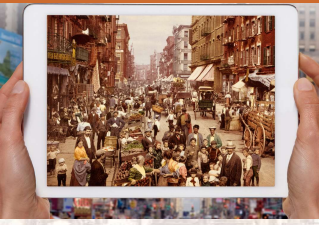


N. GREGORY MANKIWI

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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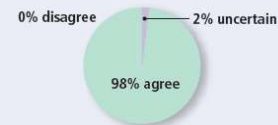
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## ASK THE EXPERTS

## 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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## 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 (**or lack of 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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## Public Goods

- Some important public goods
  - National defense
    - Very expensive public good
    - USA: US\$649 billion (3.2% GDP) in 2019
    - Taiwan: US\$11.4 billion (2.3% GDP) in 2019
  - 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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## 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 (5G next year?!)
- 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)

2019/10/24

Public Goods/Nonexcludable

Joseph Tao-yi 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**
    - So is this really market failure?
    - Or, failure due to the **lack of market**?
  - 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, **especially those not excludable**.

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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 &amp; 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 &amp; 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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## 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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### 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 x rate of return**

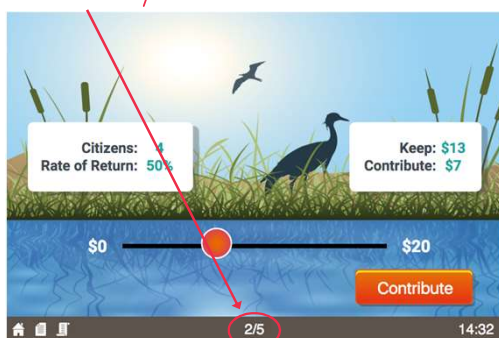
water purification I

www.moblab.com

A Playground for Decisions

### your game screen

current round/total number of rounds



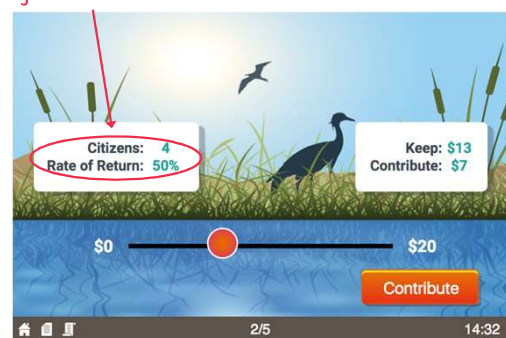
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### your game screen

project details



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**your game screen**

move slider

Citizens: 4  
Rate of Return: 50%

Keep: \$13  
Contribute: \$7

\$0 ————— \$20

Contribute

water purification 1 www.moblab.com A Playground for Decisions

**your game screen**

move slider to choose contribution

Citizens: 4  
Rate of Return: 50%

Keep: \$13  
Contribute: \$7

\$0 ————— \$20

Contribute

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**your game screen**

and submit

Citizens: 4  
Rate of Return: 50%

Keep: \$13  
Contribute: \$7

\$0 ————— \$20

Contribute

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**your game screen**

to view previous rounds

Citizens: 4  
Rate of Return: 50%

Keep: \$13  
Contribute: \$7

\$0 ————— \$20

Contribute

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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 40% = 2/5
- contributed \$12 of \$30 group contribution

$\text{payoff} = \text{start} - \text{your contribution} + \text{rate of return} \times \text{total group contributions}$
$\$20 = \$20 - \$12 + 40\% \times \$30$

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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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## 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  $\times$  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 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 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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## 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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## 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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## 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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## 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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