Tradable Permit Markets:
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
  - Ace Pig & Big Fat Piggy
  - Each year dump 100 tons of glop into the river
- The cost of reducing glop emissions per ton
  - NT$1,000,000 for Ace Pig
  - NT$50,000 for Big Fat Piggy
- Goal: Reduce pollution from 200 to 100 tons

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)?

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

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")

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?

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
- Minimizes the total cost of reducing the remaining pollution to 100 tons

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 x 100 tons = NT\$5 million
- Total cost = NT \$5 million

We are NOT God…

- Suppose the government does not know each firm's cost of pollution reduction
- Impose uniform reductions on the firms
- Calculate:
  - Reduction made by each firm,
  - The cost to each firm, and
  - The total cost to the firms together.

We are NOT God…

- Calculate reduction made by each firm, the cost to each firm, and the total cost.
- Uniform reduction: Each firm reduces same amount (50 tons x 2 = 100 tons)
- Ace Pig's Cost:
  - 50 x \$1 million = NT\$50 million
- Big Fat Piggy's Cost:
  - 50 x \$50,000 = NT\$2.5 million

Total Cost: \$52.5 million

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 gains from trade come from?
- What is the total cost of pollution reduction in this situation

A Tradable Permit Market

- Who sells & 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 their unit cost of reducing pollution.
- There are gains from trade because Ace Pig faces higher costs of reducing pollution

A Tradable Permit Market

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

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?

Comparison

- Compare the total cost of pollution reduction in parts (b), (c) and (d).
- In Part (b) & (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

Comparison

- If the government does not know the cost of reduction for each firm, what is the best way to proceed?
- The gov't could achieve the same result by auctioning off pollution permits
- This ensures Big Fat Piggy reduced its pollution to zero
  - because Ace Pig outbids it for the permits

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?

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 reduction of 50 tons
  = Cost for Ace Pig to reduce 50 tons
- What is the total cost?
- Total cost = NT$100 million

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)?

Firms still have the right to pollute

- If the gov't 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's the total cost? Is it less than part (f)?
- This costs NT$5 million, and is 1/20 of the cost of part (f)

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

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

Coase Theorem

- 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)

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
- Final outcomes are both be efficient (same)

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...)