

Chapter 18

Externalities and Public Goods

Topics to be Discussed

- Externalities
- Ways of Correcting Market Failure
- Externalities and Property Rights
- Common Property Resources



Topics to be Discussed

- Public Goods
- Private Preferences for Public Goods



Externalities

■ Negative

- Action by one party imposes a cost on another party

■ Positive

- Action by one party benefits another party



External Cost

■ Scenario

- Steel plant dumping waste in a river
- The entire steel market effluent can be reduced by lowering output (fixed proportions production function)



External Cost

■ Scenario

- Marginal External Cost (MEC) is the cost imposed on fishermen downstream for each level of production.
- Marginal Social Cost (MSC) is MC plus MEC.

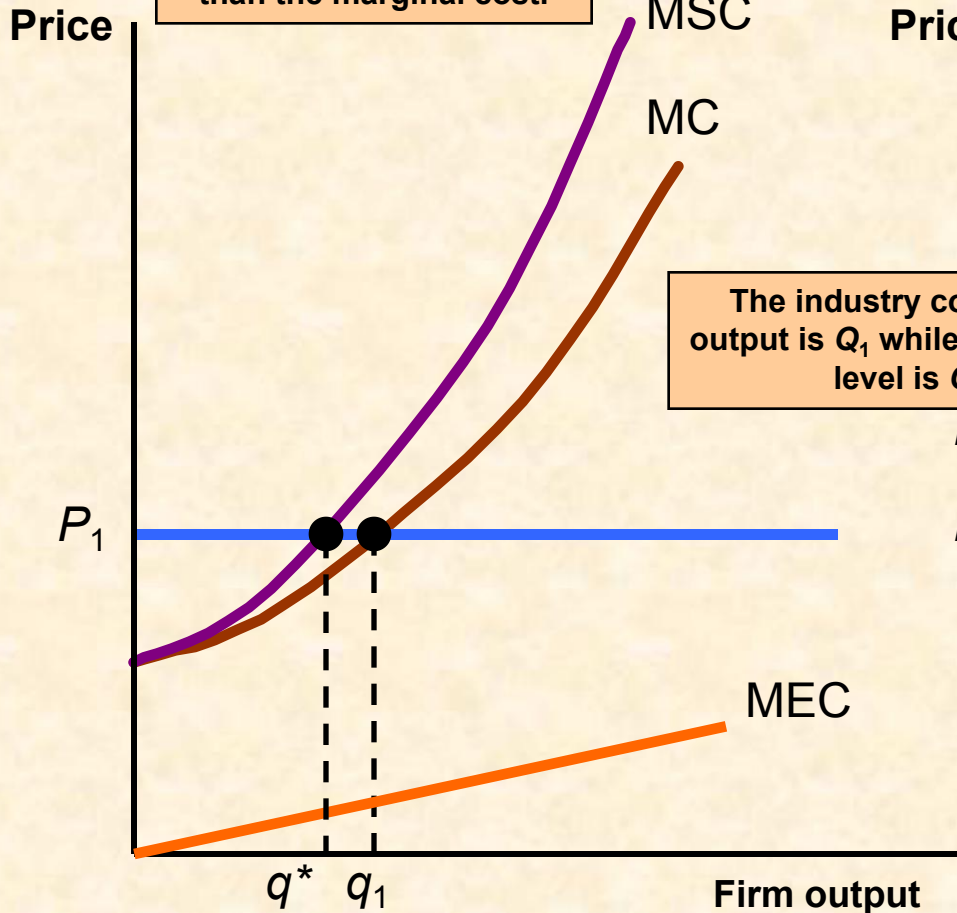


External Costs

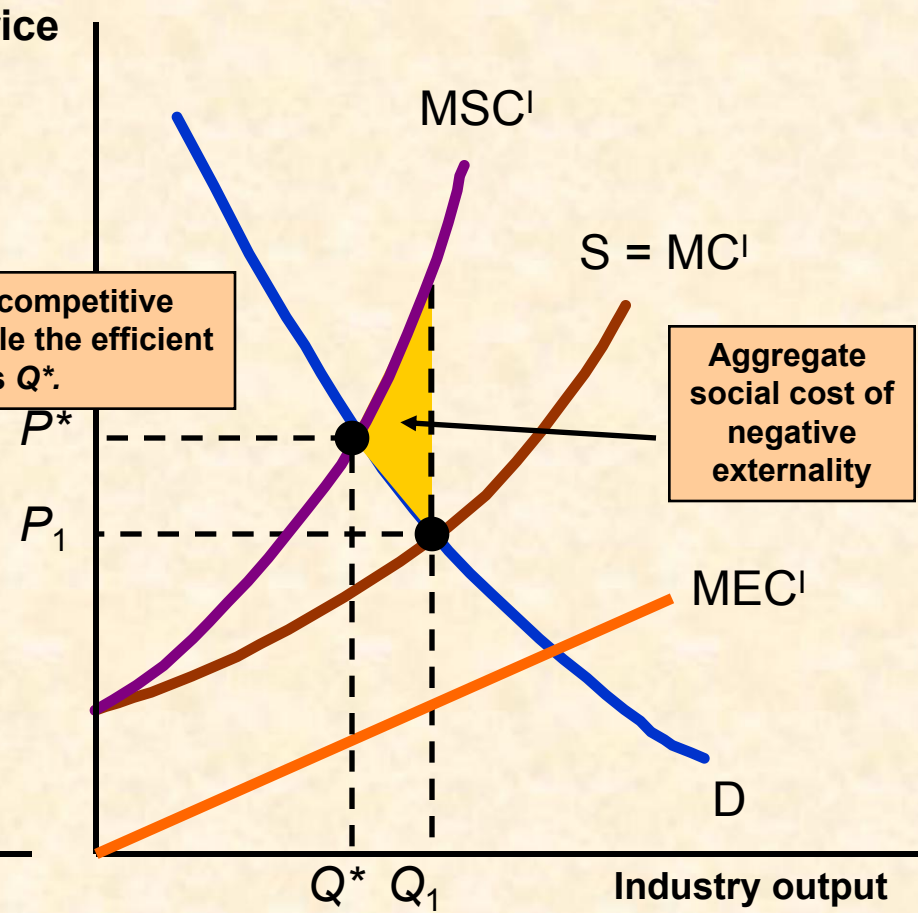
When there are negative externalities, the marginal social cost MSC is higher than the marginal cost.

The difference is the marginal external cost MEC.

The profit maximizing firm produces at q_1 while the efficient output level is q^* .



The industry competitive output is Q_1 while the efficient level is Q^* .



Aggregate social cost of negative externality

External Cost

- Negative Externalities encourage inefficient firms to remain in the industry and create excessive production in the long run.

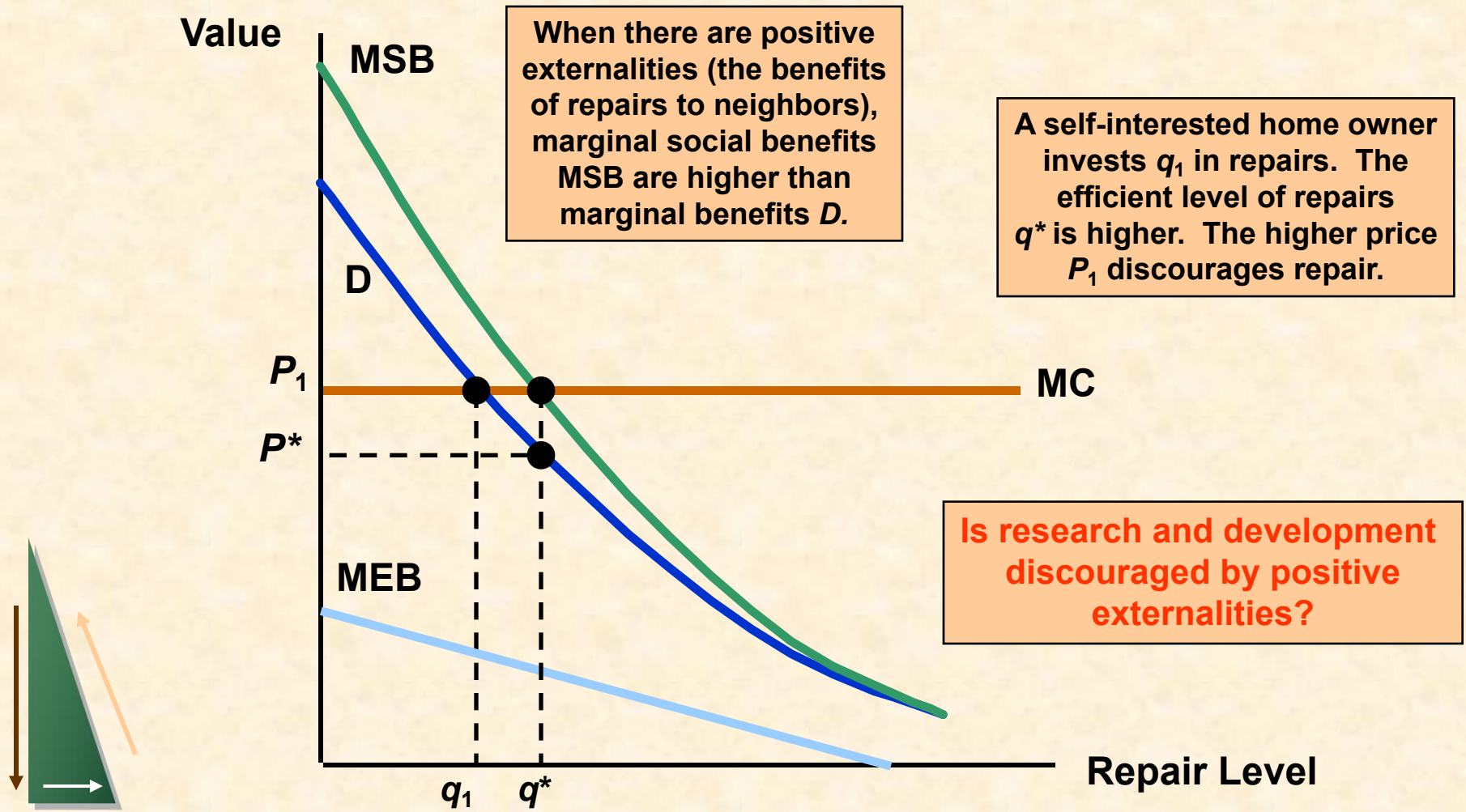


Externalities

- Positive Externalities and Inefficiency
 - Externalities can also result in too little production, as can be shown in an example of home repair and landscaping.



External Benefits



Ways of Correcting Market Failure

- Assumption: The market failure is pollution
 - Fixed-proportion production technology
 - ◆ Must reduce output to reduce emissions
 - ◆ Use an output tax to reduce output
 - Input substitution possible by altering technology

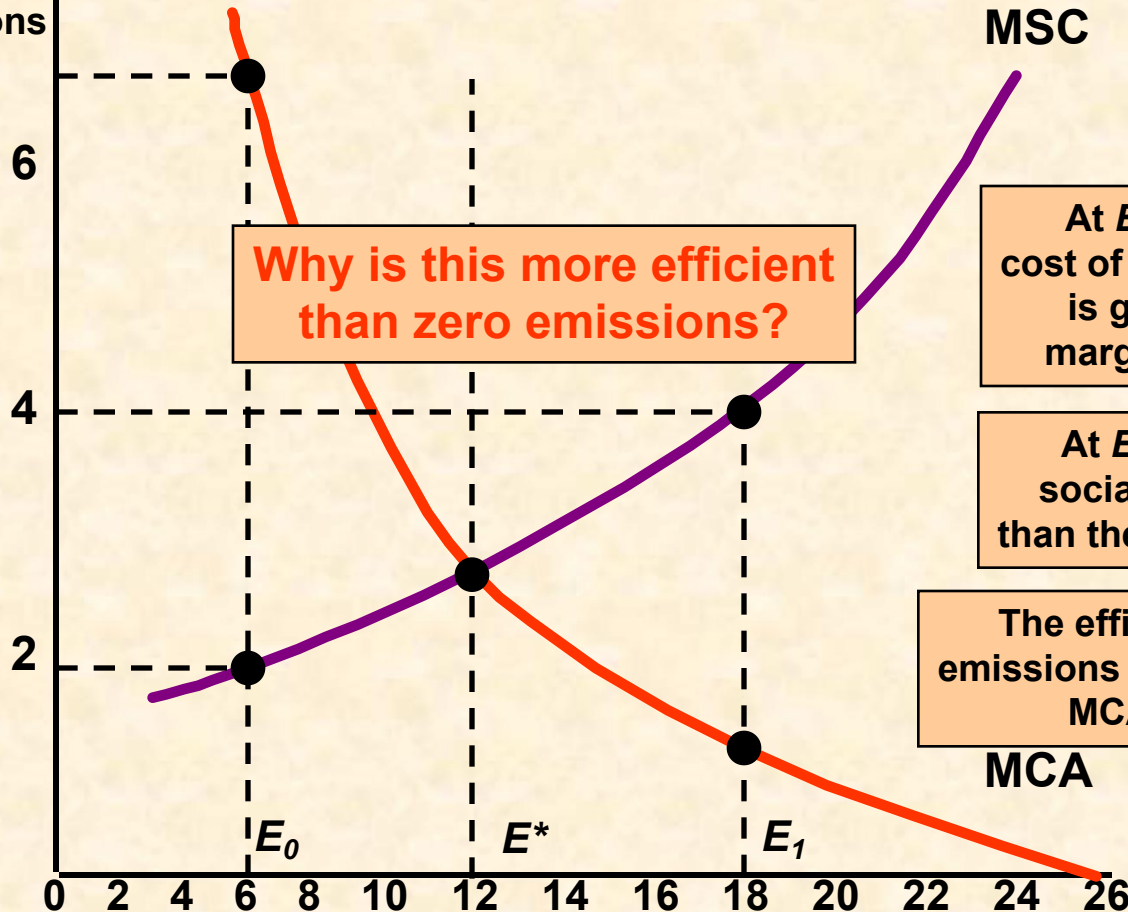


The Efficient Level of Emissions

Assume:

- 1) Competitive market
- 2) Output and emissions decisions are independent
- 3) Profit maximizing output chosen

Dollars
per unit
of Emissions



Why is this more efficient than zero emissions?

At E_0 the marginal cost of abating emissions is greater than the marginal social cost.

At E_1 the marginal social cost is greater than the marginal benefit.

The efficient level of emissions is 12 (E^*) where $MCA = MSC$.

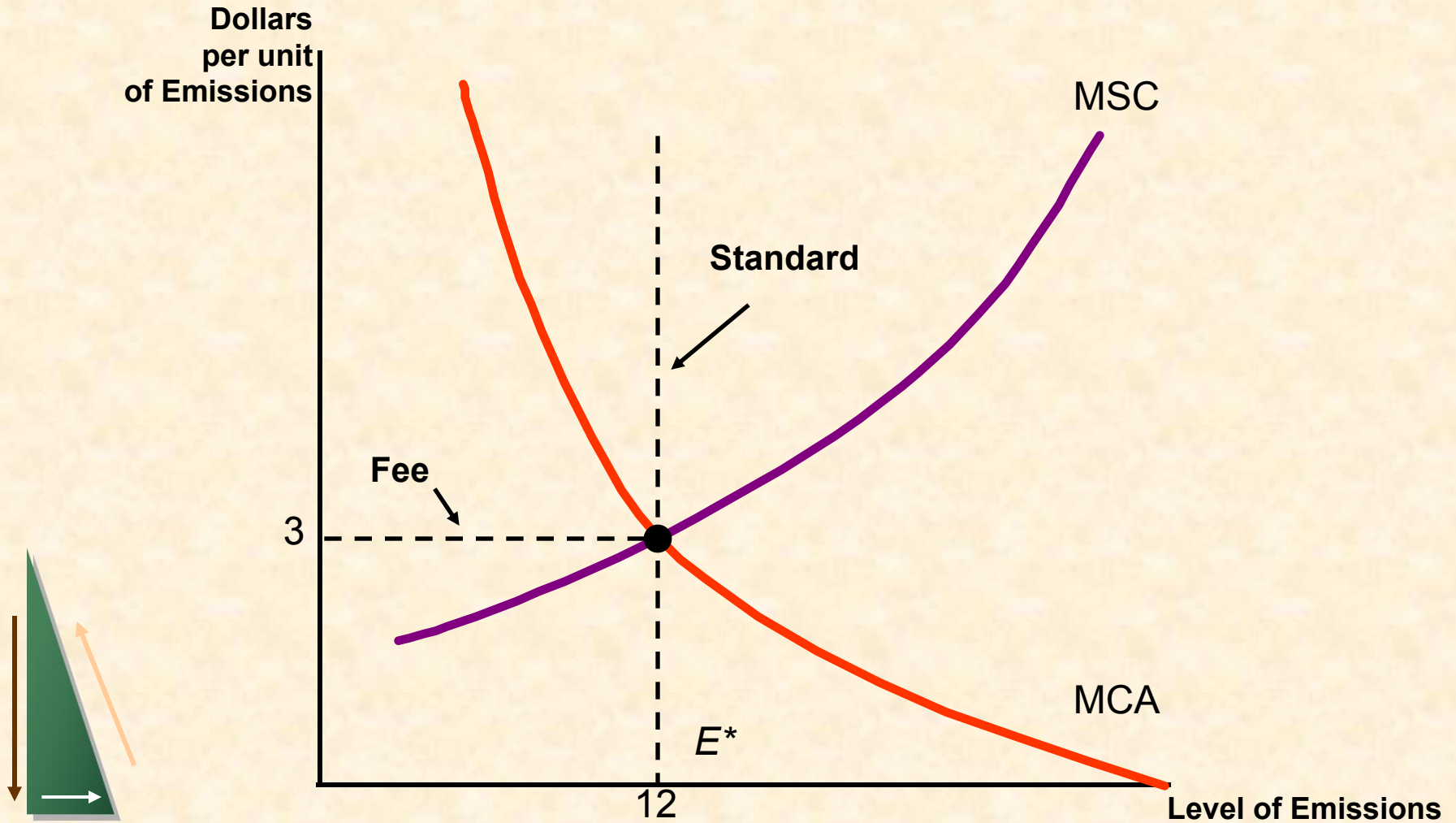


Ways of Correcting Market Failure

- Options for Reducing Emissions to E^*
 - Emission Standard
 - ◆ Set a legal limit on emissions at E^* (12)
 - ◆ Enforced by monetary and criminal penalties
 - ◆ Increases the cost of production and the threshold price to enter the industry



Standards and Fees

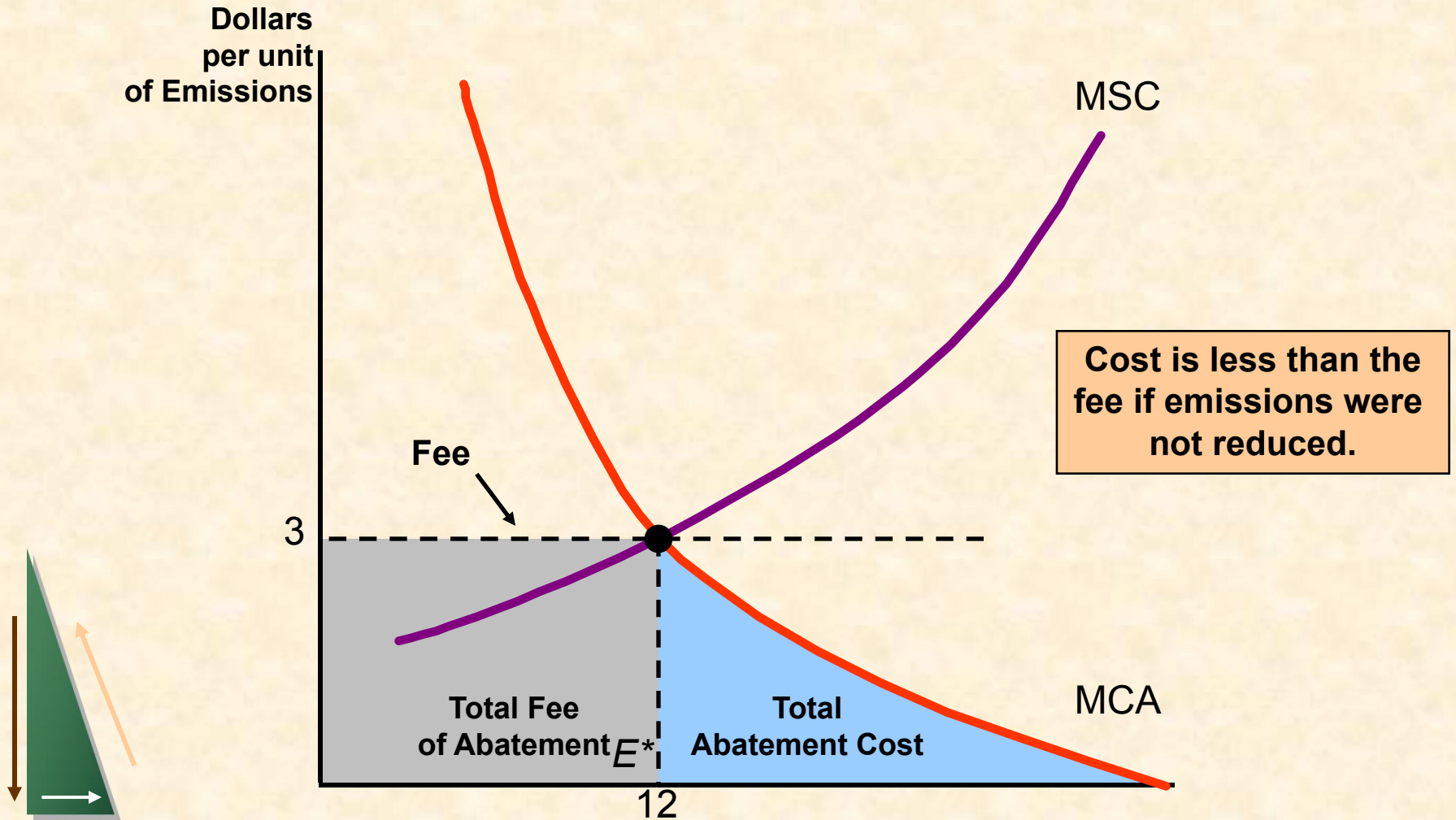


Ways of Correcting Market Failure

- Options for Reducing Emissions to E^*
 - Emissions Fee
 - ◆ Charge levied on each unit of emission



Standards and Fees

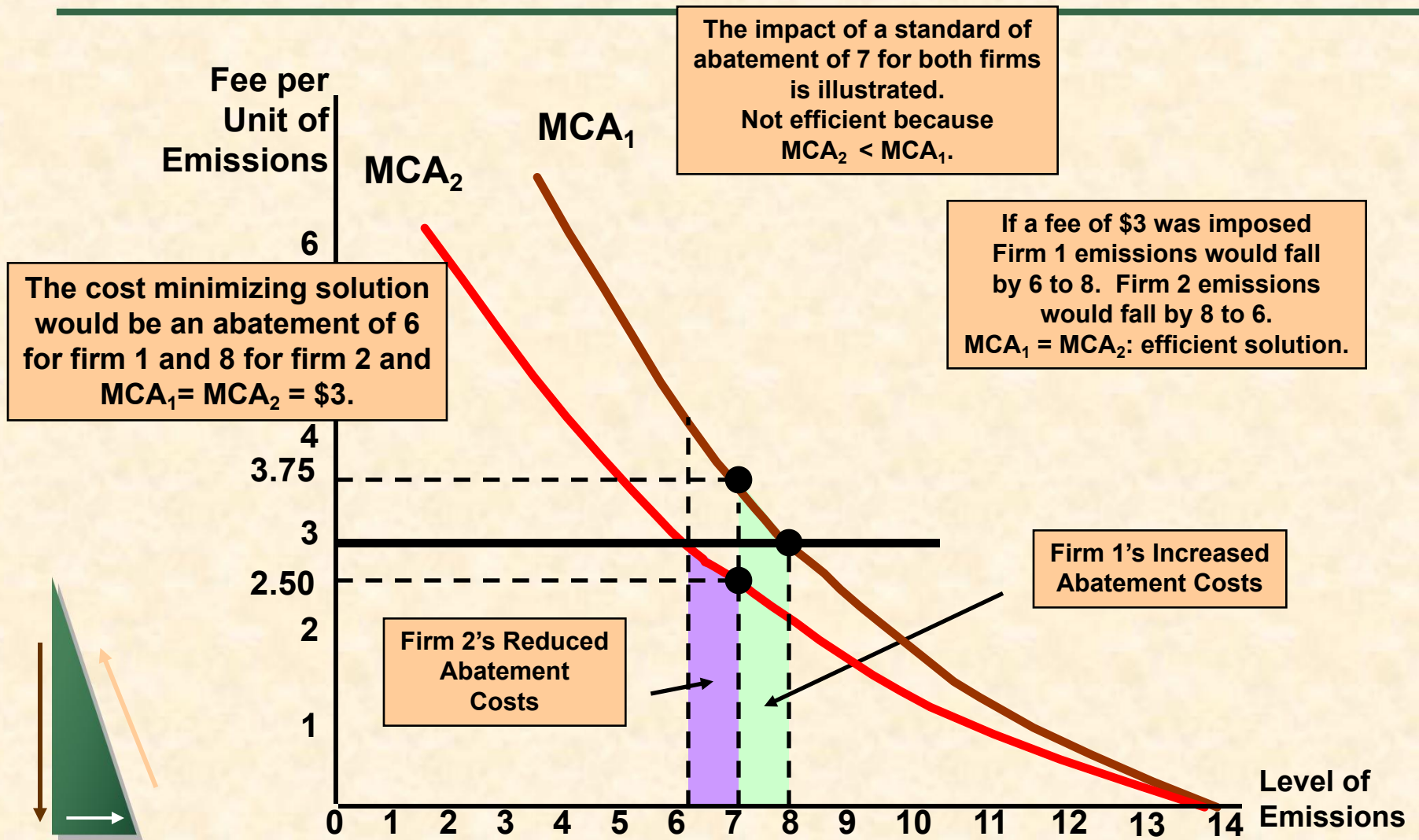


Ways of Correcting Market Failure

- Standards Versus Fees
 - Assumptions
 - ◆ Policymakers have asymmetric information
 - ◆ Administrative costs require the same fee or standard for all firms



The Case for Fees



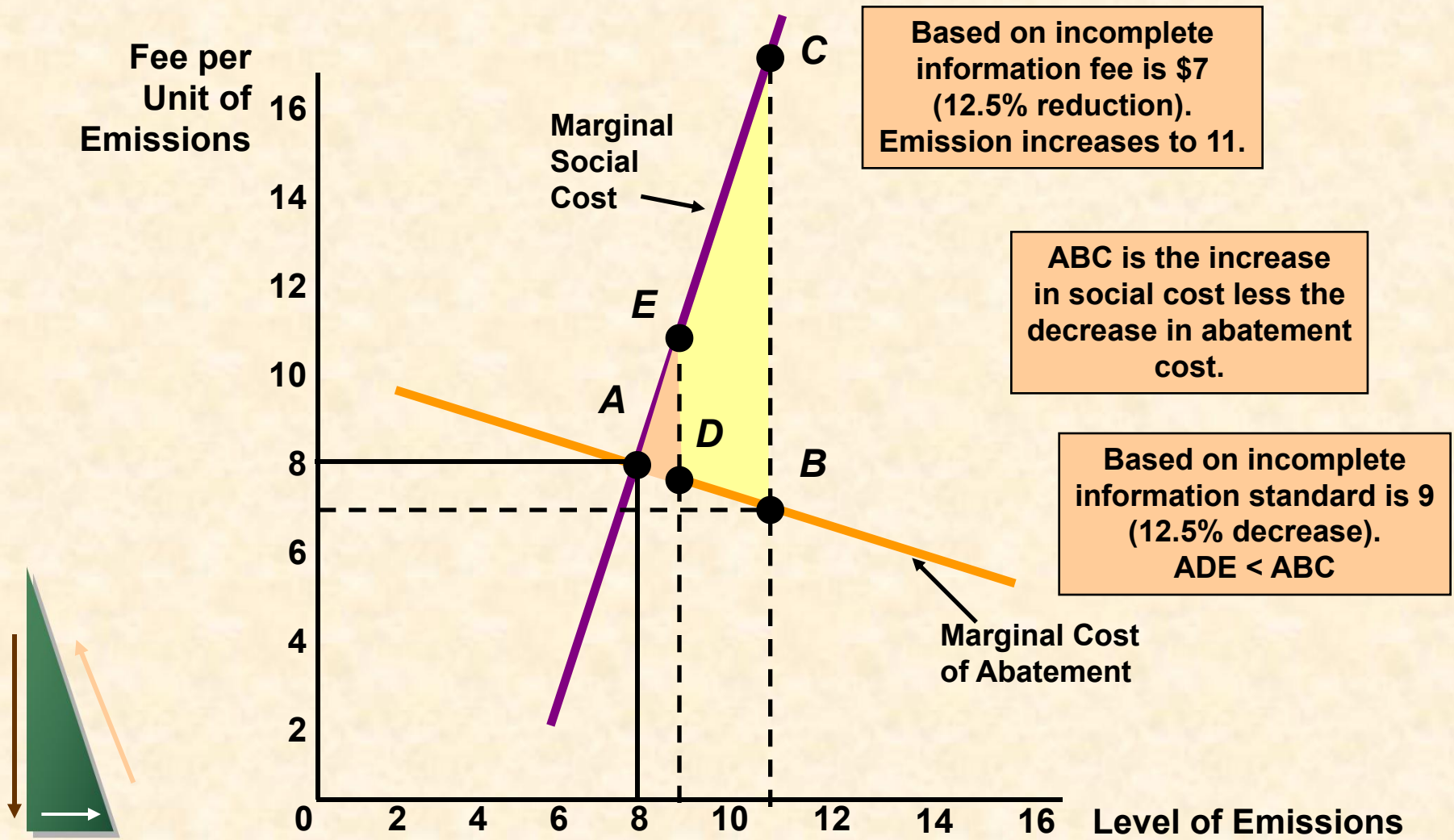
Ways of Correcting Market Failure

■ Advantages of Fees

- When equal standards must be used, fees achieve the same emission abatement at lower cost.
- Fees create an incentive to install equipment that would reduce emissions further.



The Case for Standards



Ways of Correcting Market Failure

- Summary: Fees vs. Standards
 - Standards are preferred when MSC is steep and MCA is flat.
 - Standards (incomplete information) yield more certainty on emission levels and less certainty on the cost of abatement.



Ways of Correcting Market Failure

- Summary: Fees vs. Standards
 - Fees have certainty on cost and uncertainty on emissions.
 - Preferred policy depends on the nature of uncertainty and the slopes of the cost curves.



Ways of Correcting Market Failure

- Transferable Emissions Permits
 - Permits help develop a competitive market for externalities.
 - ◆ Agency determines the level of emissions and number of permits
 - ◆ Permits are marketable
 - ◆ High cost firm will purchase permits from low cost firms



Ways of Correcting Market Failure

■ Question

- What factors could limit the efficiency of this approach?



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The Costs and Benefits of Reduced Sulfur Dioxide Emissions

- Cost of Reducing Emissions
 - Conversion to natural gas from coal and oil
 - Emission control equipment



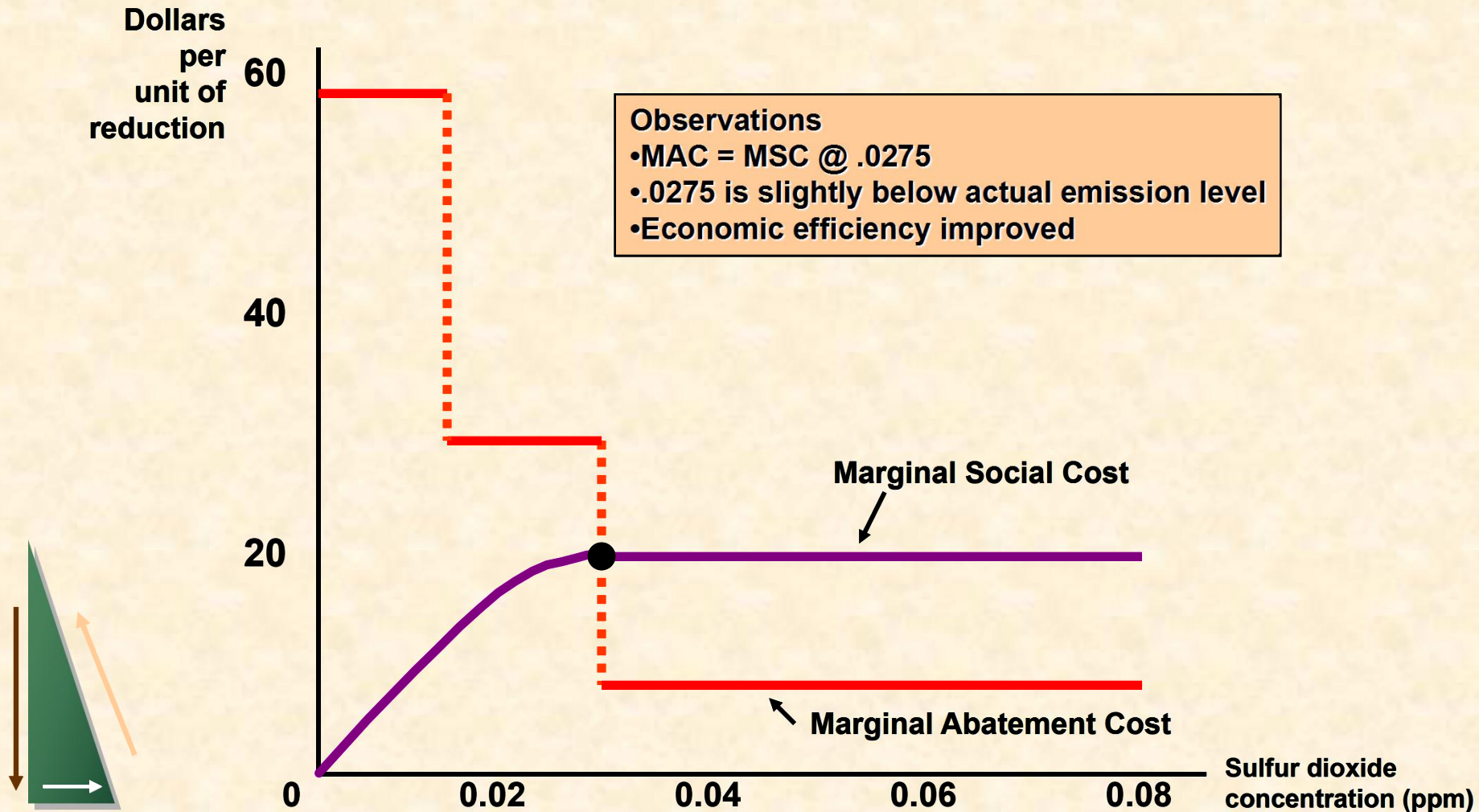
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The Costs and Benefits of Reduced Sulfur Dioxide Emissions

- Benefits of Reducing Emissions
 - Health
 - Reduction in corrosion
 - Aesthetic



Sulfur Dioxide Emissions Reductions



Emissions Trading and Clean Air

■ Bubbles

- Firm can adjust pollution controls for individual sources of pollutants as long as a *total pollutant limit* is not exceeded.

■ Offsets

- New emissions must be offset by reducing existing emissions
 - ◆ 2000 offsets since 1979



Emissions Trading and Clean Air

- Cost of achieving an 85% reduction in hydrocarbon emissions for DuPont
 - Three Options
 - ◆ 85% reduction at each source plant (total cost = \$105.7 million)
 - ◆ 85% reduction at each plant with internal trading (total cost = \$42.6 million)
 - ◆ 85% reduction at all plants with internal and external trading (total cost = \$14.6 million)



Emissions Trading and Clean Air

■ 1990 Clean Air Act

- Since 1990, the cost of the permits has fallen from an expected \$300 to below \$100.

■ Causes of the drop in permit prices

- More efficient abatement techniques
- Price of low sulfur coal has fallen



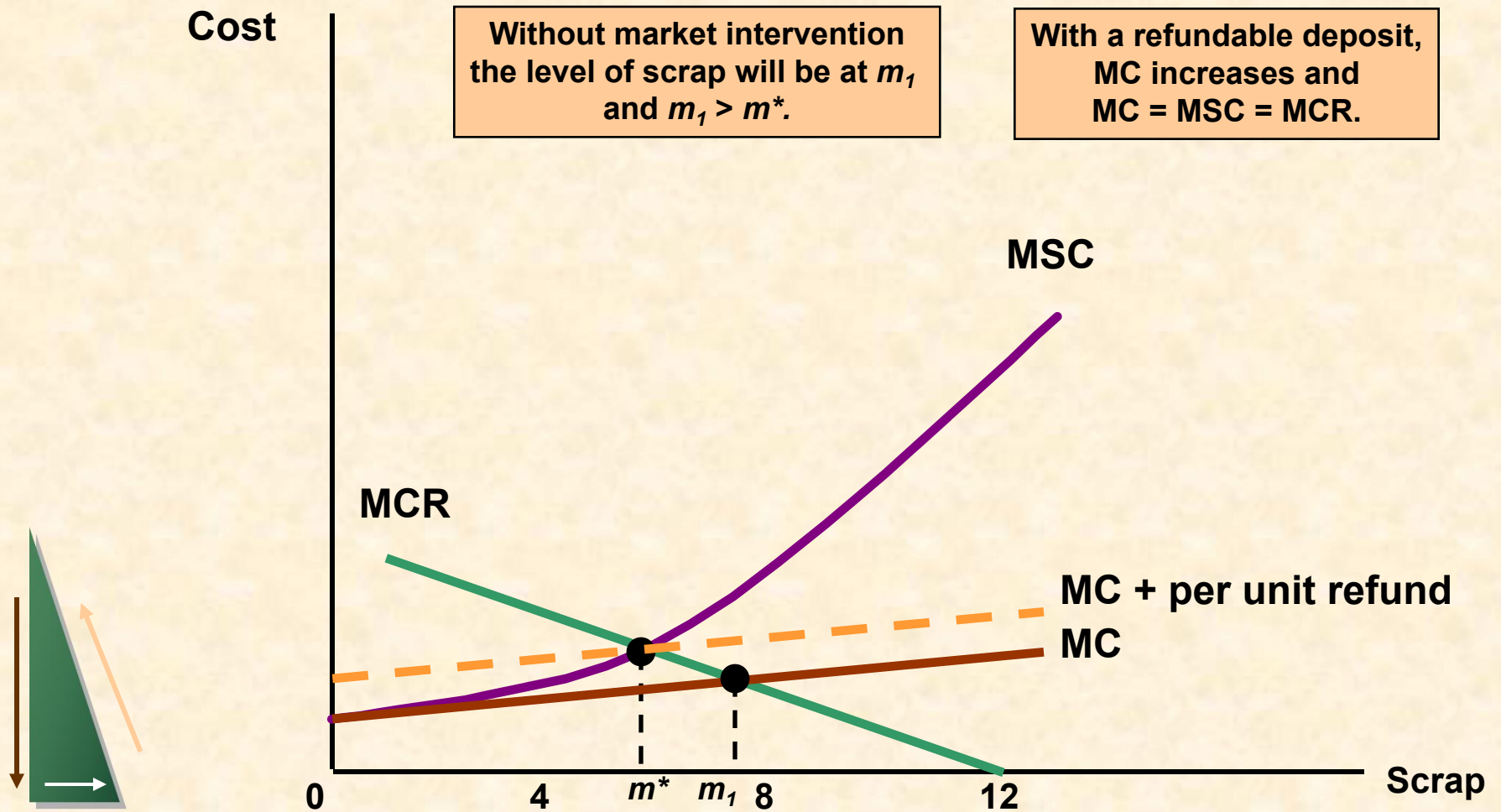
Ways of Correcting Market Failure

■ Recycling

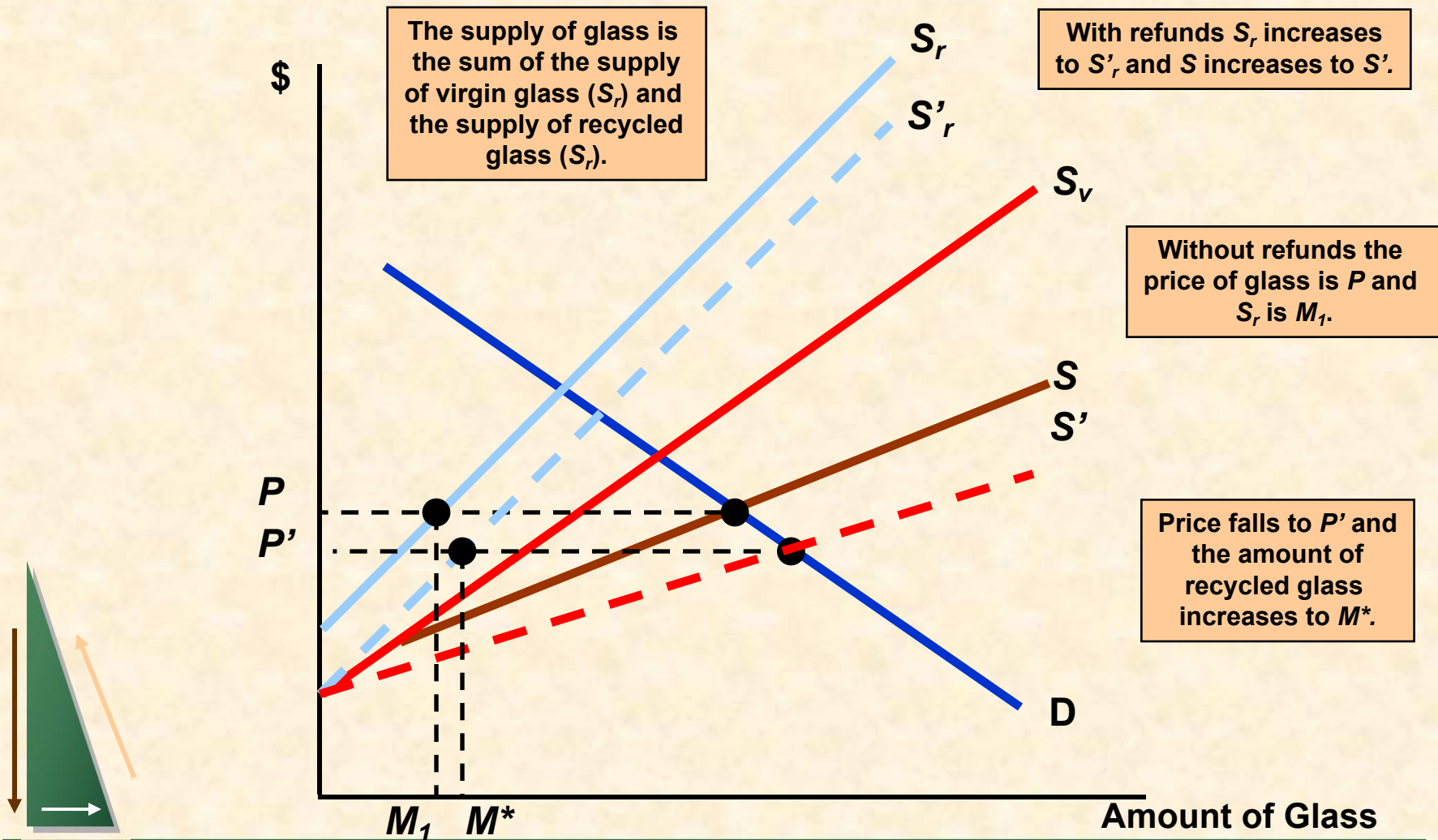
- Households can dispose of glass and other garbage at very low cost.
- The low cost of disposal creates a divergence between the private and the social cost of disposal.



The Efficient Amount of Recycling



Refundable Deposits



Externalities and Property Rights

■ Property Rights

- Legal rules describing what people or firms may do with their property
- For example
 - ◆ If residents downstream owned the river (clean water) they control upstream emissions.



Externalities and Property Rights

- Bargaining and Economic Efficiency
 - Economic efficiency can be achieved without government intervention when the externality affects relatively few parties and when property rights are well specified.



Profits Under Alternative

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Emissions Choices (Daily)

	Factory's Profit	Fishermen's Profit	Total Profit
No filter, not treatment plant	500	100	600
Filter, no treatment plant	300	500	800
No filter, treatment plant	500	200	700
Filter, treatment plant	300	300	600



Externalities and Property Rights

■ Assumptions

- Factory pays for the filter
- Fishermen pay for the treatment plant

■ Efficient Solution

- Buy the filter and do not build the plant



Bargaining with

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Alternative Property Rights

Right to Dump Right to Clean Water

No Cooperation

Profit of factory	\$500	\$300
Profit of fishermen	\$200	\$500

Cooperation

Profit of factory	\$550	\$300
Profit of fishermen	\$250	\$500



Externalities and Property Rights

■ Conclusion: Coase Theorem

- *When parties can bargain without cost and to their mutual advantage, the resulting outcome will be efficient, regardless of how the property rights are specified.*



Externalities and Property Rights

- Costly Bargaining --- The Role of Strategic Behavior
 - Bargaining requires clearly defined rules and property rights.



Externalities and Property Rights

■ A Legal Solution --- Suing for Damages

- Fishermen have the right to clean water
- Factory has two options
 - ◆ No filter, pay damages
 - Profit = \$100 (\$500 - \$400)
 - ◆ Filter, no damages
 - Profit = \$300 (\$500 - \$200)



Externalities and Property Rights

- A Legal Solution --- Suing for Damages
 - Factory has the right to emit effluent
 - Fishermen have three options
 - ◆ Put in treatment plant
 - Profit = \$200
 - ◆ Filter and pay damages
 - Profit = \$300 (\$500 - \$200)
 - ◆ No plant, no filter
 - Profit = \$100



Externalities and Property Rights

■ Conclusion

- A suit for damages results in an efficient outcome.

■ Question

- How would imperfect information impact the outcome?



The Coase Theorem at Work

- Negotiating an Efficient Solution
 - 1987 --- New York garbage spill (200 tons) littered the New Jersey beaches
 - ◆ The potential cost of litigation resulted in a solution that was mutually beneficial to both parties.



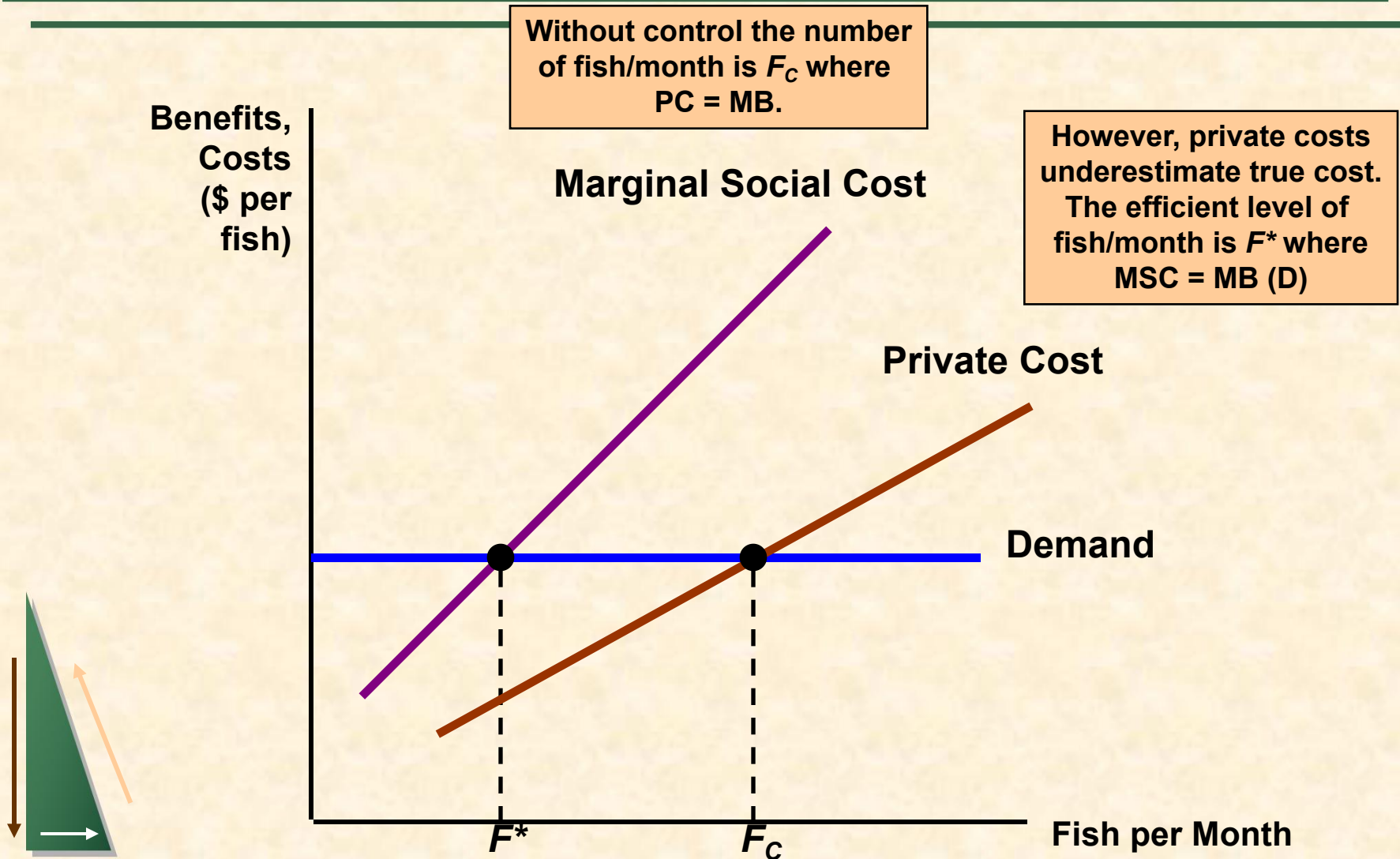
Common Property Resources

■ Common Property Resource

- Everyone has free access.
- Likely to be overutilized
- Examples
 - ◆ Air and water
 - ◆ Fish and animal populations
 - ◆ Minerals



Common Property Resources



Common Property Resources

■ Solution

- Private ownership

■ Question

- When would private ownership be impractical?



Crawfish Fishing in Louisiana

- Finding the Efficient Crawfish Catch
 - F = crawfish catch in millions of pounds/yr
 - C = cost in dollars/pound



Crawfish Fishing in Louisiana

■ Demand

- $C = 0.401 = 0.0064F$

■ *MSC*

- $C = -5.645 + 0.6509F$

■ *PC*

- $C = -0.357 + 0.0573F$



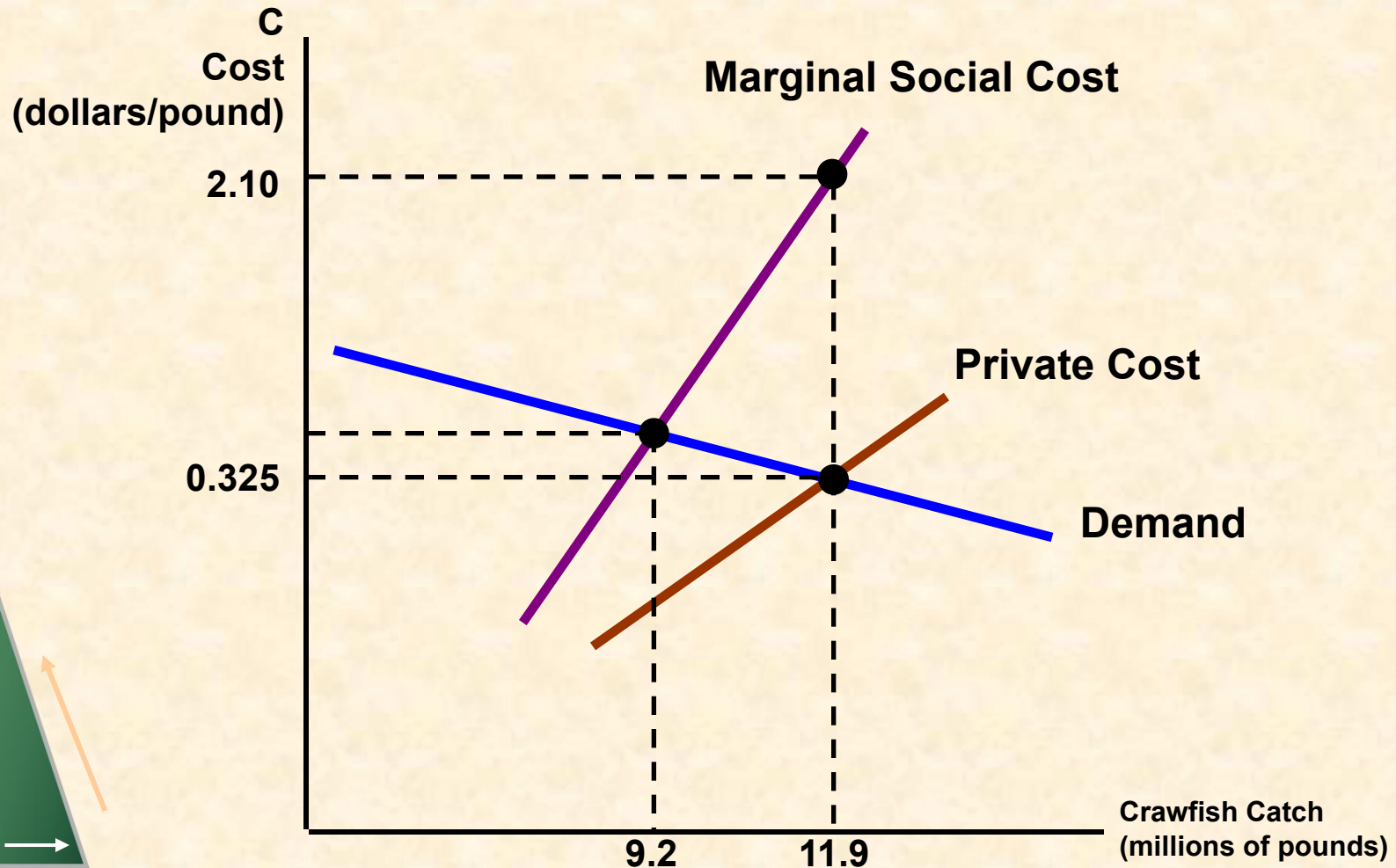
Crawfish Fishing in Louisiana

- Efficient Catch
 - 9.2 million pounds
 - $D = MSC$



Crawfish as a Common Property Resource

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Public Goods

■ Question

- When should government replace firms as the producer of goods and services?



Public Goods

■ Public Good Characteristics

- Nonrival

- ◆ For any given level of production the marginal cost of providing it to an additional consumer is zero.

- Nonexclusive

- ◆ People cannot be excluded from consuming the good.

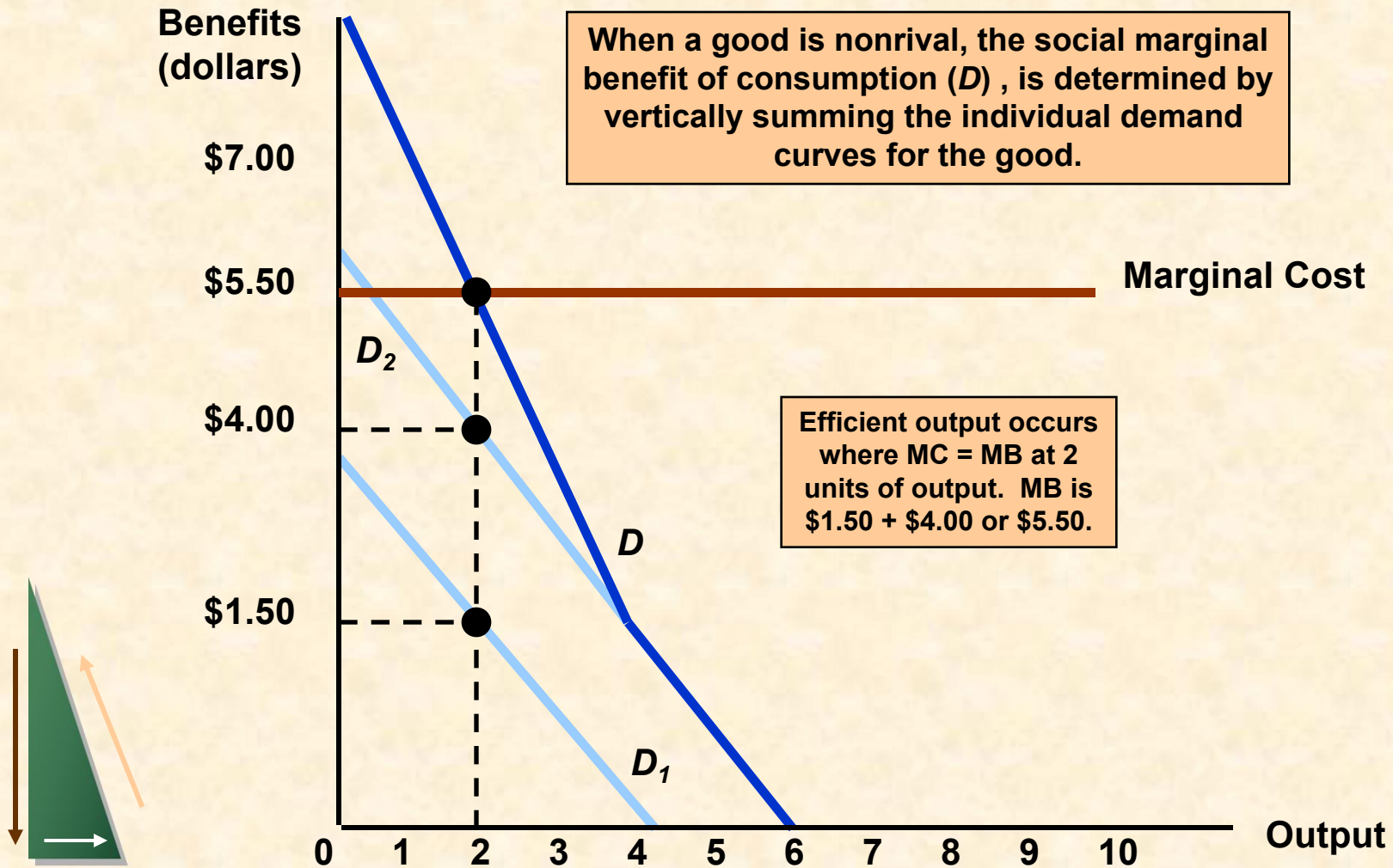


Public Goods

- Not all government produced goods are public goods
 - Some are rival and nonexclusive
 - ◆ Education
 - ◆ Parks



Efficient Public Good Provision



Public Goods

- Public Goods and Market Failure
 - How much national defense did you consume last week?



Public Goods

■ Free Riders

- There is no way to provide some goods and services without benefiting everyone.
- Households do not have the incentive to pay what the item is worth to them.
- **Free riders** understate the value of a good or service so that they can enjoy its benefit without paying for it.



Public Goods

- Establishing a mosquito abatement company
 - How do you measure output?
 - Who do you charge?
 - A mosquito meter?



The Demand for Clean Air

- Clean Air is a public good
 - Nonexclusive and nonrival
- What is the price of clean air?

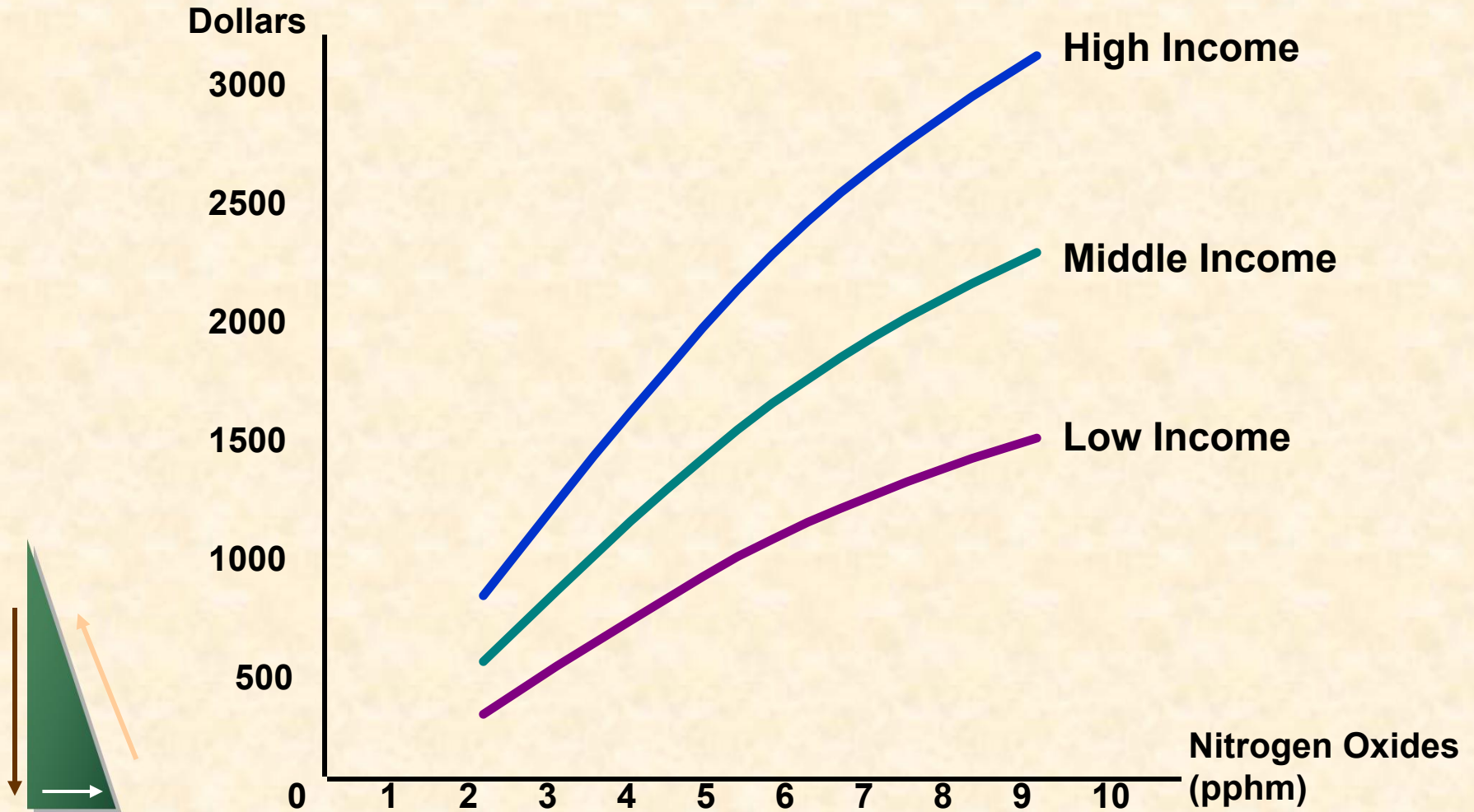


The Demand for Clean Air

- Choosing where to live
 - Study in Boston correlates housing prices with the quality of air and other characteristics of the houses and their neighborhoods.



The Demand for Clean Air



The Demand for Clean Air

■ Findings

- Amount people are willing to pay for clean air increases substantially as pollution increases.
- Higher income earners are willing to pay more (the gap between the demand curves widen)
- National Academy of Sciences found that a 10% reduction in auto emissions yielded a benefit of \$2 billion---somewhat greater than the cost.



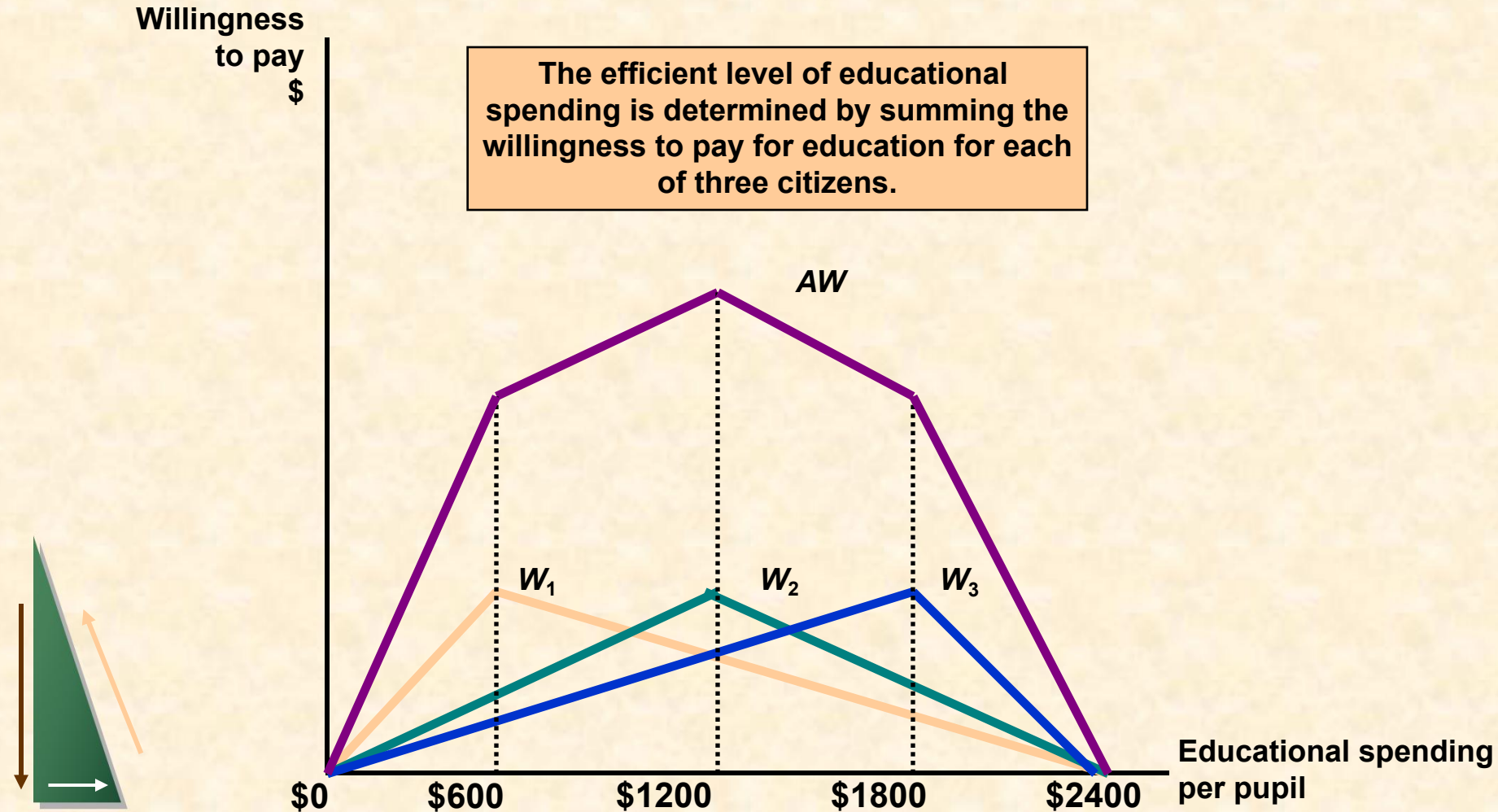
Private Preferences for Public Goods

- Government production of a public good is advantageous because the government can assess taxes or fees to pay for it.
- Determining how much of a public good to provide when free riders exist is difficult.



Determining the Level of Educational Spending

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Willingness to pay \$

Will majority rule yield an efficient outcome?
• W_1 will vote for \$600
• W_2 and W_3 will vote for \$1200
The median vote will always win in a majority rule election.



Private Preferences for Public Goods

■ Question

- Will the median voter selection always be efficient?

■ Answer

- If two of the three preferred \$1200 there would be overinvestment.
- If two of the three preferred \$600 there would be underinvestment.



Private Preferences for Public Goods

- Majority rule is inefficient because it weighs each citizen's preference equally--the efficient outcome weighs each citizen's vote by his or her strength of preference.



Summary

- There is an externality when a producer or a consumer affects the production or consumption activities of others in a manner that is not directly reflected in the market.
- Pollution can be corrected by emission standards, emissions fees, marketable emissions permits, or by encouraging recycling.



Summary

- Inefficiencies due to market failure may be eliminated through private bargaining among the affected parties.
- Common property resources are not controlled by a single person and can be used without a price being paid.



Summary

- Goods that private markets are not likely to produce efficiently are either nonrival or nonexclusive. Public goods are both.
- A public good is provided efficiently when the vertical sum of the individual demands for the public good is equal to the marginal cost of producing it.



Summary

- Under majority rule voting, the level of spending provided will be that preferred by the median voter---this need not be the efficient outcome.





End of Chapter 18

Externalities and Public Goods