

EXTERNALITIES

Abel Embaye

UofA

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OUTLINE

1. Externality Theory
2. Private-Sector Solutions to Negative Externalities
3. Public-Sector Remedies for Externalities
4. Distinctions Between Price and Quantity Approaches to Addressing Externalities
5. Conclusion

EXTERNALITIES

Market failure: A problem that violates one of the assumptions of the 1st welfare theorem and causes the market economy to deliver an outcome that does not maximize efficiency

Externality: Externalities arise whenever the actions of one economic agent **directly** affect another economic agent outside the market mechanism

Externality example: a steel plant that pollutes a river used for recreation

Not an externality example: a steel plant uses more electricity and bids up the price of electricity for other electricity customers

Externalities are one important case of market failure

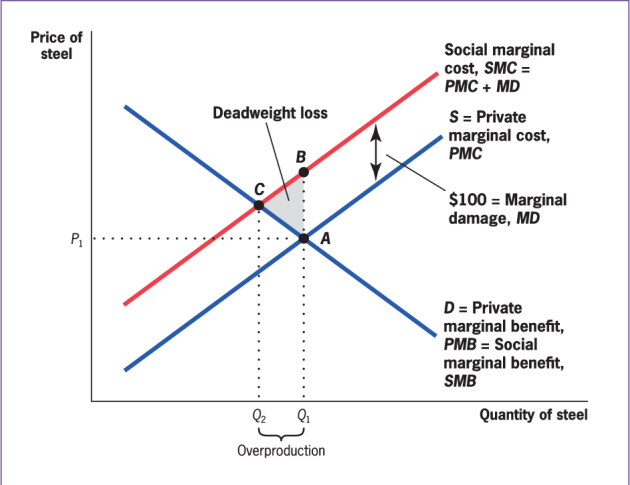
Externality Theory

- **Negative production externality:** When a firm's production reduces the well-being of others who are not compensated by the firm.
 - Example: steel plant pollutes a river but plant does not face any pollution regulation (and hence ignores pollution when deciding how much to produce)
- **Negative consumption externality:** When an individual's consumption reduces the well-being of others who are not compensated by the individual.
 - Smoking at a restaurant affects the health and enjoyment of others.
- Negative production externalities drive a wedge between private and social marginal cost and Negative consumption externalities drive a wedge between private and social marginal benefit.

Private and Social Marginal Cost

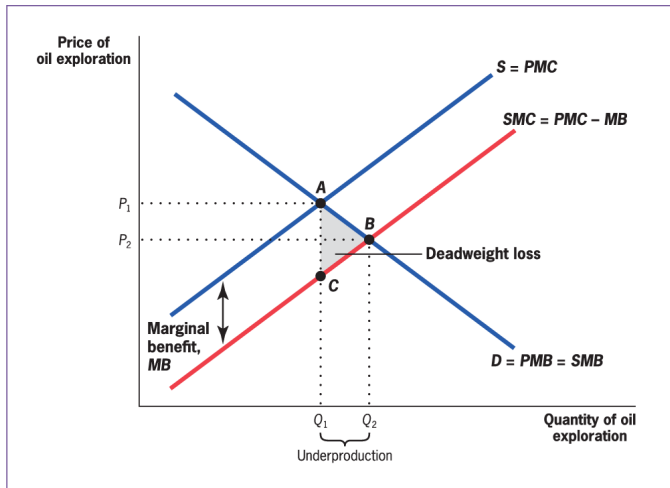
- **Private marginal cost (PMC):** The direct cost to producers of producing an additional unit of a good
- **Marginal Damage (MD):** Any additional costs associated with the production of the good that are imposed on others but that producers do not pay
- **Social marginal cost ($SMC = PMC + MD$):** The private marginal cost to producers plus marginal damage

Negative Production Externality



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POSITIVE PRODUCTION EXTERNALITIES



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Externality Theory: Positive Externalities

Positive production externality: When a firm's production increases the well-being of others but the firm is not compensated by those others.

Example: Beehives of honey producers have a positive impact on pollination and agricultural output

Positive consumption externality: When an individual's consumption increases the well-being of others but the individual is not compensated by those others.

Example: Beautiful private garden that passers-by enjoy seeing

ECONOMICS OF NEGATIVE CONSUMPTION EXTERNALITIES

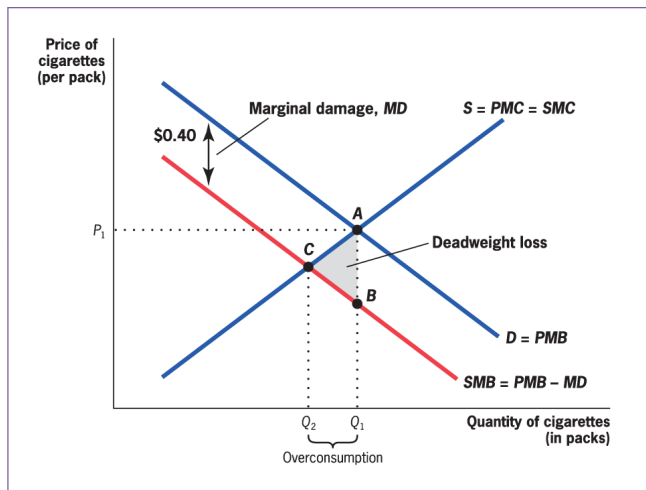
Negative consumption externality: When an individual's consumption reduces the well-being of others who are not compensated by the individual.

Private marginal benefit (PMB): The direct benefit to consumers of consuming an additional unit of a good by the consumer.

Social marginal benefit (SMB): The private marginal benefit to consumers plus any costs associated with the consumption of the good that are imposed on others

Example: Using a car and emitting carbon contributing to global warming

ECONOMICS OF NEGATIVE CONSUMPTION EXTERNALITIES



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Externality Theory: Market Outcome is Inefficient

With a free market, quantity and price are such that $PMB = PMC$

Social optimum is such that $SMB = SMC$

⇒ Private market leads to an inefficient outcome (1st welfare theorem does not work)

Negative production externalities lead to over production

Positive production externalities lead to under production

Negative consumption externalities lead to over consumption

Positive consumption externalities lead to under consumption

Numerical Example:

Suppose $Q_s = 2p$ and $Q_D = 100 - 3p$ and the $MD = \$1$ per unit of production:

1. Find the P^* and Q^* that maximize producers' profit
2. Find the p^* and Q^* that maximize the social welfare
3. Find the deadweight loss if externality is not corrected

Private-Sector Solutions to Negative Externalities

Key question raised by Ronald Coase (famous Nobel Prize winner Chicago libertarian economist):

Are externalities really outside the market mechanism?

Internalizing the externality: When either private negotiations or government action lead the price to the party to fully reflect the external costs or benefits of that party's actions.

PRIVATE-SECTOR SOLUTIONS TO NEGATIVE EXTERNALITIES: COASE THEOREM

Coase Theorem (Part I): When there are well-defined property rights and costless bargaining, then negotiations between the party creating the externality and the party affected by the externality can bring about the socially optimal market quantity.

Coase Theorem (Part II): The efficient quantity for a good producing an externality does not depend on which party is assigned the property rights, as long as someone is assigned those rights.

COASE THEOREM EXAMPLE

Firms pollute a river enjoyed by swimmers. If firms ignore swimmers, there is too much pollution

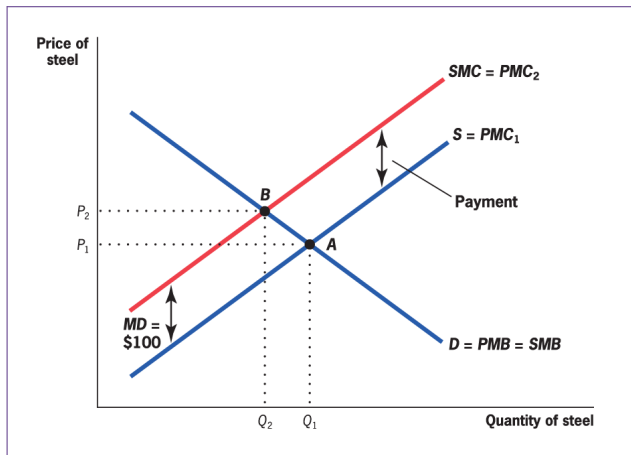
1. **Swimmers own river:** If river is owned by swimmers then swimmers can charge firms for polluting the river. They will charge firms the marginal damage (MD) per unit of pollution.

Why price pollution at MD? If price is above MD, swimmers would want to sell an extra unit of pollution and get hit by pollution damage MD, so price must rise. MD is the equilibrium efficient price in the newly created pollution market.

2. **Firms own river:** If river is owned by firms then firm can charge swimmers in exchange of polluting less. They will also charge swimmers the MD per unit of pollution reduction.

Final level of pollution will be the same in (1) and (2)

Coasian Solution for Negative Production Externality!



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PROBLEMS WITH COASIAN SOLUTION

In practice, the Coase theorem is unlikely to solve many of the types of externalities that cause market failures.

1. **The assignment problem:** In cases where externalities affect many agents (e.g. global warming), assigning property rights is difficult
 - Coasian solutions are likely to be more effective for small, localized externalities than for larger, more global externalities involving large number of people and firms
2. **The holdout problem:** Shared ownership of property rights gives each owner power over all the others (because joint owners have to all agree to the Coasian solution)

As with the assignment problem, the holdout problem would be amplified with an externality involving many parties.

3. **The Free Rider Problem:** When an investment has a personal cost but a common benefit, individuals will underinvest

PROBLEMS WITH COASIAN SOLUTION

4. **Transaction Costs and Negotiating Problems:** The Coasian approach ignores the fundamental problem that it is hard to negotiate when there are large numbers of individuals on one or both sides of the negotiation.

This problem is amplified for an externality such as global warming, where the potentially divergent interests of billions of parties on one side must be somehow aggregated for a negotiation.

PROBLEMS WITH COASIAN SOLUTION: BOTTOM LINE

Ronald Coase's insight that externalities can sometimes be internalized was useful.

It provides the competitive market model with a defense against the onslaught of market failures.

It is also an excellent reason to suspect that the market may be able to internalize some small-scale, localized externalities.

It won't help with large-scale, global externalities, where only a "government" can successfully aggregate the interests of all individuals suffering from externality

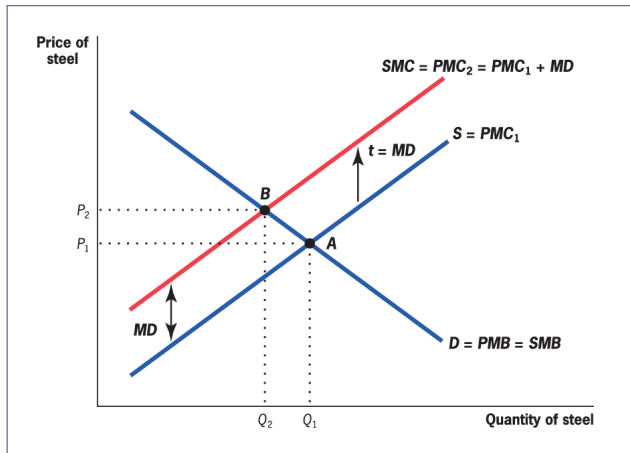
Public Sector Remedies For Externalities

The Environmental Protection Agency (EPA) was formed in 1970 to provide public-sector solutions to the problems of externalities in the environment.

Public policy makers employ two types of remedies to resolve the problems associated with negative externalities:

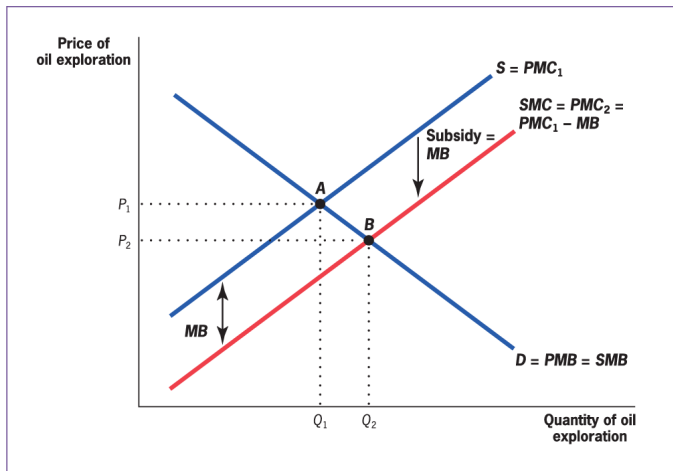
1. **price policy (Pigouvian tax)**: corrective tax or subsidy equal to marginal damage per unit
2. **quantity regulation**: government forces firms to produce the socially efficient quantity

1a. Tax producers when there is negative production externality



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1b. Subsidize producers when there is positive production externality



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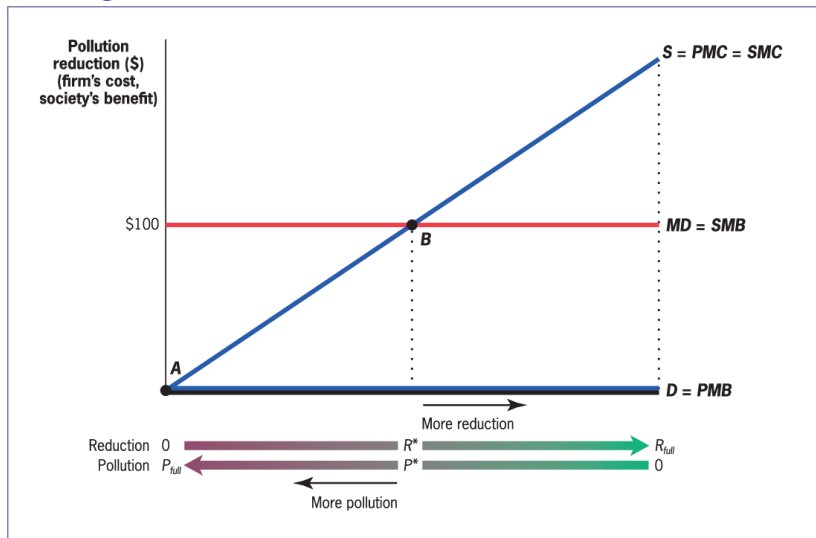
2. REGULATION

In an ideal world, Pigouvian taxation and quantity regulation would be identical

Quantity regulation seems more straightforward, hence, it has been the traditional choice for addressing environmental externalities

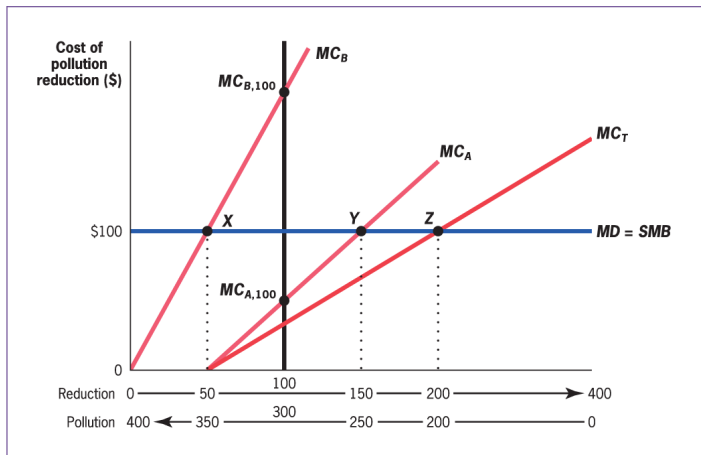
In practice, there are complications that may make taxes a more effective means of addressing externalities.

Distinctions Between Price and Quantity Approaches to Addressing Externalities: Basic Model



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Multiple Firms with Different Reduction Costs 1



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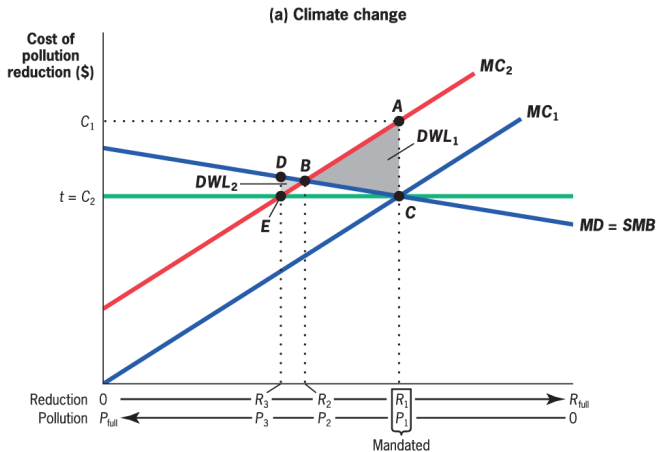
Multiple Firms with Different Reduction Costs 2

Three possible policies here are:

1. Quantity regulation: For each plant, the marginal cost of reducing pollution is set equal to the social marginal benefit of that reduction.
2. Corrective tax: Pigouvian taxes cause efficient production by raising the cost of the input by the size of its external damage.
3. Quantity regulation with tradable permits: Trading allows the market to incorporate differences in the cost of pollution reduction across firms.

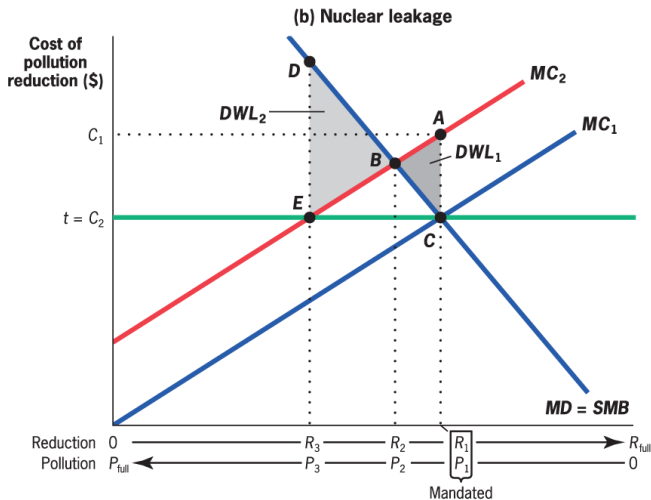
Comparison of Policy Under Uncertainty:

Flat MD Curve: Global climate Change



Comparison of Policy under uncertainty:

Step MD Curve: Local Nuclear Waste



SUMMARY

- Externalities are the classic answer to the “when” question of public finance: when one party’s actions affect another party, and the first party doesn’t fully compensate (or get compensated by) the other for this effect, then the market has failed and government intervention is potentially justified.