Intergenerational democracy for sustainable water allocation

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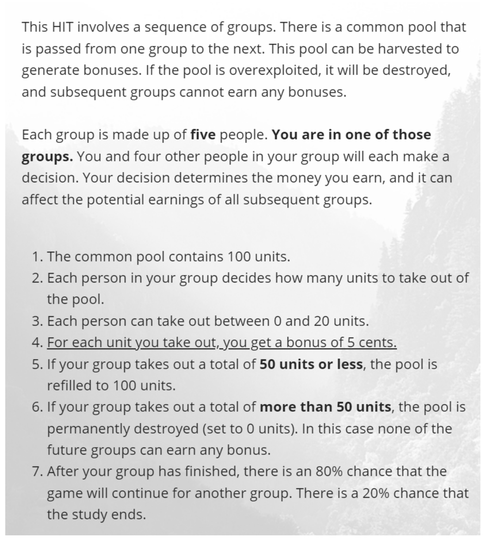
Introduction

- My research question is how different institutional rules and voter composition from different generations lead individuals to conserve surface water resources, leaving enough to provide for the next generation.
- To answer this question, my research project extends the intergenerational good game (IGG) framework for understanding possible intergenerational cooperation among overlapping generations.
- Designing online laboratory experiments, I explored four different institution setups: (1) unregulated without overlapping generations (2) baseline voting without overlapping generations (3) unregulated with overlapping generations (4) baseline voting overlapping generations.
- With data collected from the experiments, I investigate how group decision rules and voter compositions from different generation alter the extent of cooperation to promote sustainable resource allocations.

Experiment Design

- I designed the IGG online experiment on Qualtrics and deployed it on the CloudResearch platform. Amazon Mechanical Turk (Mturk) was linked to CloudResearch that provides an intuitively designed interface for online experiments and ensures the quality of MTurk workers.
- The experiment collected responses from Mturk workers between May 17, 2022 and May 29, 2022.
- Each worker had to take a comprehension quiz before entering one of the four online IGG games (institution setups). If they failed to answer all three questions correctly, the game ends and the participant only received a show-up fee of $.50.
- Once a worker passed the comprehensive quiz, they played a game (that was randomly assigned by Qualtrics among four games) and answered a demographic survey before they left the game. Depending on their performance in the task, a bonus payment ranged between $0.00 and $2.00.
- For example, the unregulated IGG without overlapping generations displayed the following page of instruction to the participants.



This HIT involves a sequence of groups. There is a common pool that is passed from one group to the next. This pool can be harvested to generate bonuses. If the pool is overexploited, it will be destroyed, and subsequent groups cannot earn any bonuses.

Each group is made up of **five** people. **You are in one of those groups.** You and four other people in your group will each make a decision. Your decision determines the money you earn, and it can affect the potential earnings of all subsequent groups.

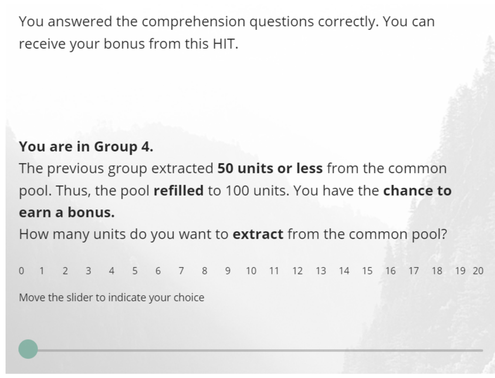
1. The common pool contains 100 units.
2. Each person in your group decides how many units to take out of the pool.
3. Each person can take out between 0 and 20 units.
4. For each unit you take out, you get a bonus of 5 cents.
5. If your group takes out a total of **50 units or less**, the pool is refilled to 100 units.
6. If your group takes out a total of **more than 50 units**, the pool is permanently destroyed (set to 0 units). In this case none of the future groups can earn any bonus.
7. After your group has finished, there is an 80% chance that the game will continue for another group. There is a 20% chance that the study ends.

Analytical Methods

- I conduct a set of computer simulations using the data generated by the MTurk participants. Since all subjects in a given condition received the same set of information and therefore made decisions which are effectively interchangeable. Thus in each simulation run, I randomly sample (with replacement) a series of generations of participant decisions, and calculate the fraction of those generations in which the pool was refilled. Using this procedure, I first simulated 10,000 pools out to 15 generations for (1) unregulated without overlapping generations (2) baseline voting without overlapping generations (3) unregulated with overlapping generations (4) baseline voting overlapping generations.
- To examine the effect of a treatment, I use a linear probability model taking (1) unregulated as the baseline and estimate the proportion of pools sustained including dummies for each other condition.

Example of an IGG Display

- Individuals who passed the comprehensive quiz were directed to participate one of four IGG.
- For example, in the unregulated IGG without overlapping generations, a participant was required to answer the following question:



You answered the comprehension questions correctly. You can receive your bonus from this HIT.

You are in Group 4.
The previous group extracted **50 units or less** from the common pool. Thus, the pool **refilled** to 100 units. You have the **chance to earn a bonus.**
How many units do you want to **extract** from the common pool?

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Move the slider to indicate your choice

Results

- I employed 2500 Mturk workers. The passage rate of the comprehension quiz was 81%, which guarantees 2,021 complete responses. Thus, each institutional setup has at least 500 complete responses. The key results are displayed in the table below.
- The results confirm that (2) baseline voting is dramatically more successful at sustaining the pool than (1) unregulated conditions. More strikingly, (3) overlapping generations unregulated condition is successful at sustaining the pool, whose first stage decisions are close to condition (2). Thus, (4) voting with overlapping generation condition is the most successful at sustaining the pool, implying that implementation of a democratic voting system and fair voter composition is important for sustainable resource management.

Institutional Setup		Mean	Standard Deviation	Count
Unregulated, one period participation		9.73	4.75	505
Baseline voting, one period participation		8.43	4.27	503
Unregulated, overlapping generations	First period	8.64	3.97	515
	Second period	9.18	4.57	515
Baseline voting, overlapping generations	First period	7.88	3.48	505
	Second period	8.65	4.32	505

Key Findings

- Different age or generation groups have voting rights in the current issues. Young voters have stake in the future resource availability while they can participate in the legislation in the current time. Therefore, understanding the impact of overlapping generations on group decision-making outcomes is important for policy design.
- My results are two-folds:

(1) a democratic decision-making system promotes sustainable resource allocations over multiple generations

(2) a representation of the future generations in the group decision-making system promotes sustainable resource allocations.

Future Direction of Work

- To understand individual's decision making, I plan to conduct a series of regressions using demographic data of the experiment participants generated at the exit survey.
- The empirical data will be used to evaluate the economic theory models that I formulate to explain the predicted behavior.

References

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