

# Externalities Activity

(20 minutes)

I begin the externalities lecture with this activity. I then call back to it throughout the lecture, so they can see how the incentives we are developing formally in class relate to their behavior in the game.

## *Materials you will need*

- 4 copies of the “Public Goods Worksheet”
- 1 copy of the “Planner Worksheet”
- externalities\_activities.pdf slides
- externalities\_score\_sheet.xlsx
- prizes if you are using them

## *Instructions*

### ACTIVITY 1

1. Ask for four volunteers. Number them players 1-4. Give each a copy of the Public Goods Worksheet.
2. (Slide 3) Say,  
“The four of you are going to play a game. Here are the rules. In each round, each of you will have 10 units. You have to choose how much of that to contribute to producing a good that will benefit your whole team. Whatever you don’t contribute to producing that good for your team, you get to use just for yourself.

Without talking, you will write down on your worksheet how much you are going to contribute to the group good. You can choose any number between 0 and 10 that can be written as a decimal.

If we label Player  $i$ 's contribution as  $t_i$  then the total amount of the good that benefits the whole team produced is

$$T = 2\sqrt{t_1 + t_2 + t_3 + t_4}$$

(Slide 4) Players don’t have to split up  $T$ . They all benefit from it. It is supposed to be a metaphor for something we can all enjoy without depleting it (like clean air or a good workplace environment).

In addition to  $T$ , Player  $i$  also has  $10 - t_i$  left over from her initial budget. So Player  $i$ 's score from that round is  $T + (10 - t_i)$ . The winner of the round is the player with the highest score.”

3. Now make sure they all understand how scoring works. (Advance slide reveal.) Say,

“Let’s do an example to make sure that everyone understands the scoring. Suppose, in Round 2, the players’ contributions were as follows:

$$t_1 = 2.5 \quad t_2 = 2 \quad t_3 = 1.5 \quad t_4 = 3$$

What would Player 2’s score be for that round?”

4. Have all participants calculate Player 2’s score **by themselves**. Ask them to tell you their answers.

(Advance slide reveal.) Explain how to calculate the score. Say,

“The total good that benefits the whole team is

$$T = 2\sqrt{2.5 + 2 + 1.5 + 3} = 2\sqrt{9} = 6$$

Player 2 contributed 2, so she has 8 left over. So her final score is  $6 + 8 = 14$ .”

Do another player’s score if they don’t yet see how to do it.

5. Finally, say,  
“The winner will be the player, among the four of you, who has the highest score over a series of rounds of this game (and a related game with a slight variation that we will get to). So your goal is to get the highest score for yourself.”

*NOTE: It helps to have real prizes. In my case, I donate to charity all the royalties I make selling the book to Chicago students. The prize is that the winners of the various games we play during the quarter form a committee to decide where I will donate the money. In the past, before I’d published the book, I gave away copies of a different book that I really like.*

6. Once you are sure everyone understands the scoring, tell them they are going to play the game several times. Play the first round of the game. Have each player write a level of contribution on their worksheet. Have them show it to a neighbor.
7. [Display externalities\_score\_sheet.xlsx “public goods” tab on the screen.] Ask the neighbors to read out the participants’ contributions. Write them into the score sheet as they are read out. The scores for that round for each player will appear.

8. Repeat until they have played 4 times.

#### ACTIVITY 1 CONTINUED: ADDING COMMUNICATION

1. (Slide 5) Say,  
“Now we are going to change the game very slightly. All the rules will be the same, but now you may talk to one another for 30 seconds before writing down your contributions. We will do this 3 times. These rounds will also count toward your final score.”
2. Play the game as above, but with brief communication, 3 times.

#### ACTIVITY 2: GAME WITH SOCIAL PLANNER

If you are teaching multiple sections of the course, do this with one player in each section and let them compete across sections. If you are teaching one section, choose 3 volunteers and let them compete against each other.

1. Ask for a (or 3) volunteer(s) [see note above]. Give volunteer(s) a copy of the Planner Worksheet.
2. (Slide 7) Say,  
“We are going to use the same scoring rules, but now you get to simply declare how much each player contributes. (These rounds don’t count towards the scores of the players from the previous game.) You are going to do this 3 times. Your payoff is simply the sum of the players’ payoffs if they were to follow your advice. The winner is the person with the highest score across three rounds.”
3. [Display externalities\_score\_sheet.xlsx “planner” tab on the screen.] Have neighbor read out the choices, as above. If there are multiple planners, you will have to use multiple tabs.

Once this is all done, ask both the players and the planner to discuss how they made the decisions they did and debrief a bit to draw out the differing incentives. Discuss whether communication helped or not.