Online Appendices for

Climate policies under collective risk:
A laboratory investigation on the provision of local irrigation systems

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Contents

1 Instructions

Player ID: ____

Thank you for coming to this experiment.

Please turn off all electronic devices. Please do not talk during the experiment. If you have any questions, raise your hand and an experimenter will come to personally assist you.

You have earned $5 for showing up on time. If you follow the instructions carefully, you can add a considerable amount to these earnings. All earnings, including the show-up fee, will be paid to you privately in cash at the end of the experiment.

Each participant is assigned a unique player ID. This ID will stay the same for the entirety of the session and be used to identify your decisions. Note that all decisions you make in the experiment, your earnings as well as your personal data will be kept confidential and will be used for research purposes only. No individually identifiable information will appear in any published or unpublished work.

This experiment consists of two games and a survey, and lasts for about two and a half hours. You need to finish each game and the survey to proceed and receive payment. We will give you instructions for each part along the way. Your total payment today will be the sum of the $5 show-up fee, the earnings from each of the two games, and an additional payment of $2 for the survey.

Finally, all scenarios described in this experiment are for academic use only and do not necessarily represent thoughts, intentions, plans or strategies of any government.

Let me know if you have any questions. Otherwise, we will start Game 1.

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[1] In these instructions, participants enter the High risk block first in Game 1. Another set of instructions start with the Low risk block.

Game 1: Funding for an Irrigation Renovation

Overview

Imagine you are part of a group of wheat farmers in a small rural village that experiences drought from time to time. You and your fellow farmers rely on an irrigation system that provides water for your crops. However, the irrigation channels in your village built many years ago have decayed over time and can hardly be used any more. If the channels are not renovated, you will face losses when drought hits.

Your village government does not have sufficient funding for the renovation of irrigation channels, but it has established an irrigation renovation fund (IRF), to which farmers can voluntarily invest money. A minimum amount of funding is required to renovate the channels. If more than enough money is invested, the extra amount will be saved by the village for some future use, and thus will not be returned to you. If the minimum amount is not met, the channels will not be renovated and the farmers who invested will receive a full refund.

You will be randomly divided into two 6-person groups and your group will stay the same throughout game 1. Each group represents one village. You will interact only with the five participants in your group. You will not know exactly who your group members are, neither will they know who you are. You will face a total of six different scenarios, each for three rounds.
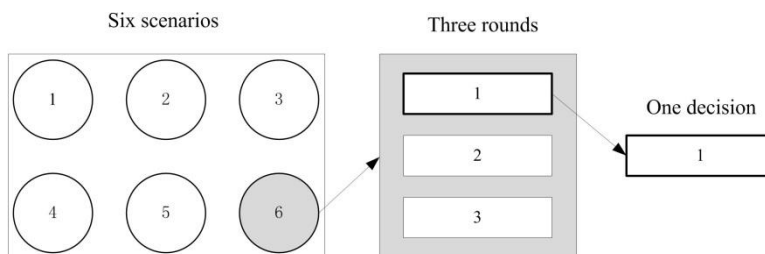

Fig 1. Scenarios, rounds and decisions

After you have finished, we will randomly select six rounds for payment, one from each scenario. Since any round might be selected for payment, it is important that you do your very best in every round. The total number of tokens you earn in these six rounds will be your earnings from Game 1. For each token you earn in Game 1, you will receive $0.20. We will describe how the payment round is selected at the end of the experiment.

Next we will give the instructions for one scenario, and the others will be similar.

Investment decision

At the beginning of each round, each farmer in your group will receive 20 tokens. You need to decide how many tokens (any integer from 0 to 20) to invest in the irrigation renovation fund (IRF). You will keep the rest as your personal income from crops. Tokens cannot be carried over across rounds.

Everybody makes their own decisions at the same time, without knowing the decisions of other participants. Remember you are not allowed to talk during the experiment.

Whether the irrigation system gets renovated depends on the total number of tokens in your group IRF.

1) If the total investment equals or exceeds 60 tokens, the irrigation channels in your village will be renovated, which will prevent your group from any personal income loss caused by drought. If more than 60 tokens are invested, the extra amount will not be returned to you.
2) If the total investment is less than 60 tokens, the channels will not be renovated, and your investment will be returned to you.

Note that each group is from a different village. Whether one village successfully renovates its irrigation channels has nothing to do with another. In other words, investment in your group's IRF will not be used to fund irrigation system for another group, nor will any other group's investment benefit your group.

Possibility of drought

After everyone has made their decision, a drought occurs with 75% chance.

There is a bingo cage with 8 balls, 6 red and 2 white. We will spin the cage until one ball drops out. If it is a red ball, then drought occurs. If it is a white ball, then there is no drought.

We will draw one ball each round, which means whether drought hits will apply to all groups in that round.

Round's earnings

At this point, we will calculate your earnings for the round. Your round's earnings depend on whether the irrigation channels in your village were renovated and whether drought hits.

1) If the irrigation channels in your village are renovated (your group's total investment is greater than or equal to 60 tokens), crops in your village are protected even if drought hits. Each farmer in your group earns the full amount after their investment.

   Your earnings = 20 – # of tokens you invested to the IRF

2) If the irrigation channels in your village were not renovated (your group's total investment is less than 60 tokens), crops in your village are under threat.
   a. If drought hits, crops in your village are destroyed. All farmers in your group lose everything.

   Your earnings = 0 tokens

   b. If drought does not hit, crops in your village are not harmed. All farmers in your group keep their 20-token personal income.

   Your earnings = 20 tokens

Table 1 Your round's earnings

	Drought hits	**No drought**
Renovated	20 - # of tokens you invested to the IRF	20 - # of tokens you invested to the IRF
Not renovated	0 tokens	20 tokens

We will show you privately total investment of your group, whether channels in your village are renovated or not, whether drought hits and your earnings for the round. After that, a new round will begin and things start over. You need to make a new investment decision. Remember you are still in the same group, but you are free to change your decision from last round. Your earnings in one round will not be affected by your decision in another round.

We now give two examples to help you better understand the game.

Example 1:

- Suppose you invest 12 tokens to the IRF.
- The other five participants in your group invest 62 tokens in total.
- The total group investment is 12+62=74 tokens, which is more than 60 tokens required.
- The irrigation system is renovated and any loss from drought will be avoided.
- The amount above 60 (14 tokens in this case) is not returned.
- Earnings
  - No matter which color ball is drawn from the cage, your earnings for the round are 20 - 12 = 8 tokens.

Example 2:

- Suppose you invest 6 tokens to the IRF.
- The other five participants in your group invest 26 tokens in total.
- The total group investment is 6+26=32 tokens, which is less than 60 tokens required.
- The irrigation system is not renovated. Each participant is returned his/her investment, so that everyone ends with 20 tokens.
- Earnings
  - If a red ball is drawn, meaning drought hits, your group loses all tokens. Your earnings for the round equal 0 tokens.
  - If a white ball is drawn, meaning there is no drought, your group keeps all tokens. Your earnings for the round equal 20 tokens.

Any questions? Remember your earnings not only depend on what you do with your tokens but also on the decisions by the other group members.

Now we will walk you through a practice round of the scenario described above. Then we will distribute a quiz. After that, the real experiment will begin.

Government subsidy (lump-sum)

In this scenario, your village government has 30 tokens, and subsidizes other's investments using lump-sum scheme.

In particular, it provides half of the total funding required (30 tokens) to the irrigation renovation fund (IRF). If the total investment of your group together with the government subsidy reaches 60 tokens, the irrigation channels will be renovated.

Example (Revisit example 2):

- Suppose you invest 6 tokens to the IRF.
- The other five participants in your group invest 26 tokens in total.
- Because now there is a lump-sum government subsidy of 30 tokens, the total investment of your group together with the government subsidy is 6+26+30=62 tokens, which is more than 60 tokens required.
- The amount above 60 (2 tokens in this case) is not returned.
- The irrigation system is renovated and any loss from drought will be avoided.
- Earnings
  - No matter which color ball is drawn, your earnings for the round are 20 - 6 = 14 tokens.

Government subsidy (one-to-one)

In this scenario, your village government has 30 tokens, and subsidizes other's investments using one-to-one matching.

In particular, every token you invest in the IRF will be matched with one token from the government, up to the government's budget of 30 tokens. If the total investment of your group together with the government subsidy reaches 60 tokens, the irrigation channels will be renovated.

Example (Revisit example 2):

- Suppose you invest 6 tokens to the IRF.
- The other five participants in your group invest 26 tokens in total.
- The total investment of your group is 6+26=32 tokens. Because the village government matches your investment with a one-to-one rate, up to 30 tokens, it will provide 30 tokens. The total investment of your group together with the government subsidy is 32+30=62 tokens, which is more than 60 tokens required.
- The amount above 60 (2 tokens in this case) is not returned.
- The irrigation system is renovated and any loss from drought will be avoided.
- Earnings
  - No matter which color ball is drawn, your earnings for the round are 20 - 6 = 14 tokens.

Game 2

In this part, you will see below seven circles with two numbers on each. Each circle stands for a 50-50 lottery, which means you have 50% chance to receive the number of points on the left and 50% chance to receive the number of points on the right. For example, the circle on the top (with 2 on the left and 78 on the right) represents a lottery that pays 2 points with half chance and 78 points with another half chance. There is one circle that has the same number 33 on both sides, meaning that this lottery pays 33 points for sure.

2 78

6 76

33 33

9 73

27 43

15 63

21 53
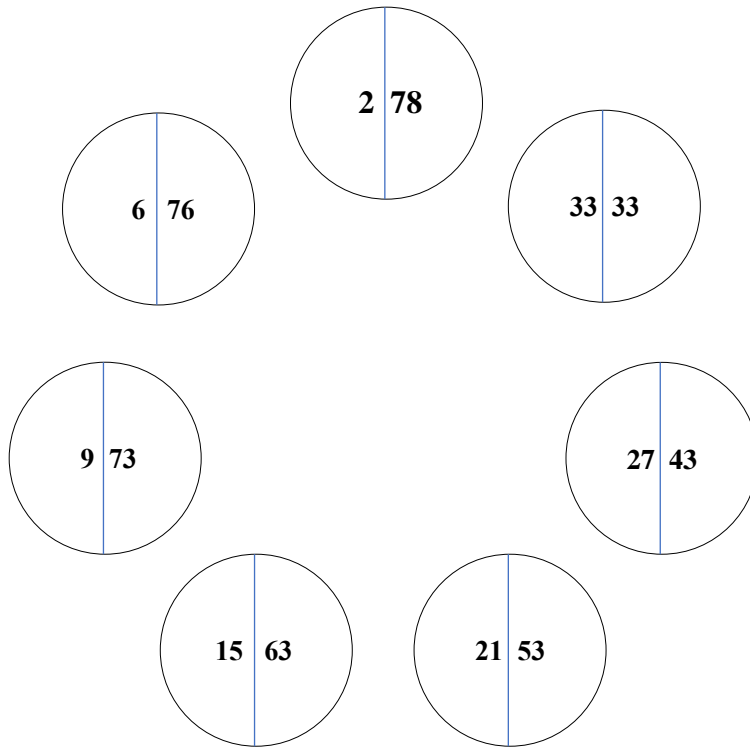
You need to choose **one circle** out of the seven, and the result of the lottery will be your earnings for Game 2.

We will use the bingo cage again for the lottery. This time, there are four blue balls and four yellow balls. After you have made your decision, we will spin the cage once for each of you. If a blue ball is drawn, you earn the number of points on the left. If a yellow ball is drawn, you earn the number of points on the right. For example, if you choose the circle on the top (with 2 on the left and 78 on the right) and we draw a yellow ball, you earn 78 points for Game 2. For each point you earn in Game 2, you will receive $0.40.

Let us know if you have any questions. Otherwise, please mark one circle now. When you are done, please raise your hand and we will collect your decision.

Payments

Your total payment today will be as follows:

Total payment = $5 show-up fee + Game 1 earnings + Game 2 earnings + $2 for the survey

Your payoff will be rounded to the nearest dollar.

Game 1 earnings

As mentioned in the beginning, we will randomly select six rounds in Game 1 for payment, one from each scenario. Now there are three balls in the bingo cage, with numbers 1, 2, and 3. We will spin the cage six times, and the number drawn by each spin will be the round number for payment in the corresponding scenario.

The total numbers of tokens you earned in these six rounds will be your earnings from Game 1. We will calculate that for you and you may refer to your decision records to ensure accuracy.

Game 2 earnings

As described above. Your lottery result will be determined in private when we start payment.

While we are calculating your payments, please complete the survey. Once everybody has finished, you will be called for payment one by one. Thanks again for participating in this experiment.

2 Survey

Survey

Thank you for taking the time to participate in this experiment. Please answer the following questions to the best of your knowledge. Your answers will be used for this study only.

1. Your Player ID:_____

2. Your age (in years):_____

3. Your gender: (Choose one)
    □ Male
    □ Female

4. Your country of citizenship:_____

5. Your major:_____

6. Which year are you in? (Choose one)
    □ Undergraduate
    □ Graduate
    □ Other

7. Please indicate the degree to which you agree (or disagree) with each of the following statements.

1) You are willing to take risks (Choose one)

○	○	○	○	○
Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree

2) People are trustworthy (Choose one)

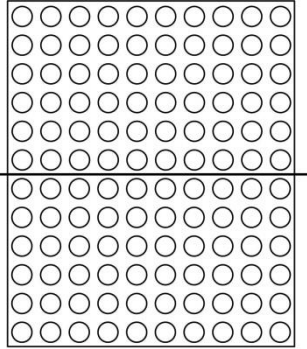| ○	○	○	○	○
Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree

8. How did you make your decisions in Game 1?

_____

_____

9. How did the government subsidy and the risk of drought affect your decisions?

_____

_____

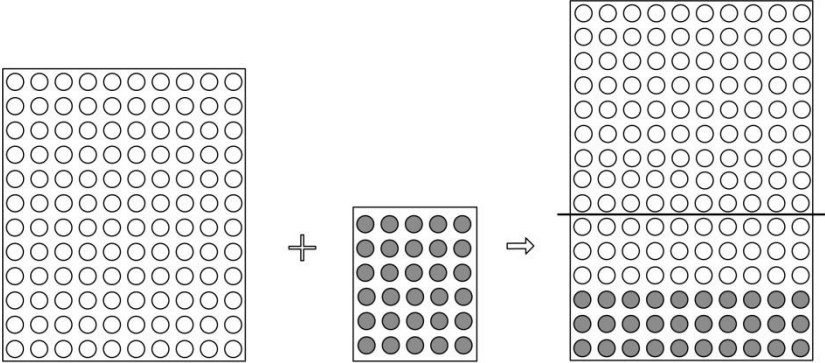10. Please also indicate any way that you might have been unsure or confused about how this experiment works.

_____

_____

_____

_____

3 Selected decision sheets

3.1 Scenario HNS

	Scenario	Your investment (0-20 tokens)	Results *(For experimenter use only)*
Round 1 **Player ID 1**	● Possibility of Drought: **75%**		 Group investment _____ ● Irrigation channels in your village renovated? _____ ● Drought hits? _____ ● Your round's earnings: _____

12

3.2 Scenario H121

	Scenario	Your investment (0-20 tokens)	Results *(For experimenter use only)*
Round 1 **Player ID 1**	● Possibility of Drought: **75%** ● Government Subsidy: **One-to-one**		 Group investment Government subsidy Total investment _____ _____ _____ ● Irrigation channels in your village renovated? _____ ● Drought hits? _____ ● Your round's earnings: _____

3.3 Scenario LLS

	Scenario	Your investment (0-20 tokens)	Results *(For experimenter use only)*
Round 1 **Player ID 1**	● Possibility of Drought: **25%** ● Government Subsidy: **Lump-sum**		 Group investment Government subsidy Total investment _____ _____ _____ • Irrigation channels in your village renovated? _____ • Drought hits? _____ • Your round's earnings: _____