Externalities Examples
Second Midterm Exam
News
Externalities and Property Rights Redux
Examples of How Economics Contributes to
Efficient Remedies for Third Party Effects
Should the U.S. use a carbon tax or a cap-
and-trade system to lower CO₂ emissions?
What Have We Learned?

Midterm Examination
The exam is Tuesday, November 3 in class.
It comprises 30-35 multiple choice questions.
It covers material in lectures 10 and 12-18.
The exam is “closed books and notes” and the
honor code will be strictly enforced.
Please bring a Scantron sheet and your UNC ID.
Late comers will be barred.
You may not leave the room during the exam.
Practice questions and the key for back-of-chapter
problems are posted on the web page.

Exam Advice
Please fill out your Scantron accurately.
There is a one-course-point penalty for
bubbling errors. There were about ten
bubbling errors on the first midterm.
Please start studying now. Most students
find the second midterm more difficult
than the first.

News
The New York Times
September 18, 2009
E.U. Alone and Lonely on Carbon
By JONES KANTER
BRUSSELS—Carbon trading put the European Union in the environmental vanguard.
Since 2005, the trade bloc has operated the world’s only nationwide system that puts a cap on
greenhouse gas emissions and that requires major polluters to hold tradable allowances.
But the system has also been the most “unfriendly policy program in the world,” according to Jorge R.
Thomazin, the president of BusinessEurope, a powerful confederation of industry and employer groups.
Externalities are the costs (and sometimes benefits) that are not experienced directly by producers and consumers of goods. Externalities “spill over” onto third parties. Externalities are generally negative...but sometimes positive.

For most goods, the total social cost of production and consumption are reflected in the price of the good.

For goods with third party effects, the total social cost and benefit of production and consumption are not wholly reflected in the price of the good.

When negative externalities are associated with production or consumption of a good, too much of the good is produced and consumed.

When positive externalities are associated with production or consumption of a good, too little of the good is produced and consumed.
Ronald Coase Explains The Connection between Externalities And Property Rights
If bargaining is not costly and If property rights are secure Then Agents can bargain over externalities and achieve an efficient outcome.

Use Your Clickers To Answer The Following Graded Question.

<table>
<thead>
<tr>
<th>Pollution Decision</th>
<th>Value of the Mill</th>
<th>Value of the Fishery</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Discharge</td>
<td>$5000</td>
<td>$2000</td>
</tr>
<tr>
<td>Low Discharge</td>
<td>$1000</td>
<td>$3000</td>
</tr>
</tbody>
</table>

If the Fishery has the right to block the mill from a high rate of discharge of pollution then...
A. The Fishery will prefer to exercise its right and keep pollution low.
B. The Fishery will achieve the social optimum by keeping pollution low.
C. The Mill will pay the Fishery over $4000 for the right to pollute. Fishery will go out of business because of pollution.
D. The Mill will achieve the social optimum by buying the right to pollute from the Fishery.

Markets and Third Party Effects
Under the Clean Air Act Amendments of 1990, the U.S. Environmental Protection Agency (EPA) established the Acid-rain Abatement Program that authorized the creation of a sulfur dioxide (SO2) allowance trading system. An air pollution allowance trading program introduces market forces into pollution control, harnessing the incentives of the free market to reduce pollution.
Markets and Third Party Effects

The total amount of pollution to be allowed from certain similar sources within the designated area for a specified period is determined based on local clean air standards and the goals of the emission reduction program.

The total is divided into allowance units, which are auctioned off to the sources.

“Allowances” are in units of pollutant emitted, such that a polluter will use up its allowances as it pollutes.

Markets and Third Party Effects

The key to the system is that these allowances may be traded between sources, or may be banked.

At the end of the period, each source must have enough allowances to balance its emissions for that period, otherwise a (large) penalty on each excess unit of pollution is imposed.

Questions

What sort of company would want to sell pollution credits? Why?
What sort of company would want to buy pollution credits? Why?
Is it a good idea to allow companies to trade pollution credits? Why or why not?
An Example Helps Answer These Questions

Suppose three companies in the Ohio Valley each produce 1000 tons of SO₂ per year.

The EPA has decided to reduce emissions by 1200 tons per year—from 3000 to 1800 tons.

The following table gives the marginal cost per ton of reducing emissions.

#### Marginal Cost of Reducing Emissions

<table>
<thead>
<tr>
<th>SO₂ Reduction</th>
<th>Marginal Cost per Ton of SO₂ Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Firm A</td>
</tr>
<tr>
<td>0-200</td>
<td>$100</td>
</tr>
<tr>
<td>200-400</td>
<td>$100</td>
</tr>
<tr>
<td>400-600</td>
<td>$100</td>
</tr>
<tr>
<td>600-800</td>
<td>$150</td>
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How To Read the Table

The total cost to firm B to reduce emissions by 700 tons is:

\[
200 \times $100 + 200 \times $150 + 200 \times $200 + 100 \times $250 = $115,000
\]

Two Important Questions

What might account for the different Marginal Costs?

What is the most efficient way to lower pollution by 1200 tons?
The EPA wants to lower emissions by 1200 tons and do so at the lowest possible cost. How much pollution reduction should each firm undertake?

<table>
<thead>
<tr>
<th>SO₂ Reduction</th>
<th>Firm A</th>
<th>Firm B</th>
<th>Firm C</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. A(600), B(200), C(400)</td>
<td>$100</td>
<td>$100</td>
<td>$50</td>
</tr>
<tr>
<td>B. A(400), B(400), C(400)</td>
<td>$100</td>
<td>$150</td>
<td>$100</td>
</tr>
<tr>
<td>C. A(800), B(200), C(200)</td>
<td>$100</td>
<td>$200</td>
<td>$150</td>
</tr>
<tr>
<td>D. A(600), B(200), C(200)</td>
<td>$150</td>
<td>$250</td>
<td>$300</td>
</tr>
</tbody>
</table>

How Can a Trading System Help Lower Pollution in an Efficient Way?

Suppose the MC schedules are private information.
A trading system can reduce pollution by 1200 at the lowest possible cost.
What will be the market price of a right to discharge a ton of SO₂?

If the Market Price of a Right to Discharge a Ton of SO₂ is $101.00, How Much Pollution Will Each Firm Choose?

Firm A will buy 400 credits.
Firm B will buy 800 credits.
Firm C will buy 600 credits.
Total pollution will be 1800 tons instead of 3000 tons.
Lowering Carbon Emissions: Carbon Tax or Cap-and-Trade?

Carbon Dioxide CO₂ emissions are an important reason for global warming.

CO₂ is released into the atmosphere when fossil fuels are burned.

The Kyoto Protocol is an agreement among nations to reduce emissions of greenhouse gases including CO₂.

Both
A Tax on Carbon and
Cap-and-Trade System Can Reduce Emissions

If a Right to Emit One Ton of SO₂ Costs $101, Firms will Lower Emissions by 1200 Tons

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A Tax of $101 on Emitting A Ton of SO₂ will Cause Firms to Lower Emissions by 1200 Tons

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</table>
What Are The Tradeoffs Between The Two Systems?

Use Your Clickers To Answer The Following Graded Questions.

According to Parry and Pizer an advantage of a carbon tax system is that ________.
A. A tax is better at hitting an emissions reduction target.
B. It is easier to compensate hard hit industries with a tax system.
C. It is politically easier to impose a carbon tax than a cap-and-trade system.
D. A tax fixes the price of emitting CO₂.

According to Kanter, the Trouble with Markets for Carbon in Europe has been ___.
A. The price of a permit to emit carbon has varied a lot.
B. Initially, too many permits were issued and the price of a permit fell by a lot.
C. There is ferocious lobbying by firms and nations seeking exceptions to the permit system.
D. All of the above.
The Case for Carbon Taxes

The Price of CO₂ is fixed and widely known. Emissions of CO₂ vary from year to year as the costs of abatement vary. CO₂ taxes collect revenues that can be used to offset other taxes or can be spent on other programs. The benefits of CO₂ tax revenues can be widely distributed. All industries face the same price of emissions.

The Case for Cap-and-Trade

A cap-and-trade system can more precisely hit an emissions reduction target. It is difficult to know what the right price of CO₂ should be. Revenues from a CO₂ tax may be wasted. It is easier to make exceptions for hard hit industries with a cap-and-trade system.

Use Your Clickers To Answer The Following Non-Graded Question.

Which of the following best represents your position?

A. The U.S. should use a cap-and-trade system to reduce CO₂ emissions.
B. The U.S. should use a CO₂ tax to reduce emissions.
C. The U.S. government should not regulate CO₂ emissions.
What Have We Learned?

Externalities Examples

Externalities threaten the efficient allocation of resources.
A cap-and-trade system is currently in effect to reduce sulfur dioxide emissions. Some favor a cap-and-trade system to regulate carbon dioxide emissions. Others favor a tax on carbon dioxide emissions. There is an exam on October 28.