

Project III

Tragedy of the Commons Game



Common pool resources (CPR)

- Natural or man made system of public resources
- Examples: ground water, irrigation systems, fisheries, forests, etc.
- Two essential characteristics:
 - Subtractable, i.e., more one participant uses the resource, the less others have.
 - Impossible or costly to exclude anyone.
→ resource may be depleted.

Tragedy of the commons

- Commons = public resource of goods, shared by a group of people, e.g., households.
- Individual benefit gained from using the commons is large compared to cost, which is shared among the participants.
 - Incentive for overuse.
 - Acquire the resource more than a fair share, and pay less than a fair share of the total cost.
- Eventually the resource is exhausted and the commons collapse.

The game

- Four households, one per each group.
- Each household has a finite endowment k units.
- Decision: divide the endowment between
 - CPR market and
 - “Private” market
- Receive payoff from the decision.
- The game is played a predetermined maximum number of rounds or until the commons collapse.
- The payoff is accumulated from round to round, and from game to game.

The Payoff

- Payoff from CPR depends on the household's own investment, and the total amount invested in the CPR market by all the households.
- Payoff from private market depends on the household's investment to the private market.
- Household i 's payoff is $p(i) = f(x_i, x_{-i}) + g(k-x_i)$,
where x is the household i 's investment to the CPR market.
- There is no stochasticity in the payoff.

The Task

- Implement a decision strategy for your household.
- Common knowledge:
 - The number of households
 - Endowment k (restored after each round)
 - Maximum number of rounds
 - Group investment in CPR market at each round
- Individual knowledge
 - Payoff from two markets at each round

Technicalities

- Program starts without arguments.
- Reads max number of rounds, number of players, and k .
- Output: the amount of endowment (x) invested in CPR (the amount invested in private market ($k-x$) is automatically calculated)
- Input: vector real numbers consisting of
 - Payoff from CPR market
 - Payoff from private market
 - Group investment in CPR market

Submission

- Write a short document that
 - Describes your decision strategy, and
 - Describes the search algorithm.
- Turn in the source and binary codes of the search algorithm.
- Prepare a short oral presentation on your decision strategy. This means
 - Couple of nice slides
 - No source code!
- Select one group member to present.