EXTERNALITIES

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Principles of Microeconomics
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TOPIC OUTLINE

I. Externalities: Basic Concepts

II. Positive Externalities

A.Inefficiency with a Positive Externality
B.Public Policy to Improve Efficiency

III. Negative Externalities

A.Inefficiency with a Negative Externality
B.Public Policy to Improve Efficiency

IV. Application: Resource Conservation

Externalities: Basic Concepts

EXTERNALITIES: BASIC CONCEPTS

- **Externalities**

Definition

A cost or benefit arising from production that falls on someone other than the producer, or a cost or benefit arising from consumption that falls on someone other than the consumer.

EXTERNALITIES: BASIC CONCEPTS

- **Externalities**

Positive externality or external benefit

A production or consumption activity that creates an external benefit.

Negative externality or external cost

A production or consumption activity that creates an external cost.

Positive Externalities

POSITIVE EXTERNALITIES

- **Private Benefits and Social Benefits**

Marginal private benefit

The benefit to the consumer of *an additional unit* of a good or service.

Marginal external benefit

The benefit of *an additional unit* of a good or service that people other than the consumer of the good or service enjoy.

POSITIVE EXTERNALITIES

- **Private Benefits and Social Benefits**

Marginal social benefit

The marginal benefit enjoyed by the entire society—by the consumers of a good or service and by everyone else who benefits from it.

Marginal social benefit is the sum of marginal private benefit and marginal external benefit:

MSB = MB + Marginal external benefit

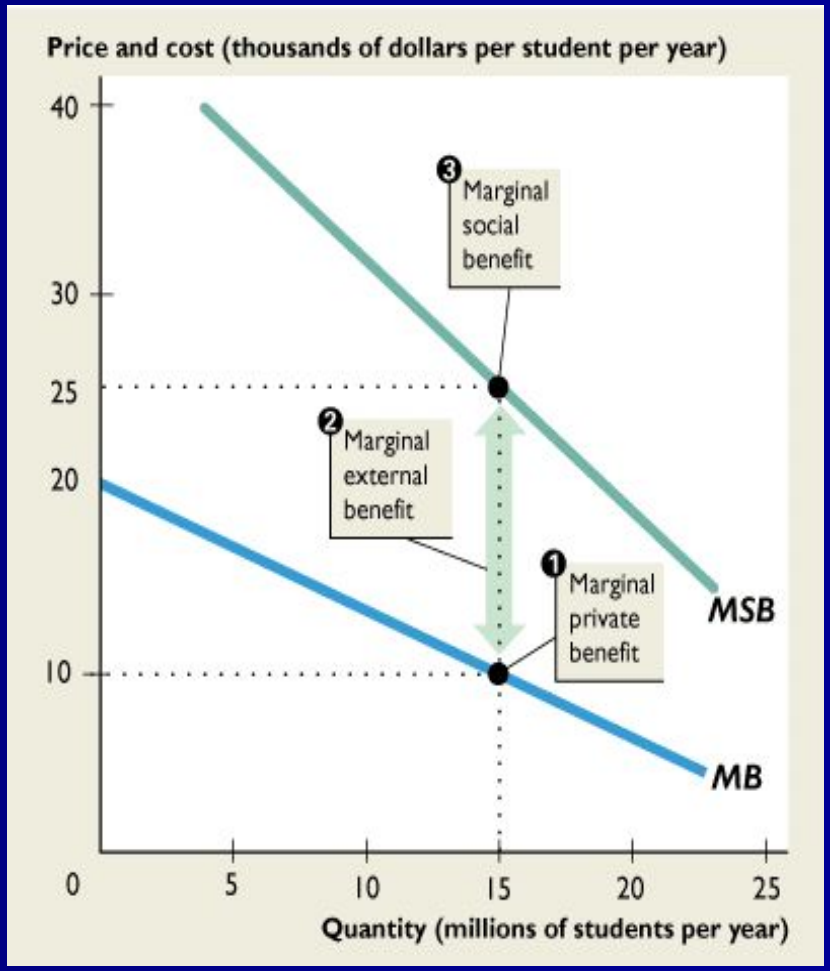
POSITIVE EXTERNALITIES

Private Benefit and Social Benefit with an Externality

When 15 million students attend college . . .

- marginal private benefit is $10,000 per student.
- marginal external benefit is $15,000 per student.
- marginal social benefit is $25,000 per student.

An external benefit creates a wedge between social benefit and private benefit.



POSITIVE EXTERNALITIES

- **Economic Efficiency with a Positive Externality**

Market equilibrium is inefficient with a positive externality

If an external benefit is *uninternalized*, consumers choose the quantity at which marginal *private* benefit equals marginal cost. They ignore or are unaware of the external benefit received by others.

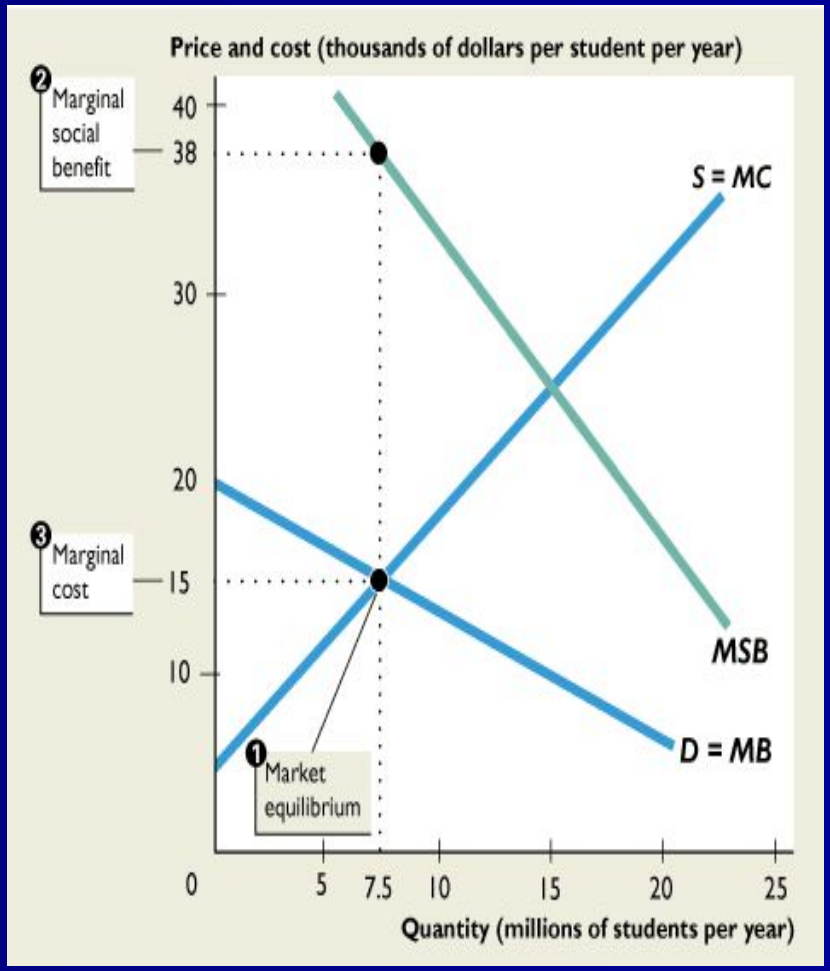
Efficiency requires that marginal *social* benefit be equal to marginal cost. Therefore, with an uninternalized external benefit, the market equilibrium is inefficient because of *underproduction*. There is too little of the good.

POSITIVE EXTERNALITIES

Inefficiency with an External Benefit

With an external benefit, equilibrium tuition is $15,000 and the equilibrium quantity is 7.5 million students.

The market equilibrium is inefficient because marginal social benefit exceeds marginal cost. In other words, people other than the students benefit from the students' education and would be willing to pay something for it.

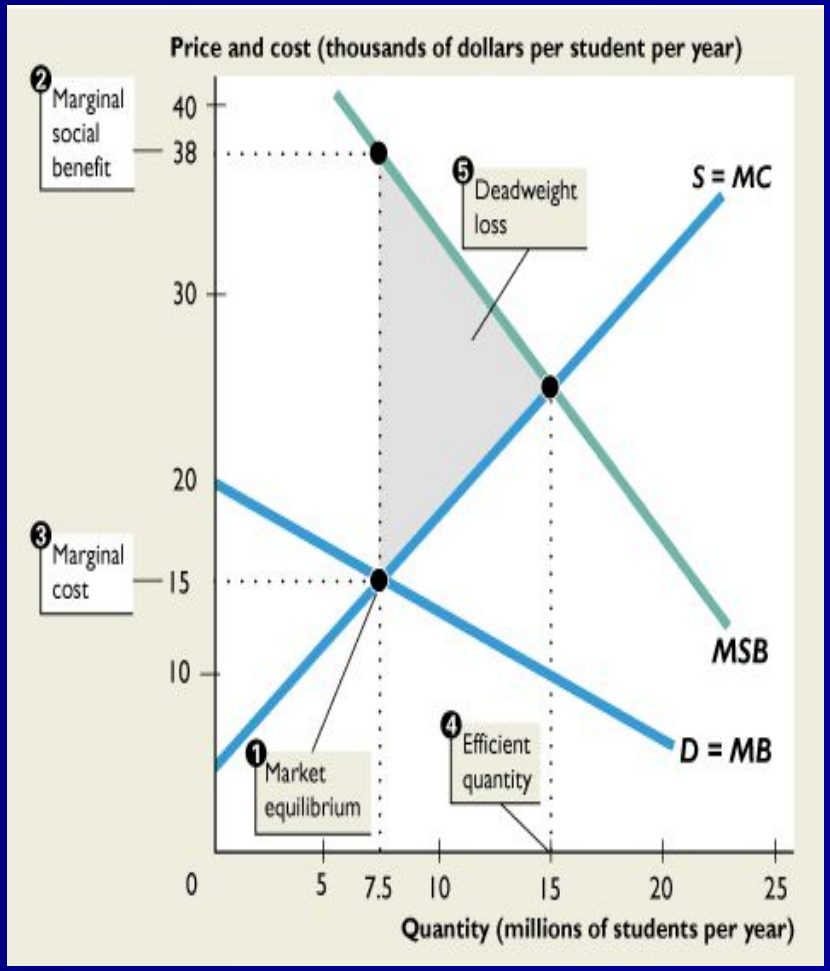


POSITIVE EXTERNALITIES

Inefficiency with an External Benefit

The efficient quantity is 15 million students, where marginal social benefit equals marginal cost.

The gray triangle shows the deadweight loss created by the uninternalized external benefits of college education.



POSITIVE EXTERNALITIES

- **Public Policy and External Benefits**

Internalizing an external benefit

Internalizing an external benefit means altering incentives so that consumers take into account the external effects of their actions.

When an external benefit is internalized

- marginal private benefit equals marginal social benefit
- in equilibrium, marginal social benefit equals marginal cost
- therefore, the equilibrium is efficient.

POSITIVE EXTERNALITIES

- **Public Policy and External Benefits**

Education is an example of a positive externality

We use education to illustrate public policy actions for internalizing an external benefit.

The external benefits from education can be internalized by

- Public provision
- Producer subsidies
- Vouchers (consumer subsidies)

POSITIVE EXTERNALITIES

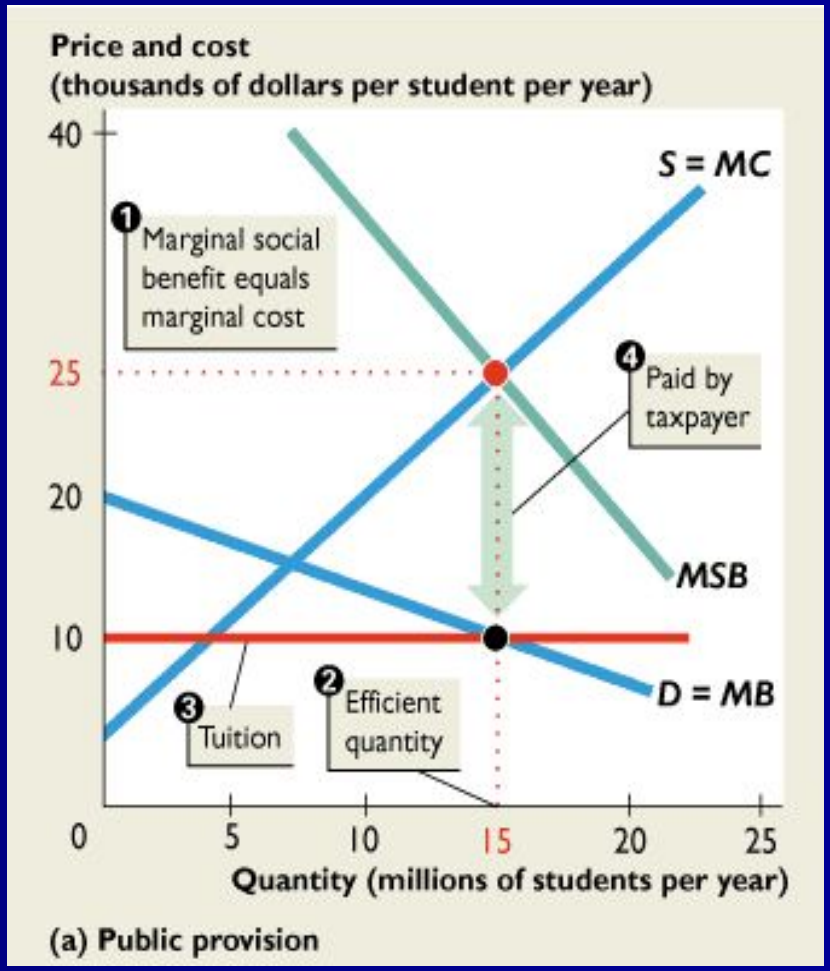
Public Provision

With public provision, a tax-funded public agency produces education.

The efficient quantity is 15 million students where marginal social benefit equals marginal cost.

To provide incentives for the efficient number of students to enroll, the agency sets tuition equal to marginal private benefit at the efficient quantity.

Tuition is $10,000. Tax revenues cover the remaining $15,000 of marginal cost per student.



POSITIVE EXTERNALITIES

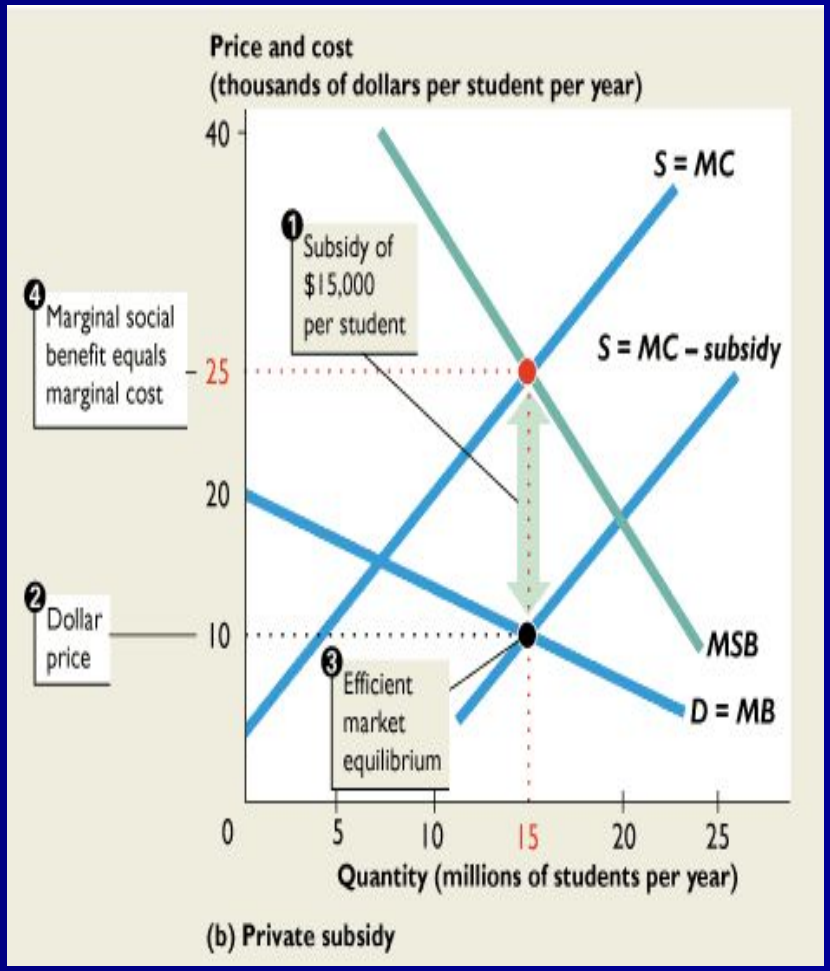
Producer Subsidies

A subsidy is a payment from the government to private producers based on the level of output.

A $15,000 per student subsidy shifts the supply curve to S = MC – subsidy.

With the subsidy, tuition can be reduced to $10,000.

At a tuition of $10,000, 15 million students enroll. This is the efficient quantity because marginal social benefit equals marginal cost.



POSITIVE EXTERNALITIES

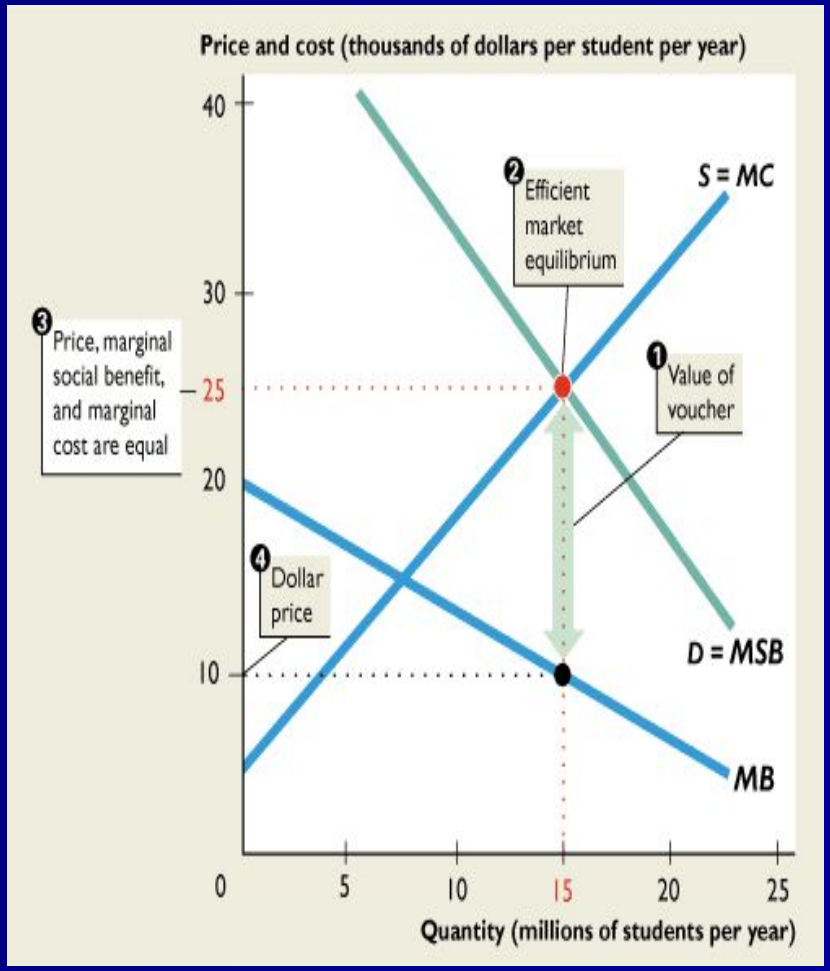
Vouchers

A voucher is a subsidy to consumers for the purchase of specified goods or services.

A $15,000 voucher shifts the demand curve up to equal the marginal social benefit.

With the voucher, 15 million students are willing to pay $25,000 per student. The equilibrium is efficient because marginal social benefit equals marginal cost.

Buyers pay their marginal benefit of $10,000 and the voucher pays the difference.



Negative Externalities

NEGATIVE EXTERNALITIES

- **Private Costs and Social Costs**

Marginal private cost

The cost of producing *an additional unit* of a good or service that is borne by the producer of that good or service.

Marginal external cost

The cost of producing *an additional unit* of a good or service that falls on people other than the producer.

NEGATIVE EXTERNALITIES

- **Private Costs and Social Costs**

Marginal social cost

The marginal cost incurred by the entire society—by the producer and by everyone else on whom the cost falls.

Marginal social cost is the sum of marginal private cost and marginal external cost:

$$MSC = MC + \text{Marginal external cost}$$

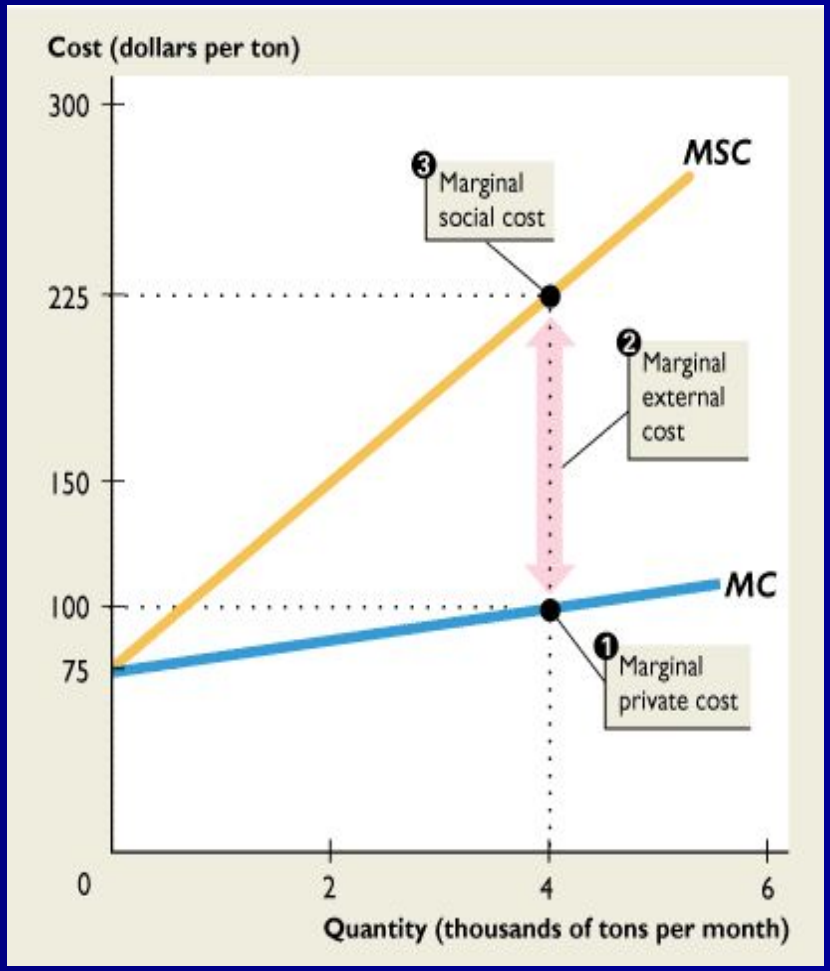
NEGATIVE EXTERNALITIES

Private Cost and Social Cost with an Externality

When output is 4,000 tons of chemicals per month . . .

- marginal private cost is $100 a ton.
- marginal external cost is $125 a ton.
- marginal social cost is $225 a ton.

An external cost creates a wedge between social cost and private cost.



NEGATIVE EXTERNALITIES

- **Economic Efficiency with a Negative Externality**

Market equilibrium is inefficient with a negative externality

If an external cost is *uninternalized*, producers choose the quantity at which marginal benefit equals marginal *private* cost. They ignore or are unaware of the external cost imposed on others.

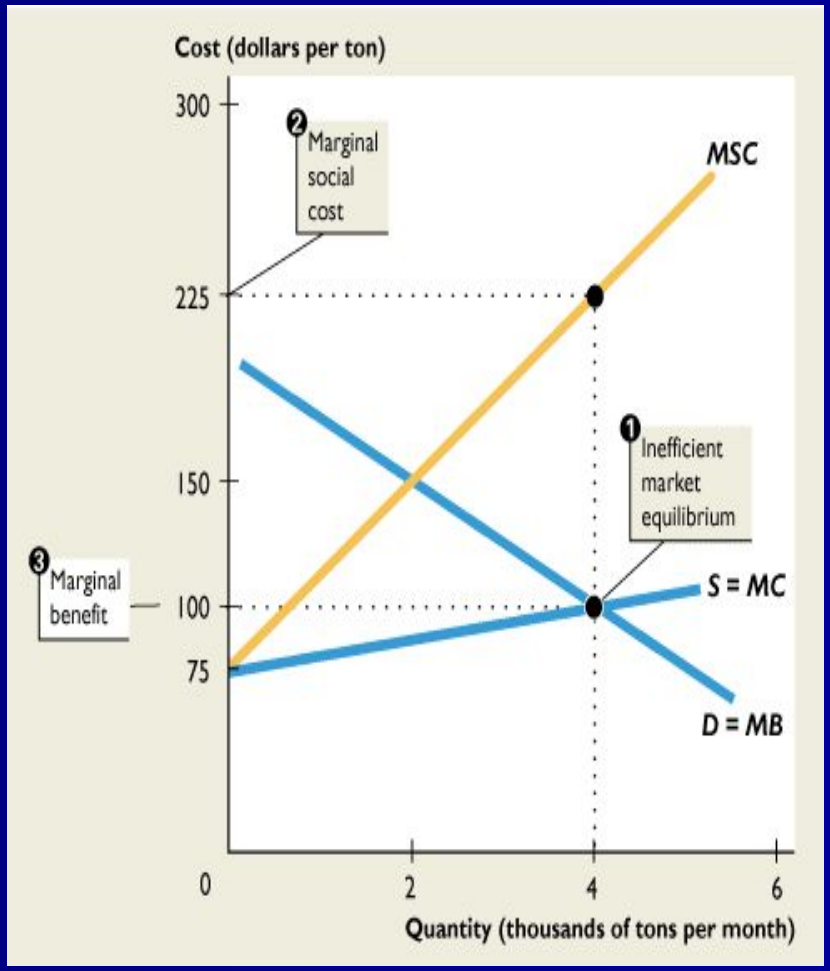
Efficiency requires that marginal benefit be equal to marginal *social* cost. Therefore, with an uninternalized external cost, the market equilibrium is inefficient because of *overproduction*. Too much of the good is produced.

NEGATIVE EXTERNALITIES

Inefficiency with an External Cost

With an external cost, equilibrium price is $100 a ton and equilibrium quantity is 4,000 tons a month.

The market equilibrium is inefficient because marginal social cost exceeds marginal benefit.

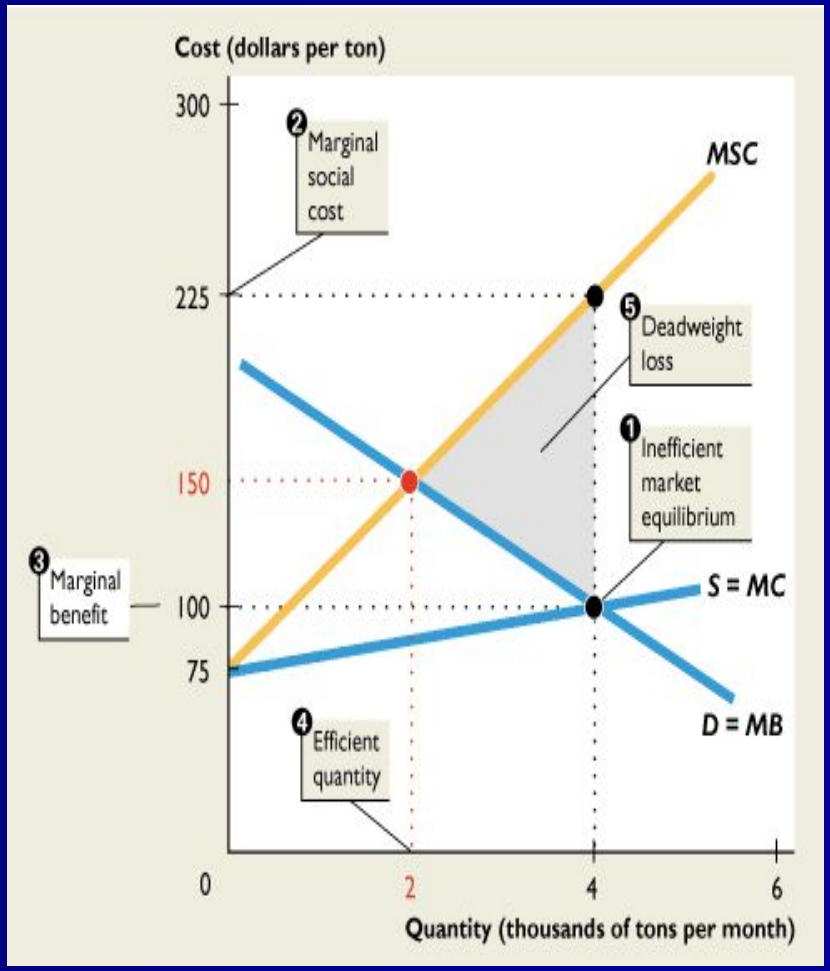


NEGATIVE EXTERNALITIES

Inefficiency with an External Cost

The efficient quantity is 2,000 tons a month, where marginal social cost equals marginal benefit.

The gray triangle shows the dead-weight loss created by the uninternalized pollution externality.



NEGATIVE EXTERNALITIES

- **Public Policy and External Costs**

Internalizing an external cost

Internalizing an external cost means altering incentives so that producers take into account the external effects of their actions.

When an external cost is internalized

- marginal private cost equals marginal social cost
- in equilibrium, marginal social cost equals marginal benefit
- therefore, the equilibrium is efficient.

NEGATIVE EXTERNALITIES

- **Public Policy and External Costs**

Pollution is an example of a negative externality

We use pollution to illustrate public policy actions for improving economic efficiency when there are external costs.

Zero pollution is not an option. Pollution imposes costs on society, but the production activities that generate pollution also confer benefits.

The objective is to balance the costs of pollution against the benefits from the goods and services whose production generates pollution—in other words, to find the optimal or efficient amount of pollution.

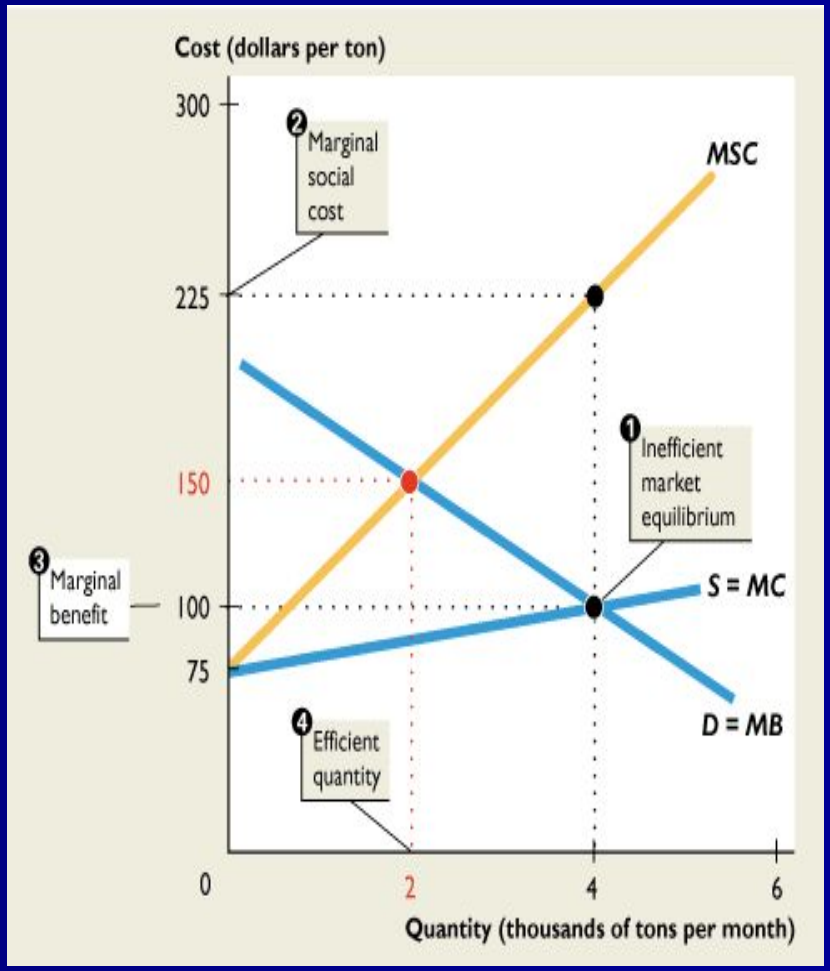
NEGATIVE EXTERNALITIES

Optimal (Economically Efficient) Pollution

The equilibrium quantity is 4,000 tons a month where MB=MC.

The equilibrium is inefficient because marginal social cost exceeds marginal benefit. At the equilibrium, there is too much production and too much pollution.

The efficient quantity is 2,000 tons a month where MB=MSC. When production is efficient, the amount of pollution is optimal.



NEGATIVE EXTERNALITIES

- **Public Policy and External Costs**

Quasi-market policies to achieve optimal pollution

Economists favor quasi-market approaches that rely on incentives to improve efficiency when there is pollution.

Quasi-market approaches to reducing pollution include

- Marketable permits (or tradable emission rights)
- Emission charges
- Pollution taxes

NEGATIVE EXTERNALITIES

- **Public Policy and External Costs**

Marketable permits

The optimal amount of pollution in a geographic area is determined based on marginal benefits and marginal costs. Each polluter is assigned a pro rata share of the total allowed pollution.

Polluters are allowed to buy and sell their pollution permits. In this way, a market is created in pollution rights and the market establishes prices for the right to pollute.

Polluters who can reduce pollution at relatively low cost sell their permits to polluters for whom pollution reduction would be relatively more costly.

NEGATIVE EXTERNALITIES

- **Public Policy and External Costs**

Emission charges

A price charged to polluters per unit of pollution. Emission charges have effects similar effects to pollution taxes.

Pollution taxes

A tax imposed on polluters equal to the marginal external cost of the polluting activity.

NEGATIVE EXTERNALITIES

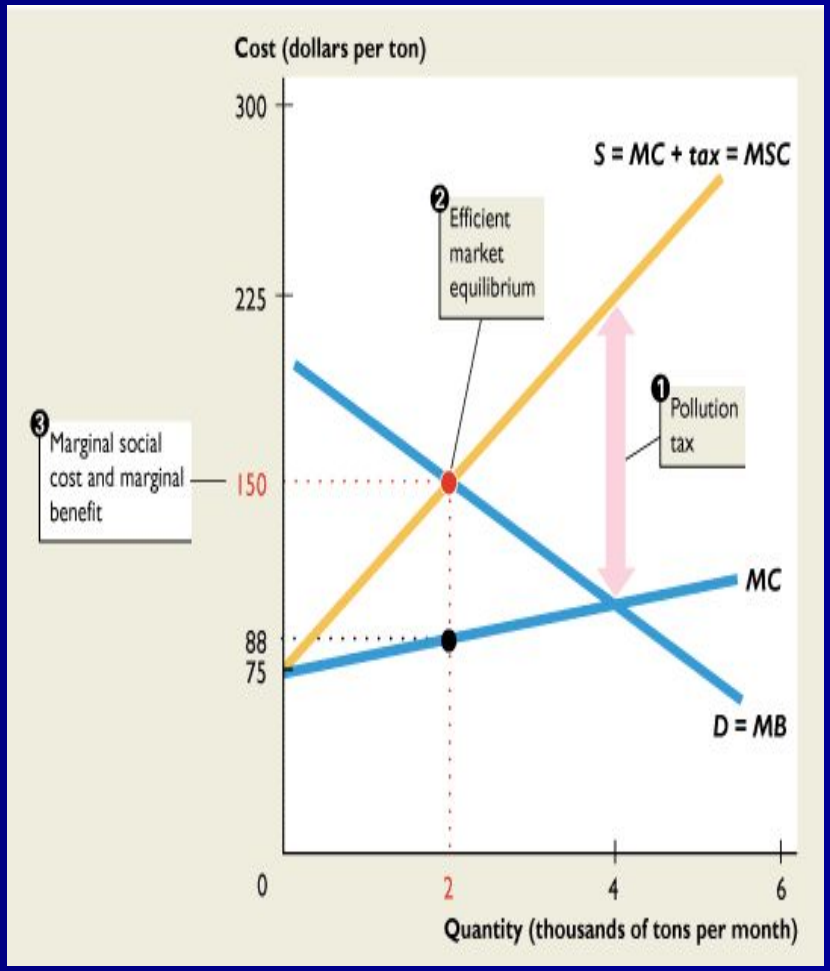
Effects of a Pollution Tax

A pollution tax equal to the marginal external cost of pollution is imposed.

Marginal private cost with the tax equals marginal social cost.

Equilibrium price with the tax is $150 a ton and equilibrium quantity is 2,000 tons a month.

The market equilibrium with the tax is efficient because marginal social cost equals marginal benefit.



NEGATIVE EXTERNALITIES

- **Public Policy and External Costs**

Advantages of quasi-market policies

Quasi-market policies are more efficient than regulation in promoting economic efficiency and achieving optimal pollution.

The desired amount of pollution reduction is achieved at the lowest possible cost.

Because pollution rights have a price, polluters have incentives to substitute less-polluting technologies for existing technologies or to develop new less-polluting technologies.

NEGATIVE EXTERNALITIES

- **Public Policy and External Costs**

Regulation is costly and often inefficient because it

- Shifts decision-making from consumers and producers who have better information about benefits and costs to bureaucrats and politicians who have less information about benefits and costs.
- Is inflexible and slow to respond to changes in benefits and costs.
- Is often politically motivated and promotes special interests rather than promoting economic efficiency and the public interest.
- Imposes high administrative costs.

NEGATIVE EXTERNALITIES

- **Private Action to Internalize an Externality**

Private action is an alternative to public policy

Many externalities are internalized by private action—by private negotiation among the affected individuals, by adjustment of market prices, and by rearrangement of property rights. No public policy action is necessary to internalize these externalities.

If only a small number of individuals are involved and transaction costs are low, then private negotiation among the affected individuals can internalize an externality.

With complete and efficient markets, market prices may internalize externalities, increasing to reflect the value of an external benefit or decreasing to reflect an external cost.

NEGATIVE EXTERNALITIES

- **Final Observation**

Not every externality problem is worth solving

An uninternalized externality imposes an opportunity cost on society. The opportunity cost is the deadweight loss that arises from overproduction with a negative externality or underproduction with a positive externality.

But, there are also costs to internalizing an externality. Sometimes the costs of internalizing the externality are greater than the cost of the externality. In that case, the optimal action is no action—do nothing. Internalizing the externality costs more than it is worth.

Application: Resource Conservation

APPLICATION: RESOURCE CONSERVATION

- **Property Rights and Conservation**

Private property encourages optimal conservation

Many people mistakenly believe that resources are more likely to be conserved for the future and less likely to be depleted if they are owned in common than if they are private property.

In fact, quite the opposite is true. Unlike common property rights, private property rights

- provide incentives for optimal conservation of a resource and
- ensure against too rapid depletion of a resource.

APPLICATION: RESOURCE CONSERVATION

- **Common Property Resources**

Definition

A resource for which rights are held in common by a group of individuals none of whom has exclusive ownership. With common property resources, property rights are absent or incomplete.

Typically, the only right to a common property resource that an individual possesses is the right to current use of the resource. In particular, an individual has no guaranteed *future interest* in the resource.

APPLICATION: RESOURCE CONSERVATION

- **Common Property Resources**

Common property rights create uninternalized externalities

An individual who refrains from consuming a resource now and conserves it for the future incurs a cost. The cost is the loss in value the individual would obtain from current consumption. But the individual also creates a benefit by increasing the amount of the resource available for future consumption.

APPLICATION: RESOURCE CONSERVATION

- **Common Property Resources**

  With common property rights, the benefits from future consumption may be enjoyed by all of society. Thus, conservation generates external benefits so there is too little conservation and too much current consumption.

  Because of the absence of private property rights, especially the lack of a guaranteed future interest, common property resources tend to be overused, poorly maintained, and depleted too rapidly.

APPLICATION: RESOURCE CONSERVATION

- **Externalities and Property Rights**

Externalities arise when private property rights are absent or unenforced

Private property rights provide incentives for individuals to use resources efficiently and prevent individuals from imposing costs on others without compensation.

Externalities arise when private property rights are either absent or unenforced.

By establishing private property rights and enforcing existing rights, some externalities can be internalized.

APPLICATION: RESOURCE CONSERVATION

- **Externalities and Property Rights**

Example: Property rights and pollution

Suppose polluting factories own a river and the homes along it. The more the factories pollute, the less rent are people willing to pay to live in the homes.

Suppose the residents own the river and the homes. Then, the factories must pay the homeowners for polluting the river. The more the factories pollute, the more they pay.

APPLICATION: RESOURCE CONSERVATION

- **Externalities and Property Rights**

  Either way, regardless of who owns the river, *so long as someone owns it*, the factories bear the cost of polluting the river, the quantity of the goods produced is efficient, and the amount of pollution is optimal.

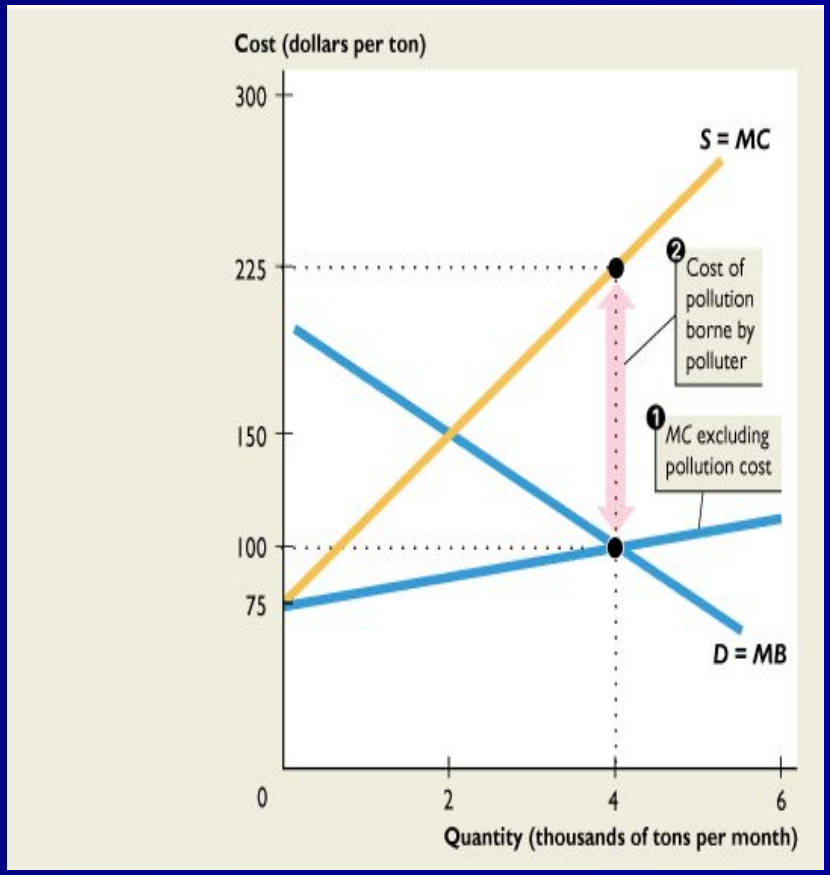
  But if there are no enforced property rights, if neither the factories nor the residents own the river, the factory can pollute the river without bearing any cost. The costs of the pollution fall on the residents, and there is overproduction and too much pollution.

APPLICATION: RESOURCE CONSERVATION

Efficiency with Private Property Rights

If private property rights are absent or unenforced, the producer pays only the marginal private cost. The producer's supply curve is the MC curve that excludes pollution costs.

With complete and enforced private property rights, the producer's supply curve is the MC curve that includes the cost of pollution—the marginal social cost curve.

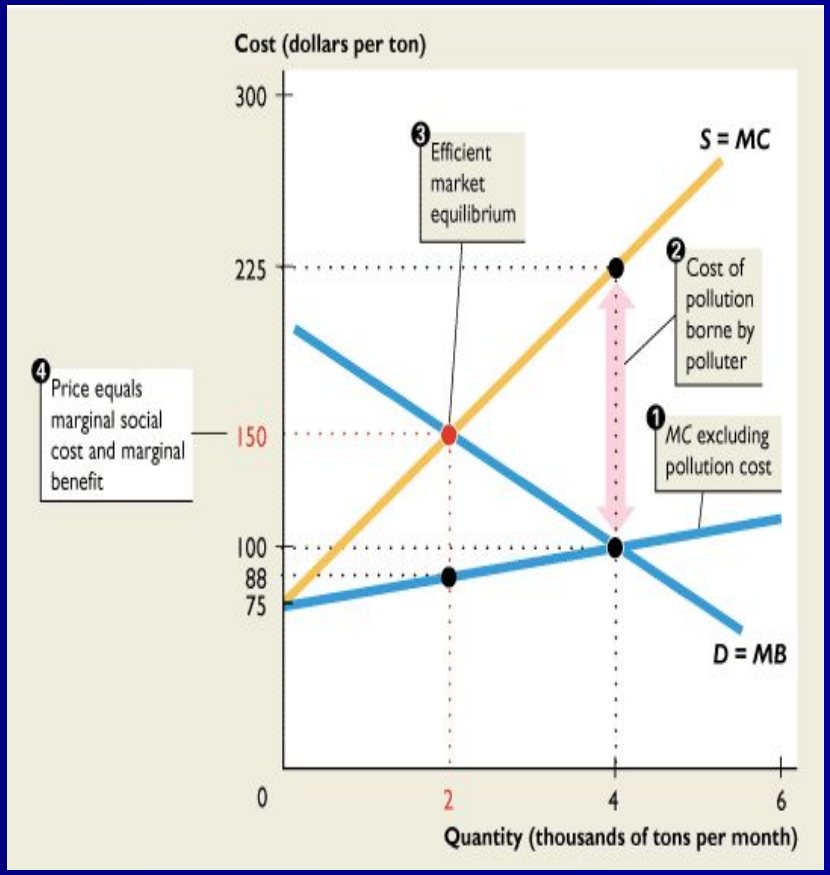


APPLICATION: RESOURCE CONSERVATION

Efficiency with Private Property Rights

Equilibrium price is $150 a ton and equilibrium quantity is 2,000 tons a month.

This market equilibrium is efficient because marginal social cost equals marginal benefit.



APPLICATION: RESOURCE CONSERVATION

- **Private Property and Optimal Conservation**

Prices determine the timing of resource consumption

The expected future price, P^F, of a resource reflects the expected value of consuming one more unit of the resource in the future.

The current price, P^C, reflects the value of consuming one more unit of the resource today.

If the resource is privately owned, the owner has an incentive to conserve the resource for future consumption if $P^F > P^C$ and to consume the resource today if $P^F < P^C$.

APPLICATION: RESOURCE CONSERVATION

- **Private Property and Optimal Conservation**

Prices reflect marginal benefits and marginal costs

The value of consuming one more unit of a resource in the future is the marginal benefit from conservation. But this means P^F=MB of conservation.

The value of consuming one more unit of a resource today is the marginal benefit of consumption today, or alternatively, it is the marginal cost of conservation. So, P^C=MB of current consumption=MC of conservation.

APPLICATION: RESOURCE CONSERVATION

- **Private Property and Optimal Conservation**

Prices provide incentives for optimal conservation

Resource owners will conserve more and consume less today if $P^F > P^C$. But this means MB of conservation>MC of conservation.

Resource owners will conserve less and consume more today if $P^F < P^C$. But this means MB of conservation<MC of conservation.

The equilibrium amount of conservation, then, is the quantity at which $P^F = P^C$. But this means MB of conservation=MC of conservation, so the equilibrium quantity is efficient.

APPLICATION: RESOURCE CONSERVATION

- **Private Property and Optimal Conservation**

Competitive markets and efficient conservation

In competitive markets with private property rights, the quantity of the resource that is conserved for future use is the quantity at which the expected future price equals the current price.

But that is also the quantity at which the marginal benefit from conservation of the resource equals the marginal cost. *And that is the rule for optimal conservation*.

With private property rights, competitive market prices guide resource owners toward optimal conservation of a resource.

APPLICATION: RESOURCE CONSERVATION

- **Private Property and Resource Depletion**

Private property rights prevent too rapid depletion of a resource

Contrary to popular belief, resource depletion is less likely to occur with private property rights in resources, competitive markets, and unregulated prices than with common property rights and regulation.

Markets and prices provide a self-limiting mechanism that prevents rapid depletion of a valuable resource. As a resource becomes scarcer, its price increases and consumption decreases so that depletion is avoided.

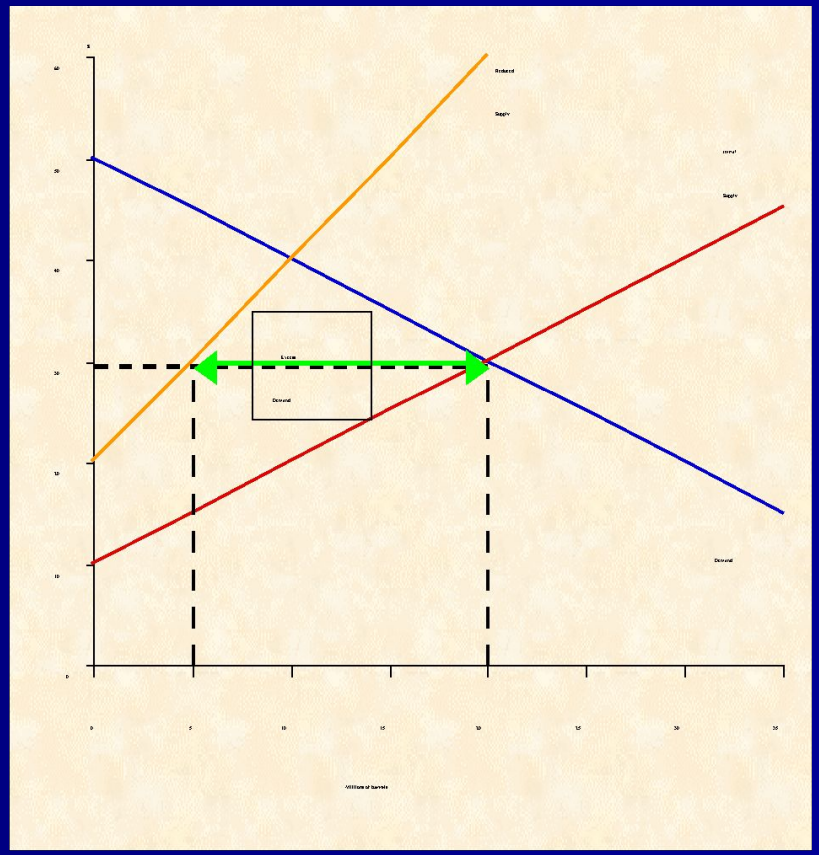
APPLICATION: RESOURCE CONSERVATION

Markets, Prices, and Resource Depletion

As a resource is used up, the *supply* of the resource decreases, shown by the shift in the supply curve to the left.

Supply at $30 per barrel decreases from 20 million barrels to 5 million barrels.

The decrease in *supply* creates an excess demand of 15 million barrels.

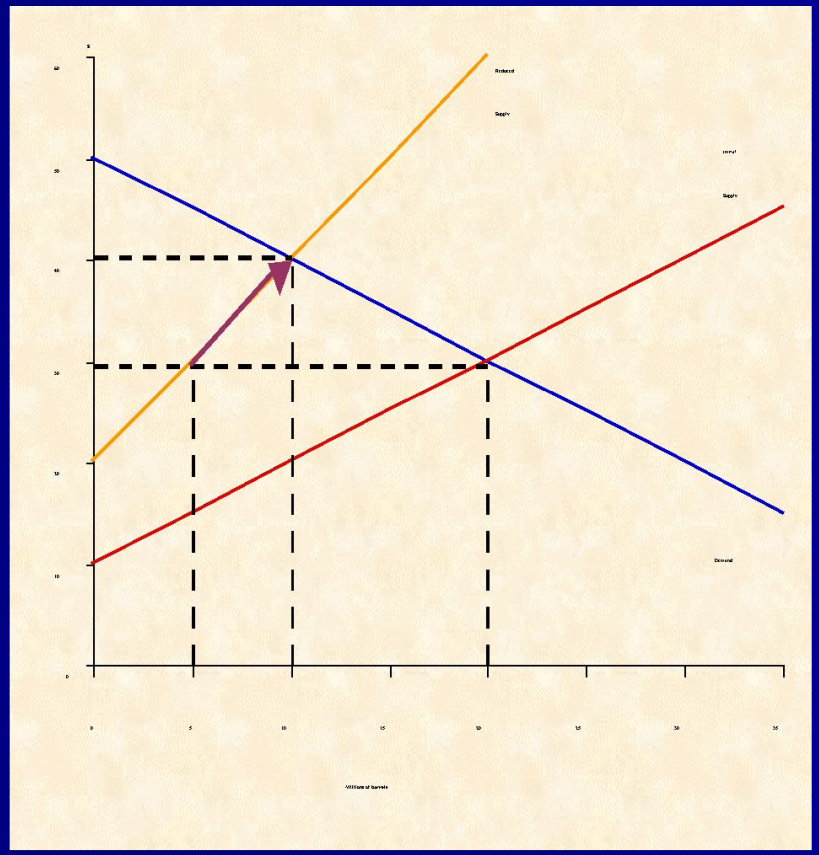


APPLICATION: RESOURCE CONSERVATION

Markets, Prices, and Resource Depletion

Because of the excess demand, price increases from $30 to $40 and quantity demanded decreases from 20 million barrels to 10 million barrels.

The higher price also makes it profitable to produce more of the resource from known but previously uneconomical sources. Q*uantity supplied* increases from 5 million to 10 million barrels.



APPLICATION: RESOURCE CONSERVATION

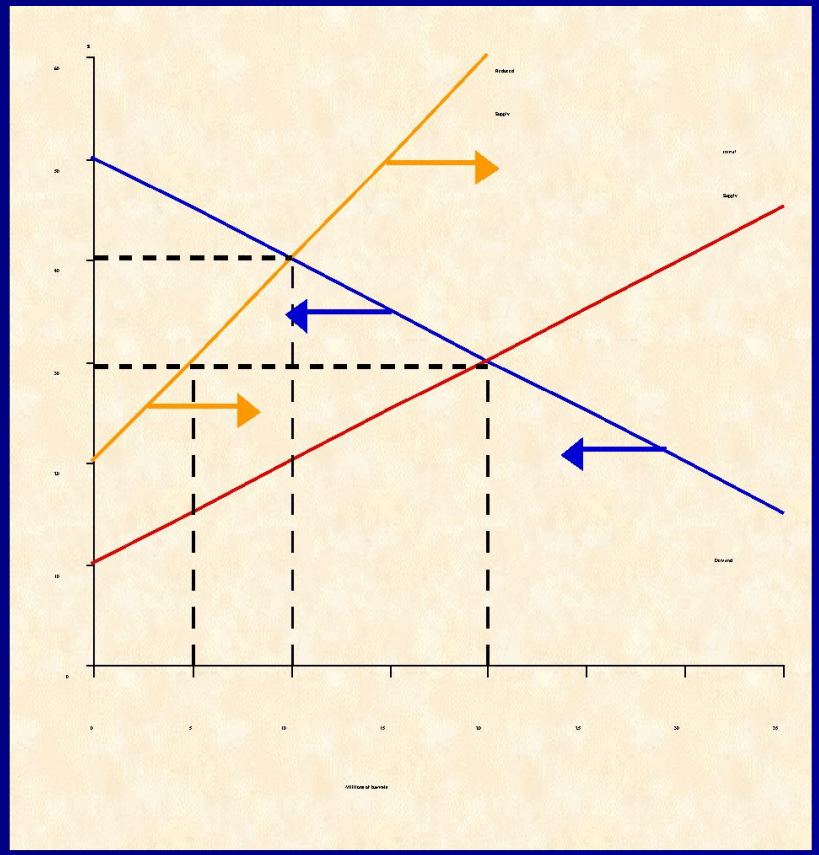
Markets, Prices, and Resource Depletion

In the long run, higher prices also create incentives for . . .

consumers to substitute other activities that use the resource less intensively, and for . . .

producers to develop new goods and new technologies that use less of the resource, both of which *decrease demand*, and for . . .

producers to search for and develop new sources, increasing *supply*.



APPLICATION: RESOURCE CONSERVATION

- **Summary**

Private property rights and economic efficiency

With a complete set of private property rights in resources

- there are no uninternalized externalities.
- competitive market prices guide resource owners toward optimal conservation of a resource.
- resources are efficiently used, efficiently maintained, and efficiently conserved so as to maximize the net social benefit of the resources.