



THE ROLE OF ECONOMICS IN FUTURE ENVIRONMENTAL CHALLENGES

Economics of Environment and Natural Resources



Introduction

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**Environmental
Challenges:**

Climate Change and Water
accessibility

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Introduction

Our society



Survived wars and shortages



Improved living standards and
life expectancy



More environmental challenges



Examples

- Wildfires: Australia, Brazil or California
- Droughts: Spain (2014), India (2012), Syria (2011)
- Floods: East Africa (2018), India (2016), South Asia (2011)



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The self-extinction premise

Thomas Malthus published “An essay on the Principle of Population” in 1798 in which he foresaw:

- Significant population growth
- Insufficient food supply
- Starvation and death

Some historical examples of societal self-extinction:

- The Mayan civilization
- The Eastern Island



02 ENVIRONMENTAL CHALLENGES

Climate Change and Water accessibility



Future societies will be confronted by:

**Resource
scarcity**



Water accessibility issues

**Accumulating
pollutants**



Climate Change

Climate Change

- **Greenhouse effect**

Rays of sun heat the Earth, radiating energy back into space. Greenhouse gases trap some of the outgoing energy.

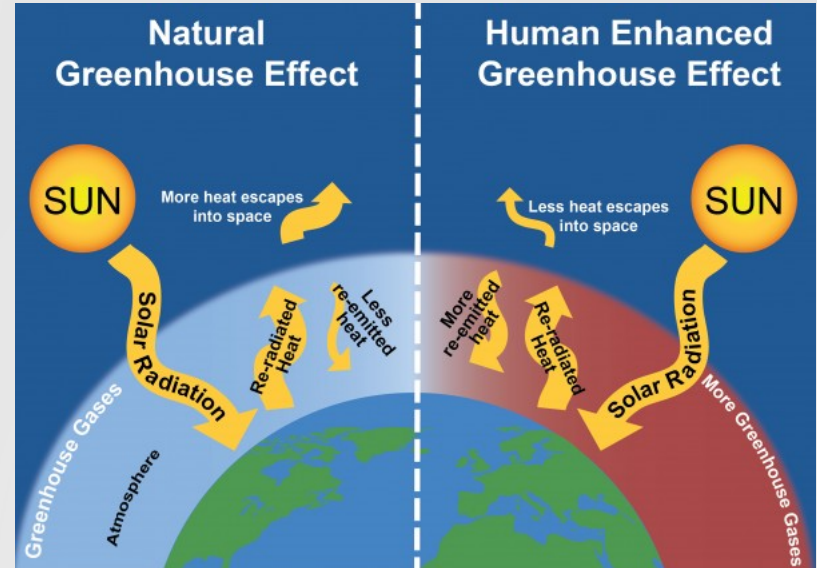
- **Greenhouse gas and human activities**

Since the Industrial Revolution, Greenhouse gases have dramatically increased and, as a consequence, temperatures are higher. Increasing temperatures have an impact of humans, human health and ecosystems.

- **Climate change and moral dimension**

Developing countries have contributed in a smaller proportion to the increase in greenhouse emissions, but they are expected to suffer the most. Moreover, they have limited ability for adaptation.

- **Climate change and international coordination**



Water Accessibility

- **Increasing water stress**

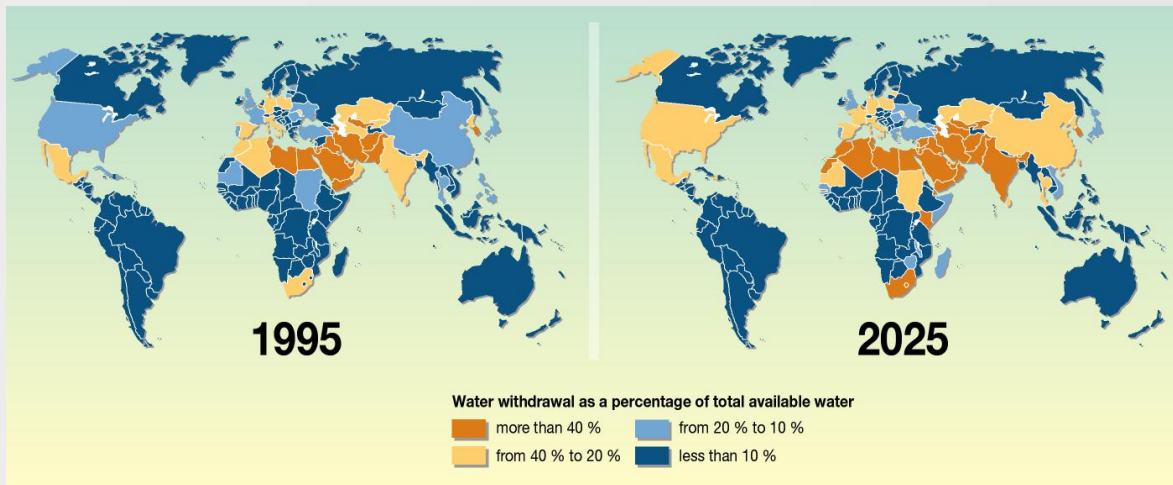
- Interaction between a rising demand for resources in the face of finite supply. Particularly worrisome as water is vital to life.
- 40% of the world's population lives in areas with moderate-high water stress.
- By 2025, two thirds of the world's population will live in areas with moderate-high water stress.

- **Nonuniformly distributed water stress**

- Groundwater is consumed faster than it is replenished in the US, Mexico, China and India.

- **Demand for water and human activities**

- Africa and Asia suffer the most from the lack of access to sufficient clean water.
- Arid areas rely on water transfers that can lead to regional or international conflicts.





03

THE ECONOMIC APPROACH



Understanding human behavior

- How societies respond to environmental challenges will depend on the behavior of human being acting individually or collectively.
- Economic analysis provides a useful set of tools to understand and/or modify human behavior.
- Two different but related disciplinary approaches have arisen to address the challenges the future holds:
 - Ecological Economics
 - Environmental Economics

Ecological Economics versus Environmental Economics

DEBATE 1.1

Over the last decade or so, the community of scholars dealing with the role of the economy and the environment has settled into two camps: ecological economics (<http://www.ecoeco.org/>) and environmental economics (<http://www.aere.org/>). Although they share many similarities, ecological economics is consciously more methodologically pluralist, while environmental economics is based solidly on the standard paradigm of neoclassical economics. While neoclassical economics emphasizes maximizing human welfare and using economic incentives to modify destructive human behavior, ecological economics uses a variety of methodologies, including neoclassical economics, depending upon the purpose of the investigation.

While some observers see the two approaches as competitive (presenting an “either-or” choice), others, including the authors of this text, see them as complementary. Complementarity, of course, does not mean full acceptance. Significant differences exist not only between these two fields, but also within them over such topics as the valuation of environmental resources, the impact of trade on the environment, and the appropriate means for evaluating policy strategies for long-duration problems such as climate change. These differences arise not only over methodologies but also over the values that are brought to bear on the analysis.

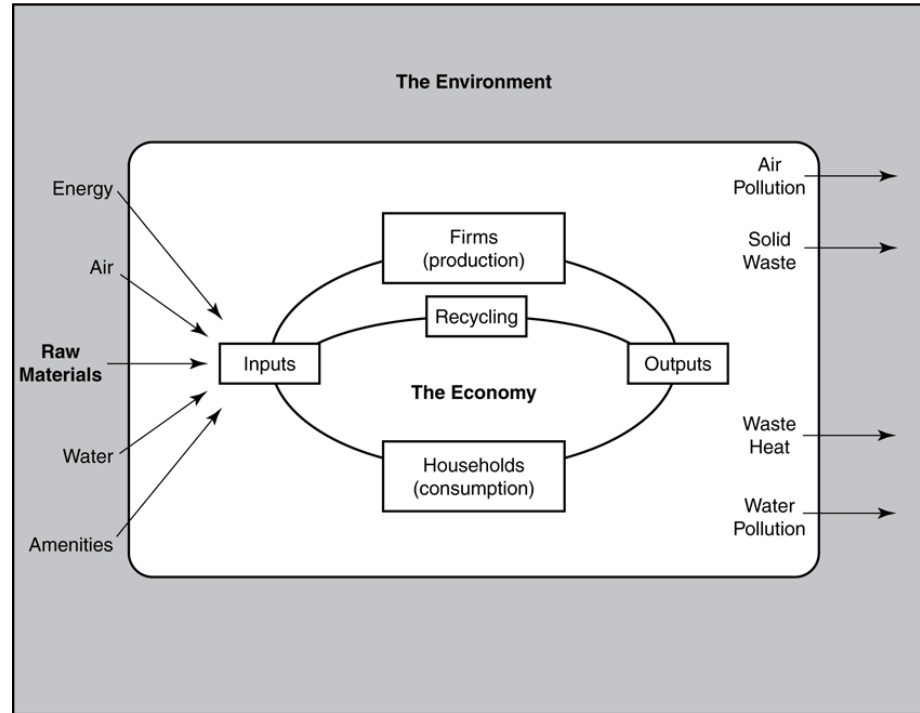
The senior author of this book has published in both fields and has served on the editorial boards of the leading journals in both fields, so it probably will not be surprising that this book draws from both fields. Although the basic foundation for the analysis is environmental economics, the chapters draw heavily from ecological economics to critique that view when it is controversial and to complement it with useful insights drawn from outside the neoclassical paradigm, when appropriate. Pragmatism is the reigning criterion. If a particular approach or study helps us to understand environmental problems and their resolution, it has been included in the text.

The human-environment relationship

In Economics, the Environment is viewed as:

- Asset that provides a variety of services (life-support systems that sustain our very existence)
- Closed system: A system where there are no inputs and no outputs of energy and matter from outside the system

The Economic System and the Environment



The Economic Approach

Two different types of economic analysis can be applied to understand the relationship between the Environment and the Economic system:

- Positive economics: Describing what is, what was, and what will be
- Normative economics: Attempting to answer what ought to be

04

Environmental Problems and Efficiency

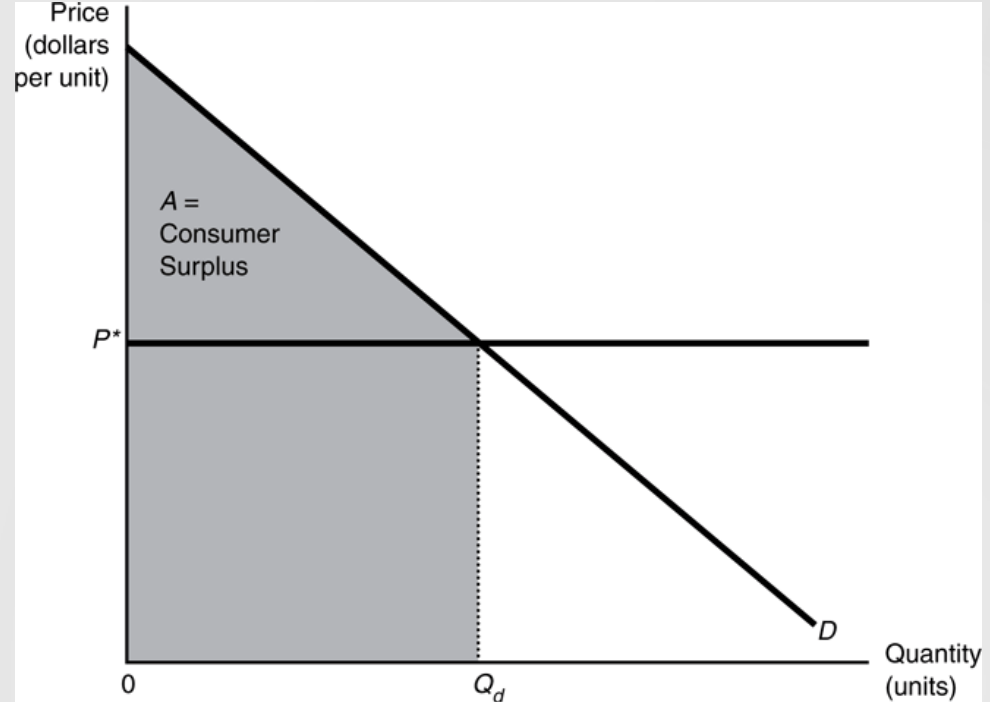
Static Efficiency

An allocation of resources is said to satisfy the static efficiency criterion if the economic surplus derived from those resources is maximized by that allocation

Economic surplus = consumer surplus + producer surplus

Consumer surplus

Consumer surplus is the value that consumers receive from an allocation minus what it costs them to obtain it. Consumer surplus is measured as the area under the demand curve minus the consumer's cost

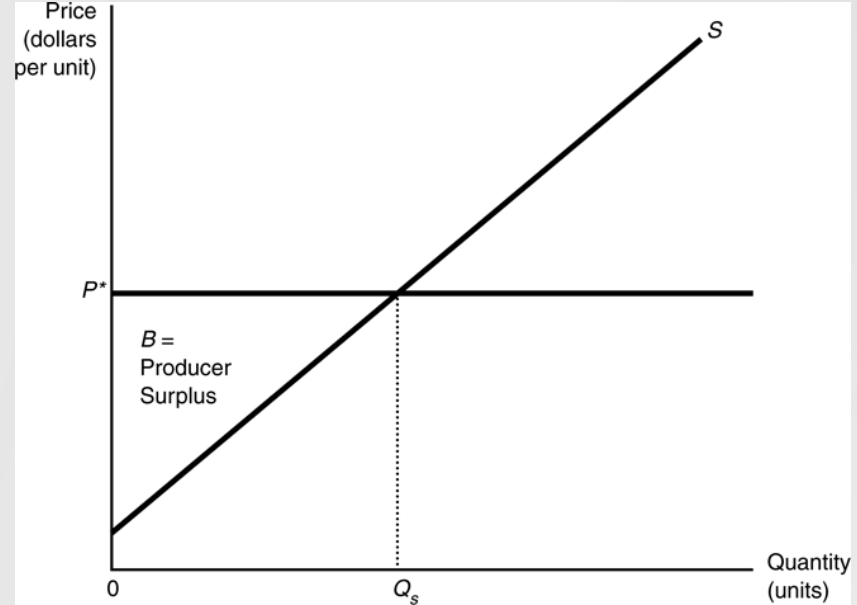


Producer surplus

Producer surplus is the difference between the amount that a seller receives minus what the seller would be willing to accept for the good.

Given price P^* , the seller maximizes his or her own producer surplus by choosing to sell Q_s units.

The producer surplus is designated by area B, the area under the price line that lies over the marginal cost curve, bounded from the left by the vertical axis and the right by the quantity of the good.



Property rights

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

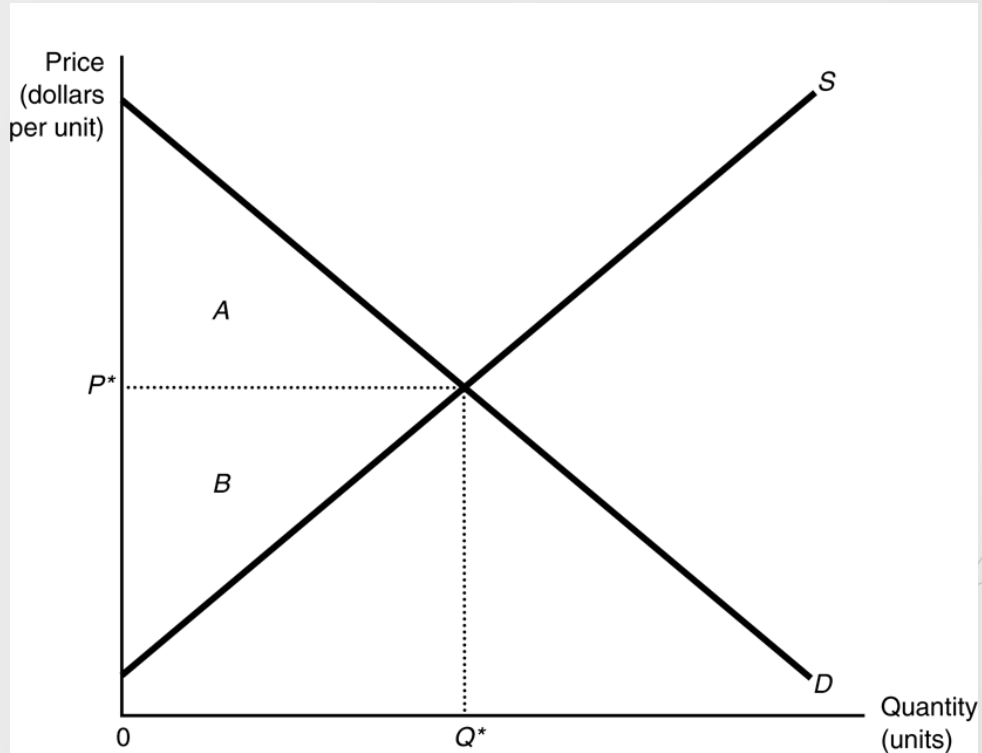
Property Rights and Efficient Market Allocations

- Either individuals or the state can capture the property rights.

Efficient Property Right Structures

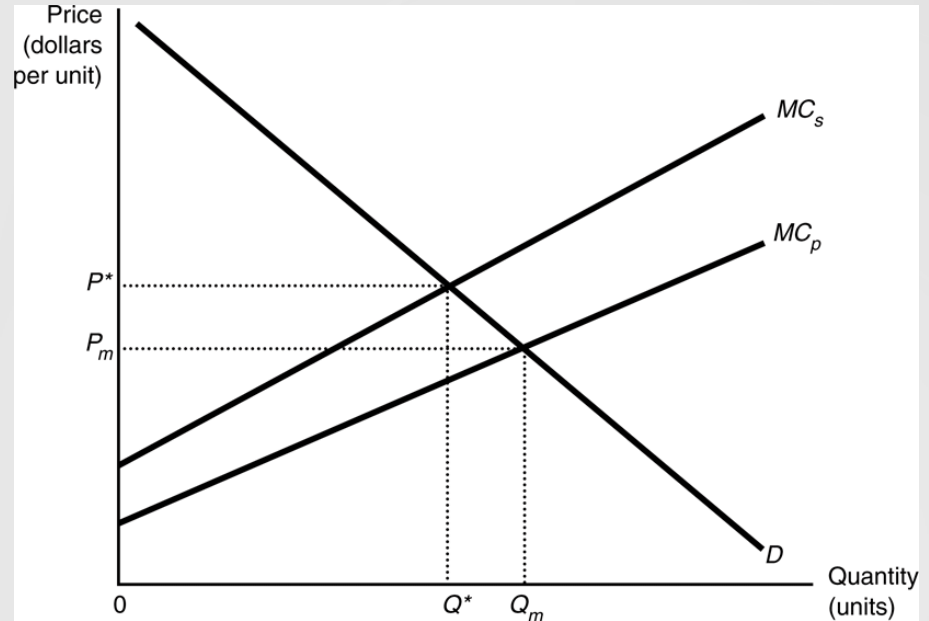
- Exclusivity—All the benefits and costs should only accrue to the owner.
- Transferability—Property rights should be transferred to others.
- Enforceability—Property rights should be secure from seizure or encroachment.

Market Equilibrium



Externalities as a Source of Market Failure

Externalities exist whenever the welfare of some agent depends not only on his or her activities, but also on activities under the control of some other agent.



Externalities as a Source of Market Failure

- The output of the commodity is too large.
- Too much pollution is produced.
- The prices of products responsible for pollution are too low.
- As long as the costs are external, no incentives to search for ways to yield less pollution per unit of output are introduced by the market.
- Recycling and reuse of the polluting substances are discouraged due to the cheap external cost.

Externalities as a Source of Market Failure

Types of Externalities:

- External cost (external diseconomy)

It imposes costs on a third party.

- External benefit (external economy)

It imposes benefits on a third party.

- Pecuniary externalities

It exists when the external effect comes from altered prices.

Externalities as a Source of Market Failure

PERVERSE INCENTIVES ARISING FROM PROPERTY RIGHT STRUCTURES:

- State-property regimes

Governments own and control property.

- Common-property regimes

Property is jointly owned and managed by a specific group.

- Res nullius or open access regimes

No one owns or exercises control over the resources

Externalities as a Source of Market Failure

Open-access resources and “tragedy of the commons”

“Common-pool” resources are shared resources characterized by nonexclusivity and divisibility

- Nonexclusivity implies that resources can be exploited by anyone
- Divisibility means that the capture of part of the resource by one group subtracts it from the amount available to the other groups

Externalities as a Source of Market Failure

PUBLIC GOODS

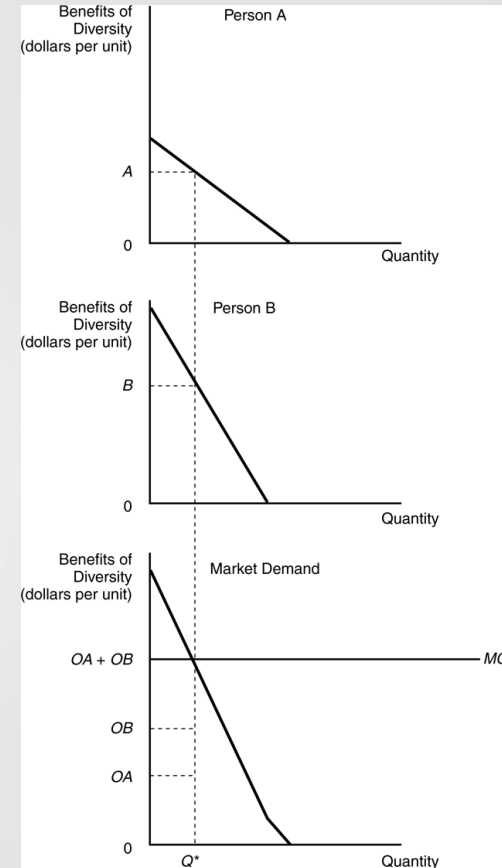
Public goods are both consumptively indivisible and nonexcludable.

- Nonexcludability refers to a circumstance where, once the resource is provided, even those who fail to pay for it cannot be excluded from enjoying the benefits it confers.
- Consumption is said to be indivisible when one person's consumption of a good does not diminish the amount available for others.

Examples include charming landscape, clean air, etc.

Externalities as a Source of Market Failure

- Biological diversity as public good
 - It includes the amount of genetic variation among individuals within a single species and the number of species in a community.



Externalities as a Source of Market Failure

Public Goods (contd.)

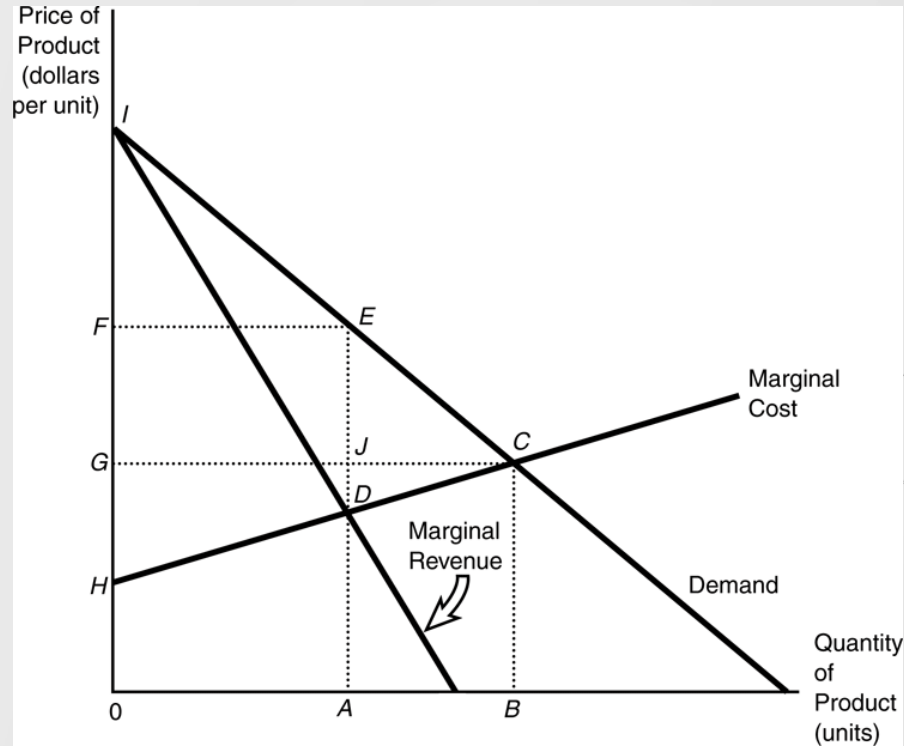
- Efficient level of diversity
- The efficient allocation maximizes economic surplus, which is represented geometrically by the portion of the area under the market demand curve that lies above the constant marginal cost curve. The allocation that maximizes economic surplus is Q^* , the allocation where the demand curve meets the marginal cost curve.

Externalities as a Source of Market Failure

IMPERFECT MARKET STRUCTURES

- Monopoly: when product is sold by a single seller
Monopolies will supply too little of a good at too high a price.
At the monopoly output, marginal benefits are greater than marginal costs. Net benefits are not maximized and there is a deadweight loss.
- A cartel is a group of producers who form a collusive agreement to gain monopoly power.

Externalities as a Source of Market Failure



Externalities as a Source of Market Failure

ASYMMETRIC INFORMATION

- It refers to a situation where one or more parties have much more information than the others.
- Asymmetric information creates problems for the market when it results in a decision-maker knowing too little to make an efficient choice.

Externalities as a Source of Market Failure

GOVERNMENT FAILURE

- Rent seeking: the use of resources in lobbying and other activities directed at securing protective legislation.
- Examples include agricultural producers seeking price supports and consumer groups seeking subsidies.

Externalities as a Source of Market Failure

