

Econ 101: Principles of Microeconomics

Chapter 17 - Externalities

Fall 2010

Outline

- 1 Externalities
- 2 Dealing with Externalities
- 3 A Simple Two-Firm Example

The Course Thus Far

- In this course we have focused our attention on
 - The basics of a market economy
 - Where do supply and demand come from?
 - How do they interact to organize market behavior, yielding an equilibrium price and quantity?
 - Why does a perfectly competitive market yield an efficient outcome, maximizing total surplus in the market?
 - Market failures due to market power
 - How does a monopoly use its market power and distort the equilibrium price and quantity?
 - Who gains and loses from this market power?
 - What are the trade-offs in regulating or maintaining a monopoly?
 - How do firms between the two extremes behave?

Other Sources of Market Failure

- There are, however, several other sources of market failure.
 - ① Chapter 17 covers **Externalities**- we will focus on pp. 433-445.
 - ② Chapter 18 covers **Public goods** and **Common Property Resources**
- Indeed, these sources of market failure provide much of rationale for government intervention in the market place, including
 - Environmental Regulation to
 - Limit pollution
 - Regulate fishing and timber harvesting
 - National Security
 - Public Education
 - Public Transportation
 - Immunization Programs.
- With the limited time remaining in the course, we will touch on a few key aspect of each of these market failures and on how to deal with them.

The Key Role of Property Rights

- As we discussed in Chapter 4, a system of property rights that would facilitate a well-functioning marketplace would include:
 - **Universality** requires that all resources are privately owned and all entitlements completely specified,
 - **Exclusivity** requires that all benefits and costs accrued as the result of owning and using the resources should accrue to the owner, and only the owner, either directly or indirectly by sale to others.
 - **Transferability** requires that all property rights should be transferable from one owner to another in a voluntary exchange.
 - **Enforceability** requires that property rights should be secure from seizure or encroachment by others
- The problems we see in chapters 17 and 18 stem in large part to departures from this system.
- This does not, however, mean that we want to change the system of property rights that we have.
- Instead, government may need to intervene in the market to fix the problems that arise.

Externalities

What is an Externality?

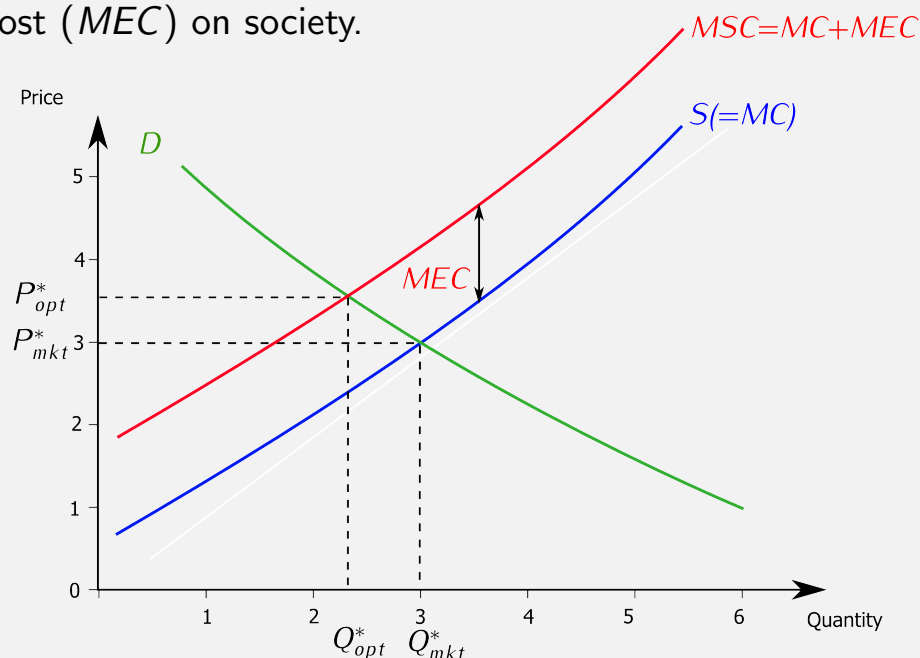
- An **externality** exists whenever the welfare of some agent, either a firm or a household, depends directly, not only on his or her activities, but also on activities under the control of some other agent as well.
- Externalities essentially violate the *exclusivity* condition above.
- There are two types of externalities:
 - ① A **negative externality (or external diseconomy)** arises when there is an *uncompensated* cost that an individual or firm imposes on others; e.g.,
 - Pollution
 - The neighbor's dog barking all night
 - ② A **positive externality (or external economy)** arises when there is an *uncompensated* benefit that an individual or firm confers on others; e.g.,
 - Bee keeper/apple orchard
 - Inoculations against infections
 - Education - leads to a more civilized society.
- It is important to think of externalities as effects not directly stemming from market activities

What Are the Consequences of a Negative Externality?

- The basic problem of a negative externality is the cost the individual sees as associated with their actions is *not* the same as the cost that society as a whole sees.
- Krugman and Wells refer to this as the *gap* between **private cost** and **social cost** of a good or activity.
- Consider the problem of a paper mill, whose production process produces waste.
- Historically (i.e., largely prior to 1970 in the U.S.) firms faced little or no regulation prohibiting the dumping of waste into nearby rivers or streams.
- Given a choice between
 - ① Carefully processing their waste stream at a cost, or
 - ② Dumping their waste at little or no cost
 firms often chose the latter alternative.
- The fundamental problem is that the market provided them with little or no *signal* that there was a cost associated with dumping their pollution.

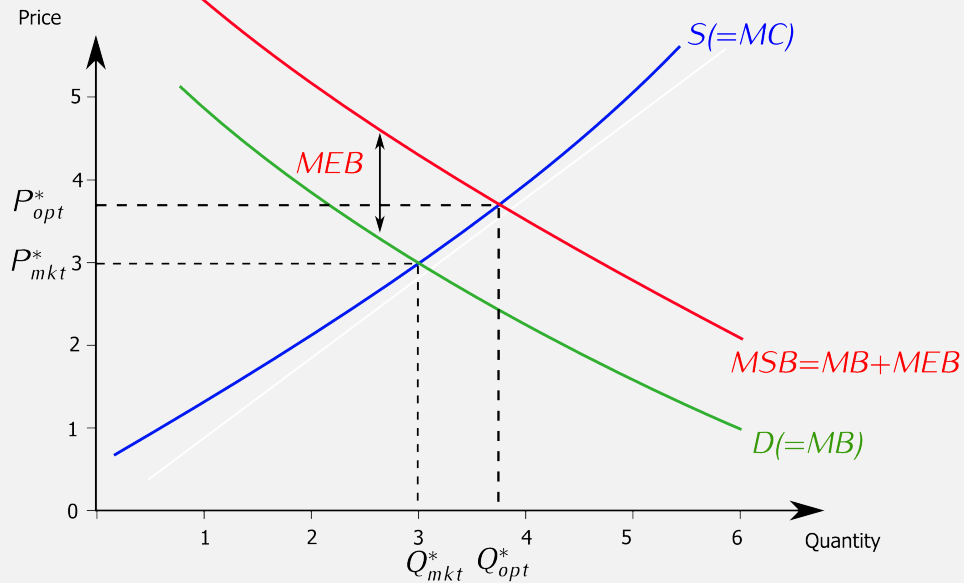
Socially Optimal vs. Market Outcome with a Negative Externality

Suppose for simplicity that the negative externality imposes a constant marginal cost (MEC) on society.



Socially Optimal vs. Market Outcome with a Positive Externality

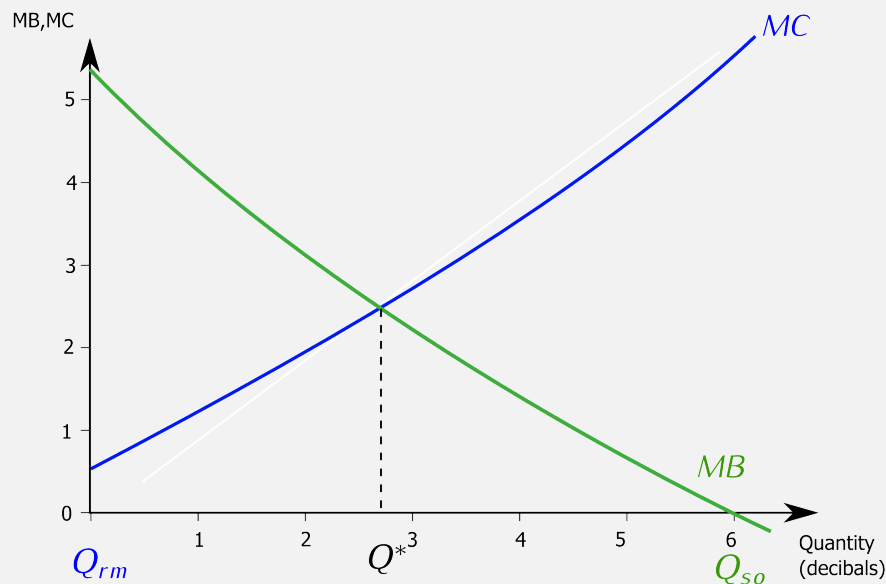
Suppose for simplicity that the positive externality confers a constant marginal benefit (MEB) on society.



Dealing with Externalities

Dealing with Externalities

To illustrate the possible solutions to externalities consider a simple example of two roommates, with one owning a stereo and the other preferring quiet.



The Optimum Solution

- Notice in this case, the optimum solution is neither complete quiet, nor unconstrained noise.
- Instead, we need to balance the costs and benefits of the noise.
- The same is true of pollution in general—there are tradeoffs involved in its regulation.
- There are a number of ways of addressing the problem of the stereo owner and the roommate
 - The stereo owner could bribe the roommate, compensating them for the “damage” done by playing their stereo
 - The roommate could bribe the stereo owner to turn their music down, compensating them for the loss of their music.
- These first two solutions are allowing for private negotiation.
- Such negotiations, according to **Coase's Theorem**, will lead to an efficient outcome, regardless of who is assigned the initial property rights, as long as the costs of negotiation are small.
- Unfortunately, for many externalities, such costs are not small and alternative solutions must be considered.

Alternative Policies Towards Externalities

- Instead of allowing for private negotiation, the government may step in to regulate or control externalities.
- One of the key problems with such regulation is defining the optimum level of the externality to allow.
- Conceptually, this requires identifying the point at which $MB = MC$ of pollution.
- Because of the difficulty of this task, policymakers often decide the allowable level of pollution.
- Economists then suggest mechanisms for achieving this emissions goal in the least cost fashion.
- Three basic approaches have been employed in the U.S. (and elsewhere):
 - ① **Emissions Standards** also known as the **Command and Control** approach.
 - ② **Emissions Taxes or Subsidies**
 - ③ **Tradeable Emissions Permits**

More on Alternative Policies

- Environmental Standards have been the dominant policy tools, though recently taxes and permit have become more common.
- Standards can specify either the allowable level of emissions or the technology firms must employ to control pollution.
- The problem with standards is that they
 - ① are less flexible
 - ② have significant information costs for regulators.
 - ③ typically are significantly less cost effective than the alternatives.
 - ④ do not encourage innovation to the same extent as other approaches.
- The key benefits of emissions taxes and permit systems are that
 - ① they automatically create the incentive for firms to control emissions in a way that minimizes the cost of emissions control.
 - ② they significantly reduce the information costs for regulators.
 - ③ they encourage innovation relative to standards.
- Both essentially try to force firms to internalize the costs of the externalities they produce.

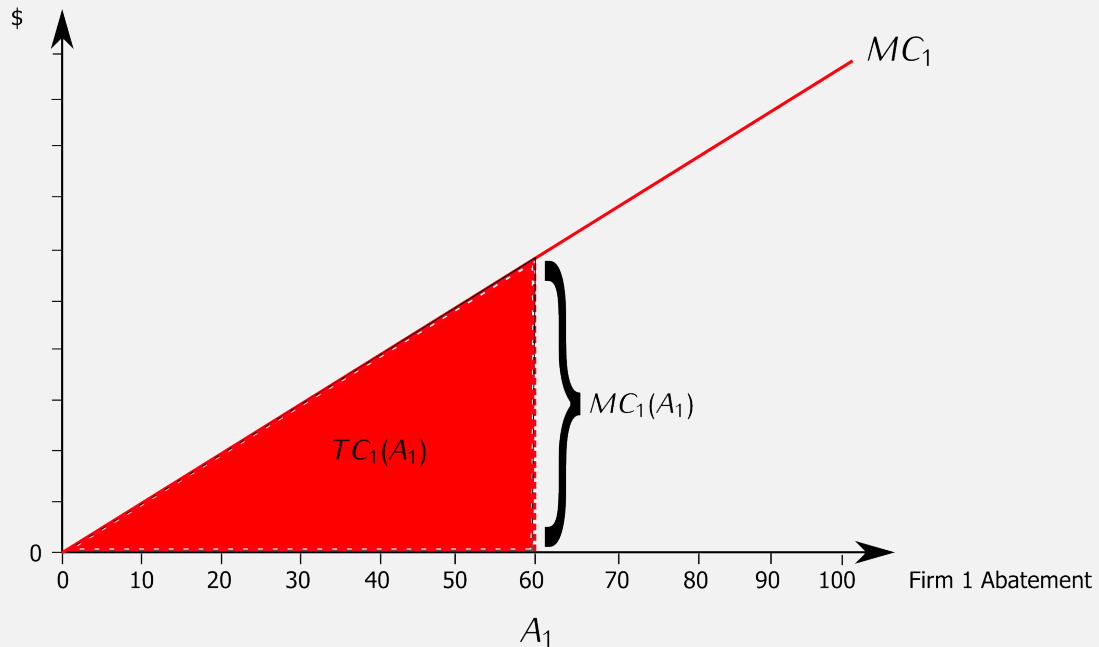
A Simple Two-Firm Example

Reducing Pollution - A Two Firm Example

- Suppose we have two firms, with each firm emitting 100 units of pollution.
- Thus, total emissions is 200 units of pollution.
- Further, suppose regulator's decide that this level of pollution is too high and needs to be cut in half.
- Pollution reduction (also known as pollution **abatement**) is typically costly to the firm (otherwise they would have reduced their pollution on their own).
- The question is, who should reduce pollution and by how much?
- What goal might we use?
- One obvious goal to achieve the desired pollution reduction in the **Least Cost** fashion.

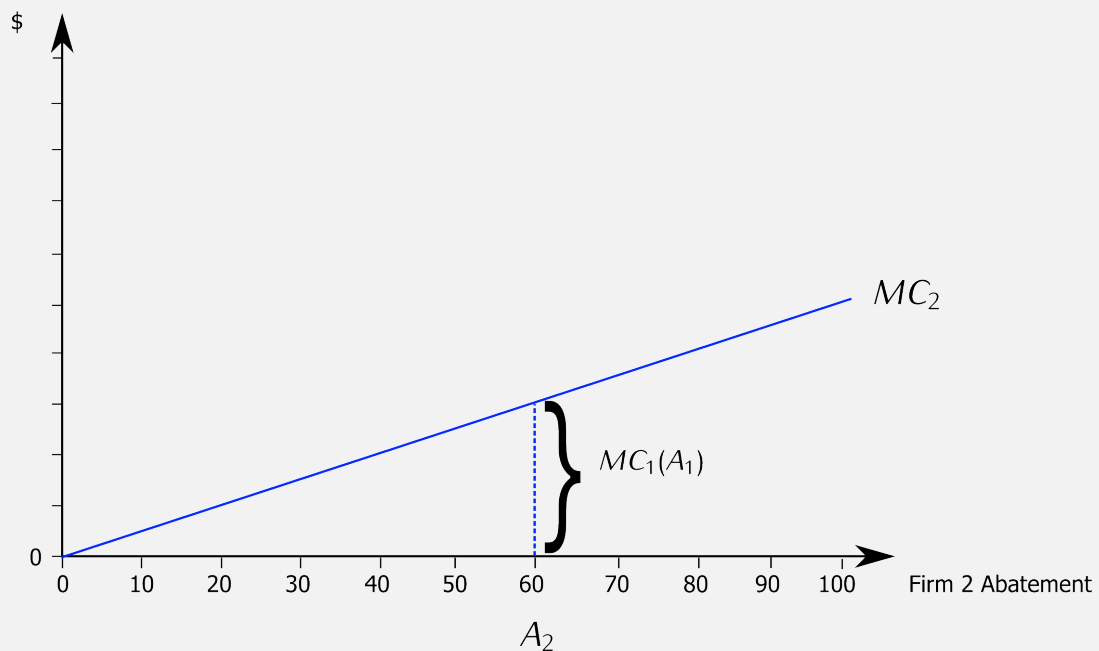
Firm 1

- The marginal cost of pollution abatement is usually an increasing function of the amount of abatement (A_1).



Firm 2

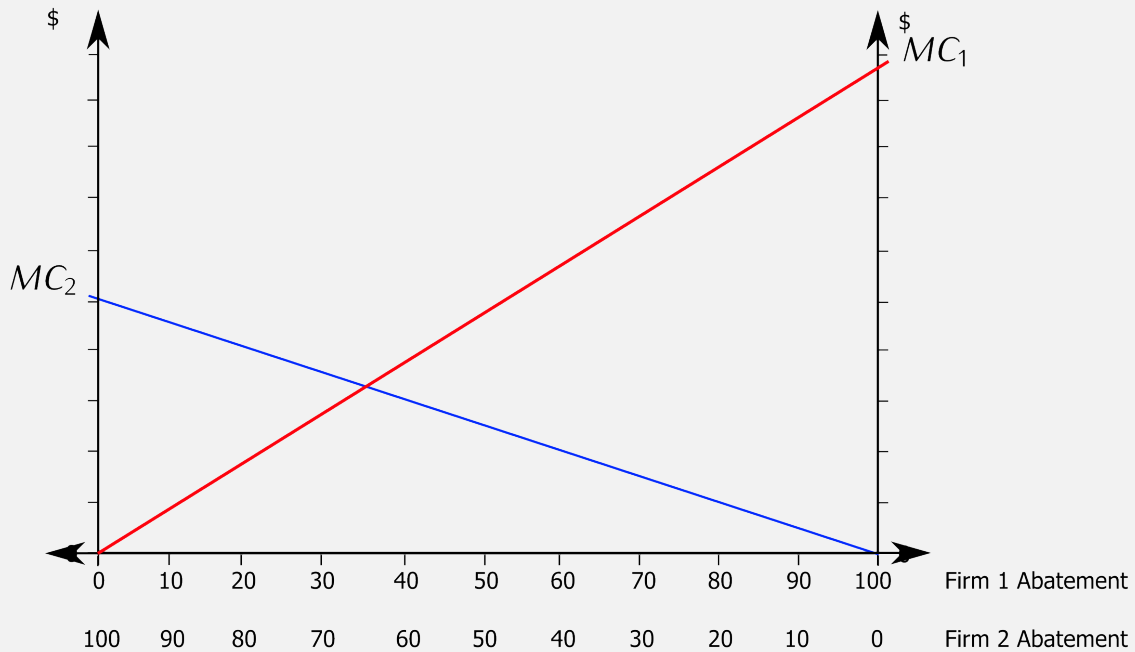
- Firm 2's abatement costs are likely to be different.



Combining the Two Pieces of Information

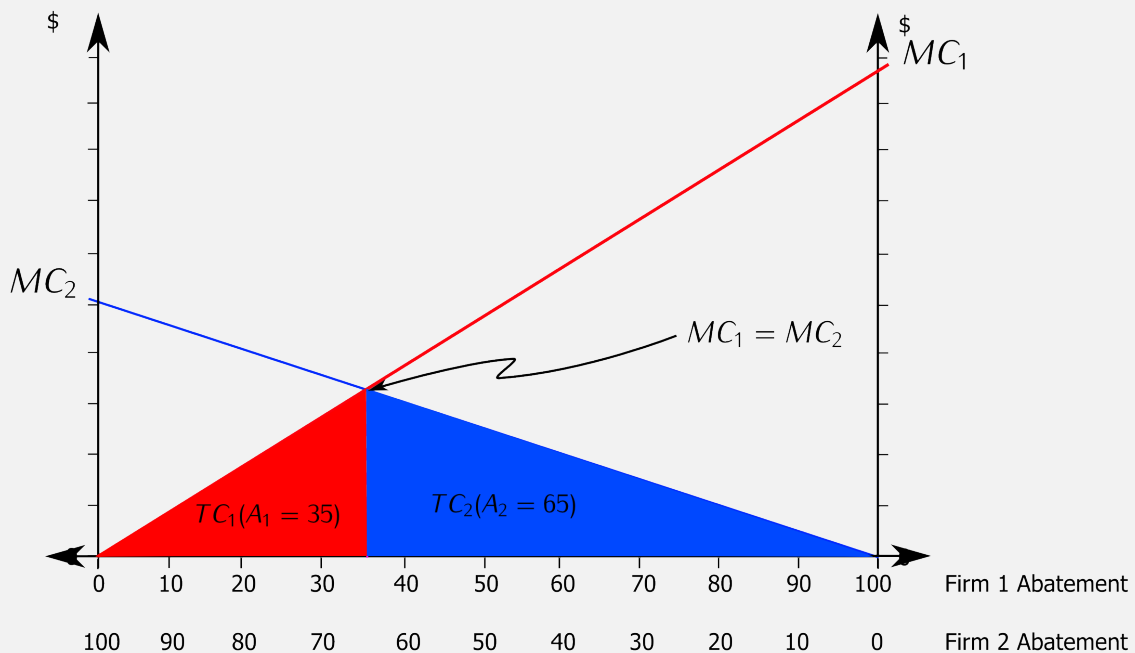
- If the government's goal is to cut pollution in half, we need

$$A_1 + A_2 = 100$$



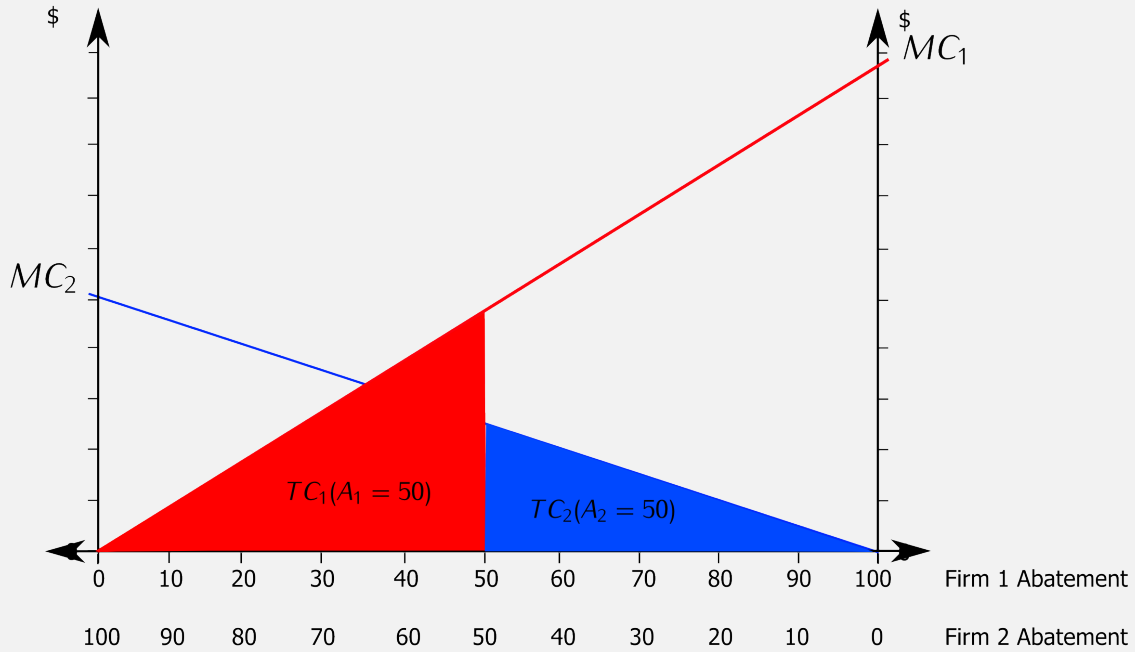
The Least Cost Solution

- The least cost solution occurs where $MC_1 = MC_2$



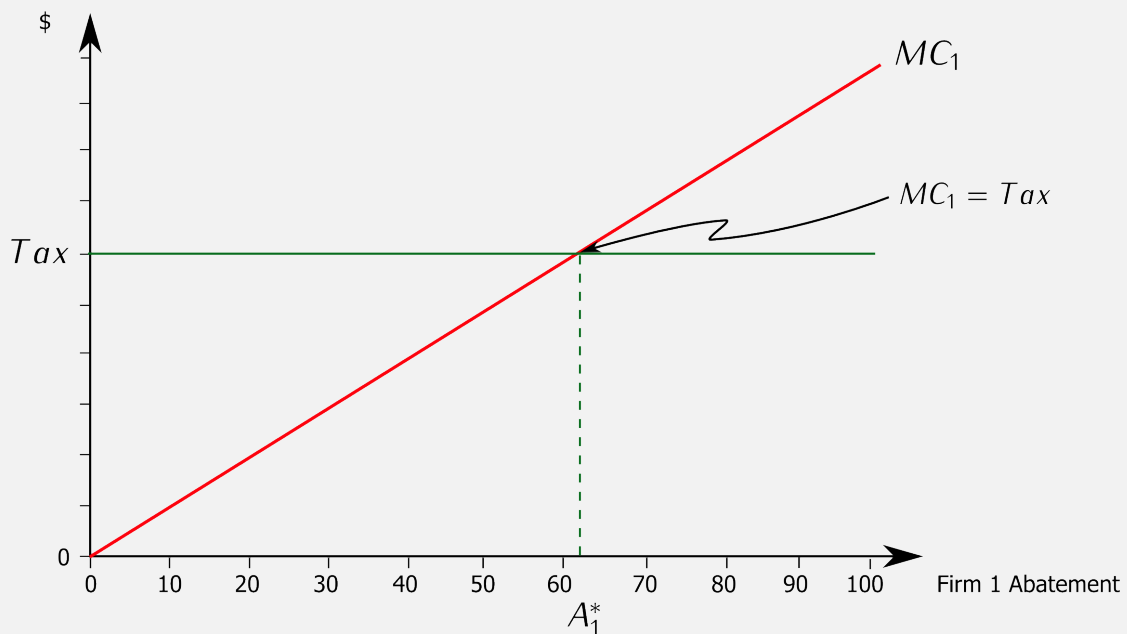
The Inefficiency of Uniform Standards

- Uniform standards tend to lead to higher overall costs for pollution abatement.



The Firm's Response to an Emissions Tax

- How should the firm respond to an emissions tax?



Setting the Tax

- Since both firms respond in the same way to the tax we end up with $MC_1 = Tax = MC_2$, automatically insuring least cost control.
- The difficulty is insuring that the tax is set high enough to achieve the desired amount of abatement.

