

## Tradable Permit Market: Bonus Question of Midterm 2007

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## 2007 Midterm Bonus Question

- The Love River runs nearby Kaohsiung city
- Two polluting pig feeding companies each dump 100 tons of glop into the river each year:
  - Ace Pig & Big Fat Piggy
- The cost of reducing glop emissions per ton
  - NT\$1,000,000 for Ace Pig
  - NT\$50,000 for Big Fat Piggy
- Need to reduce overall pollution from 200 tons to 100 tons

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## Common Resource/Public Good

- For the following two goods,
  - Love River
  - Pollution Reduction
- Public goods or common resources?
- Would people overuse or under-use (over-reduce or under-reduce)?

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## The Tragedy of Love River

- Public goods or common resources?
- Love River is a common resource
- Would people overuse or under-use it?
- People overuse common resources
- Love River is a common resource
- People overuse Love River

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## Insufficient Pollution Reduction

- Public goods or common resources?
- Pollution reduction is a public goods
- Would people over- or under-reduce it?
- People under-provide public goods
- Pollution reduction is a public goods
- People under-reduce pollution (under-produce "pollution reduction")

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## Is the Government like God?

- Suppose the government knew the cost of reduction for each firm
- What reductions would it impose to reach its overall goal?
- What would be the cost to each firm and the total cost to the firms together?

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### Is the Government like God?

- What reductions would it impose to reach its overall goal?
- Knowing Big Fat Piggy has the lowest cost, it would only require Big Fat Piggy eliminate all its pollution
- This minimizes the total cost of reducing the remaining pollution to 100 tons

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### Is the Government like God?

- What would be the cost to each firm and the total cost to the firms together?
- Ace Pig:
  - Cost = 0
- Big Fat Piggy:
  - Cost =  $\$50,000 \times 100 \text{ tons} = \text{NT}\$5 \text{ million}$
- Total cost = NT \$5 million

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### We are NOT God...

- Suppose the government does not know the cost of pollution reduction for each firm
- Imposing uniform reductions on the firms
- Calculate the reduction made by each firm, the cost to each firm, and the total cost to the firms together.

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### We are NOT God...

- Calculate the reduction made by each firm, the cost to each firm, and the total cost.
- Uniform reduction: Each firm reduces the exact same amount ( $50 \text{ tons} \times 2 = 100 \text{ tons}$ )
- Ace Pig:
  - Cost =  $50 \times \$1 \text{ million} = \text{NT}\$50 \text{ million}$
- Big Fat Piggy:
  - Cost =  $50 \times \$50,000 = \$2,500,000$
- Total Cost = NT\$52.5 million

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### A Tradable Permit Market

- Suppose the government decides to give each firm 50 tradable pollution permits.
- Who sells permits and how many?
- Who buys permits and how many?
- Where did the gains from trade come from?
- What is the total cost of pollution reduction in this situation

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### A Tradable Permit Market

- Who sells and who buys permits and how many?
- Ace Pig buys all 50 permits from Big Fat Piggy so that it can pollute 100 tons
- Where did the gains from trade come from?
- A permit is worth NT\$1,000,000 to Ace Pig and NT\$50,000 to Big Fat Piggy, because that is the cost of reducing pollution by one ton. There is gains from trade because Ace Pig faces the higher costs of reducing pollution

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## A Tradable Permit Market

- What is the total cost of pollution reduction in this situation?
- Ace Pig will not reduce its pollution at all
  - Cost = [Price for 50 permits]
- Big Fat Piggy reduces its pollution by 100 tons
  - Cost = NT\$50,000 × 100 - [Price for 50 permits]
- Total Cost = NT\$5 million

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## Comparison

- Compare the total cost of pollution reduction in parts (b), (c) and (d).
- If the government does not know the cost of reduction for each firm, what is the best way to proceed?

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## Comparison

- Compare the total cost of pollution reduction in parts (b), (c) and (d).
- In Part (b) and (d), it costs NT\$5 million to reduce total pollution to 100 tons
- In Part (c) it costs NT\$52.5 million
- It is less costly to have Big Fat Piggy reduce all of its pollution

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## Comparison

- If the government does not know the cost of reduction for each firm, what is the best way to proceed?
- The government could achieve the same result by auctioning off pollution permits
- This would ensure that Big Fat Piggy reduced its pollution to zero (because Ace Pig would outbid it for the permits)

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## Firms have the right to pollute

- Suppose the government has to compensate the cost
- What is the minimum compensation so that both would accept a uniform pollution reduction of 50 tons each?
- What is the total cost?

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## Firms have the right to pollute

- What is the minimum compensation so that both would accept a uniform pollution reduction of 50 tons each?
- It would have to pay at least NT\$50 million for a uniform pollution reduction of 50 tons
  - this is the cost for Ace Pig to reduce 50 tons
- What is the total cost?
- Total cost = NT\$100 million

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### Firms still have the right to pollute

- Suppose firms are each granted 100 tradable pollution permits
- If the government wants to buy back 100 permits, what is the minimum price per permit it has to pay?
- Who will sell the permit to the government at this price?
- What is the total cost? Is this less costly than that of part (f)?

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### Firms still have the right to pollute

- If the government wants to buy back 100 permits, what is the minimum price it has to pay?
- Who will sell the permit at this price?
- The government only has to pay NT\$50,000 each to buy 100 permits from Big Fat Piggy
- What is the total cost? Is this less than part (f)?
- This costs NT\$5 million, and is 1/20 of the cost of part (f)

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### Coase Theorem

- What is the difference between property rights in part (d) and (g)?
- What is the difference in terms of outcome efficiency?
- Explain why according to the Coase Theorem, this result is more or less expected

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### Coase Theorem

- What is the difference between property rights in part (d) and (g)?
- Part (d): Government / people have the property right to a clean Love River
- Part (g): Firms have to property right to use Love River as their dumpster and pollution at will
- What is the difference in terms of outcome efficiency?
- In both cases, it is always Big Fat Piggy who sells all his permits and reduces pollution to zero
- Same efficient outcome as in part (b)

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### Coase Theorem

- Explain why according to the Coase Theorem, this result is more or less expected
- Coase Theorem: If property rights are clearly defined, and the transaction cost of bargaining are negligible, people will cut a deal and induce the socially efficient outcome on their own.
- In both cases, property rights are well defined and there is a permit trading market
- The final outcomes are both be efficient (same)

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### Market Creation

- What are some other things that can benefit from such a property right and market creation process?
- This is an open question, examples are:
  1. 經濟專屬海域
  2. 智慧財產權
  3. 上課教室佔位子
  4. 可轉讓選課權 (2008 Fall Midterm...)

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