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## Chapter 2

### The Economic Approach

### *Property Rights, Externalities, and Environmental Problems*

#### Introduction

- Before examining specific environmental problems and the policy responses to them, it is important that we develop and clarify the economic approach.
- We begin by examining the relationship between human actions, as manifested through the economic system, and the environmental consequences of those actions.
- We can then establish criteria for judging the desirability of the outcomes of this relationship. These criteria provide a basis for identifying the nature and severity of environmental problems and a foundation for designing effective policies to deal with them.

# The Economic Approach

## The Human–Environment Relationship

### The Environment as an Asset

- In economics, the environment is viewed as a composite asset that provides a variety of services. It is a very special asset, to be sure, because it provides the life-support systems that sustain our very existence, but it is an asset nonetheless
- The environment provides the economy with raw materials, which are transformed into consumer products by the production process, and energy, which fuels this transformation. The environment also provides goods and services directly to consumers.

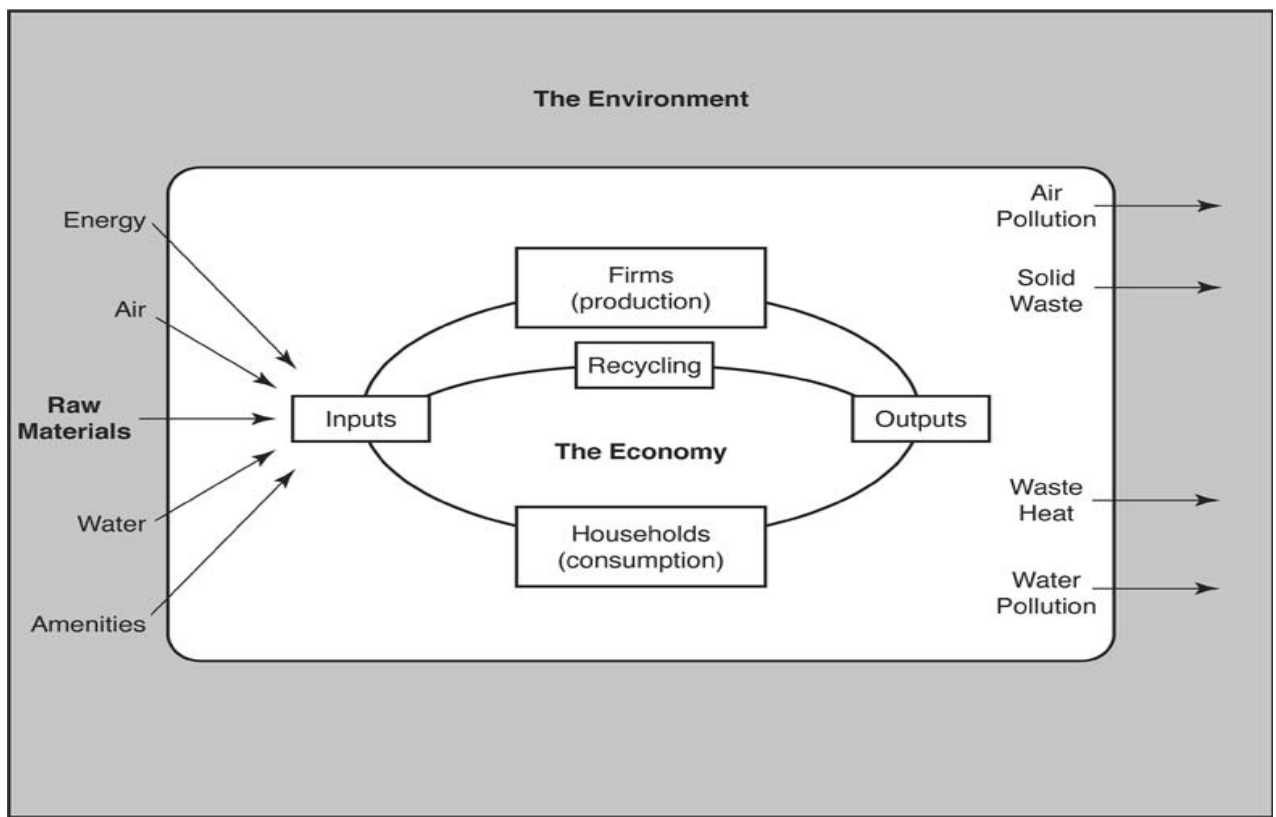


Figure 2.1 The Economic System and the Environment

## The Economic Approach

- A closed system is one in which no inputs (energy or matter) are received from outside the system and no outputs are transferred outside the system.
- An *open system*, by contrast, is one in which the system imports or exports matter or energy.

If we restrict our conception of the relationship in [Figure 2.1](#) to our planet and the atmosphere around it, then clearly we do not have a closed system. We derive most of our energy from the sun, either directly or indirectly.

- The treatment of our planet and its immediate environs as a closed system has an important implication that is summed up in the *first law of thermodynamics*—energy and matter can neither be created nor destroyed.
- The relationship of people to the environment is also conditioned by another physical law, *the second law of thermodynamics*. Known popularly as the *entropy law*, this law states that “entropy increases.” *Entropy* is the amount of energy unavailable for work.

## [The Economic Approach](#)

Two different types of economic analysis can be applied to increase our understanding of the relationship between the economic system and the environment: *Positive economics* attempts to describe *what is*, *what was*, or *what will be*. *Normative economics*, by contrast, deals with what *ought to be*.

## EXAMPLE 2.1

### Economic Impacts of Reducing Hazardous Pollutant Emissions from Iron and Steel Foundries

The U.S. Environmental Protection Agency (EPA) was tasked with developing a “maximum achievable control technology standard” to reduce emissions of hazardous air pollutants from iron and steel foundries. As part of the rule-making process, the EPA conducted an *ex ante* economic impact analysis to assess the potential economic impacts of the proposed rule.

If implemented, the rule would require some iron and steel foundries to implement pollution control methods that would increase the production costs at affected facilities. The interesting question addressed by the analysis is how large those impacts would be.

The impact analysis estimated annual costs for existing sources to be \$21.73 million. These cost increases were projected to result in small increases in output prices. Specifically, prices were projected to increase by only 0.1 percent for iron castings and 0.05 percent for steel castings. The impacts of these price increases were expected to be experienced largely by iron foundries using cupola furnaces as well as consumers of iron foundry products. Unaffected domestic foundries and foreign producers of coke were actually projected to earn slightly higher profits as a result of the rule.

This analysis helped in two ways. First, by showing that the impacts fell under the \$100 million threshold that mandates review by the Office of Management and Budget, the analysis eliminated the need for a much more time- and resource-consuming analysis. Second, by showing how small the expected impacts would be, it served to lower the opposition that might have arisen from unfounded fears of much more severe impacts.

*Source:* Office of Air Quality Planning and Standards, United States Environmental Protection Agency. (November 2002). *Economic Impact Analysis of Proposed Iron and Steel Foundries*. NESHAP Final Report; National Emissions Standards for Hazardous Air Pollutants for Iron and Steel Foundries. (April 17, 2007). Proposed Rule. *Federal Register*, 72(73), 19150–19164.

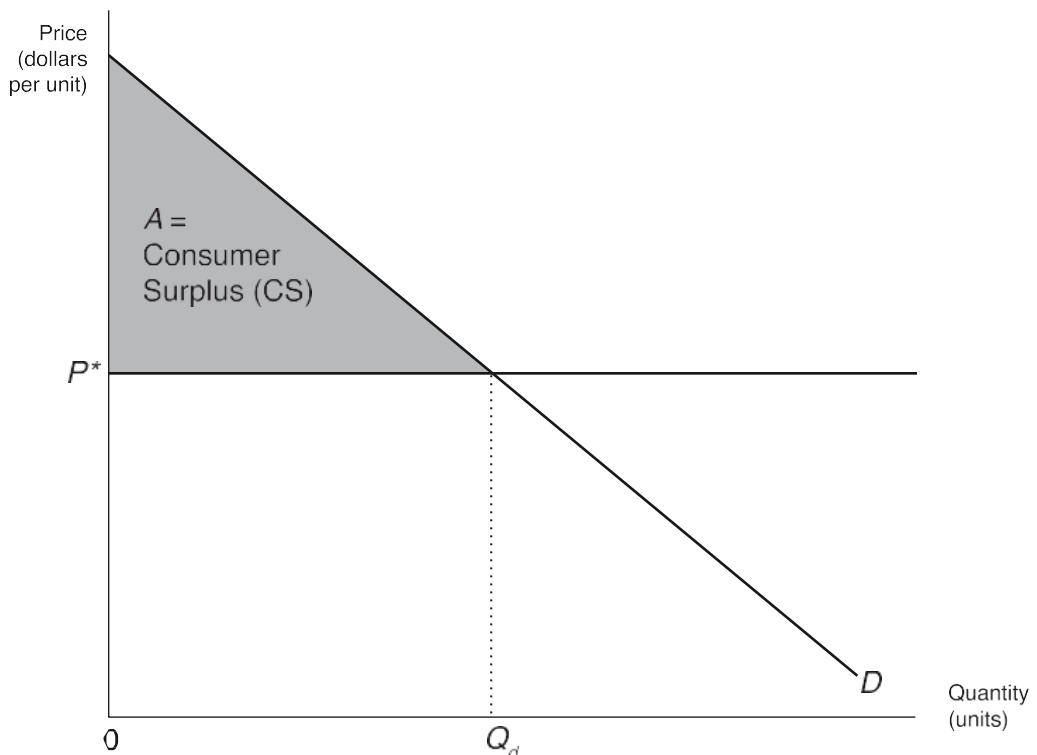
# Environmental Problems and Economic Efficiency

## Static Efficiency

**Economic surplus**, in turn, is the sum of consumer's surplus and producer's surplus.

**Consumer surplus** is the value that consumers receive from an allocation minus what it costs them to obtain it.

### ***The total willingness to pay (WTP)***



**Figure 2.2** The Consumer's Choice

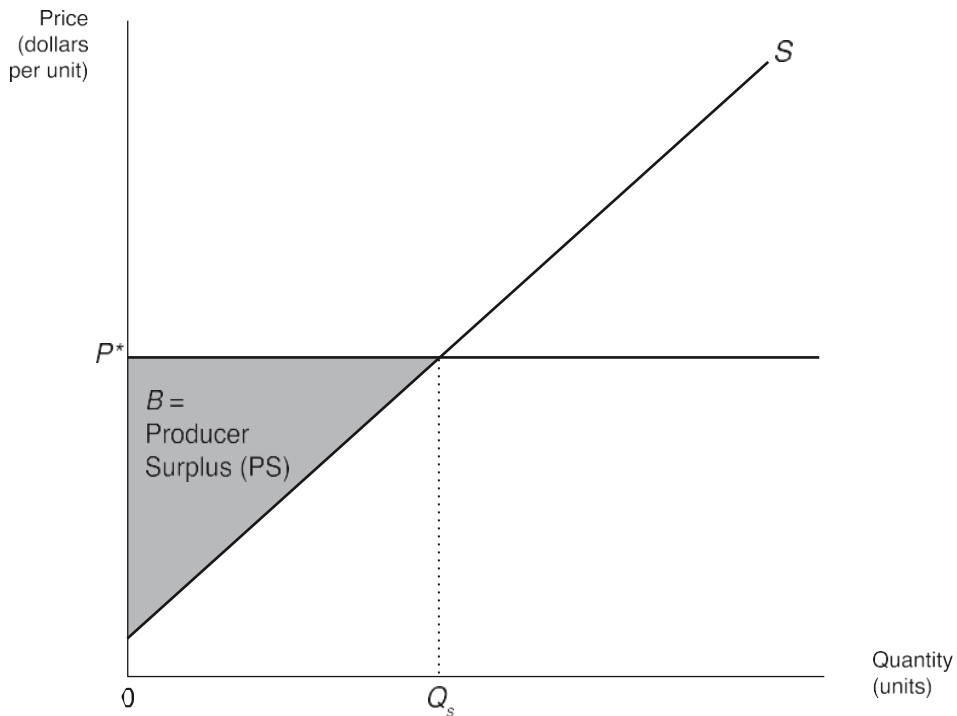


Figure 2.3 The Producer's Choice

([Figure 2.3](#)). The *producer surplus* is designated by the shaded area  $B$ , the area under the price line that lies above the marginal cost curve (supply Curve  $S$ ), bounded from the left by the vertical axis and the right by the quantity of the good.

## To calculate producer or consumer surplus

Remember that the area of a right triangle is calculated as  $1/2 \times$  the base of the triangle  $\times$  the height of the triangle.

## Property Rights

### Property Rights and Efficient Market Allocations

In economics, *property rights* refer to a bundle of entitlements defining the owner's rights, privileges, and limitations for the use of the resource.

### Efficient Property Rights Structures

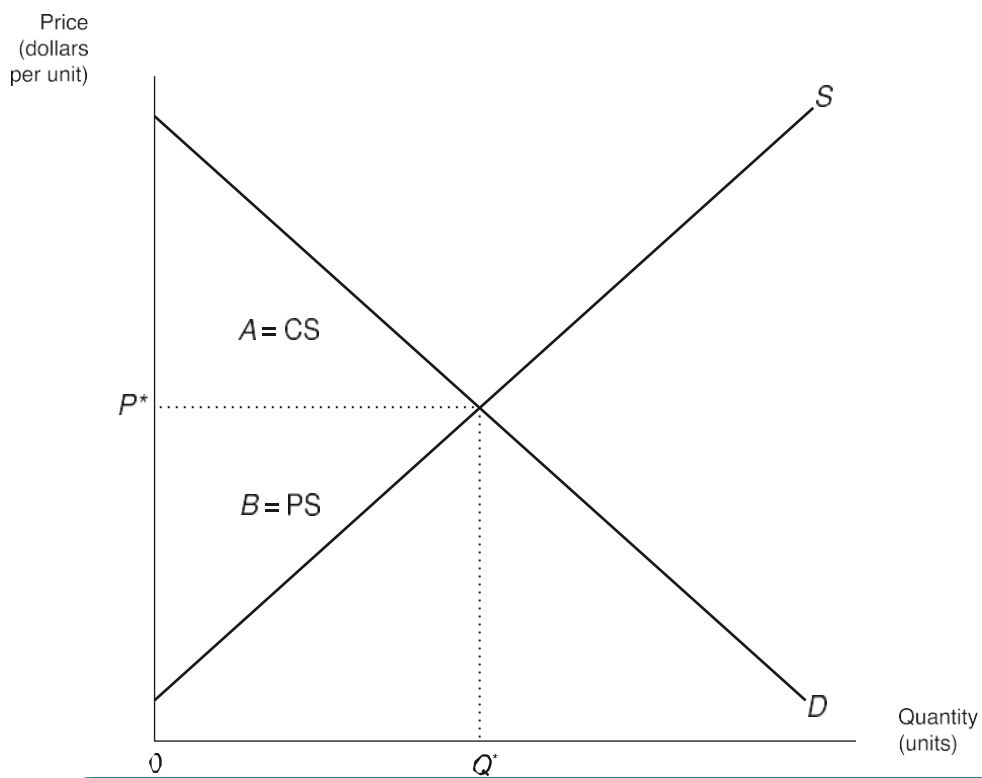
the structure of property rights that could produce efficient allocations in a well-functioning market economy. An efficient structure has three main characteristics:

1. *Exclusivity*—All benefits and costs accrued as a result of owning and using the resources should accrue to the owner and only to the owner, either directly or indirectly by sale to others.
2. *Transferability*—All property rights should be transferable from one owner to another in a voluntary exchange.
3. *Enforceability*—Property rights should be secure from involuntary seizure or encroachment by the law.

### What is the allocation efficient when we define property rights?

We can illustrate this point by examining the incentives consumers and producers face when a well-defined system of property rights is in place. Because the seller has the right to prevent the consumer from consuming the product in the absence of payment, the consumer must pay to receive the product. Given a market price, the consumer decides how much to purchase by choosing the amount that maximizes his or her individual consumer surplus.

Is this allocation efficient? According to our definition of static efficiency, it is clear the answer is yes. The economic surplus is maximized by the market allocation, and, as seen in [Figure 2.4](#), it is equal to the sum of consumer and producer surpluses (areas  $A + B$ ). Thus, we have not only established a procedure for measuring efficiency but also a means of describing how the surplus is distributed between consumers and producers.



**Figure 2.4** Market Equilibrium



## Externalities as a Source of Market Failure

An *externality* exists whenever the welfare of some agent, either a firm or household, depends not only on his or her activities, but also on activities under the control of some other agent.

a side effect or consequence of an industrial or commercial activity that affects other parties without this being reflected in the cost of the goods or services involved, such as the pollination of surrounding crops by bees kept for honey

Ex: Steel Company, Burring fossil fuels, smoking, waste

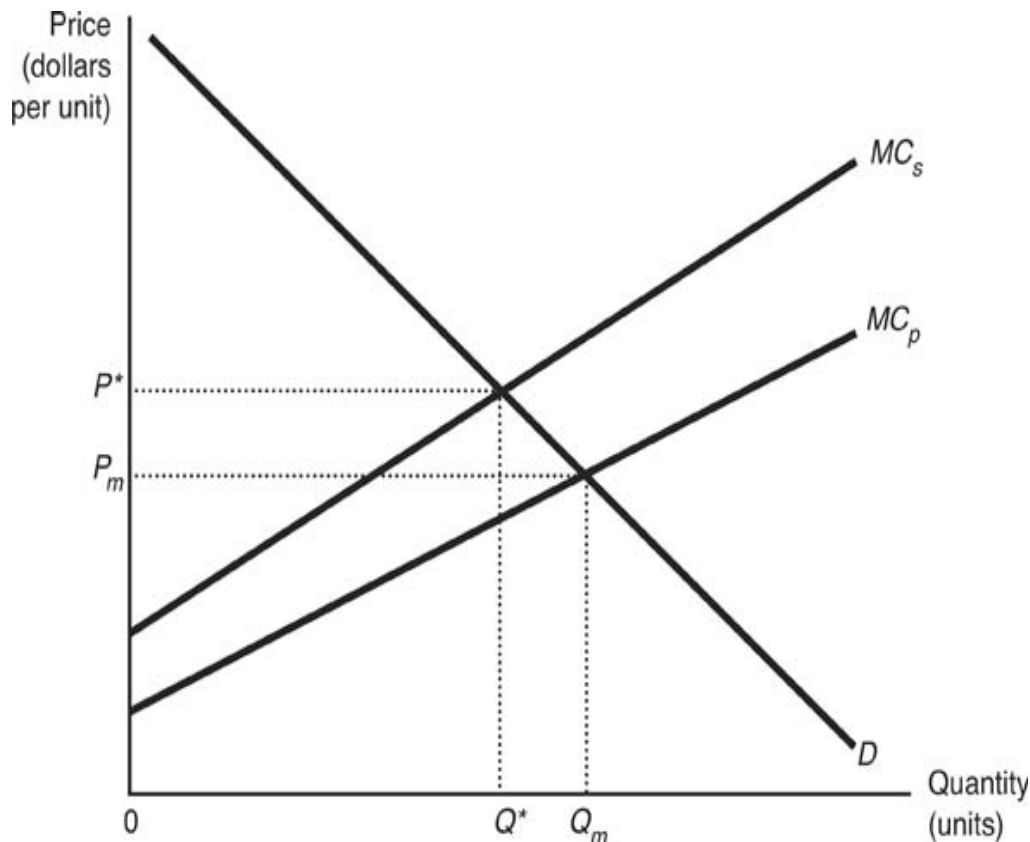


Figure 2.5 The Market for Steel

## The Economic Approach

With the help of [Figure 2.5](#), we can draw a number of conclusions about market allocations of commodities causing pollution externalities:

1. The output of the commodity is too large.
2. Too much pollution is produced.
3. The prices of products responsible for pollution are too low.
4. As long as the costs remain external, no incentives to search for ways to yield less pollution per unit of output are introduced by the market.
5. Recycling and reuse of the polluting substances are discouraged because release into the environment is so inefficiently cheap.

The effects of a market imperfection for one commodity end up affecting the demands for raw materials, labor, and so on. The ultimate effects are felt through the entire economy.

# Types of Externalities

## ➤ **Negative externalities**

- A negative externality is an indirect cost that a third party incurs from another party's production or consumption of a good.
- Negative externalities indicate that the social costs are higher than the third parties' private costs.

## **Causes of negative externalities**

For example, the pollution created during the production of goods causes negative externalities.

## ➤ **Positive externalities**

- A positive externality is an indirect benefit that a third party incurs from another party's production or consumption of a good.
- Positive externalities indicate that the social benefits from producing or consuming goods are greater than the private benefits to third parties.

## **Causes of positive externalities**

For example, the consumption of education causes positive externalities

# What is market failure?

- I. 1-Public Goods
- II. 2- Imperfect Market Structures
- III. 3-Asymmetric Information
- IV. 4-Externalities

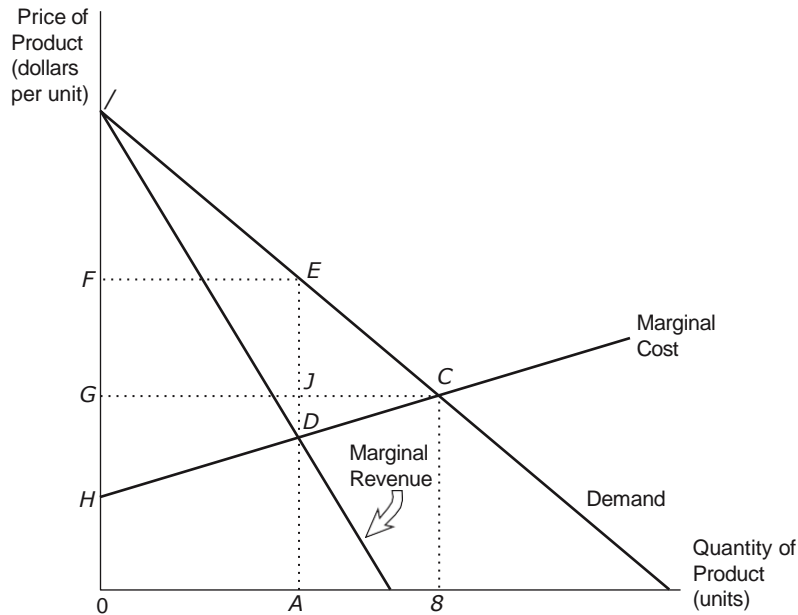
## I. Public Goods ( Free Rider problem)

Public goods are goods that are commonly available to all people within a society or community and that possess two specific qualities: they are non-excludable and non-rivalrous.

Example: **Street lighting, Emergency services**, education

## II. Imperfect Market Structures

Environmental problems also occur when one of the participants in an exchange of property rights is able to exercise an inordinate amount of power over the outcome. This can occur, for example, when a product is sold by a single seller, or monopoly.



**Figure 2.8 Monopoly and Inefficiency**

Asymmetric Information

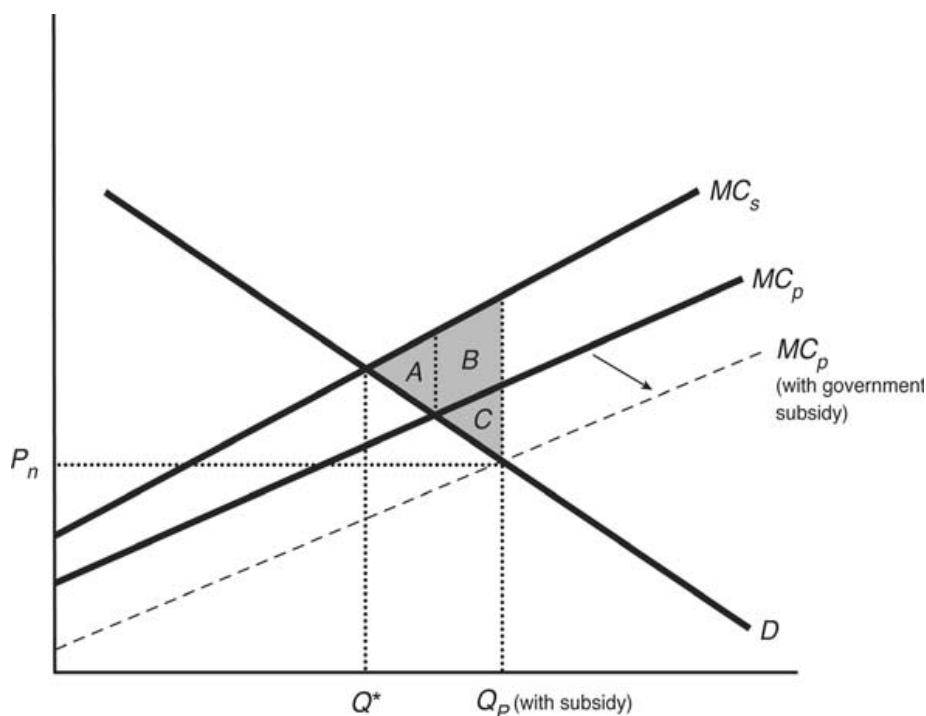
Asymmetric information creates problems for the market when it results in a decision maker knowing too little to make an efficient choice. Suppose, for example, a consumer had a preference for organic food, but didn't know what food choices were truly organic. Since it would be relatively easy for producers to claim their produce was organically grown even if it were not, consumers who could not accurately distinguish truly organic produce from its fraudulent substitute would tend to be unwilling to pay a higher price for organic produce. As a result, both the profits and the output of organic farmers would be inefficiently low. If consumers do not have full information, negative externalities may result.

Government Failure

Market processes are not the only sources of inefficiency. Political processes are fully as culpable. As will become clear in the chapters that follow, some environmental problems have arisen from a failure of political, rather than economic, institutions. To complete our study of the ability of institutions to allocate environmental resources, we must understand this source of inefficiency as well.

Government failure shares with market failure the characteristic that improper incentives are the root of the problem. Special interest groups use the political process to engage in what has become known as *rent seeking*. Rent seeking is the use of resources in lobbying and other activities directed at securing legislation that results in more profitable outcomes for those funding this activity. Successful rent-seeking activity will typically increase the net benefits going to the special interest group, but it will also frequently lower the surplus to society as a whole.

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**Figure 2.9** The Market for Steel Revisited

## The Pursuit of Efficiency

We have seen that environmental problems can arise when property rights are ill defined and when these rights are exchanged under something other than competitive conditions. We can now use our definition of efficiency to explore possible remedies, such as private negotiation, judicial remedies, and regulation by the legislative and executive branches of government.

How to fix the market failure? So we can achieve efficiency allocation?

Discuss.....