Externalities and the Selection of Policy Tools: Other Considerations

(1) **Property Rights and The Coase Theorem**:

If property rights are well defined and transactions costs are very low, then it may be possible for the parties involved in an externality situation to reach an efficient solution by bargaining among themselves.

(2) **The Economics of Environmental Restoration and Clean-Up**:

Given a limited amount of financial resources, it is important to determine the optimal amount of pollution to clean up.

(3) Uncertainty and the Weitzman Model:

Uncertainty about the demand for environmental amenities and the costs of environmental protection may make standards preferable to taxes in certain situations.

(4) **Limited Information and Second-Best Outcomes**:

A complete lack of knowledge of environmental costs or benefits will lead to the development of *second-best* sub-optimal policies.

(5) **The Political Economy and Externality Policy Choice:**

Many special interest groups attempt to influence the formulation of regulatory policy through political contributions.

The Coase Theorem

Property rights: entitlements which holders cannot be forced to give up.

Example: water pollution
- a chemical plant may have the property right to pollute a river.
- swimmers and bathers may have the property right to clean water.

Coase Theorem:

When property rights are clear and enforceable, when all economic agents have full information, and when transaction costs are low, there is no need for government intervention to correct externalities, because the economic agents can bargain to achieve a Pareto optimal allocation of resources. Further, the ability of economic agents to achieve the Pareto optimal allocation does not depend on which economic agent is given the property rights.

The Coase Theorem Depends on Bribery:

If swimmers have the right to clear water, the chemical plant may bribe them to be able to pollute.

If the chemical plant has the right to pollute, then swimmers may bribe the manager to not pollute.

Note: In order for the Coase Theorem to hold, it is important that property rights owners be able to sell or transfer their rights (or part of them) to other users.

Graphical Depiction of the Coase Theorem

Polluter   MB -Polluter   MC -Pollutee   M   Pollutee

E

T   C   F

0   B   A
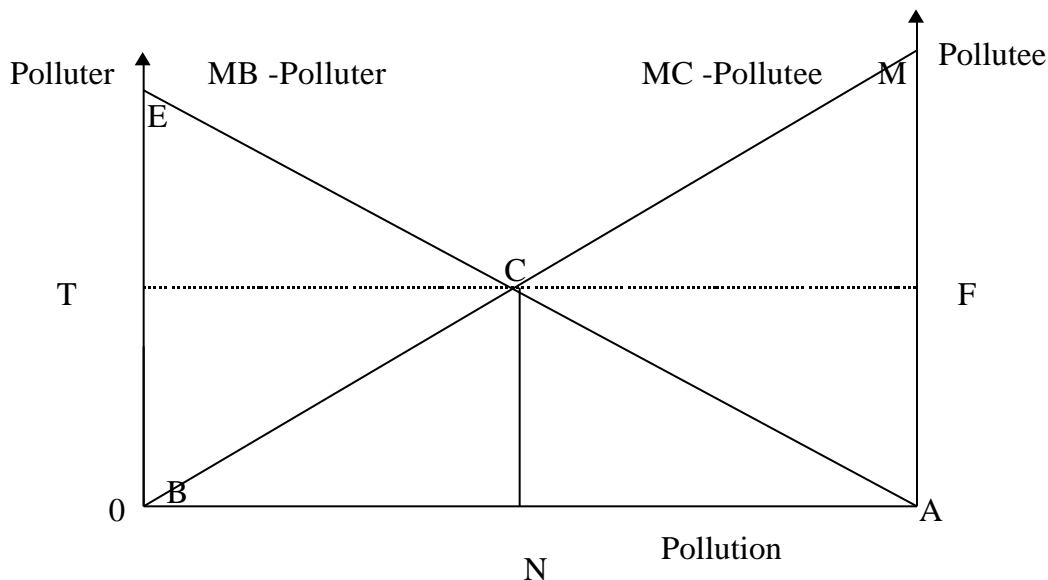
N   Pollution

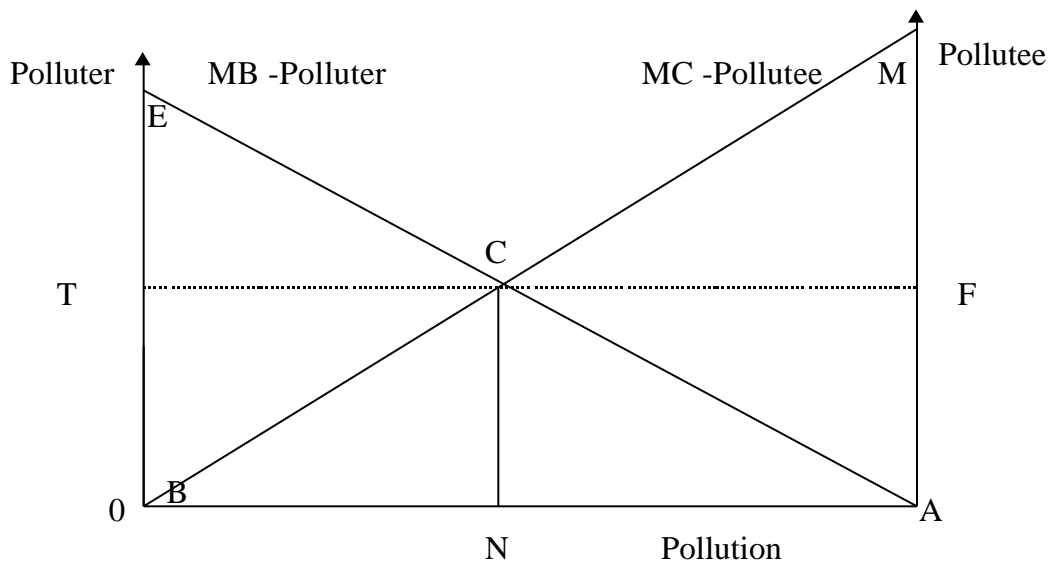## Case 1: The polluter has the Right to Pollute:

Initial Outcome:
- Pollution occurs until MB pollution = 0 to the polluter (Length 0A).
- Polluter Welfare = Area 0EA
- Pollutee Welfare = -M0A (negative surplus)
- Social Welfare = 0EC-MCA

Outcome after Negotiation: (pollutee pays the polluter $F per unit pollution reduction)
- Pollution = 0N
- Polluter Welfare = 0ECN + NCFA
- Pollutee Welfare = -0CN-NCFA
- Social Welfare = 0EC
- Gain in welfare = MCA

Graphical Depiction of the Coase Theorem

Polluter   MB -Polluter   MC -Pollutee   M   Pollutee

E

C

T   ....   F

0   B   A

N   Pollution

Case 2: The pollutee has the Right to No Pollution:

Initial Outcome:

- Pollution $= 0$
- Polluter Welfare $= 0$
- Pollutee Welfare $= 0$
- Social Welfare $= 0$

Outcome after Negotiation: (polluter pays the pollutee $T per unit pollution emitted)

- Pollution $= 0N$
- Polluter Welfare $=$ ECT
- Pollutee Welfare $= 0TC0$
- Social Welfare $= 0ECB$

Why The Coase Theorem May Not Apply:

Transaction Costs:
- costs of monitoring, enforcement, and negotiation

Observability (**uncertainty):**
- must have full knowledge of benefit functions

Legal Means for Determining the Allocation of Property Rights:

Property Rules:
• grant private ownership of a resource to a certain individual.

Liability rules:
• allow a violation of property right to occur, but assess penalties for doing so.

      -- example, Pollution taxes

Negligence rules:
• penalize individuals for not exercising sufficient care in an action.
• an example is **Retroactive Liability**:

    polluters are liable for the clean-up of pollution   caused by past activities

• **Full Retroactive Liability**

    requires that new owners accept clean-up responsibility for existing environmental conditions when purchasing an asset

Inalienability:
• rights which cannot be sold or transferred
• example, rights to freedom and to life itself
• why do law-makers impose inalienable rights:

• **Cognitive Dissonance**:

    A psychological notion representing the idea that   people tend to think nothing bad will happen to them.

        -- People may refuse to wear seatbelts
        -- Workers may not wear safety gear

• **Morality**:

    Society may decide that some behavior will simply not   be tolerated.

-- For example, slavery

The Economics of Environmental Restoration

Question: How much should be cleaned up?

The Optimal Cleanup Level
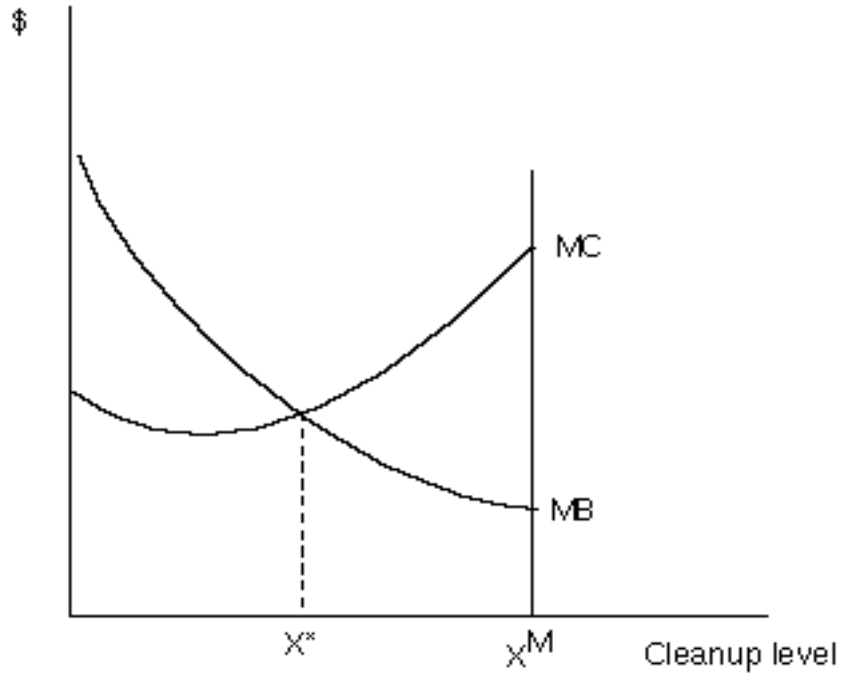
MB = Marginal Benefit of environmental clean-up
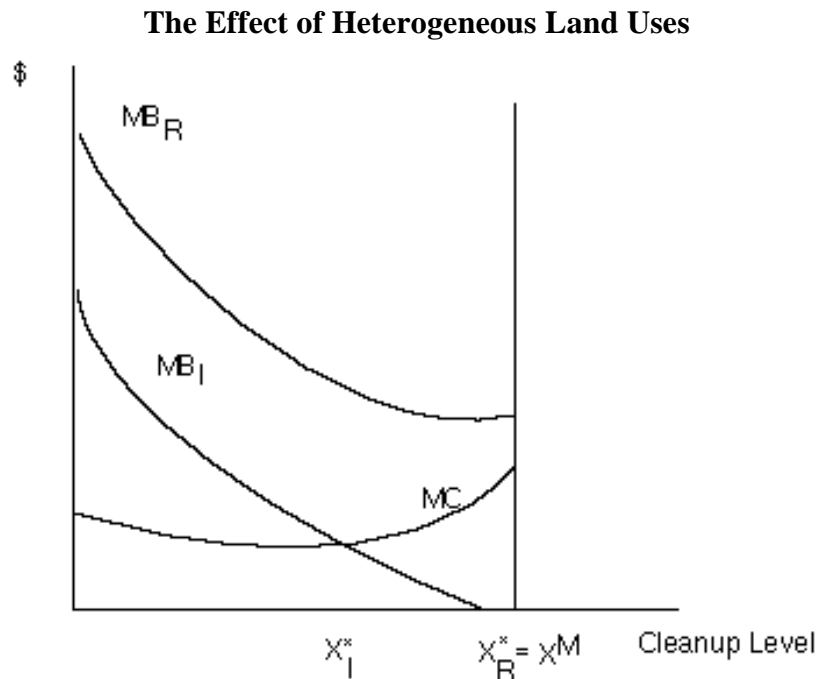MC = Marginal Cost of environmental clean-up

Note: MC includes the opportunity cost of other projects
     not undertaken due to a limited budget.

X^M = complete cleanup
X^* = optimal cleanup.

Policy Conclusion: Complete cleanup may not be optimal.

The Optimal Clean-Up Level Varies with Land Use Type

The Effect of Heterogeneous Land Uses

$ ↑

MB$_R$

MB$_I$

MC

X$^*_I$ X$^*_R$ = X^M Cleanup Level

MB$_R$ =   marginal benefit of cleanup in residential use

MB$_I$ =marginal benefit of cleanup in industrial use

MC =marginal cost of cleanup

X^*_I =optimal cleanup of industrial uses

$X^*_R = X^M$ = optimal cleanup in residential uses.

Notice that $X^*_R = X^M$, but $X^*_I < X^M$:

- because, MB of clean-up on residential land is higher than the MB of cleanup on industrial land.

Thus, heterogeneity in land use may cause the optimal level of cleanup to differ across land-use types.

Two types of pollution:
- point source: pollution created at an easily identifiable source
- non-point source: pollution from hard to identify sources

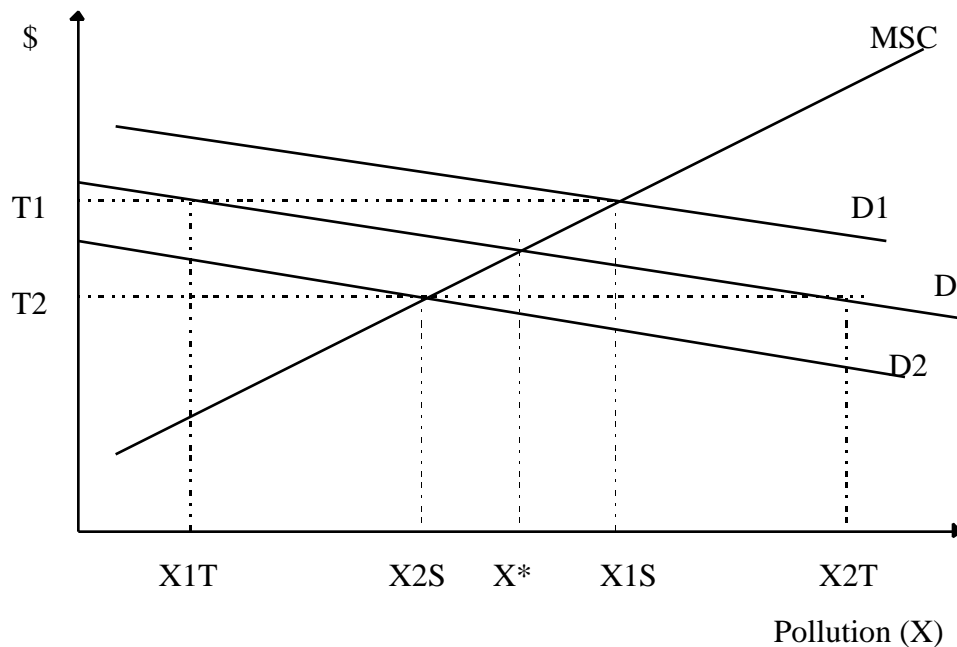# Uncertainty and Policy Choices

X = Level of Pollution
D = Demand or Marginal Social Benefit of Pollution
MSC = Marginal Social Cost of Pollution

The regulator is uncertain about the true value of MSB. Suppose that the true Demand is D, but that:
- 50% of the time overestimate the demand at D1
- 50% of the time underestimate it to be D2.

Wietzman's Model Under Elastic Demand

If policymakers think demand is D1:
  set the tax t*=T1 => pollution level X1T
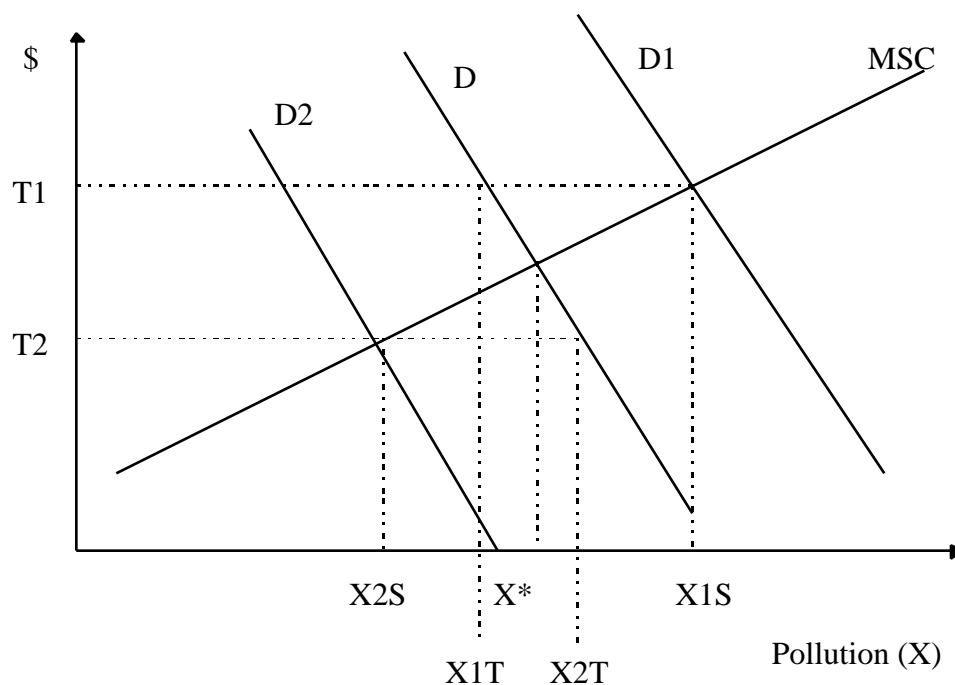 set the standard X1S.
If policymakers think demand is D2:
  set the tax t*=T2 => pollution level X2T
  set the standard X2S.

When demand is elastic, standards perform better than taxes

Uncertainty and Policy Choices (cont.)

Wietzman's Model Under Inelastic Demand

If policymakers think demand is D1:
 set the tax t*=T1 => pollution level X1T
 set the standard X1S.
If policymakers think demand is D2:
 set the tax t*=T2 => pollution level X2T
 set the standard X2S.

When demand is inelastic, taxes perform better than subsidies

Intuition: Elastic demand curves are highly price-responsive. Thus, a small mistake in the price of a good (i.e., the tax) leads to a much larger change in the quantity of pollution controlled. Therefore, under uncertainty taxes perform better when demand is *inelastic*, since even a very large deviation from the optimal tax rate may not create a significant divergence from the optimal quantity.

Limited Information and Second-Best Policy

When policymakers have only limited information regarding environmental costs or benefits, they may lack sufficient knowledge to design optimal, or **first-best** outcomes (i.e. a policy which ensures that MSB=MSC). Instead, they may be forced to develop a **second-best** policy.

For example, as a second-best policy alternative, a regulator may decide to *minimize the cost of achieving some target* level of pollution. Such a target may be set by experts who might make educated guesses as to the optimal level while further research is being done.

The following model is due to Baumol and Oates.

The goal is to minimize the cost of reducing regional pollution to a point at or below a target threshold. That is, we will solve the second-best problem of maximizing profits from production subject to the constraint that an environmental pollution standard is met.

Second-Best Policy (cont.)

Y = output; P = output price

Z = pollution; $\bar{Z}$ = pollution target (standard)

X = input; W = input price

$Y = f(X)$ is a production function

$Z = g(X)$ is a pollution generation function

The second-best policy is derived by solving:

$$\max_{X} Pf(X) - WX \quad \text{s.t. } g(X) \quad \bar{Z}$$

The lagrangian expression for this problem is:

$$L = \max_{X,l} Pf(X) - WX + \lambda\left[\bar{Z} - g(X)\right]$$

.

the FOCs are:

$$L_X = Pf_X - W - \lambda g_X = 0 \tag{1}$$

$$L_\lambda = \bar{Z} - g(X) = 0 \tag{2}$$

- where   is the shadow price of pollution associated with the target level, $\bar{z}$.
- Equation (1) states that:
    MRP - Wage $=$ (Shadow Price)(Marginal Emission Rate)
- unregulated firms do not pay shadow prices and will set:
    MRP - Wage $= 0$.
- a unit *pollution tax* that would achieve the second-best target level would be, t*
    $=$. Alternatively, the second-best optimal *input tax* would be, $= \lambda g_X(X^*)$.

Political Economy and Externality Policy

- producers or consumers may desire regulation because they believe that they can capture the regulators (influence the regulators to create rents through regulatory activities and to then distribute those rents back to the interest group)

- producers often influence regulators to choose standards, because standards generate larger rents for producers. Rents arise because the imposition of regulatory standards decreases supply, and this enables producers to charge higher prices for their products, thereby creating "monopoly rents".

Rents Can Be Generated By Environmental Standards
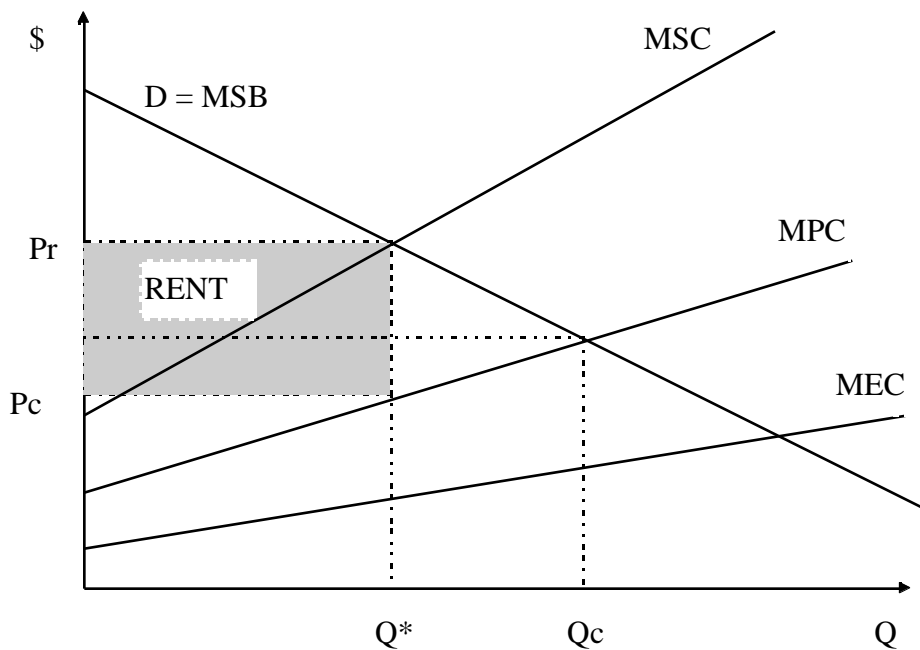
- initially:
output at Qcomp and price Pcomp.
- with a standard (MSB=MSC):
output at Q* and price P*
    -earn additional rents (producer surplus) = to the shaded area.