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PRINCIPLES OF
ECONOMICS
Eight Edition



CHAPTER
11 **Public Goods and
Common Resources**

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Look for the answers to these questions:

- What are public goods?
- What are common resources?
Give examples of each.
- Why do markets generally fail to provide the efficient amounts of these goods?
- How might the government improve market outcomes in the case of public goods or common resources?

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Introduction

- We consume many goods without paying:
 - Parks, national defense, clean air & water
 - When goods have no prices, the market forces that normally allocate resources are absent
 - The private market may fail to provide the socially efficient quantity of such goods
- ‘Governments can sometimes improve market outcomes’

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The Different Kinds of Goods

- Excludability
 - Property of a good whereby a person can be prevented from using it
 - **Excludable**: MOS rice burgers, Wi-Fi access
 - **Not excludable**: radio signals, national defense
- Rivalry in consumption
 - Property of a good whereby one person's use diminishes other people's use
 - **Rival**: MOS rice burgers
 - **Not rival**: An MP3 file of David Tao's latest single

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The Different Kinds of Goods

- Private goods
 - Excludable & Rival in consumption (food)
- Public goods
 - Not excludable & Not rival in consumption (national defense)
- Common resources
 - Rival in consumption & Not excludable (fish in the ocean)
- Club goods
 - Excludable & Not rival in consumption (cable TV)

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Active Learning 1

Categorizing Roads

- A road is which of the four kinds of goods?
- *Hint*: The answer depends on whether the road is congested or not, and whether it's a toll road or not. Consider the different cases.

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Active Learning 1

Answers

- Rival in consumption? Only if congested.
- Excludable? Only if a toll road.

Four possibilities:

- Uncongested non-toll road: public good
- Uncongested toll road: club good
- Congested non-toll road: common resource
- Congested toll road: private good

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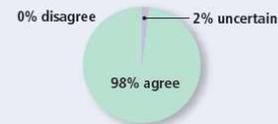
7

ASK THE EXPERTS

Congestion Pricing

"In general, using more congestion charges in crowded transportation networks — such as higher tolls during peak travel times in cities, and peak fees for airplane takeoff and landing slots — and using the proceeds to lower other taxes would make citizens on average better off."

What do economists say?



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8

The Different Kinds of Goods

- **Public goods and common resources**
 - Externalities arise because something of value has no price attached to it
 - Private decisions about consumption and production can lead to an inefficient outcome
 - Public policy can potentially raise economic well-being

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Public Goods

- **Free rider**
 - Person who receives the benefit of a good but avoids paying for it
- **The free-rider problem**
 - Public goods are not excludable, so people have an incentive to be free riders
 - Prevents the private market from supplying the goods
 - Market failure

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Public Goods

- **Government can remedy the free-rider problem**
 - If total benefits of a public good exceeds its costs
 - Provide the public good
 - Pay for it with tax revenue
 - Make everyone better off
 - Problem: Measuring the benefit is usually difficult

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Public Goods

- **Cost-benefit analysis**
 - Compare the costs and benefits to society of providing a public good
 - Doesn't have any price signals to observe
 - Government findings: rough approximations at best
 - Cost-benefit analyses are imprecise, so the efficient provision of public goods is more difficult than that of private goods

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12



Public Goods

- Some important public goods
 - National defense
 - Very expensive public good
 - USA: US\$610 billion (3.1% GDP) in 2017
 - Taiwan: US\$10.6 billion (1.8% GDP) in 2017
 - Basic research
 - General knowledge
 - Subsidized by government
 - The public sector fails to pay for the right amount and the right kinds

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Public Goods

- Some important public goods
 - Antipoverty programs financed by taxes
 - Welfare system (Temporary Assistance for Needy Families program, TANF)
 - Provides a small income for some poor families
 - Food stamps (Supplemental Nutrition Assistance Program, SNAP)
 - Subsidize the purchase of food for those with low incomes
 - Government housing programs
 - Make shelter more affordable

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Common Resources

- Common resources are **not excludable**
 - Cannot prevent free riders from using
 - Little incentive for firms to provide
 - Role for government:
 - Seeing that they are provided
- Common resources: **rival in consumption**
 - Each one's use reduces others' ability to use
 - Role for government:
 - Ensuring they are not overused

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Common Resources

- The tragedy of the commons
 - Parable that shows why common resources are used more than desirable
 - Medieval town where sheep graze on common land
 - As the population grows, the number of sheep grows
 - The amount of land is fixed, the grass begins to disappear from overgrazing

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Common Resources

- The tragedy of the commons
 - Social and private incentives differ
 - The private incentives (using the land for free) outweigh the social incentives (using it carefully)
 - Arises because of a negative externality
 - Allowing one's flock to graze on the common land reduces its quality for other families
 - People neglect this external cost, resulting in overuse of the land

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Active Learning 2

Policy options for common resources

- What could the townspeople (or their government) have done to prevent the tragedy?
- Try to think of two or three options.

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Active Learning 2

Answers

- Impose a corrective tax on the use of the land to “internalize the externality.”
- Regulate use of the land (the “command-and-control” approach).
- Auction off permits allowing use of the land.
- Divide the land, sell lots to individual families; each family will have incentive not to overgraze its own land.

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19



Policy Options to Prevent Overconsumption of Common Resources

- Regulate use of the resource
- Impose a corrective tax to internalize the externality
 - Hunting & fishing licenses, entrance fees for congested national parks

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Policy Options to Prevent Overconsumption of Common Resources

- Auction off permits allowing use of the resource
 - Example: spectrum auctions by the US Federal Communications Commission, –4G LTE Cell Phone License Auctions in Taiwan
- If the resource is land, convert to a private good
 - By dividing and selling parcels to individuals

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Common Resources

- Some important common resources
 - Clean air and water
 - Negative externality: pollution
 - Regulations or corrective taxes
 - Congested roads
 - Negative externality: congestion
 - Corrective tax: charge drivers a toll
 - Tax on gasoline

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Common Resources

- Some important common resources
 - Fish, whales, and other wildlife
 - Oceans: the least regulated common resource
 - Needs international cooperation
 - Difficult to enforce an agreement
 - Fishing and hunting licenses
 - Limits on fishing and hunting seasons
 - Limits on size of fish
 - Limits on quantity of animals killed

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Solutions to Lack-of-Market Failure

- ▶ In 2009, "Lin" Ostrom won the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel for:
 - ▶ Studying how real people manage common resources both in the field (case study) and lab (experiments)
- ▶ In 2012, Al Roth won the same prize for:
 - ▶ Designing markets for medical interns, school choice and even organ transplants (kidney exchange)

2018/11/1

Public Goods/Nonexcludable

Joseph Tao-qi Wang

CASE STUDY "You've Got Spam!"

- **Some firms use spam e-mails to advertise their products.**
 - Spam is not excludable: firms cannot be prevented from spamming
 - Spam is rival: as more companies use spam, it becomes less effective.
- **Thus, spam is a common resource.**
 - Like most common resources, spam is overused – which is why we get so much of it!

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Importance of Property Rights

- **Market fails to allocate resources efficiently**
 - Because property rights are not well established
 - Some item of value does not have an owner with the legal authority to control it

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Importance of Property Rights

- **The government can potentially solve the problem**
 - Help define property rights and thereby unleash market forces
 - Regulate private behavior
 - Use tax revenue to supply a good that the market fails to supply

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Summary

- Goods differ in whether they are excludable and whether they are rival in consumption.
 - A good is excludable if it is possible to prevent someone from using it.
 - A good is rival in consumption if one person's use of the good reduces others' ability to use the same unit of the good.
 - Markets work best for private goods, which are both excludable and rival in consumption.
 - Markets do not work as well for other types of goods.

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Summary

- Public goods are neither rival in consumption nor excludable.
 - Examples of public goods include fireworks displays, national defense, and the discovery of fundamental knowledge.
 - Because people are not charged for their use of the public good, they have an incentive to free ride, making private provision of the good untenable.
 - Therefore, governments provide public goods, basing their decision about the quantity of each good on cost-benefit analysis.

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Summary

- Common resources are rival in consumption but not excludable.
 - Examples include common grazing land, clean air, and congested roads.
 - Because people are not charged for their use of common resources, they tend to use them excessively.
 - Therefore, governments use various methods, such as regulations and corrective taxes, to limit the use of common resources.

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11: Public Goods & Common Resources

- ▶ Excludable vs. Rivalness
- ▶ Public Goods
 - ▶ Non-excludable and non-rival goods
- ▶ Common Resources
 - ▶ Non-excludable and rival goods
- ▶ Classical Market Failure = **Lack of Market Failure!**
 - ▶ Caused by lack of property rights!

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Public Goods/Nonexcludable

Joseph Tao-yi Wang

11: Public Goods & Common Resources

- ▶ Homework:
 - ▶ Mankiw, Ch.11, Problem 4, 5, 7, 9, 10
- ▶ Challenge Questions (Past Midterms)
 - ▶ 2007 - Essay Q7
 - ▶ 2009 - (Multi-Choice Q14)
 - ▶ 2012 - (True/False Q10)

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Public Goods/Nonexcludable

Joseph Tao-yi Wang

Classroom Experiment 7: Public Goods Contribution

經濟學實驗七：公共財自願捐獻

台大經濟系 王道一老師
Joseph Tao-yi Wang

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Public Goods/Nonexcludable

Joseph Tao-yi Wang

a water purification project

overview

- each round, each group member receives same amount of money
- each simultaneously chooses how much to contribute to water purification project
- *each* individual's benefit from project:
 - total group contributions × rate of return**

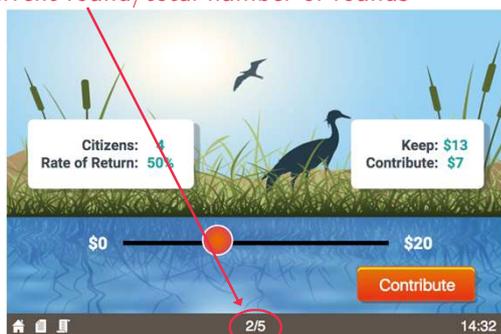
water purification I

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A Playground for Decisions

your game screen

current round/total number of rounds



water purification I

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your game screen

project details



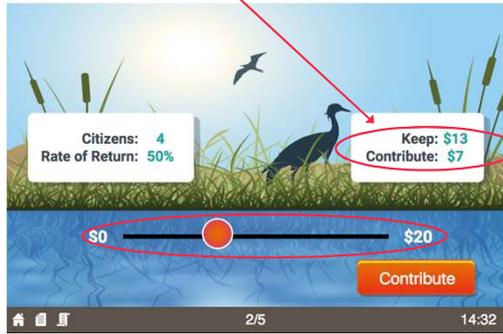
water purification I

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A Playground for Decisions

your game screen

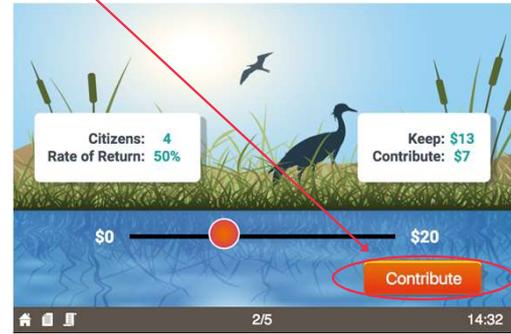
move slider to choose contribution



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your game screen

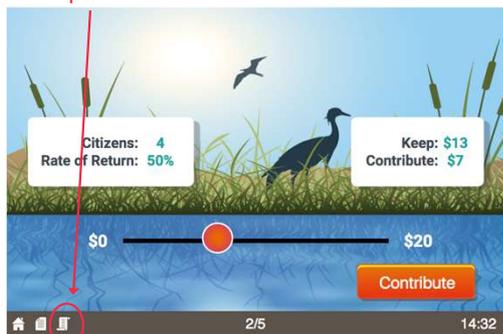
and submit



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your game screen

to view previous rounds



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payoffs

happy playing!

overview

- depend on your contributions and contributions of other group members

another example

- start with \$20; rate of return is 50%
- you contributed \$12 of \$30 group contribution

$$\text{payoff} = \text{start} - \text{your contribution} + \text{rate of return} \times \text{total group contributions}$$

$$\$23 = \$20 - \$12 + 50\% \times \$30$$

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Experiment 7-2: Irrigation Game

- Do people cooperate after group discussion?
- We now play the irrigation game
 - Same rule as before, except
- Members claim from the pool in order:
 - Member 1 can take whatever s/he wants
 - Then, Member 2 can take from what is left
 - Etc.
- Order is known before contribution

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Public Goods/Nonexcludable

Joseph Tao-yi Wang

Experiment 7-2: Irrigation Game

- You have small cards with your order #
 - The TA will hand them out
- Please write your contribution on the card
 - The TA will collection them
- Calculate (total group contribution x 2)
 - The TA will write it on your record sheet
- Decide how much to claim one-by-one
 - The TA will hand over to you at your turn

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Public Goods/Nonexcludable

Joseph Tao-yi Wang

Public Goods Contribution (公共財自願捐獻)

1. A Set of Rules
 - ▶ Everybody can contribute, but equally divided
2. Individuals Optimize
 - ▶ The Selfish Gene? (拔一毛以利天下而不為?)
3. You React to Others Optimizing
 - ▶ You React to Others Optimizing
4. What Should Aggregate Data Look Like?
 - ▶ Nash equilibrium says nobody would contribute, leading to the **Tragedy of Commons!**

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Public Goods/Nonexcludable

Joseph Tao-yi Wang

Public Goods Contribution (公共財自願捐獻)

5. Does Empirical Data Match the Theory?
 - ▶ How many contributed zero? **Give to Pool = ?**
6. Can Individual Differences be Explained?
 - ▶ Why did some contribute, but others not?
7. How Can the Institution (Rules) Improve?
 - ▶ How can you induce more contribution?
8. Where Did this Institution Come From?
 - ▶ Social norms solved the Tragedy of Commons
 - ▶ What about Global Warming?

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Public Goods/Nonexcludable

Joseph Tao-yi Wang

Applications of Public Goods Contribution

- ▶ Team Work Requires Preventing **Free Riders**
 - ▶ Better if all contribute, but you never know if...
- ▶ Examples:
 - ▶ **Project Management**
 - ▶ Design Reward Schemes To Induce Effort
 - ▶ **Disclosure** (Good Way to Encourage Donation!)



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Public Goods/Nonexcludable

Joseph Tao-yi Wang

Would Pre-play Communication Help?

- ▶ Watch this Video:
 - ▶ <http://www.youtube.com/watch?v=p3Uos2fzIJ0>
- ▶ Two Players Each Choose to **Split** or **Steal**
 1. **Split** the Money If Both Choose to **Split**
 2. If One Chooses to **Split**, the Other Chooses to **Steal**, the **Steal** Guy Gets All the Money
 3. If Both Choose to **Steal**, Both Get Nothing

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Joseph Tao-yi Wang

Would Pre-play Communication Help?

- ▶ How Would You Convince the Other Guy to **Split** (as One of the Players)?
 - ▶ British TV Program: Golden Balls
 - ▶ How Many People Really Choose to **Split**? Why?
 - ▶ How to Prevent Being **Stolen**/Both Get Nothing?
- ▶ How Can You Make Both of You Better Off?
 - ▶ An Unexpected Twist...
 - ▶ <http://www.youtube.com/watch?v=S0qjK3TWZE8>

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Public Goods/Nonexcludable

Joseph Tao-yi Wang

事先溝通(Pre-play Communication)有用嗎?

- ▶ Cooperation is Good, But He **May Betray You**
 - ▶ Though Consumers Look Competition
- ▶ Examples of Pre-play Communication:
 - ▶ WSJ: Airlines Ticket Sales On Monday Night
 - ▶ Opponents Forced to Match Tuesday Morning
 - ▶ Best Online Airfares Occur @ Tuesday 3pm EST
 - ▶ Will Airlines Honor Agreements Not to Sale?
 - ▶ If Books.com.tw offers 21% off, so will TAAZE!

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