ECO2011 Basic Microeconomics

Mankiw Chapter 10 (Externality)

2023

Motivation

- One night before Zhang San's ECO2011 midterm exam, his roommate talks loudly on his phone for 2 hours in the dorm……

Externalities

- 'Externality: one type of market failure
  - The uncompensated impact of one person's actions on the well-being of a bystander
  - Negative externality
    - Impact on the bystander is adverse
  - Positive externality
    - Impact on the bystander is beneficial

Externalities

- Self-interested buyers and sellers neglect the external effects of their actions, so the market outcome is not efficient.

- Another principle from Chapter 1: Governments can sometimes improve market outcomes.

Pollution: A Negative Externality

- Example of negative externality: Air pollution from a factory.
  - The firm does not bear the full cost of its production, and so will produce more than the socially efficient quantity.
- How govt may improve the market outcome:
  - Impose a tax on the firm equal to the external cost of the pollution it generates

Internet photo

More Examples of Negative Externalities

- Air pollution from a factory

- The neighbor's barking dog

Internet photo

- Late-night stereo blasting from the dorm room next to yours

- Noise pollution from construction projects

- Health risk to others from second-hand smoke

- Talking on cell phone while driving makes the roads less

  safe for others

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Positive Externalities from Education

- A more educated population benefits society:
  - lower crime rates: educated people have more opportunities, so less likely to rob and steal
  - better government: educated people make better-informed voters
- People do not consider these external benefits when deciding how much education to "purchase"
- Result: market eq'm quantity of education too low
- How govt may improve the market outcome:
  - subsidize cost of education

More Examples of Positive Externalities

- Being vaccinated against contagious diseases protects not only you, but people who visit the salad bar or produce section after you

- Research and development creates knowledge others can use

Internet photo

- People going to college raise the population's education level, which reduces crime and improves government
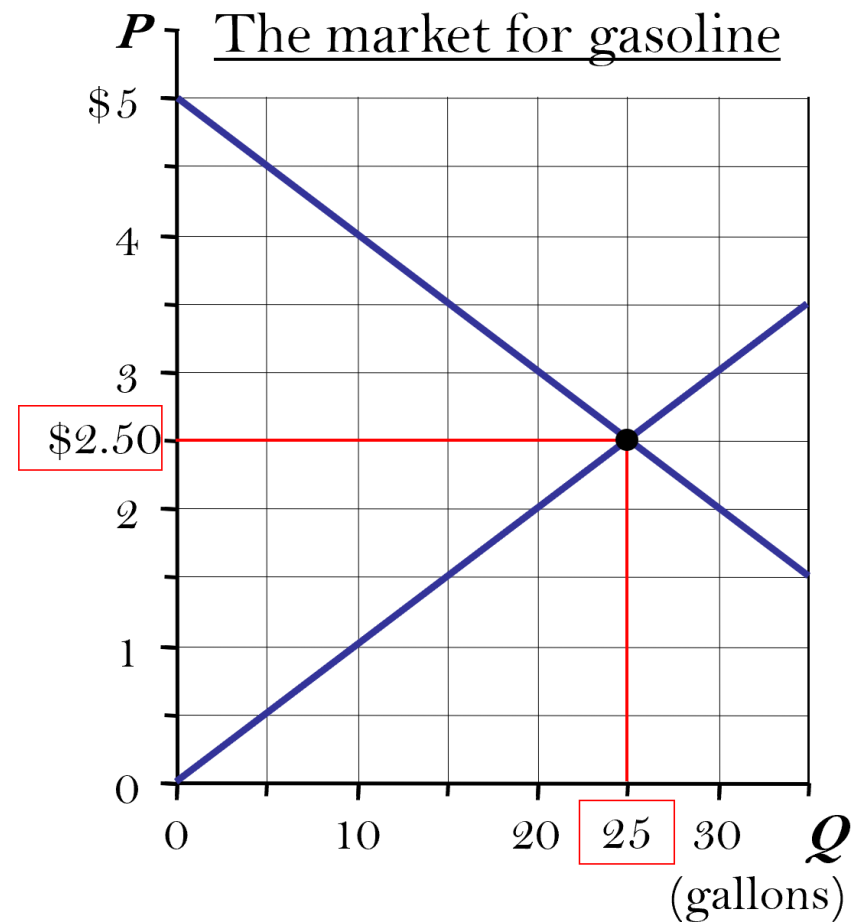
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Recap of Welfare Economics

- The market equilibrium maximizes consumer + producer surplus.

- Supply curve shows **private cost**, the costs directly incurred by sellers.

- Demand curve shows **private value**, the value to buyers (the prices they are willing to pay).


The market for gasoline

Analysis of a Negative Externality

- **External cost**
- = value of the negative impact on bystanders
- = $1 per gallon (value of harm from smog, greenhouse gases)

The market for gasoline

Social cost = private + external cost

Supply (private cost)
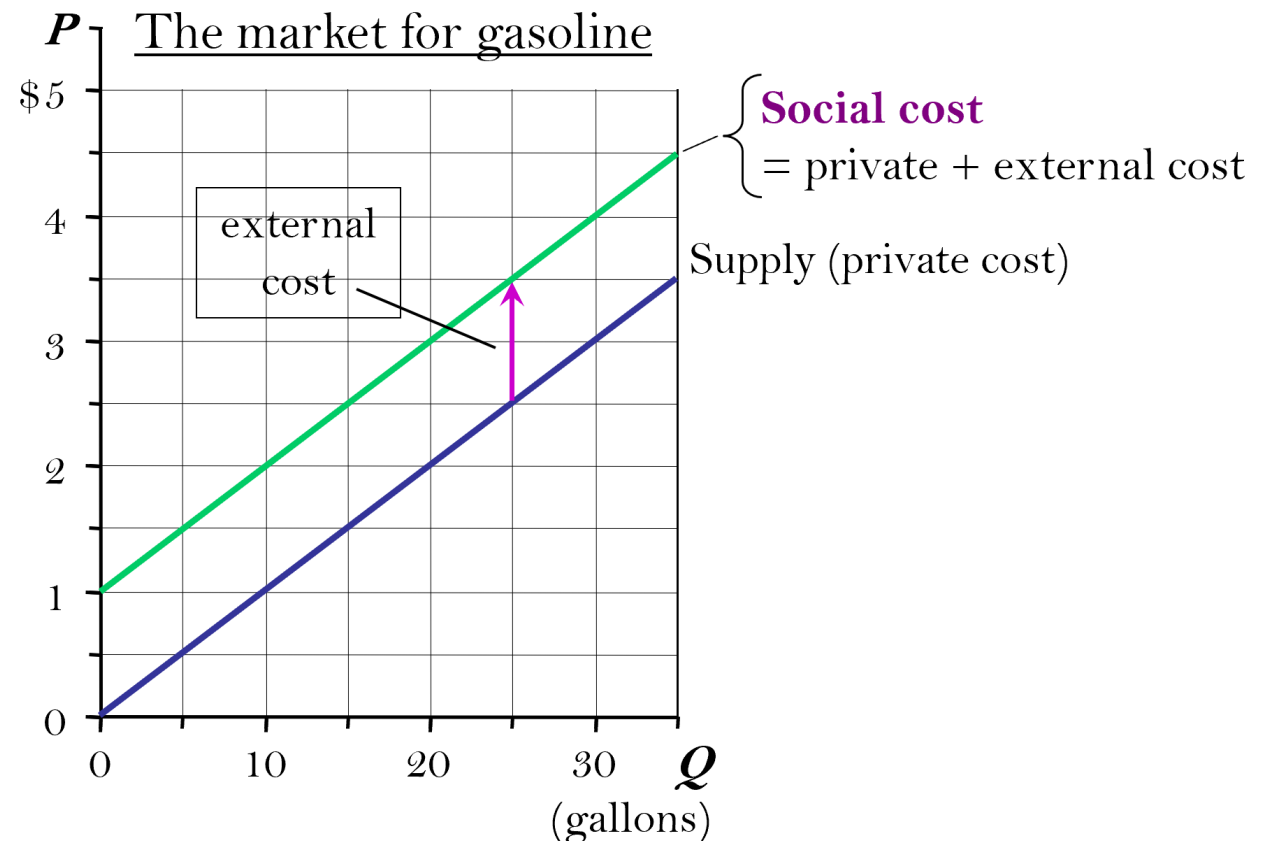
external cost

Analysis of a Negative Externality

- The socially optimal quantity is 20 gallons.

- At any $Q < 20$, value of additional gas exceeds social cost.

- At any $Q > 20$, social cost of the last gallon is greater than its value to society.

- What is the deadweight loss in this case?

The market for gasoline
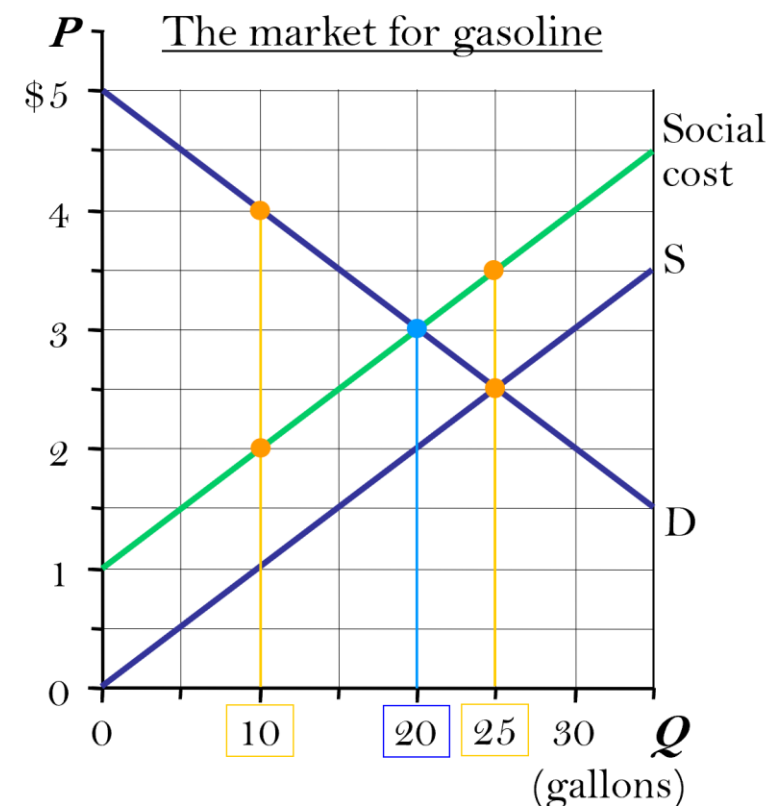
Analysis of a Negative Externality

- Market equilibrium ($Q = 25$) is greater than social optimum ($Q = 20$).

- One solution: tax sellers $1/gallon, would shift S curve up $1.

The market for gasoline
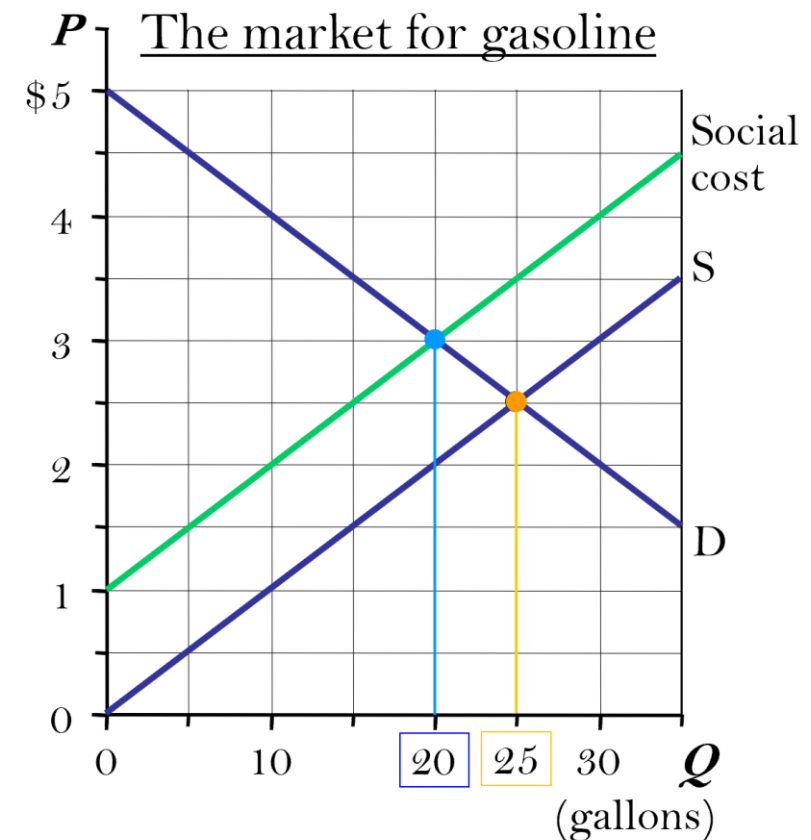
"Internalizing the Externality"

- Internalizing the externality: Altering incentives so that people take into account the external effects of their actions

- In the previous example, the $1/gallon tax on sellers makes sellers' costs equal to social costs.

- When market participants must pay social costs, the market eq'm matches the social optimum. (Imposing the tax on buyers would achieve the same outcome; market Q would equal optimal Q.)
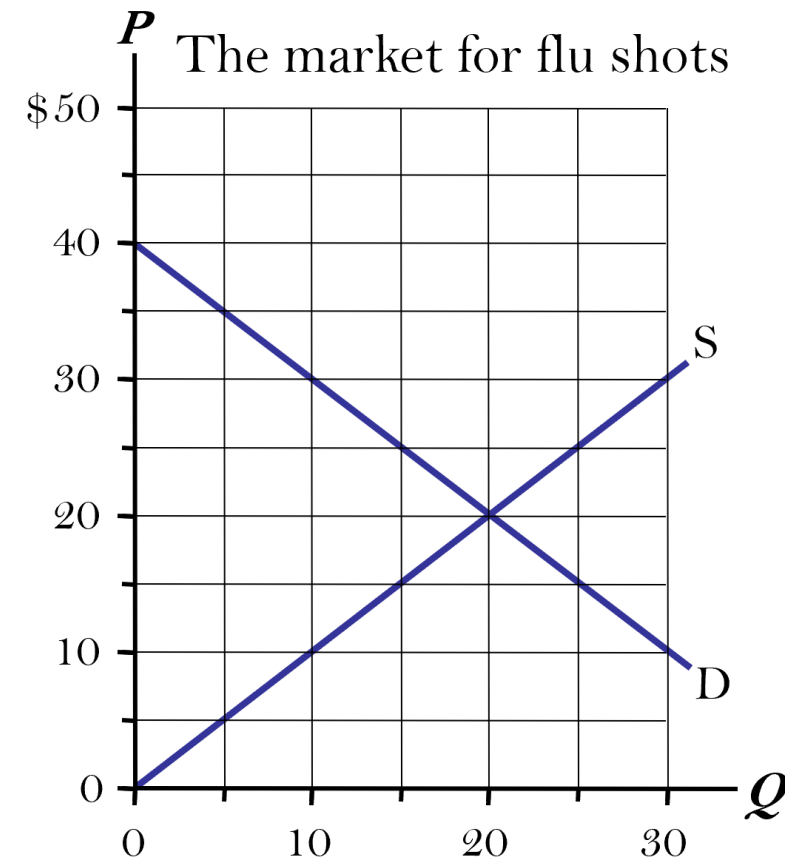
Positive Externalities

- With a positive externality
  - The social value of a good includes
    - Private value – the direct value to buyers
    - External benefit – the value of the positive impact on bystanders
- The socially optimal Q maximizes welfare:
  - At any lower Q, the social value of additional units exceeds their cost.
  - At any higher Q, the cost of the last unit exceeds its social value.

- External benefit = $10/shot
  - Draw the social value curve.
  - Find the socially optimal Q.
  - What policy would internalize this externality?
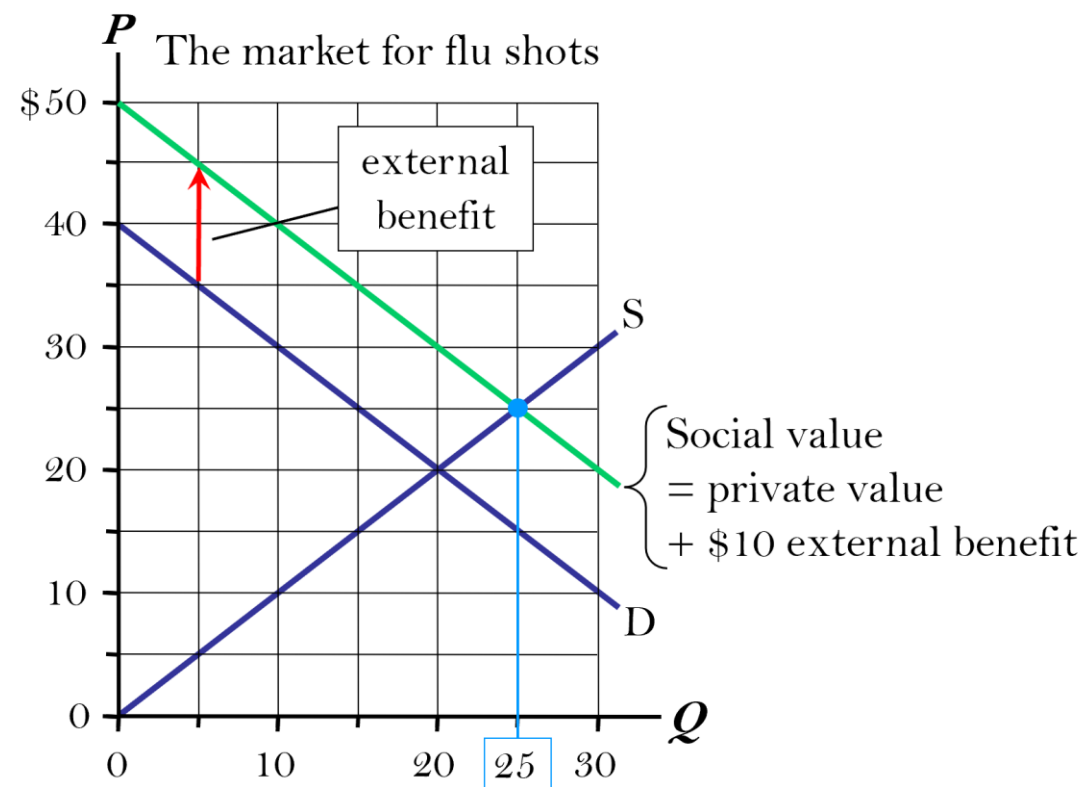

The market for flu shots

Socially optimal $Q = 25$ shots.

To internalize the externality, use subsidy = $10/shot.

The market for flu shots

external benefit

Social value = private value + $10 external benefit

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Effects of Externalities: Summary

- **If negative externality**
  - Market quantity larger than socially desirable

- **If positive externality**
  - Market quantity smaller than socially desirable

- **To remedy the problem, "internalize the externality"**
  - Tax goods with negative externalities
  - Subsidize goods with positive externalities

Private Solutions to Externalities

- The Coase theorem
  - If private parties can bargain without cost over the allocation of resources
    - They can solve the problem of externalities on their own

- Whatever the initial distribution of rights
  - Interested parties can reach a bargain:
    - Everyone is better off
    - Outcome is efficient

Coase Theorem: An Example

1. Dick has the legal right to keep a barking dog (Spot).

  - Dick gets a $500 benefit from the dog

  - Jane bears an $800 cost from the barking

  - Efficient outcome:

    - Jane can offer Dick $600 to get rid of the dog

    - Dick will gladly accept

    - Bye-bye Spot!

    - Both are better off

Private Solutions to Externalities

2. Dick has the legal right to keep a barking dog (Spot).

- Dick gets a $1,000 benefit from the dog
- Jane bears an $800 cost from the barking
- Efficient outcome:
    - Dick turns down any offer below $1,000
    - Jane will not offer any amount above $800
    - Dick keeps the dog

Private Solutions to Externalities

3. Jane can legally compel Dick to get rid of the dog (Spot)

- Dick gets a $800 benefit from the dog
- Jane bears an $500 cost from the barking
- Efficient outcome
  - Dick keeps Spot
  - Private outcome: Dick pays Jane $600 to put up with Spot's barking

The private market achieves the efficient outcome regardless of the initial distribution of rights

Collectively, the 1000 residents of Green Valley value swimming in Blue Lake at $100,000.

A nearby factory pollutes the lake water, and would have to pay $50,000 for non-polluting equipment.

A. Describe a Coase-like private solution.

B. Can you think of any reasons why this solution might not work in the real world?

Why Private Solutions Do Not Always Work?

- Transaction costs: the costs that parties incur in the process of agreeing to and following through on a bargain

- Sometimes when a beneficial agreement is possible, each party may hold out for a better deal.

- Coordination problems & costs when the number of parties is very large.

Public Policies Toward Externalities

- Command-and-control policies
  - Regulate behavior directly. Examples:
    - Limits on quantity of pollution emitted
    - Requirements that firms adopt a particular technology to reduce emissions

- Market-based policies
  - Incentives so that private decision makers will choose to solve the problem on their own
    - Corrective taxes and subsidies

Market-Based Policy: Corrective Taxes & Subsidies

- Corrective tax: a tax designed to induce private decision-makers to take account of the social costs that arise from a negative externality

- Also called Pigouvian taxes after Arthur Pigou (1877-1959).

- The ideal corrective tax = external cost

- For activities with positive externalities, ideal corrective subsidy = external benefit

Market-Based Policy: Corrective Taxes & Subsidies

- Example: Acme, US Electric run coal-burning power plants. Each emits 40 tons of sulfur dioxide per month. SO_2 causes acid rain & other health issues.

- Policy goal: reducing SO_2 emissions 25%

- Policy options
  - regulation: require each plant to cut emissions by 25%
  - corrective tax: make each plant pay a tax on each ton of SO_2 emissions. Set tax at level that achieves goal.

Market-Based Policy: Corrective Taxes & Subsidies

- Suppose cost of reducing emissions is lower for Acme than for US Electric.

- Socially efficient outcome: Acme reduces emissions more than US Electric.

- The corrective tax is a price on the right to pollute.

- Like other prices, the tax allocates this "good" to the firms who value it most highly (US Electric).

Market-Based Policy: Corrective Taxes & Subsidies

- Under regulation, firms have no incentive to reduce emissions beyond the 25% target.

- A tax on emissions gives firms incentive to continue reducing emissions as long as the cost of doing so is less than the tax.

- If a cleaner technology becomes available, the tax gives firms an incentive to adopt it.

Market-Based Policy: Corrective Taxes & Subsidies

- Other taxes distort incentives and move economy away from the social optimum.

- But corrective taxes enhance efficiency by aligning private with social incentives.

Example of a Corrective Tax: The Gas Tax

The gas tax targets three negative externalities:

- <u>Congestion</u>
The more you drive, the more you contribute to congestion.

- <u>Accidents</u>
Larger vehicles cause more damage in an accident.

- <u>Pollution</u>
Burning fossil fuels produces greenhouse gases.

Case Study: Carbon Taxes

- "The Brookings Institution recently described a U.S. carbon tax of $20 per ton, increasing at 4 percent per year, which would raise an estimated $150 billion per year in federal revenues over the next decade. Given the negative externalities created by carbon dioxide emissions, a federal carbon tax at this rate would involve fewer harmful net distortions to the U.S. economy than a tax increase that generated the same revenue by raising marginal tax rates on labor income across the board."

What do economists say?

0% disagree — 2% uncertain

98% agree
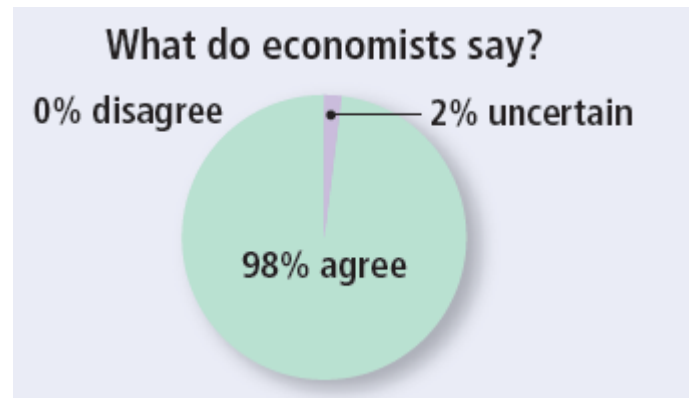
Case Study: Carbon Taxes

- "A tax on the carbon content of fuels would be a less expensive way to reduce carbon-dioxide emissions than would a collection of policies such as 'corporate average fuel economy' requirements for automobiles."

What do economists say?

2% disagree — 3% uncertain

95% agree
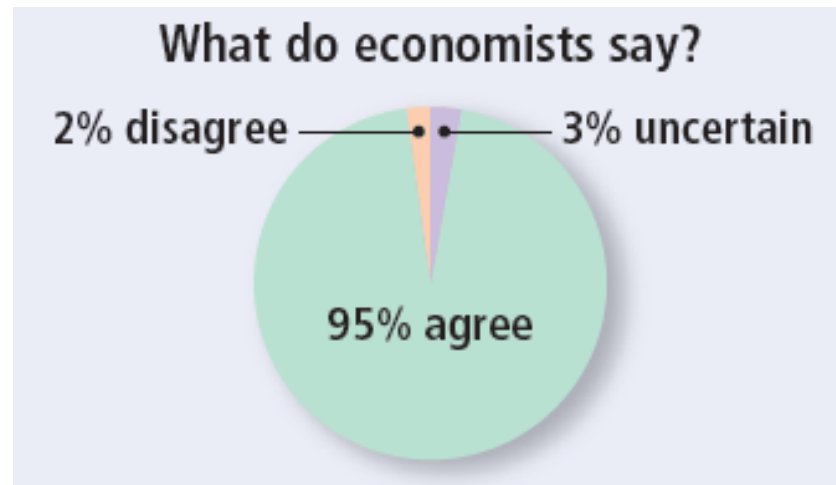
Discussion Question

Policy goal: Reducing gasoline consumption

Two approaches:

A. Enact regulations requiring automakers to produce more fuel-efficient vehicles

B. Significantly raise the gas tax

Discuss the merits of each approach. Which do you think would achieve the goal at lower cost? Who do you think would support or oppose each approach?

Objections to the Economic Analysis of Pollution

- Some politicians, many environmentalists argue that no one should be able to "buy" the right to pollute, cannot put a price on the environment.

- However, people face tradeoffs.

- The value of clean air & water must be compared to their cost.

- The market-based approach reduces the cost of environmental protection, so it should increase the public's demand for a clean environment.

Can You Answer the Following Questions?

- What is an externality?

- Why do externalities make market outcomes inefficient?

- What public policies aim to solve the problem of externalities?

- How can people sometimes solve the problem of externalities on their own? Why do such private solutions not always work?

End