Professional Career Program

Environmental Economic Theory No. 7

(13 November 2018)

Criteria for Evaluating Environmental Policies.

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Textbook: Barry .C. Field & Martha K. Fields (2009) ***Environmental Economics - an introduction***, McGraw-Hill, International Edition

PCP Environmental Economic Theory (Hosoda) Notification

No homework next week

- Please prepare for the mid-term exam.

- We are getting into the latter half of the course.

- There is no class on 25th December.

Policy evaluation (1)

- In many countries, policy evaluation is required in order to confirm whether an adopted policy has positive effects on environment as expected. (Ex post evaluation.)

- Sometimes, policy evaluation is made in advance, namely before a policy is carried out. (Ex ante evaluation.)

- Ex ante as well as ex post policy evaluation is utilized for enhancement of policy quality.

Policy evaluation (2)

- To evaluate policies adopted by central government, local government and whatsoever, we have to have a definite criterion for evaluation.

- The problem is, however, that there are multiple criteria for policy evaluation.

- It is not so easy which criterion should be adopted.

How to evaluate policy options.

- Efficiency: Pareto efficiency, maximization of surplus and so on
- Cost-effectiveness
- Fairness
- Incentives for technological innovations
- Enforceability
- Agreement with moral precepts

Let us consider the above alternatives in order.

(1) Efficiency

- The efficiency criterion requires that the net social benefits are maximized or the net social costs are minimized. (Social welfare maximization)

- Thus, an efficient policy leads an economy to the situation in which marginal abatement costs are equal to marginal damages.

- Efficiency implies cost-effectiveness, but the reverse is not true.

- Efficiency $\rightleftarrows$ Cost-effectiveness.

6

Important remarks

- As an efficiency criterion, the so-called Pareto efficiency is often used in economics.

- Pareto efficiency: If change of allocation of resources cannot increase any one person's utility without decreasing other person's utility, the situation is Pareto efficient.

Important remarks (cont.)

- It is a very weak criterion, since there is infinitely many equilibria which satisfy the Pareto efficiency.

- Moreover, it is not easy to apply the criterion to real environmental problems.

- Compared to this, maximization of social welfare (surplus) is easily adopted.

Important remarks (cont.)

- Notice that maximization of social welfare (net benefits) is equivalent to minimization of social costs.

- You should remember the following:

The socially desirable level of emissions: an efficiency criterion
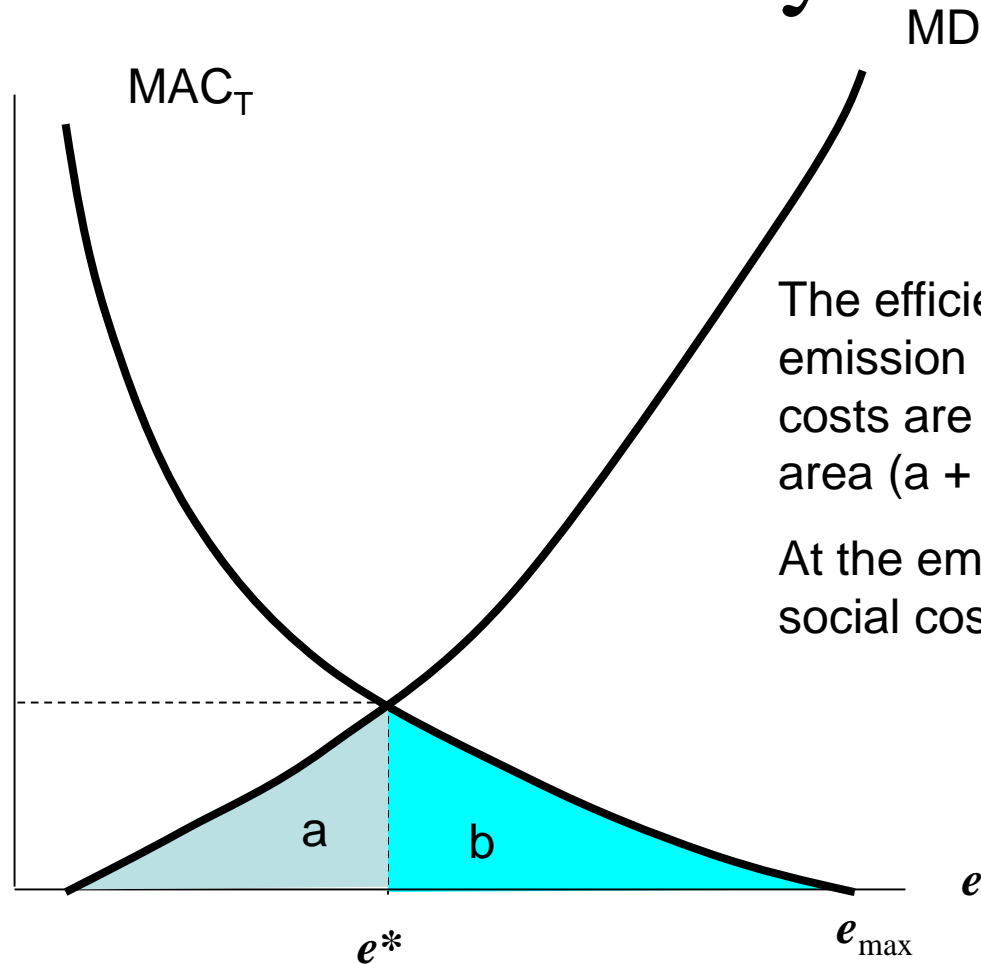
MD

MAC_T

The efficient level of the emission is e^*, and the social costs are expressed by the area (a + b).

At the emission level e^*, the social costs are minimized.

a

b

e

e^*

e_{max}

From p. 32 of Lecture No. 3.

Centralized policy or decentralized policy? (1)

- One way of thinking about environmental policies is along a continuum from centralized to decentralized.

- The government has to choose a proper policy from the continuum.

- It is often said that centralized policies require huge amount of information on, say, MAC functions of related actors.

Centralized policy or decentralized policy? (2)

- Quite a few economists consider that decentralized policies utilize *individual incentives* so that such information could often be voluntarily provided.

- Recently, decentralized policies are preferred to in many countries, although centralized policies are also adopted.

- This, however, does not mean that decentralized policies do not need any information. Actually, they do.

Remember the following figure.
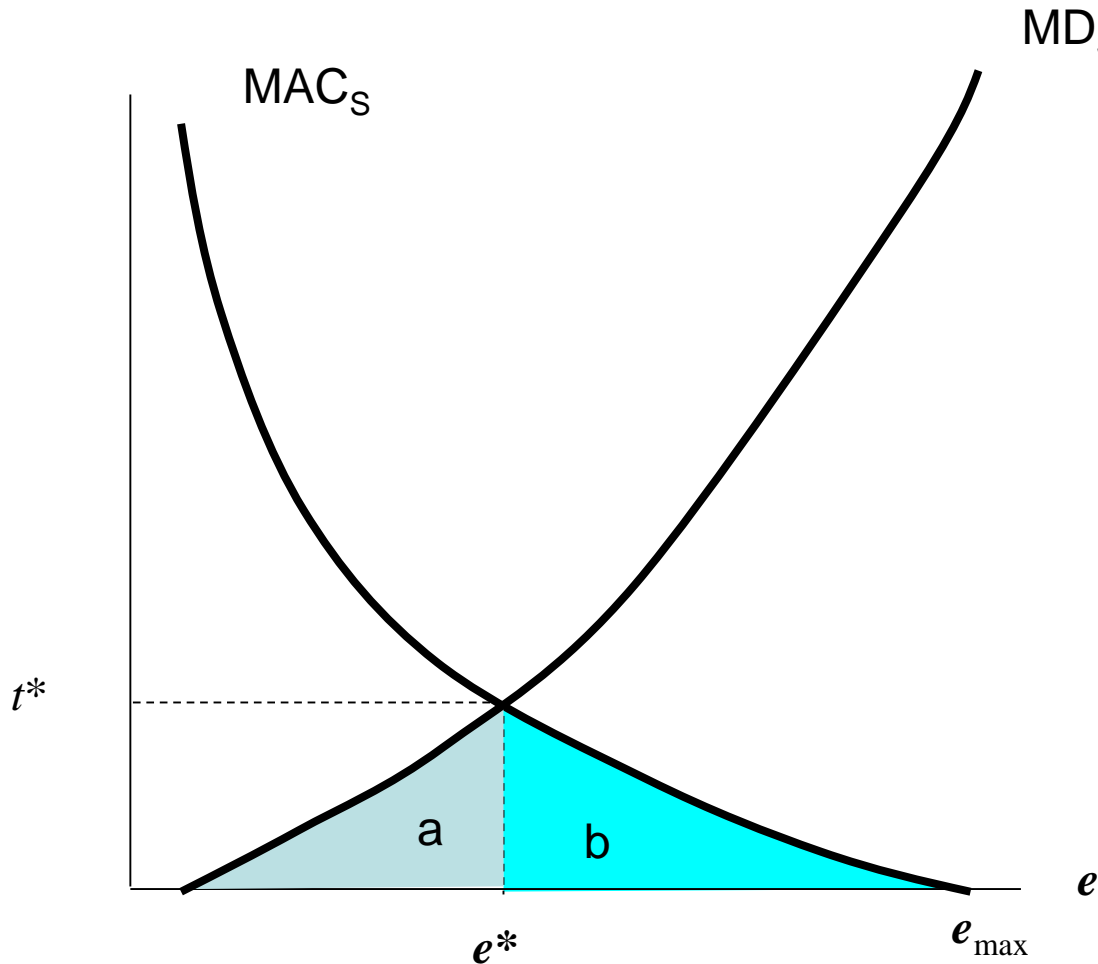
The efficient level of the emission is e^*, and the social costs are expressed by the area (a + b).

At the emission level e^*, the social costs are minimized. The optimal tax rate is t^*.

To set the emission tax at t^*, the government needs to know the *social* marginal abatement cost curve as well as the *social* marginal damage curve.

But, the government does not need to know *each* actor's MAC. This is worth emphasizing. Remember how MAC_S and MD_S are deduced from each MAC and MD of individual actors.

13

The equi-marginal principle is satisfied by an emission tax.
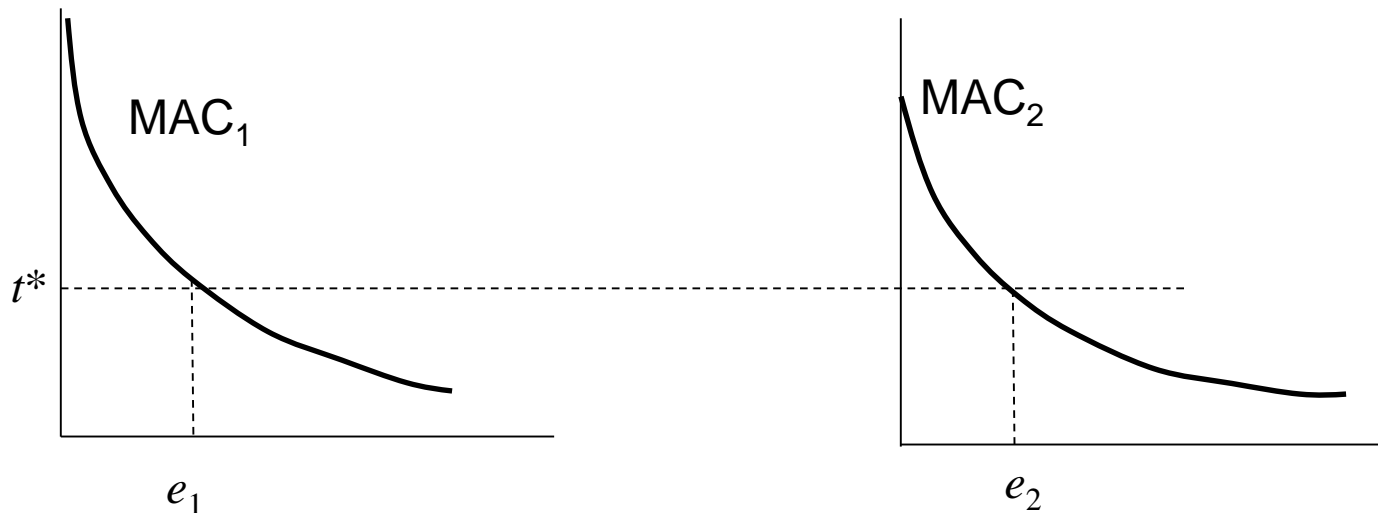
In the emission tax scheme, the government does not need to know marginal abatement curves of the two plants. Once the proper tax rate (t^*) is given, the optimal allocation of emission is determined at (e_1, e_2). Yet, to give the proper tax rate (t^*), the government needs information on the social marginal abatement and marginal damage curve.

Examples of two types of policies

- Centralized policies: Command and control, direct regulation, imposition of self-restraints, and so on.

- Decentralized policies: Emission tax (carbon tax), scheme of tradeable emission permits, voluntary bargaining, and so on.

Demerits of decentralized policies

- There are demerits as well as merits in decentralized policies.

- It may possibly be costly to create institutional infrastructure for decentralized policies.

- Some important information may not be shared by all the actors, due to certain reasons.

- Furthermore, information may be intentionally distorted by some actors.

Economists bias for decentralized policies

- Economists tend to prefer decentralized policies to centralized ones for environmental protection.

- It is worth referring to the fact that command and control policy (a centralized policy) was utilized at the early stage of pollution control, rather than tax or tradable emission permit schemes (decentralized policies).

(2) Cost-effectiveness

- Policies which meet the target with minimum costs, or those which obtain the best environmental results with given resources are called *cost-effective*.

- The concept "cost-effective" or "cost-effectiveness" can be applied to a *wrong policy*. In that case, difference between marginal abatement costs (MAC) and marginal damages (MD) must be large.

- A cost-ineffective policy may lead an economy to the situation where the amount of emission is too large.

- Cost-effectiveness does not imply efficiency.

Explanation by means of a figure (1)

It is often the case that environmental damages (MD) cannot be measured accurately. In such a case, cost-effective criterion is often adopted.

Suppose that the amount of emission is given at e, then the technology which satisfies the criterion is the one which corresponds to MAC_1. Too large emission!

If there are plural dischargers, then each firms' MAC must equal each other (equi-marginal principle).
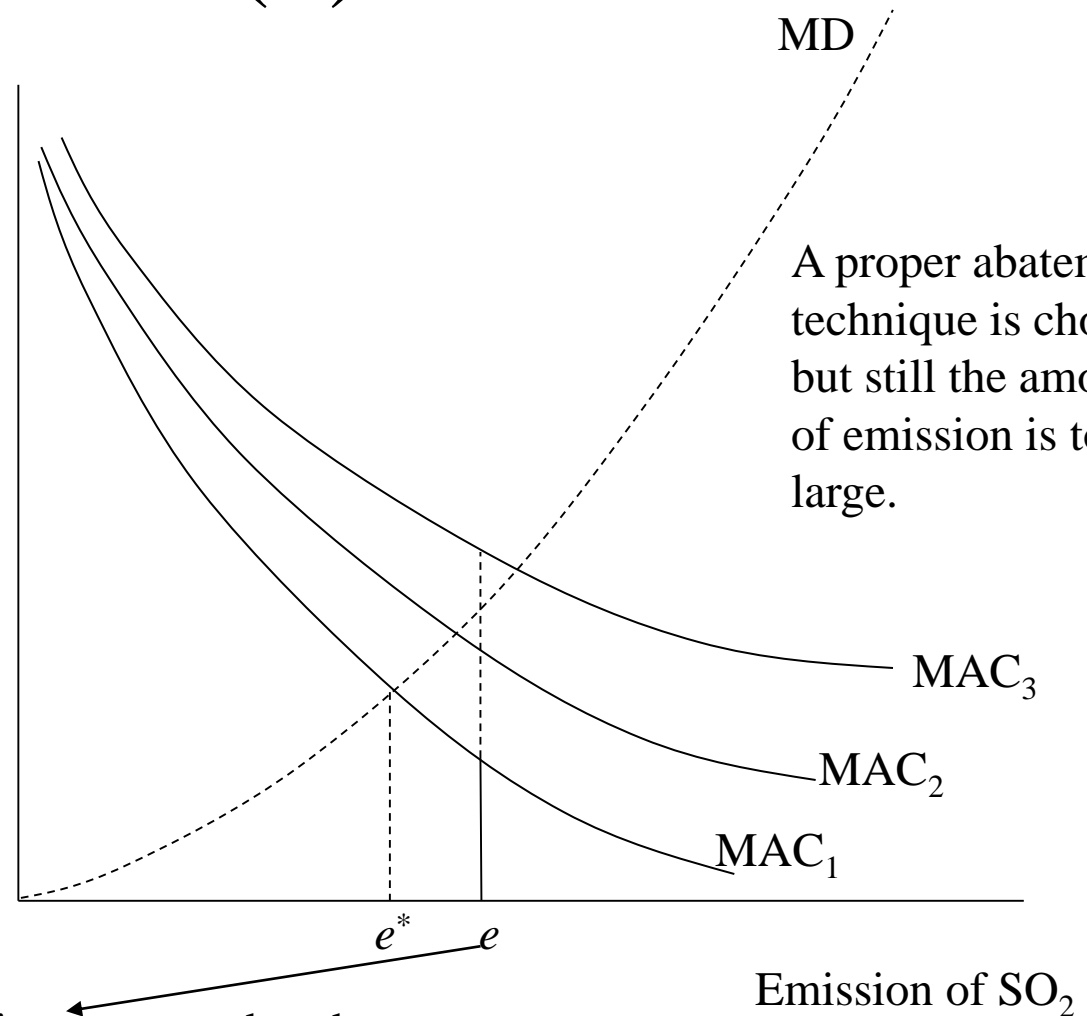
A proper abatement technique is chosen but still the amount of emission is too large.

MD

MAC_3

MAC_2

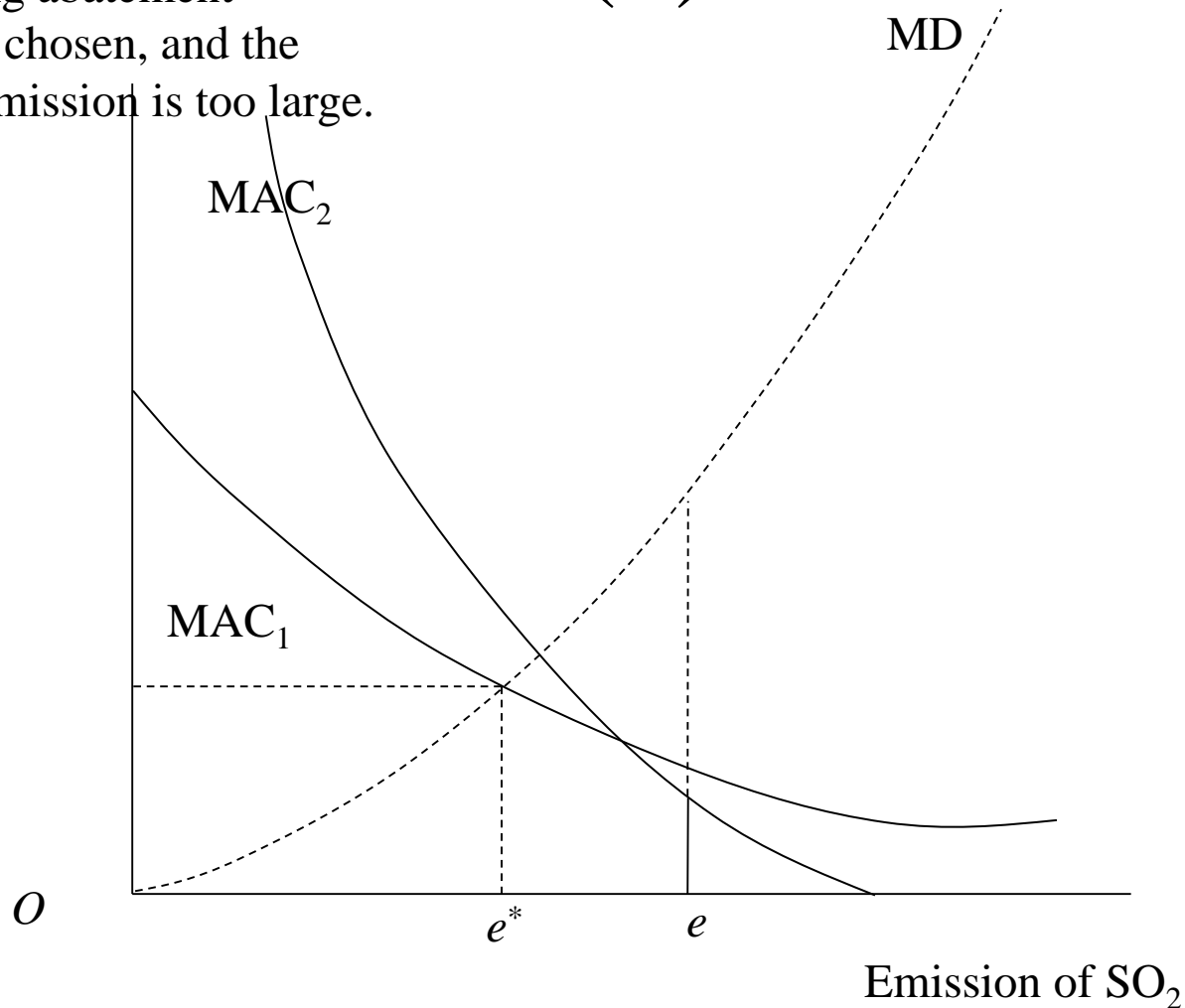MAC_1

O

e^* e

Emission of SO_2

To large emission compared to the optimal one e^*.

Explanation by means of a figure (2)
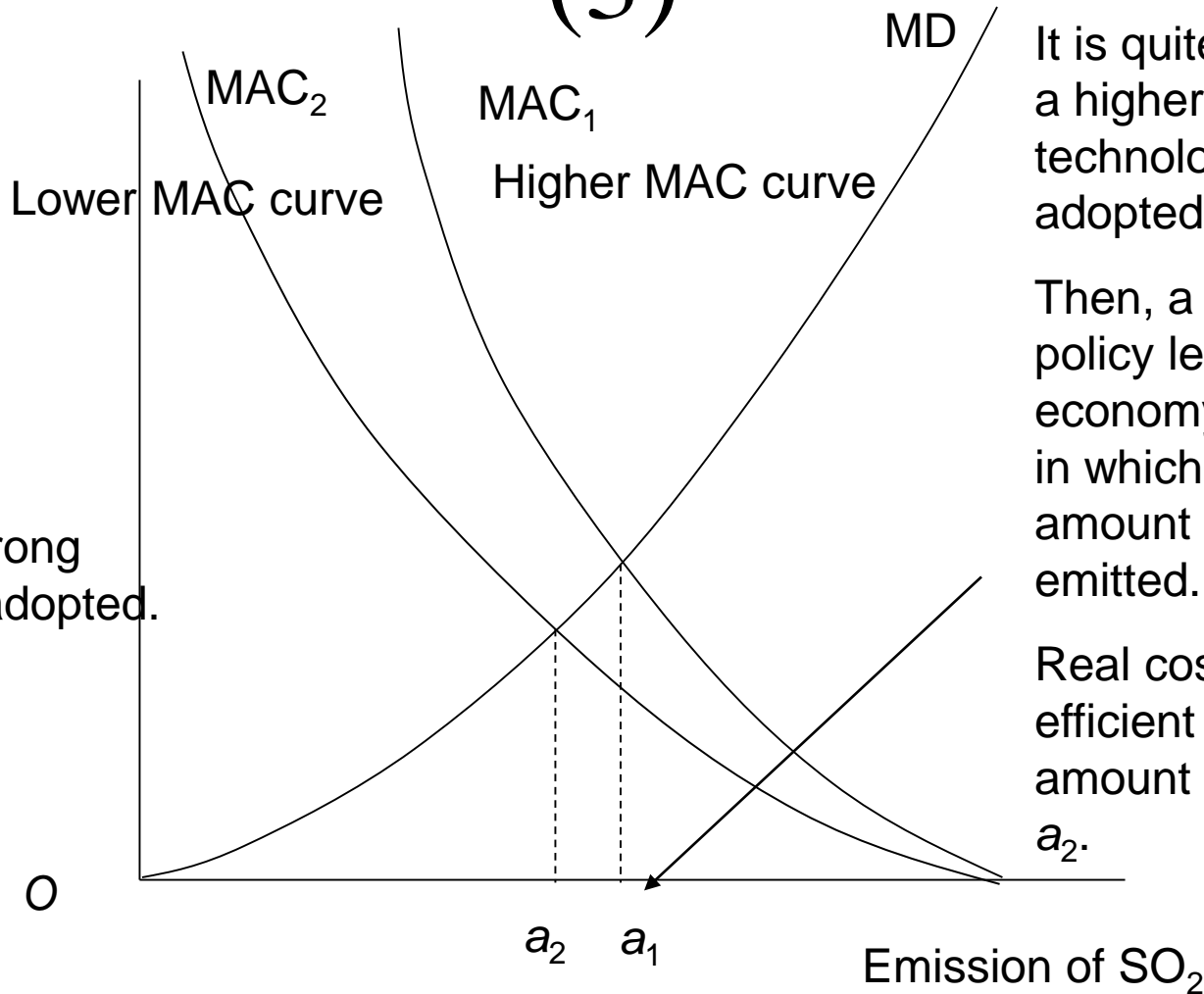
A little bit more complicated case: a wrong abatement technique is chosen, and the amount of emission is too large.

MD

MAC$_2$

MAC$_1$

O

e^* e

Emission of SO$_2$

Explanation by means of a figure (3)

It is quite possible that a higher cost technology is wrongly adopted.

Then, a cost-ineffective policy leads an economy to a situation in which too large amount of pollutants is emitted.

Real cost effective (and efficient in this case) amount of emission is a_2.

Exercise

- How is the efficient policy different from the cost-effective policy?

- Why is the cost-effective policy adopted, instead of the efficient policy?

- Is there a concrete example that the cost-effective policy is adopted, instead of the efficient policy?

A remark

- In actual environmental problems, a target of reduction of pollutants and so on is often determined by a certain political process.

- One of the reasons is that, possibly due to the lack of knowledge of a MD curve, it is hard to agree on the amount of the optimal reduction of pollutants.

An example: the global warming problem

- It is relatively easy to calculate the marginal abatement costs for reduction of carbon emission, since technologies for the reduction is well known.

- However, it is very hard to calculate the marginal damages caused by the global warming, mainly due to uncertainty.

- Thus, the reduction scenarios of CO_2 by IPCC may not satisfy MAC = MD.

(3) Fairness

- Efficient policies or cost-effective policies do not always attain fair allocation of resources.

- Benefits and costs of policies are distributed among economic actors, some of whom are rich and others are poor.

- Efficient or cost-effective policies may possibly be opposed on the grounds that they may invite unfair results.

- The concept of "fairness" differs among countries, particularly between developed and developing countries. *cf*. The right to develop.

Discussion: The right to develop

- How do you define the right to develop?

- Do you agree that developing countries insist the right to develop?

- Do you think that the right to develop justify environmental degradation?

An example

- Quite often, developing countries insist the right to develop.

- Since marginal abatement costs are usually much cheaper, say for CO_2 reduction, in developing countries, it is reasonable to reduce CO_2 emission in those countries.

- Since this may give serious effects to growth and development, developing countries oppose the idea, insisting that it is unfair.

A remark: Environmental justice

- Environmental justice is sometimes regarded as an important issue.

- Environmental costs or burden are often on the shoulders of racial minorities, poor people and so on.

- It must be remembered that rich people can avoid environmental degradation with relatively low cost.

- People who are starving are often suffering from environmental degradation, either.

A case of the Minamata disease

- Fifty years ago, people who lived near the Minamata bay was afflicted with a strange disease.
- It was revealed that this disease was caused by eating of fish and shellfish which were contaminated with a very toxic substance, organic mercury.
- This contamination was brought by improper emission of waste water of the *Chisso*-company.
- Seriously affected local people mainly belonged to the low income classes.

A case of the Minamata disease (cont.)

- It took such long time to trace the sources of contamination.

- Until the truth was revealed, many people were afflicted with the disease, and some even died.

- The proper countermeasures against the disease had not been taken for long time, so that many patients had remained without help.

- The related social costs should have been huge.

(4-1) Incentives for technological improvement

- It is private actors whose economic decisions determine environmental performances.

- It is vital to *utilize incentives* of those actors for implementing environmental policies.

- In a dynamic context, this point is further more important, since private actors can innovate new technologies which can abate pollutants less costly if proper incentives are given.

- Namely, MAC curves can shift due to innovations.

(4-2) Incentives for technological improvement

- The greater these incentives, the better the policy.

- New innovations and new ideas for environmental improvement are in nature of public goods.

- Thus, they have externalities (external economies).

- Regulations which are in place over time are supposed to create stronger incentives for innovations.

- Well-designed environmental regulation promotes technical progress toward sustainable development.

An Example

- An example of well-designed environmental regulation: the regulation against exhaust gas from automobiles which was introduced into Japan in 1978.

- This regulation stimulated the development of new efficient engines, plugs, and so on.

- As a result, Japanese cars became more fuel-efficient and more environmental friendly, so that their competitiveness was strengthened in the world automobile market, against negative expectation.

(5-1) Enforceability

- For environmental policies to be realistic, they must be enforceable.

- Time and resources are required for enforcement of policies.

- Non-compliance is often seen in a real economy.

- Policies differ in terms of easiness of enforcement.

- Two steps of enforcement: monitoring and sanctioning.

(5-2) Enforceability
Difficulty of monitoring

- Monitoring polluting *behavior* is a very tough job.

- Polluters may try to cheat the authority and outwit the monitoring process.

- They may also manipulate the data of emissions.

- In certain circumstances, the emission data of some big plants can be grasped by the authority in real time by means of developed technology.

(5-3) Enforceability Sanction

- The second step of enforcement is sanction.
- If penalties are imposed on firms which infringe regulations or manipulate data, incentives of compliance may be strengthened.
- Yet, sanction needs time, efforts and resources.
- Tougher penalties do not always mean good performance of firms.
- Courts may be reluctant to apply heavy penalties.

Remark: Material balance issues

- Material balance aspects must be taken into account when environmental policies are introduced.

- When flow of residuals is to be restricted by regulations, they may take different flows, which can possibly cause another environmental problem.

- Hence, potential cross-media transfer of pollutants is an important problem. Yet, it is sometimes hard to identify that transfer.

An example

- Suppose that people are required to reduce waste by the authority, although the authority does not arrange proper ways for the reduction of waste, e.g. recycling.

- Then, they may dispose of waste in kitchen sink.

- Thus, the waste water becomes much more dirty than before.

- The flow of waste is changed from solid waste disposal to sewage treatment.

38

(6-1) Moral consideration

- Different people have varied opinions on ethical issues.

- A way of thinking on what is right and wrong affects how people look at different environmental policies.

- Thus, environmental policies are disliked by some people even if those policies are efficient or cost-effective.

(6-2) Moral consideration

- Consider a subsidy or tax option, which is supposed to attain the same result in an equilibrium.

- The former option may cause quicker actions of firms and attain the result earlier than the latter option.

- From this standpoint, the former option is preferred to.

- But subsidy to polluters may run counter to the ethical notion.

(6-3) Moral consideration

- Quite a few people consider that those who cause pollution ought to bear the major burden of alleviating it.

- This way of thinking gives a base to Polluter Pays Principle (PPP).

- Although both the Pigouvian tax and subsidy attain the social optimum, the latter was not adopted in many countries, at least explicitly.

- Subsidy is considered to be against PPP.

41

Remarks: Three types of economic failure

- There are three types of economic failure; market failure, government failure and organization failure.

- The most famous one is market failure.

- When there are externalities, public goods, monopoly and so on, markets fail.

- Then, there is a room for the government to intervene in markets.

- Yet, the government may also fail.

Remarks (cont.)

- There is cognizance lag for the government.
- Even if there is no such lag, the governmental decision may be biased for political reasons.
- Political parties must win elections to obtain the political power.
- Political struggles will distort the governmental behavior toward environmental policies.

Remarks (cont.)

- Some may argue that NGOs or NPOs should play important roles in the case that both markets and the government fail.

- Yet, those organizations do not often have the rule of governance, and may also fail.

- The road to hell is paved with good intensions (The famous words by Dr. Samuel Johnson, edited by Karl Marx).

- Thus, Governments, NPOs and private actors must cooperate one another for creating a sustainable society, playing different roles.