08, Average std 32.19

Pilot session

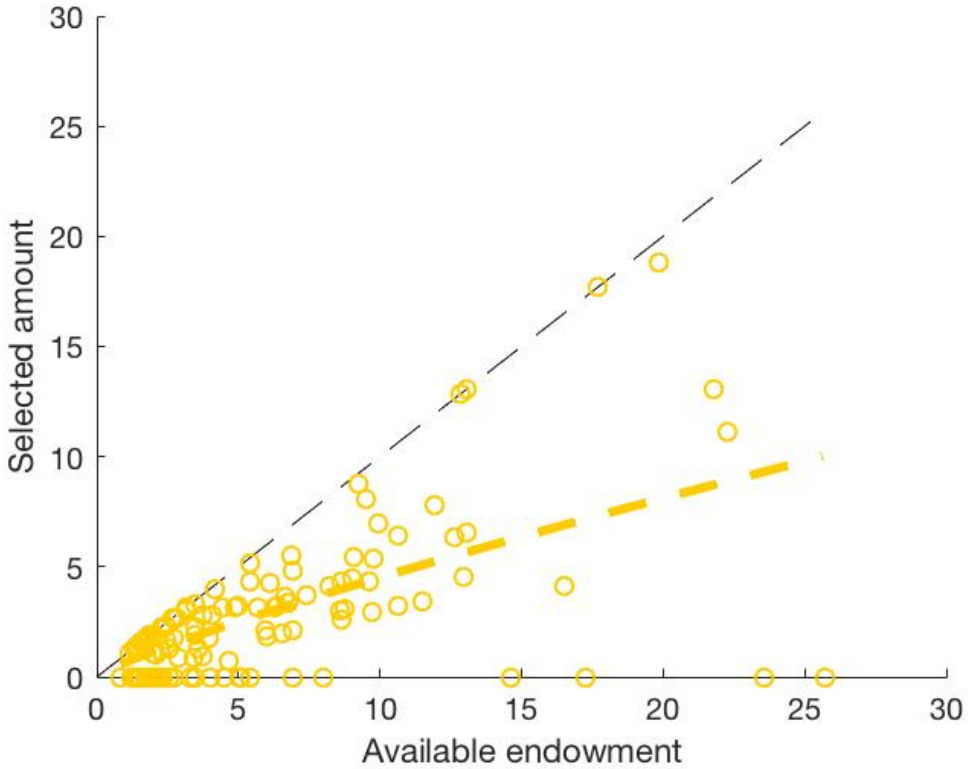

Figure: Fitting curve $\hat{p} = \hat{\beta} \cdot x^{\hat{\alpha}} = 0.645 \cdot x^{0.845}$.

SDG $\delta = 0.33$: Average selected percentage 43.07, Average std 33.78

Pilot session

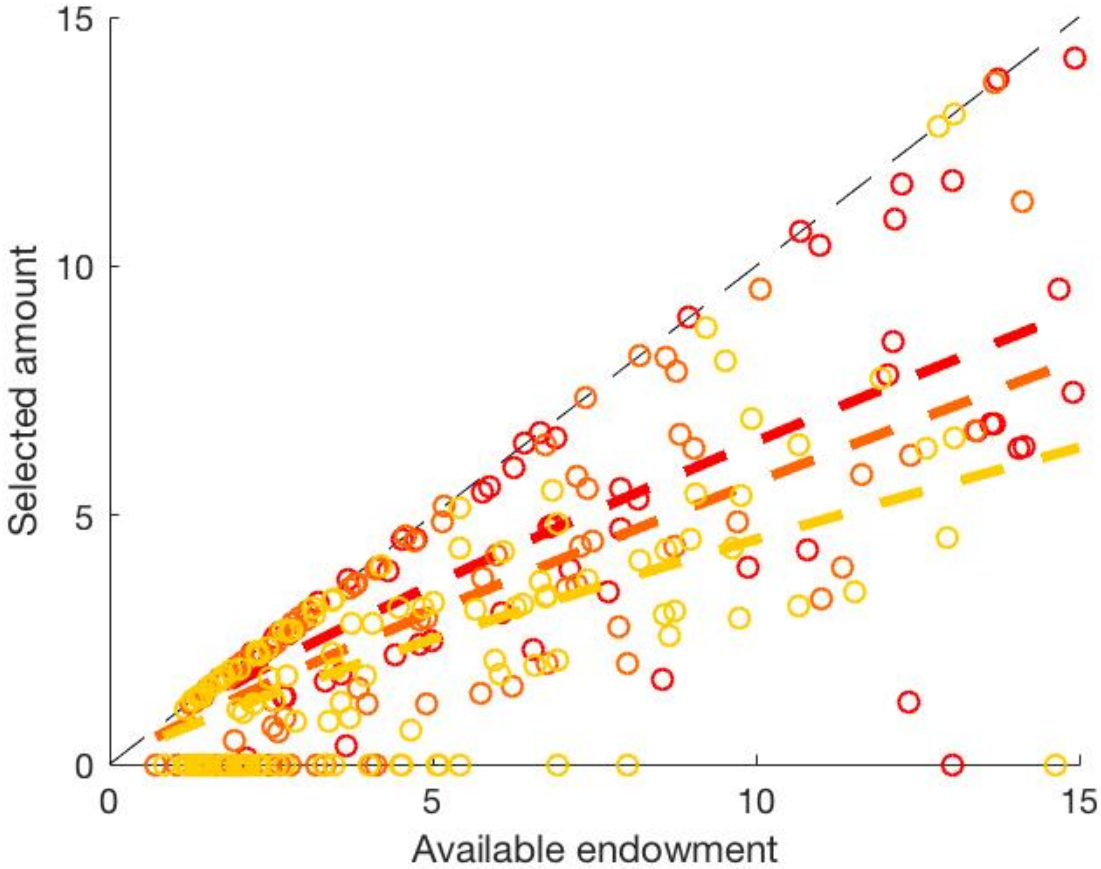

Figure: Red: DG treatment, Orange: SDG $\delta = 0.5$, Yellow: SDG $\delta = 0.33$.

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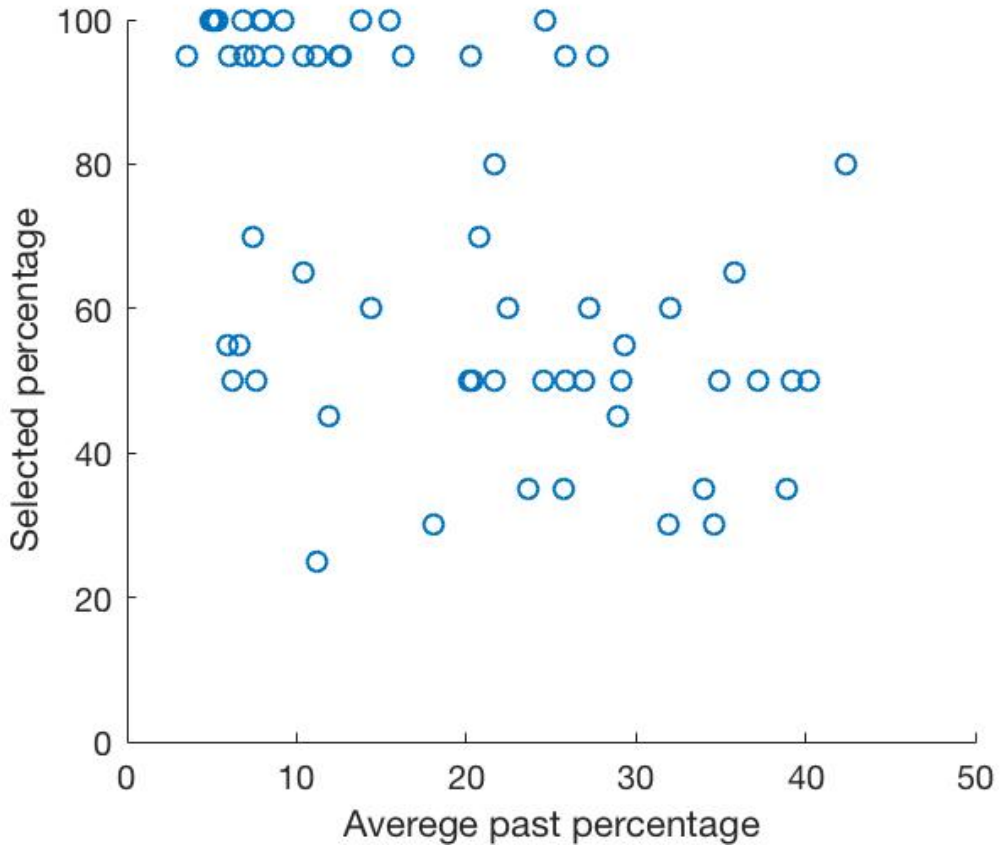

Figure: Relation between average history (x-axis) and dictator behavior (y-axis) in the SDG trials (pilot session).

Analysis: what to do next

In the decision process, there are (up to) three components

- $p_1^i = \pi_1^i \cdot x_i$ *baseline* dictator component (no manipulation)
- p_2 forward-looking component (leadership effect)
- p_3 backward-looking component (social norm)

Let's make some assumptions:

- $p_1^i = \beta x_i^\alpha$, with $0 < \beta \leq 1$ and $0 < \alpha \leq 1$
- $p_2 = \frac{1}{(1/\delta)+1} x_i$, i.e. equal division of endowment
- $p_3 = \pi_3 \cdot x_i = \bar{\pi}_{past\ rounds} \cdot x_i$, i.e. average past percentage

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Analysis

Assume linearity: action as weighted average of the components
Assume consistency of weights across treatments (but not α and β)

$$p^i = \underbrace{(1 - w_2 - w_3) \cdot p_1^i}_{\text{baseline dictator}} + \underbrace{w_2 \cdot p_2}_{\text{leadership}} + \underbrace{w_3 \cdot p_3}_{\text{social norm}}$$

We want to estimate the weights w_2 and w_3: magnitude of info manipulation effect

All tasks, all rounds, NH session	$p^i = p_1^i$
Task 1, Task 2,3 (round 1 only), H	$p^i = (1\text{-}w_2)p_1^i + w_2 p_2$
Task 2,3 (round ≥ 2), H	$p^i = (1\text{-}w_2\text{-}w_3)p_1^i + w_2 p_2 + w_3 p_3$

Random assignment of participants to the sessions

Analysis

- Compare the distributions of actions in the first treatment DG
- H and NH sessions differ only in the forward-looking component (leadership effect)
- Under the assumptions above, random assignment rule guarantees that, with enough subjects, the joint distribution of α and β is the same across sessions
- We can add a further assumption about the relation between αs and βs across treatments (constant ratio ρ between rewards for future players [to estimate])
  - Estimated partition p_i, p_{-i} in DG
  - Maintain ratio $\frac{p_i}{p_{-i}}$ between dictator and first receiver
  - And constant ratio $\rho = \frac{p_{n>i}}{p_{n+1}}$
  - Standardize to sum up to the available endowment

Within subject analysis: hypothesis

Selfish dictator

- The dictator always keeps all the endowment
- Estimated parameters $\hat{\alpha} = \hat{\beta} = 1$

One-generation altruism

- The dictator only considers the immediately following player
- Estimated parameters constant across treatments

Multi-generation altruism

- The dictator includes the distribution of number of subsequent players in the sequence
- $\hat{\alpha}$ and/or $\hat{\beta}$ increasing in δ

Between subject analysis: hypothesis

Disentangle Multi-generation / Forward-looking hypothesis

- The fraction of endowment selected by the dictator is decreasing in the expected number of players
- First effect in the NH session
- Both effects in the H session (feedback)

Backward-looking hypothesis

- Assume participants are not Bayesian: in the NH session they do not adjust beliefs about past actions based on current endowment
- B-L effect captures the social norm (average past action)
- Alternative hypothesis: look at the last action only

Summary

- Experimental design for the sequential dictator game (SDG)
- Agents interact sequentially and cannot reciprocate
- Within subject analysis: different expected number of players
- Between subjects analysis: different information manipulation
- We want to estimate the effects of these manipulations
  - Forward-looking: “anonymous reputation”
  - Backward-looking: creation of a social norm

Critiques and suggestions from previous presentation

- **Alessandra's critique**
- Role of beliefs about future dictators' actions
- Add random or known default action for future rounds

- **Mark's critique**
- Double treatment: forward and backward-looking manipulations are simultaneous
- Solved by delaying feedback in the DG treatment?
- Focus on backward manipulation: create a counterfactual inside the session

- **Judd's solution**
- Create a counterfactual OUTSIDE the session (session zero)