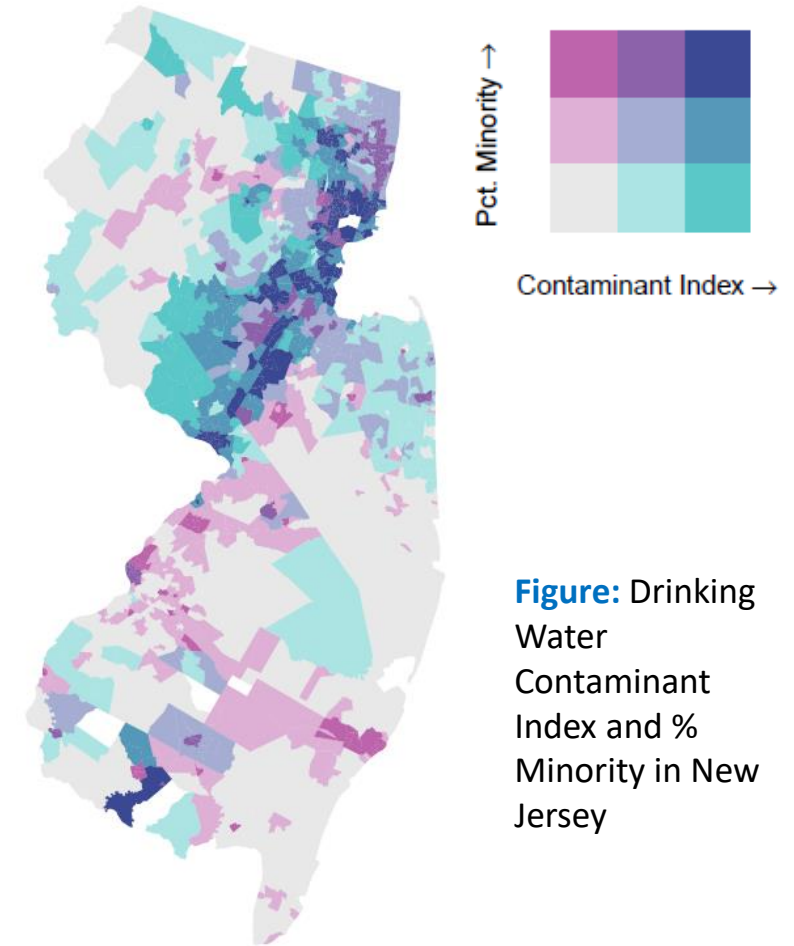
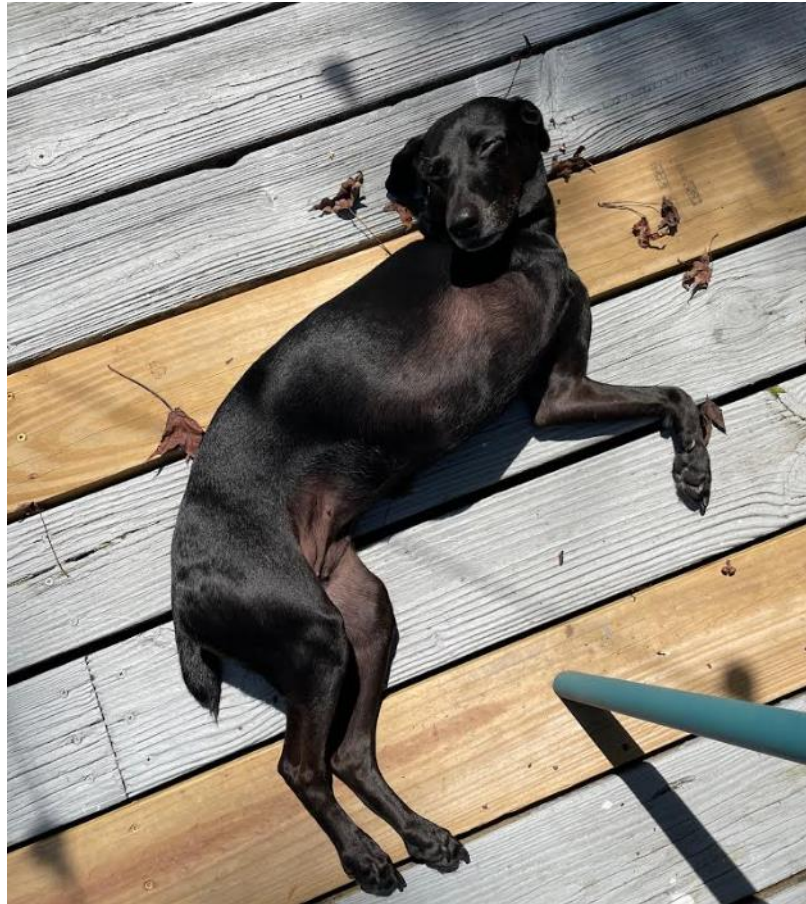


Lecture 12: Economics of Environmental Regulation 1

Prof. Austin
Environmental Economics
Econ 475

About me



Part 1: The Coase Theorem

Refresher on Market Failures

Recall market failures discussed in Lecture 2.

- Information asymmetries, market power, public goods/bads, and externalities are sources of market failures.
- Public goods lead to market failure because there's little incentive to provide or purchase a good that is nonexcludable and nonrival.
- Externalities are when private actions have unintended consequences on individuals not part of the transaction.

Theories of Regulation

Two broad theories of why the government should or does intervene in the economy through regulations:

- The **public interest** theory of regulation suggests that government intervenes in the economy to promote the public interest in the face of imperfect information, market power, or externalities.
- The **interest group** theory of regulation suggests that specific industries or interest groups capture government functions for rent-seeking purposes.

Is There a Role for Intervention?

The Coase Theorem

According to the Coase Theorem, private bargaining will result in an efficient resolution of negative externalities if property rights are assigned and transaction costs are minimal, regardless of who has the property rights.

- Example: A farmer and a rancher build a fence.
- Conclusion: Costly government intervention, which often has unintended consequences, may not be necessary to solve the problems of externalities and public goods/bads.

Aside: The theorem does not speak to issues of equity.



Note: Created using open-source AI software DALL-E.
“A farmer and a rancher agree to build a fence cow corn”

The Question of Transaction Costs

Ronald Coase, The Problem of Social Cost (1960), pg. 16: “The argument has proceeded up to this point on the assumption... that there were no costs involved in carrying out market transactions. This is, of course, a very unrealistic assumption.” Transaction costs include:

- Discovery costs.
- Legal costs.
- Collective bargaining costs.
- Compliance/enforcement costs.
- Time.

Coase: “These operations are often extremely costly, sufficiently costly at any rate to prevent many transactions that would be carried out in a world in which the pricing system worked without cost.”

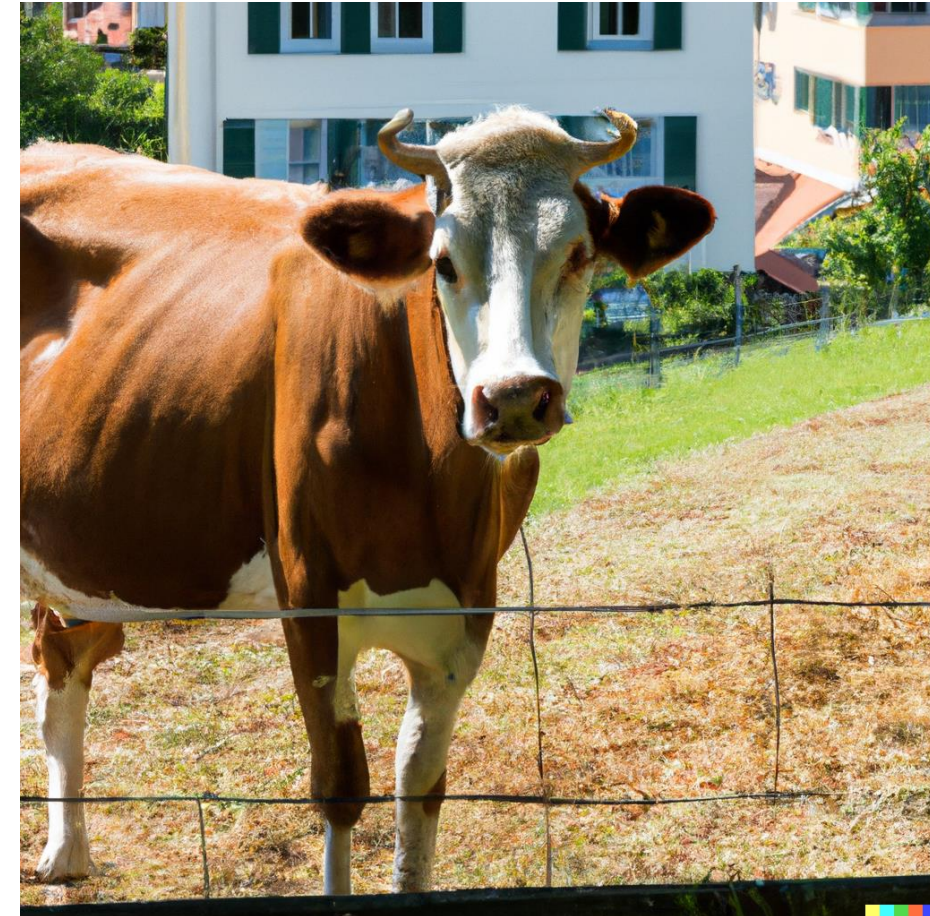
A Real Example

The city of Santa Maria, California was located close to a cattle feedlot that produced noxious odors and other air emissions. As the town expanded closer and closer to the feedlot, residents began to complain more about the smells.

Two actors, multiple decisions:

- 1) The cattle feedlot controls the odors **or** ceases operation.
- 2) The town puts up with the odors **or** pays the polluter some amount to minimize the noxious smell.

Solution: The city council voted for a tax on all residents to pay the feedlot owner to move (Source: [Kolstad, 2011](#)).



Note: Created using open-source AI software DALL-E.

Limitations of the Coase Theorem: Back to Pigou

Pigou's original example of an externality in *The Economics of Welfare* (1920) is a train causing sparks that catch forests and farms on fire. This illustrates some hurdles to Coasian bargaining:

- Difficult to establish causation (i.e., “assignment problems”).
- The collective action problem (free-riding and bargaining within/across groups).
- Imperfect information about payoff or damage functions.
- Non-maximizing behavior.
- Wealth effects and the endowment effect.



Note: Created using open-source AI software DALL-E.

In Defense of Coase

The Coase Theorem is like “economics in a vacuum.” While not directly applicable to most scenarios of interest, it provides some policy implications:

- Because transaction costs are everywhere, the theorem is counter-intuitively a strong argument for government intervention in many cases.
- Paying polluters to reduce emissions *might be* the most efficient outcome.
- More generally, creative implementation of property rights over environmental goods is one method of mitigating environmental problems in a cost-effective way.

Part 2: Regulatory Instruments

Regulatory Instruments

Many regulatory instruments are available. These need not be implemented in isolation:

- Information approaches
 - Toxic Releases Inventory and the Emergency Planning and Community Right-to-Know Act
 - Behavioral Nudges
- Liability approaches
 - CERCLA and the Superfund program
- Prescriptive Regulations (Command-and-Control)
 - Technology and performance-based standards
- Emission Fees or Abatement Subsidies
 - Pigouvian taxes
- Quantity Control and Allowance Trading
 - Cap-and-trade systems

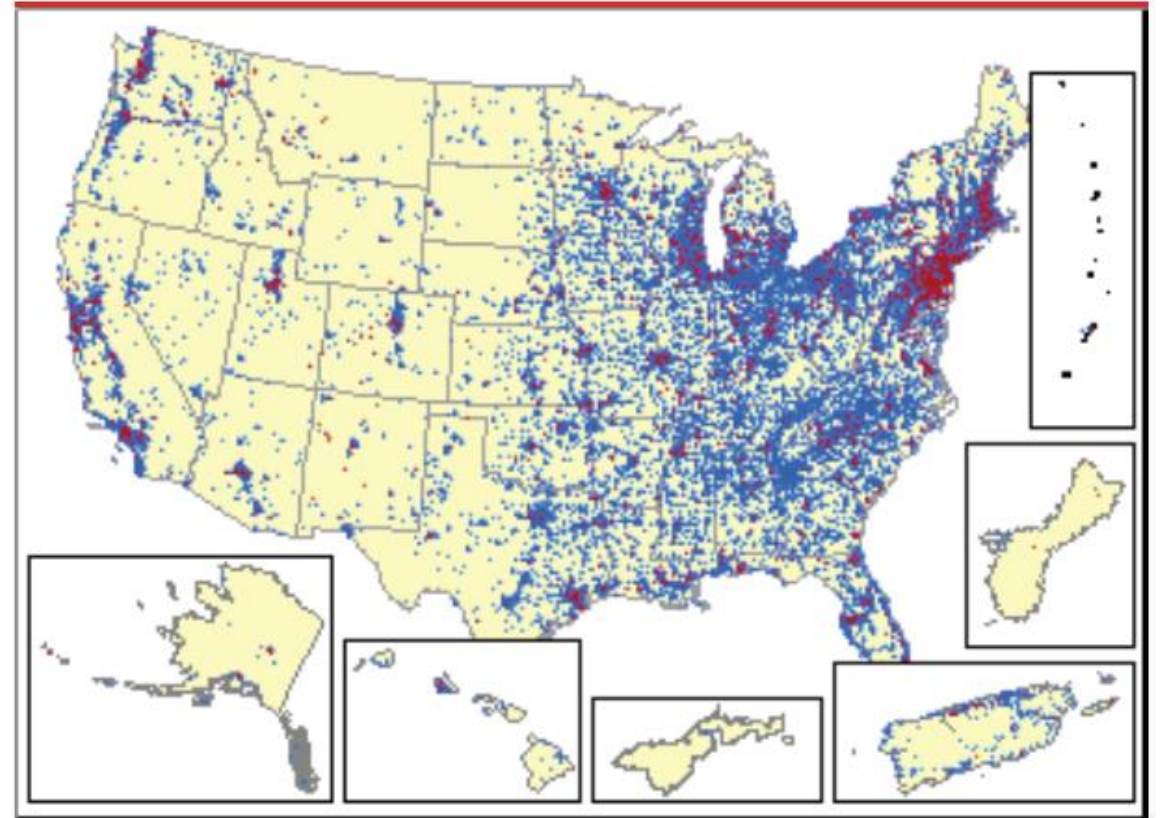
Information Approaches: TRI

Information-based approaches help to solve market failures that may arise from information asymmetries. Examples: eco-labeling, environment/sustainability/governance metrics.

The Emergency Planning and Community Right to Know Act created the **Toxic Releases Inventory (TRI)** program in 1983.

- TRI tracks some facilities that emit pollution into air, land, and water.
- Hundreds of pollutants and their emission quantities by type of release are reported to the program each year.

Toxic Release Inventory and Superfund Sites in the US



Note: TRI sites in blue and Superfund sites in red.

Source: [Persico, 2019](#).

Information Approaches: Behavioral Nudges

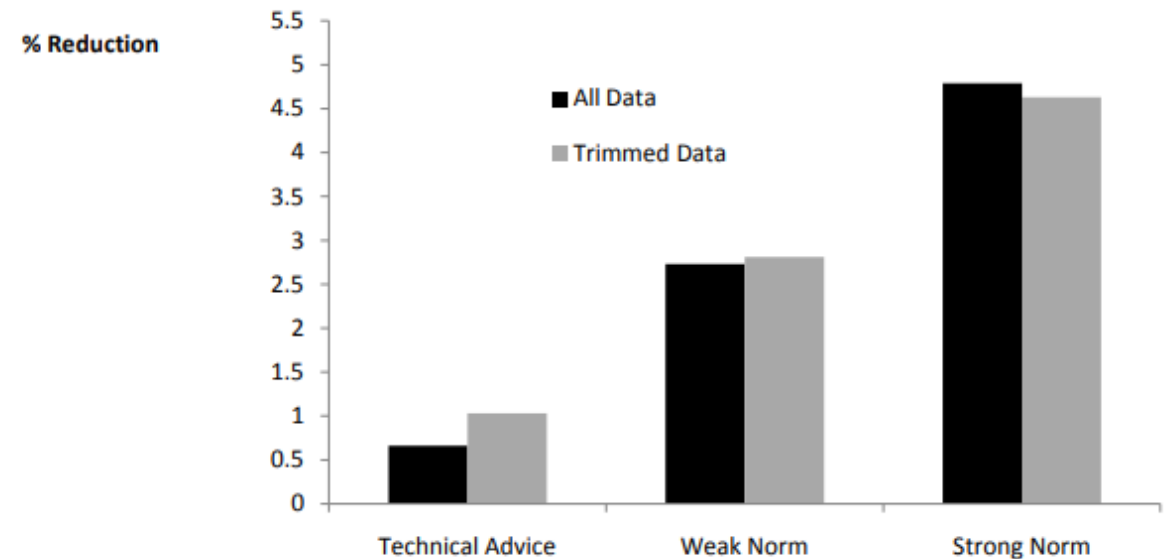
Providing consumers or firms with technical advice for improving their behavior or information about their activities in comparison to their peers can elicit conservation behaviors.

In one study, water ratepayers in Atlanta were randomly given:

- Technical advice,
- An appeal to reduce water consumption,
- A comparison to water consumption among peers.

The social comparison effect (c) is roughly the same as the effect of increasing water prices 12 to 15 percent, or \$5 per month for a median user.

Figure 1: Estimated Treatment Effects – All and Trimmed Data



Source: [Ferraro and Price, 2011](#).

Information Approaches: Behavioral Nudges

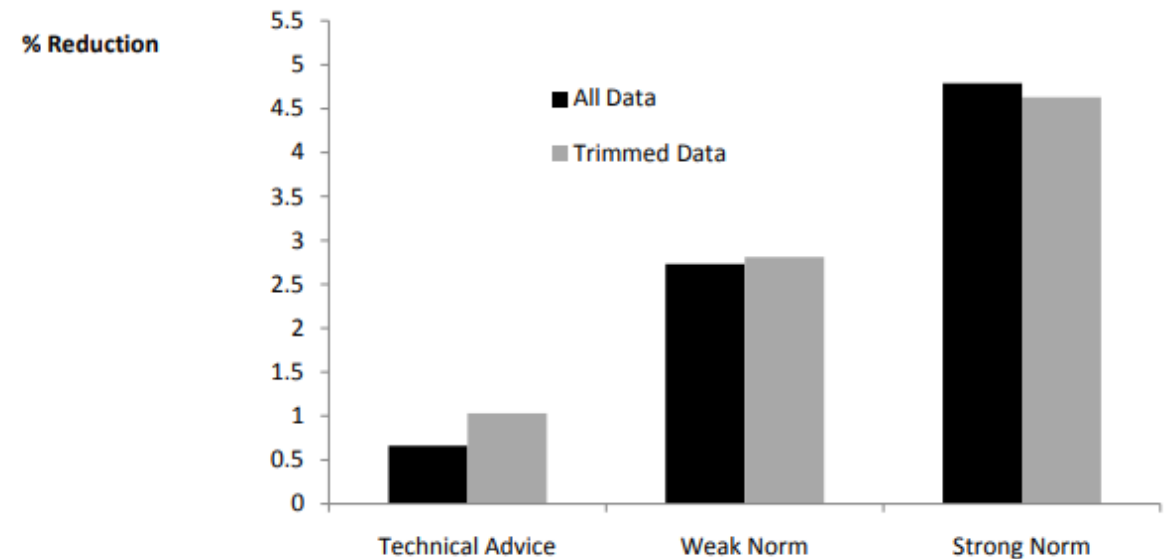
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Liability approaches

Liability rules create incentives for acceptable behavior of firms and facilities by raising the costs of non-compliance or externalizing behavior. These are often used in conjunction with other regulatory instruments.

Liability approaches: Examples

Some common examples:

- Legal institutions that compel payment for clean-up (i.e., the Superfund program).
- Non-compliance fees for violating set environmental standards.
- Deposit refunds (e.g., for recycling).



Note: Created with DALL-E (“superfund site”).

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Prescriptive Regulations

Command-and-control, or prescriptive regulatory instruments, stipulate the outcome or action that a firm or facility must achieve to limit pollution or protect the environment. Firms often have some flexibility in meeting the requirements.

Two general types:

- **Technology-based standards:** a firm must install a specific technology to comply with the regulation.
- **Performance-based standards:** a firm must ensure that pollution emissions meet a designated target emission quantity or rate.

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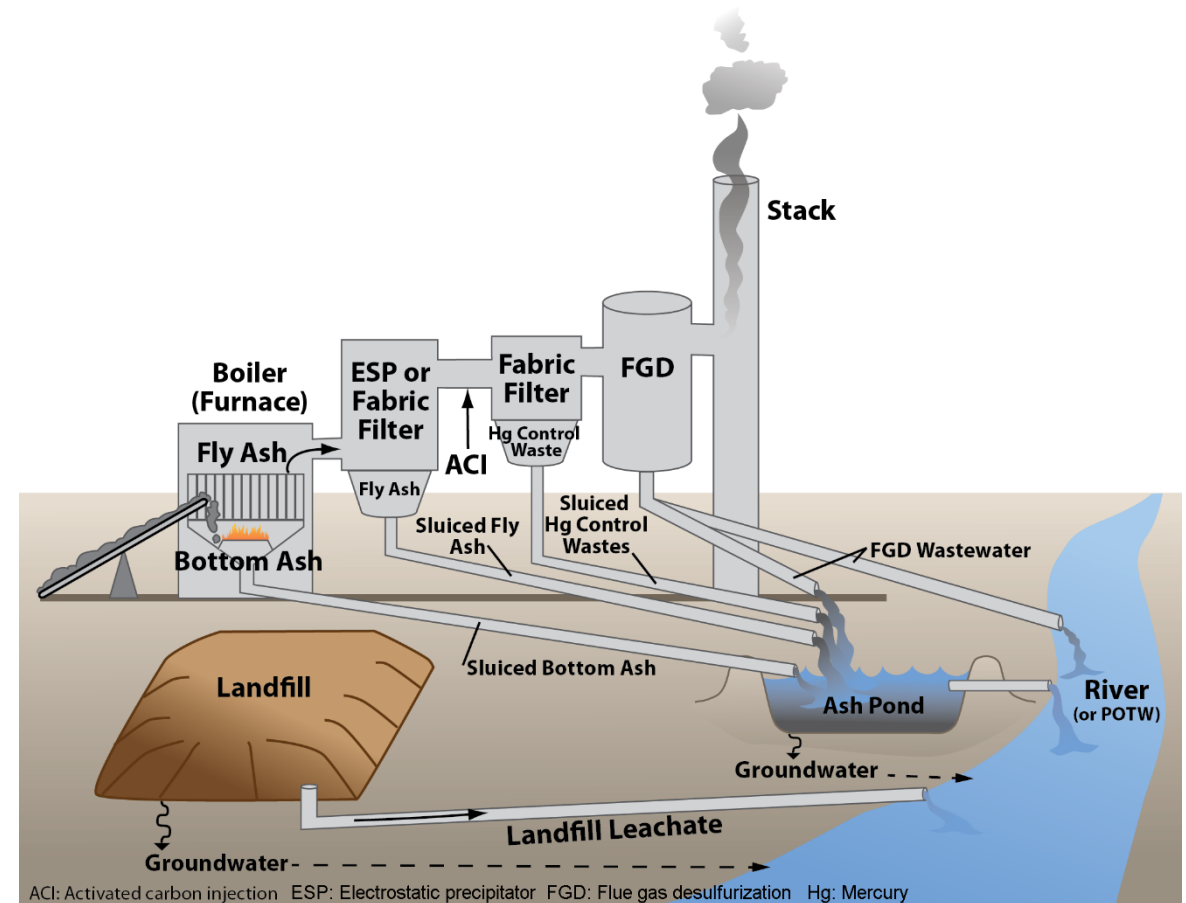
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Prescriptive Regulations: Examples

Real-world examples:

- Clean Water Act's "best available technology economically achievable" for effluent limitation guidelines.
- Occupational Safety and Health Administration (OSHA) permissible exposure limits (PELs) for chemicals exposure in the workplace.



Note: Key coal ash waste-streams.

Source: [EPA Steam Electric Power Generating Effluent Guidelines](#).

Prescriptive Regulations: Examples

Another real-world example:

- The Risk Management Program requires risk management plans (RMPs) for facilities handling or storing risky substances.
- Inspired by the Bhopal Union Carbide Chemical plant disastrous release of methyl isocyanate in 1984.



Source: [Bhopal: The World's Worst Industrial Disaster, 30 Years Later](#), *The Atlantic*, 2014.

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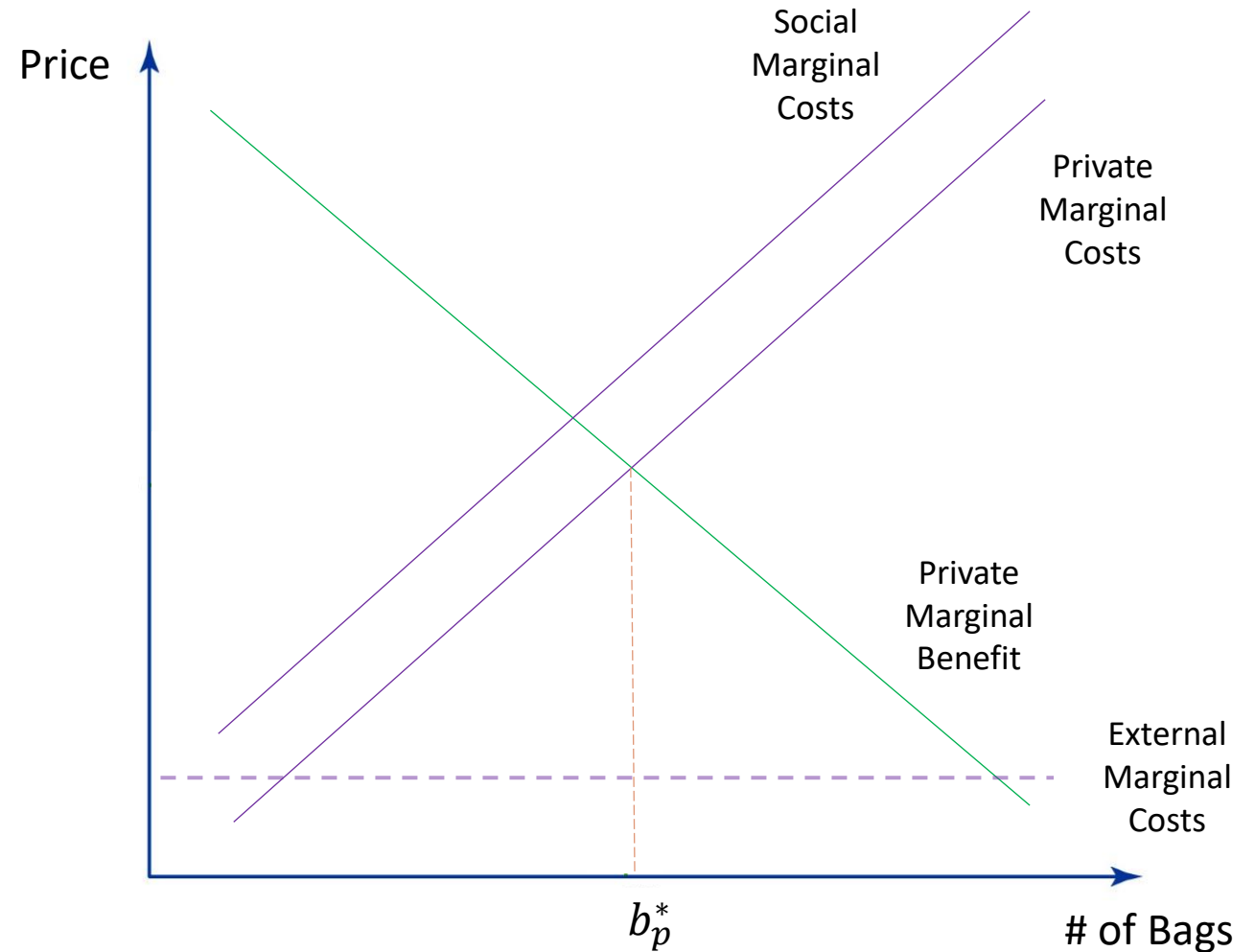


Market-based instruments.

Emissions Taxes

Emissions taxes, a form of Pigouvian tax, charge the polluter for each unit of pollution they emit. Recall the discussion in lecture 2 regarding plastic bags.

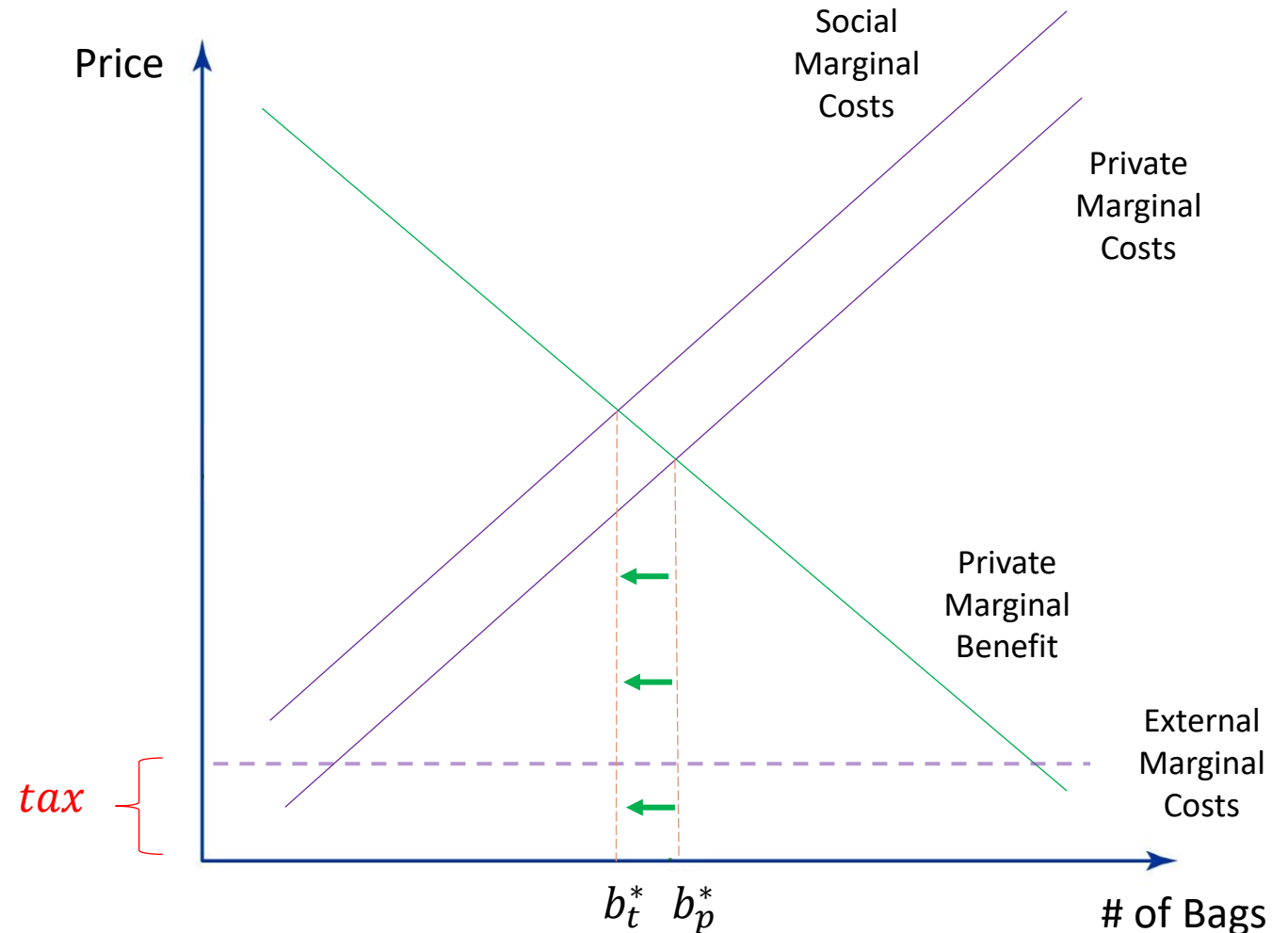
What is the optimal tax?



Emissions Taxes

What is the optimal tax?

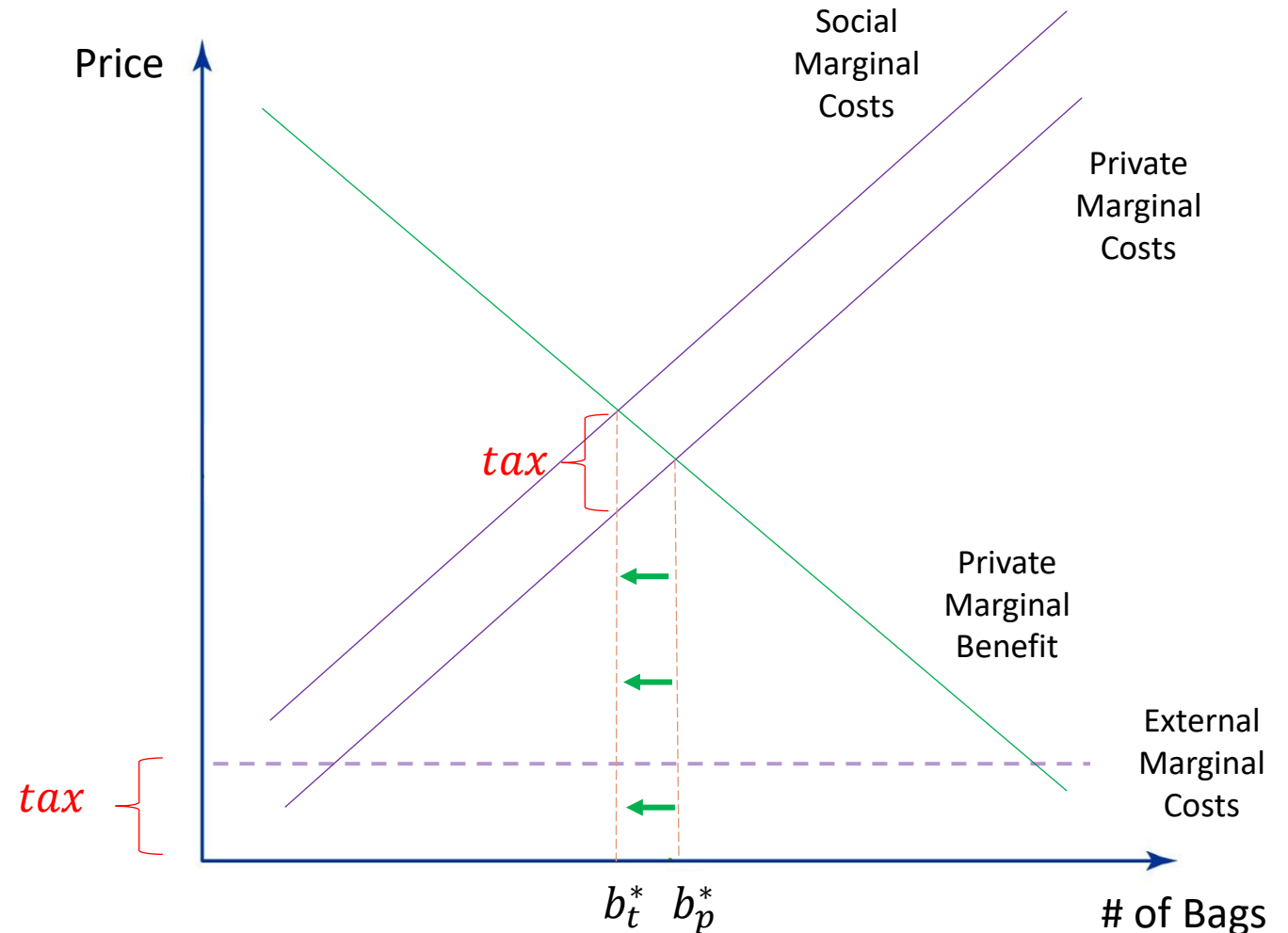
- The optimal tax is equal to external marginal costs (i.e., marginal damages) at the quantity (b_t^*) where the social marginal cost curve intersects the private marginal benefit curve (i.e., the demand curve).



Emissions Taxes

What is the optimal tax?

- The optimal tax is equal to external marginal costs (i.e., marginal damages) at the quantity (b_t^*) where the social marginal cost curve intersects the private marginal benefit curve (i.e., the demand curve).
- Equivalently, the optimal tax is the vertical distance between SMC and PMC at the optimal quantity (i.e., tax = SMC – PMC).



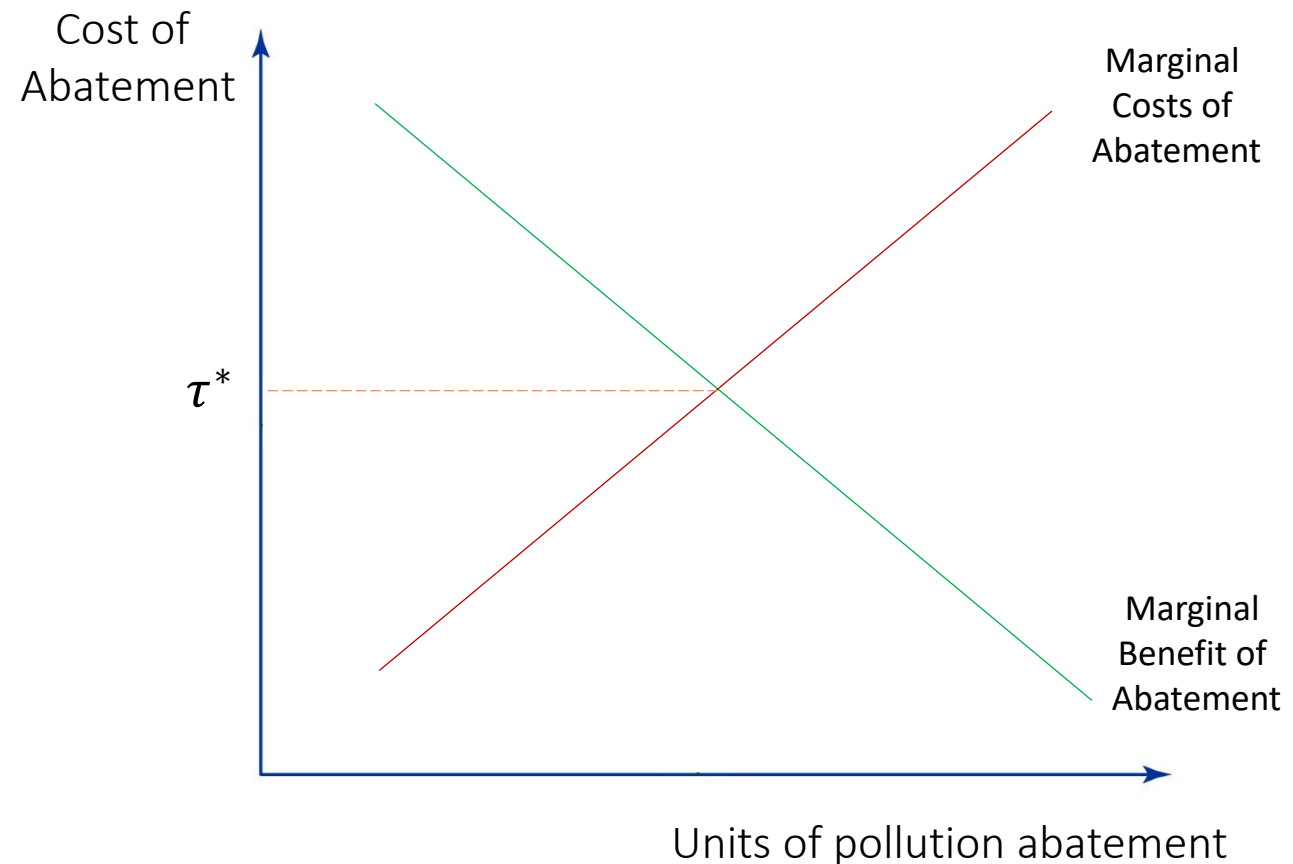
“Market” for Pollution

Let's return to our “market” for pollution.

The new tax mimics a market with incentives for firms to reach the optimal quantity of abatement.

This optimal abatement occurs at the tax τ^* , the cost per unit of pollution imposed by the regulator.

- “Demand” is society’s demand for abatement, which is the marginal benefit of abatement.
- “Supply” is the marginal costs of abatement (in perfect competition).

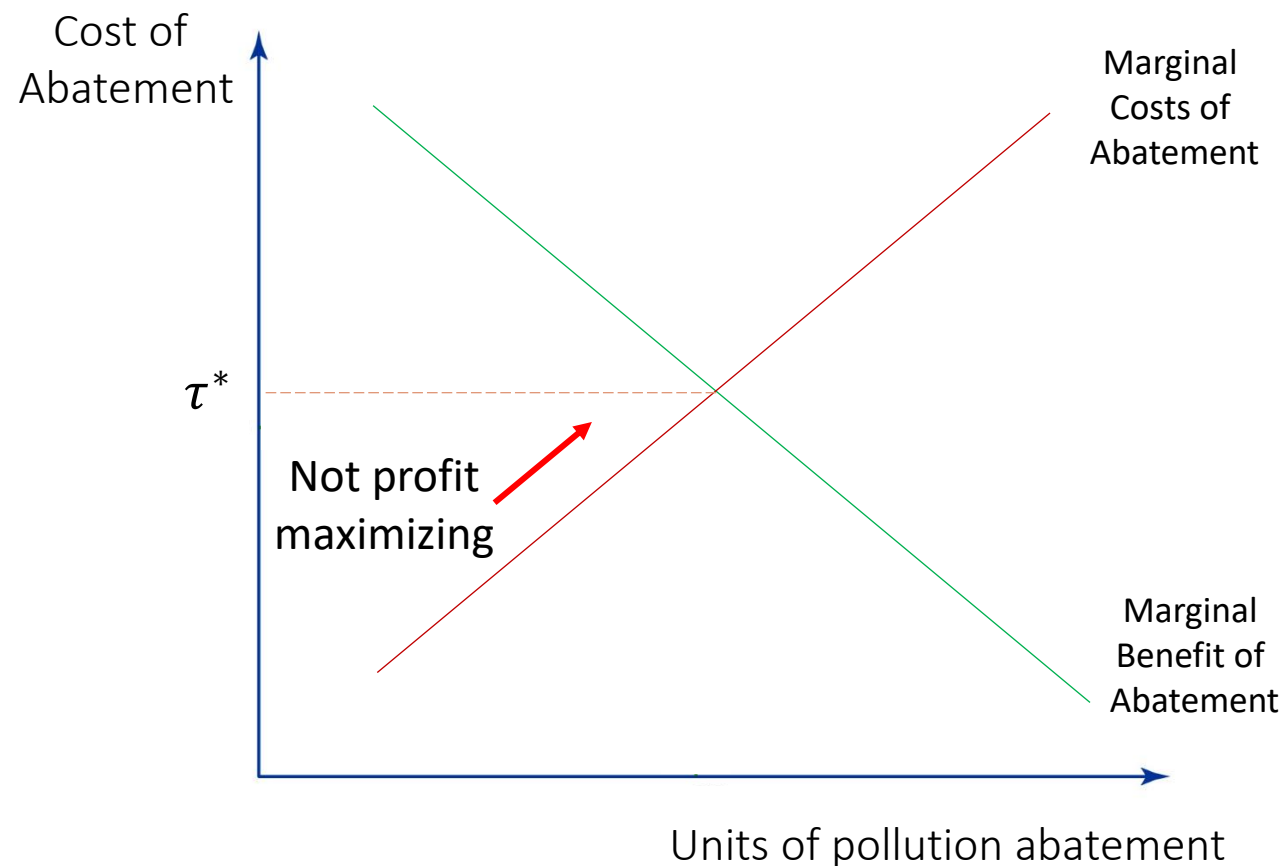


“Market” for Pollution

Why do firms abate up to the quantity associated with τ^* on their supply curve?

- At quantities of abatement below τ^* , it is cheaper for the firm to abate than to pay the tax.

Marginal Benefits and Marginal Costs



Abatement Subsidies

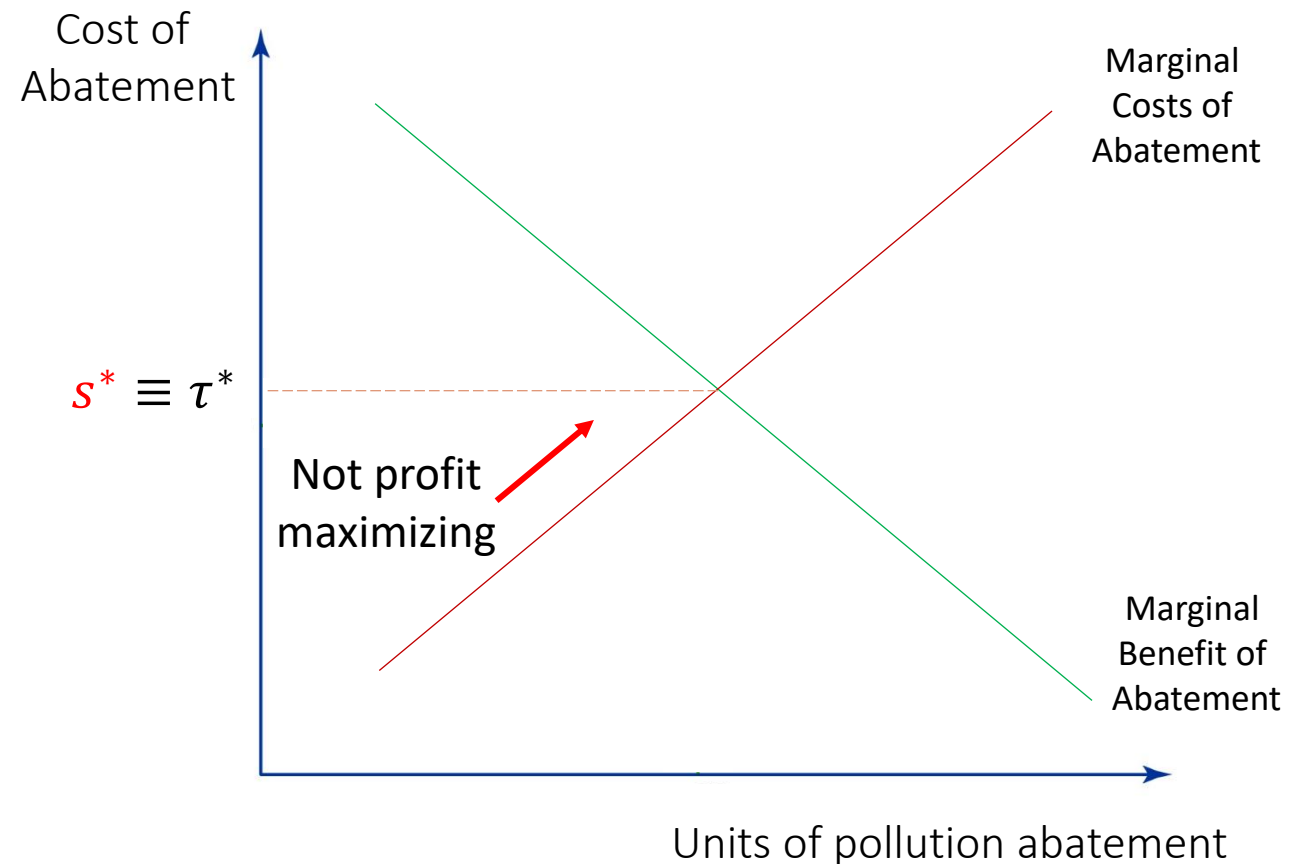
Why do firms abate up to the quantity associated with τ^* on their supply curve?

- At quantities of abatement below τ^* , it is cheaper for the firm to abate than to pay the tax.

Note that the socially optimal quantity can be achieved with the same tax or **subsidy**.

- At quantities of abatement below s^* , the firm makes more for abatement than it costs to abate.

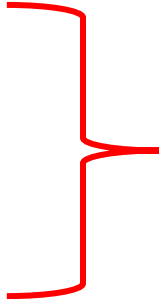
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We'll pick up with quantity controls next time.

Next class

- If you have questions about the first midterm, please e-mail Bryan, Katie, and Yagmur.
- We will be playing a pollution trading game to illustrate cap-and-trade next class. It is a modified version of musical chairs. Please let me know if you have any concerns about your willingness or ability to participate.
- Assigned materials for next Monday:
 - K&O (textbook) Chapter 9
 - Building a Carbon Trading System in New York ([RFF Podcast](#))