Lecture 13 – Externalities and Public Goods

1. Market Failure and Resource Allocation
 1) Market Performance
 • 3 big objectives in economy
   Efficient resource allocation
   Equality in (re)distribution of income and wealth
   Stability and growth of economy

 • Market Economy with many socioeconomic problems. Why?
   Sometimes self-correcting (laissez-faire) mechanism doesn't work well historically (The Great
   Depression in 1930s).
   Market economy doesn't necessarily guarantee the equal distribution of income and wealth.
   "Invisible hands" work in allocation through price mechanism. Through the severe competition,
    few people are able to survive this game to finally command the exclusive ownership of the
    resources and income.

 • Market Failure
   Distortion of resource allocation mechanism in the market economy due to several reasons.

 2) Several reasons for the failure
  • **Imperfect Competition**
   Decentralized resource allocation is efficient through perfect competition.
   Imperfect competition through technical reasons – increasing returns to scale and natural
   monopoly
  • **Public Goods**
   Non Rivalry: When consumption of a food by one person does not reduce the quantity that can
                be consumed by others.
   Non Excludability: A good, once produced, is accessible to all consumers
  • **Externalities**
   The effect that an action of any decision maker has on the well-being (utility) of other
   consumers or producers, beyond the effects transmitted by changes in prices.
   Positive Externalities: Bandwagon effect, education, health care, R&D, public transit, etc.
   Negative Externalities: toxic emissions, noise, pollution, congestion, etc.
  • **Uncertainty**
   Uncertainty cannot guarantee the Pareto optimality in general equilibrium analysis. Kenneth
   Arrow proved that the efficient allocation can be achieved even under uncertainty if and only if
   there is a condition of **perfect contingency market**, which means that there is a perfect
   insurance for any possible situations. But, we know this is almost impossible.[*]
  • **Role of the Government**
   Market failure is not a sufficient condition but can be a necessary condition.
   Government failure?[†] Excess burden or Deadweight loss.

2. Public Goods
 1) Free Rider Problem
   Since the provision of a public good is nonexclusive, everyone benefits once the public good is
   provided. So, individuals have no incentive to pay as much as the good is really worth to them.

---

[*] Please review "Moral Hazard" and "Adverse Selection" in Lecture 11 and 12.
[†] According to "Bureaucracy Model" in Public Finance, production of public goods by bureaucracy has
 originally internal inefficiency. And think about William Niskanen's model.

A consumer can behave as a free rider, paying nothing for a good while anticipating that others will contribute.

Free rider problem makes it difficult for a private market to provide public goods efficiently. It is generally easier to organize effective efforts to collect voluntary funding when the number of people involved in paying for a project is small because each person recognizes that his or her contribution is important. But, as the number of consumers of a public good gets larger, it is more likely that many consumers will act as free riders. Public intervention may be necessary to ensure the provision of a socially beneficial public good. The government therefore often produces public good itself or subsidizes the companies that produce the good.

2) Optimal Output Decision of Public Good

It's hard to identify true preferences for the public good because many people will pretend that they don't need that good not to incur any production costs.

• **Model**

Suppose we can easily identify the preferences.

For private goods, we can derive the market demand curve by *horizontally* adding up the individual demand curves.

For public goods, however, we need to *vertically* add up the individual demand curves because everyone *consumes same amount of public good* compared to private goods consumed at the same price. The height of each demand curve implies the *marginal benefit* from public good.

(**private good**)   (**public good**)
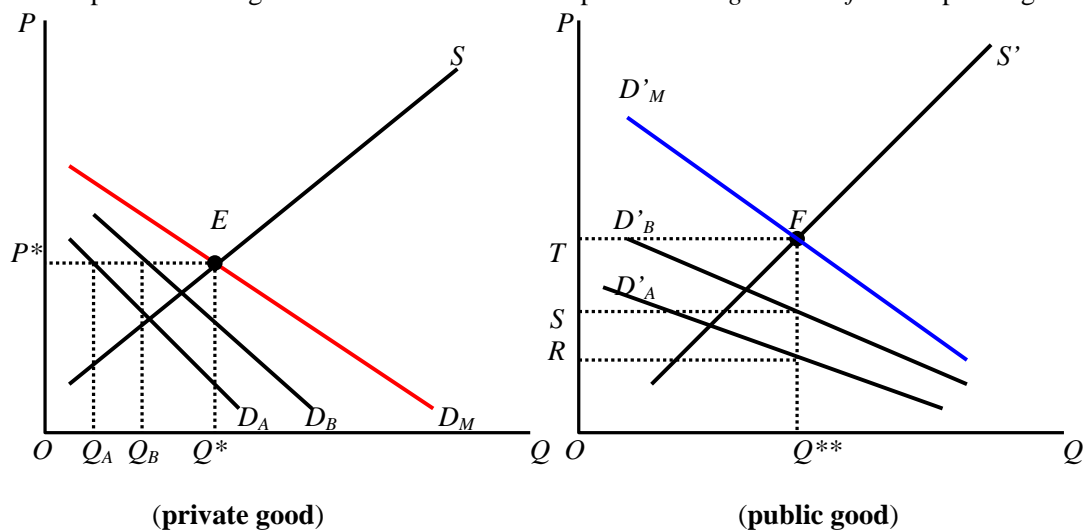
Point F implies the socially optimal amount of public good (Q^{**}). But $\overline{OT}$ is not the unit price of this public good in a market. $\overline{OT}$ means the marginal cost to produce Q^{**} units to the market. At Q^{**} units, we can charge $\overline{OR}$ and $\overline{OS}$ for A and B, respectively.[‡]

For private good, $MB_A = MB_B = MC$ (*i*)

For public good, $\sum_{i=1}^{n} MB_i = MC$ (*ii*)

[‡] But, this pricing is not actually possible because consumers tend to understate their preferences to minimize or even avoid any financial charges.

3. Externalities and Pollution Problem

1) Pollution
   Negative Externalities
   Private Marginal Cost (PMC) is different from *Social Marginal Cost (SMC)* because the free
   market economy failed to achieve the efficient resource allocation.
   Ex) Company emitting pollutants will not count the damages that the neighboring residents
       will face.

   In this case, the company's *PMC* is smaller than *SMC*.
   $$PMC < SMC \qquad (iii)$$
   In perfectly competitive market, the market price of good equals the marginal cost (*MC*),
   $$P = MC \ (=PMC) \quad (iv)$$
   Combining (*iii*) and (*iv*), we get
   $$P = PMC < SMC \qquad (v)$$
   In consuming any goods, consumers feel that (both private and social) marginal benefit equals
   Price,[§]
   $$SMB = PMB = P = PMC < SMC \quad (vi)$$
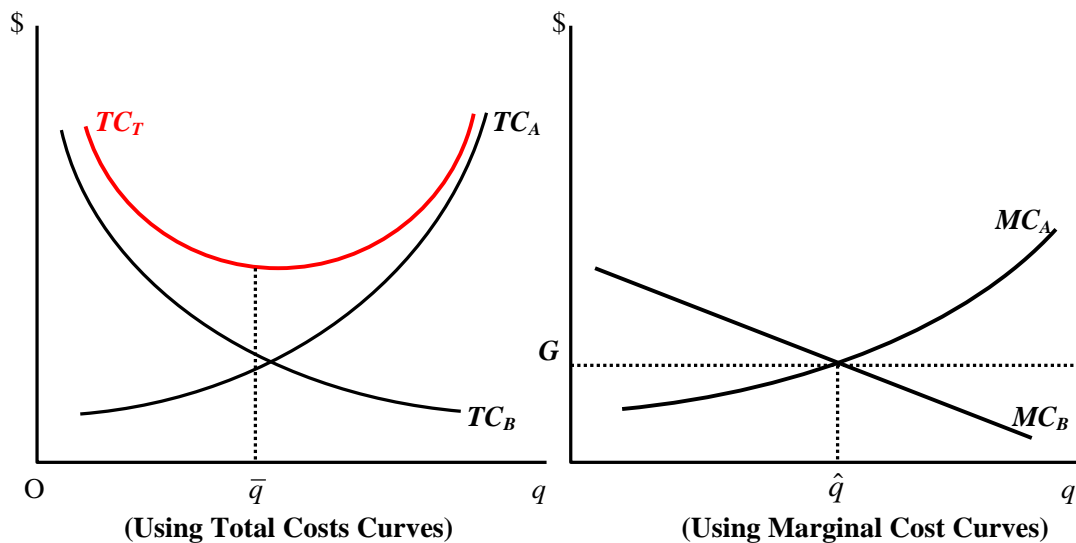
2) Optimal Environmental Management
   Up to what amount of pollutants that we can allow? How can we determine that value?
   Sustainable development?
 • 2 Types of Costs
   Direct Damages (Type-A cost, TC_A): sickness, diseases, pain, lowered production, etc.
   Maintenance Costs (Type-B cost, TC_B): to reduce pollution level.

| (Using Total Costs Curves) | (Using Marginal Cost Curves) |

   We intuitively know that $\bar{q} = \hat{q}$.

3) Efficient Management
 • **Imposing Effluent Fee or Pollution Tax (Pigouvian Tax)**
   $\overline{OG} = Tax$. If $q < \hat{q}$, it is more reasonable to increase q to pay lower cost. If $q > \hat{q}$, producer
   will reduce q because MC_B is smaller than $\overline{OG}$.

[§] If there are externalities in consumption, $PMB \neq SMB$. So, implicitly we defined that there are only
externalities in production.

This is designed to give producers some incentives to maximize their (private) profits.
$\overline{OG} = MC_A$ (value of marginal damages) at $\hat{q}$ (Arthur Pigou).

• Direct Control (Emission Standard)
Quantity control is not preferred to price control. Why?

4) Property Rights and Coase Theorem
As an alternative, the government can assign a property right, that is, the exclusive control over the use of an asset or resource, without interference by others.

Why are property rights important in dealing with externalities? Polluters do not have to compensate anyone when they released pollutants into the river. That's why the firms based their production decision on private marginal costs that did not include the harm that pollution brought to the environment. The costs of pollution were external to the polluters.

If the community owns a property right to clean the river, it could require firms to compensate it for the right to pollute. Now, the costs of pollution would be *internalized* to the firm.

In 1960, Ronald Coase developed a fundamental theorem demonstrating how the problem of externalities could be addressed by assigning property rights.[**] He illustrates the idea with an example involving two farms. Farm A raises cattle, and the cattle occasionally stray onto the land of a neighboring Farm B, which raises crops. Farm A's cattle impose a negative externality by damaging the crops on Farm B.

Coase addressed the issues: Should the cattle be allowed to roam on the property of Farm B? Can the owner of Farm B require the owner of Farm A to construct a fence to restrain the cattle? If so, who should pay for the fence? Does it mater whether the property rghts are assigned to the owners of Farm A and B?

The Coase Theorem states that, regardless of how property rights are assigned with an externality, the allocation of resources will be efficient when the parties can costlessly bargain with each other. If the owner of Farm A has the right to let his cattle roam on B's land, B's owner will pay A's owner to build a fence when the damage to B's crops exceeds the costs of fence. If the cost of the fence exceeds the damage to the crops, it will not be the interest of owner B to pay for the fence, and the cattle will roam. When it is socially efficient to construct the fence, the fence will be built to eliminate the externality.

If, instead, the property rights are assigned to owner B, so that A has to compensate B for any damage. Owner A would build a fence if the damage to B's crops exceeds the cost of the fence. However, if the cost of the fence is greater than the damage to the crops, then owner A will compensate owner B for the damage, and once again, the cattle will roam.

Regardless of whether the property rights are assigned to the owner A or to owner B, the outcome is the same and it is socially efficient. The fence will be built when the fence costs less than the damage to the crops, and it will not be built when the fence costs more than the damage.

[**] Ronald H. Coase, "The Problem of Social Cost," *Journal of Law and Economics*, 3 (1960): 1-44.