Do we need
environmental
policy?
Private solutions
to market failures

Do we need environmental policy?
Private solutions to market failures

September 22, 2025

Intro

Do we need environmental policy?
Private solutions to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example
Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

Outline

- Pigouvian solution (what you learned in principles)
- Coase theorem
- Simple example
- Real world example

Do we need
environmental
policy?
Private solutions
to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example

Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

Recap: When externalities are present, market outcome no longer maximizes social welfare

Do we need environmental policy?
Private solutions to market failures

Intro

Coase
Baker - doctor ex.
Neighbor example
Pigouvian solution
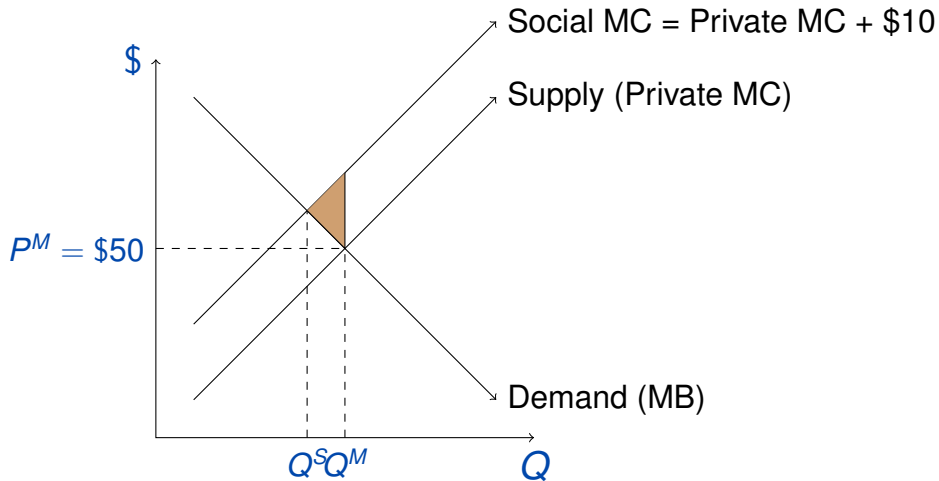Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

Classical approach: Pigou (1920)

- In classic treatise on public goods, Pigou (1920) used economic theory to advocate for government intervention
  - counter to Adam Smith's invisible hand
- Imagine a railroad running through woodland
  - sparks from railroad often start fires, destroying the woodland
- Railroad will continue to run to maximize profits, regardless of this externality
- Pigou called on government to make railroad liable for damages

Do we need
environmental
policy?
Private solutions
to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example
Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

Imagine external costs of oil are \$10/bbl. A tax equal to that amount aligns private and social MC

Do we need
environmental
policy?
Private solutions
to market failures

Coase

Do we need
environmental
policy?
Private solutions
to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example
Pigouvian solution
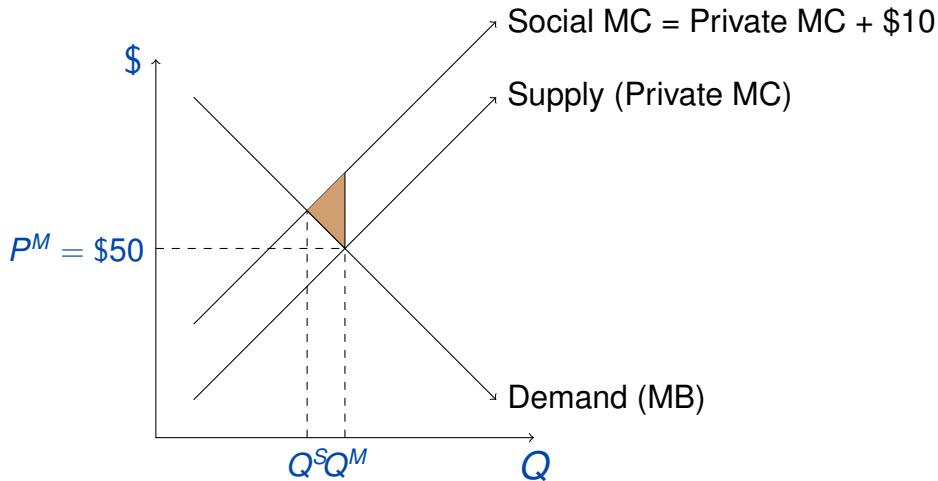Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

Coase's challenge

- In *The Problem of Social Cost*, which helped win him the Nobel Prize, Coase argued that government intervention might not be necessary to achieve the efficient outcome
- If property owners along the tracks wanted the railroad to slow down, they could offer money to offset profit losses from slowing down.
- Coase reasoned that under certain (strong?) conditions, this will result in the same outcome

Do we need
environmental
policy?
Private solutions
to market failures

Case of baker and the doctor

- Coase's example was a baker and a doctor that share a small building.
- The baker's loud machinery is disturbing the doctor's practice.

Do we need
environmental
policy?
Private solutions
to market failures

Case of baker and the doctor

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- Pigouvian view: the baker should pay for the externality imposed on the doctor

Do we need
environmental
policy?
Private solutions
to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example
Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

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- The baker's loud machinery is disturbing the doctor's practice.
- Pigouvian view: the baker should pay for the externality imposed on the doctor
- Coase's insight: isn't the doctor also imposing an externality by limiting the baker's production?
  - example: living off campus

Do we need environmental policy?
Private solutions to market failures

Intro
Coase
Baker - doctor ex.
Neighbor example
Pigouvian solution
Market solution
Distribution of surplus
Summary
Cheshire
Transaction
Airplane example
Summary

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- The baker's loud machinery is disturbing the doctor's practice.
- Pigouvian view: the baker should pay for the externality imposed on the doctor
- Coase's insight: isn't the doctor also imposing an externality by limiting the baker's production?
  - example: living off campus
- From a legal perspective, this is clear
- From an economic perspective, what's important is whose production is more valuable

Do we need
environmental
policy?
Private solutions
to market failures

Case of baker and the doctor (cont)

- Imagine this noise is costing the doctor $2,000 in revenue
- Two solutions:
    - the baker can install quieter machinery for $1,000
    - the doctor could soundproof for $500
- What is the economically efficient solution?

Do we need
environmental
policy?
Private solutions
to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example
Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

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  - Economic efficiency demands soundproofing
- Does this mean that the doctor should pay? (hands)

Do we need
environmental
policy?
Private solutions
to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example
Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

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  - the doctor could soundproof for $500
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  - Economic efficiency demands soundproofing
- Does this mean that the doctor should pay? (hands)
- What if the town assigns noise control rights to doctor?
  - Who will pay and how much?

Do we need
environmental
policy?
Private solutions
to market failures

Neighbor example

Do we need
environmental
policy?
Private solutions
to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example

Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

Simple example: Neighbor problems

Do we need environmental policy?
Private solutions to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example
Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

Payoffs from BBQing

Table: Total Utility ($) from grilling

Days per week	0	1	2	3
BBQers	0	30	50	60
Vegans	45	30	15	0
Total Benefits	45	60	65	60

What is the socially optimal level of grilling?

13 / 40

Do we need
environmental
policy?
Private solutions
to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example

Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

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What is the socially optimal level of grilling?

- Can see total benefits are highest when grilling occurs only 2 times per week

How often will grilling occur if the BBQers only consider their private utility? (poll)

Do we need
environmental
policy?
Private solutions
to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example

Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

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What is the socially optimal level of grilling?

- Can see total benefits are highest when grilling occurs only 2 times per week

How often will grilling occur if the BBQers only consider their private utility? (poll)

- 3 days a week

Do we need
environmental
policy?
Private solutions
to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example

Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

Pigou's insight: social optimum can be achieved by taxing externalities at their marginal cost

First need to convert total utility to marginal utility.

Table: Total Utility ($) from grilling

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Total: BBQers	0	30	50	60
Total: Vegans	45	30	15	0
Marginal: BBQers		30	20	10
Marginal: Vegans		-15	-15	-15

- The marginal external social cost of the BBQers grilling is $15 per day.

Do we need environmental policy?
Private solutions to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example
Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

Imagine a $15 per day tax on grilling is enacted

- How often will they grill?

Table: Marginal Utility ($) from grilling

Days per week	0	1	2	3
BBQers		30	20	10
Vegans		-15	-15	-15

- Will only grill if the marginal utility from that day is at least $15.

Do we need environmental policy?
Private solutions to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example
Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

Is a government tax really necessary?

Table: Marginal Utility ($) from grilling

Days per week	0	1	2	3
BBQers		30	20	10
Vegans		-15	-15	-15

- Imagine grilling occurs 3 days a week.
- How much would the Vegans be willing to pay the BBQers to reduce this to 2 days?
- How much would the BBQers need to be paid to accept this arrangement?

Do we need
environmental
policy?
Private solutions
to market failures

Intro

Coase
Baker - doctor ex.
Neighbor example
Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

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- Imagine grilling occurs 3 days a week.
- How much would the Vegans be willing to pay the BBQers to reduce this to 2 days?
- How much would the BBQers need to be paid to accept this arrangement?
- Private solution will be viable for any payment between \$10 and \$15

Do we need environmental policy?

Private solutions to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example

Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire

Transaction
Airplane example
Summary

What are there utilities from this deal?

Assume they split the difference (payment = \$12.5/ day reduced)

- Total BBQer utility = $50 + 12.5 = 62.5 > 60$
- Total Vegan utility = $15 - 12.5 = 2.5 > 0$
- This is higher than the 3 day benefits for both, and the sum is the social optimum (65)

Do we need environmental policy?
Private solutions to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example
Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

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- What if the vegans offered another payment to reduce to 1 day?

Do we need
environmental
policy?
Private solutions
to market failures

Intro

Coase
Baker - doctor ex.
Neighbor example
Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

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- This is higher than the 3 day benefits for both, and the sum is the social optimum (65)
- What if the vegans offered another payment to reduce to 1 day?
  - Now the BBQers require \$20 to comply, so there is no mutually beneficial payment

Do we need
environmental
policy?
Private solutions
to market failures

Intro

Coase
Baker - doctor ex.
Neighbor example
Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

Now imagine a vegan rights law is passed

Table: Marginal Utility ($) from grilling

Days per week	0	1	2	3
BBQers		30	20	10
Vegans		-15	-15	-15

- If the vegans want, they can call the police to stop the BBQers from grilling.
- Without any side payments, how often does grilling occur now?

Do we need environmental policy?
Private solutions to market failures

Intro

Coase
Baker - doctor ex.
Neighbor example
Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

What if we allow side payments?

Table: Marginal Utility ($) from grilling

Days per week	0	1	2	3
BBQers		30	20	10
Vegans		-15	-15	-15

- How much would the BBQers be willing to pay the vegans per day to grill 1 day a week? 2 days?
- At what point is this payment below the vegan's willingness to accept?

Do we need environmental policy?
Private solutions to market failures

Intro

Coase
Baker - doctor ex.
Neighbor example
Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

What if we allow side payments?

Table: Marginal Utility ($) from grilling

Days per week	0	1	2	3
BBQers		30	20	10
Vegans		-15	-15	-15

- How much would the BBQers be willing to pay the vegans per day to grill 1 day a week? 2 days?
- At what point is this payment below the vegan's willingness to accept?
- The social optimum is again achieved.
- So what's the real impact of this law?

Do we need environmental policy?
Private solutions to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example
Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

Property rights affect allocation, not efficiency

- Assume they settle on a payment of 17.5, but this time its the BBQers paying for each day grilling
    - Total BBQer utility = $50 - 2*17.5 = 15 > 0$
    - Total Vegan utility = $15 + 2*17.5 = 50 > 45$
- So the total utility and level of grilling is unchanged from the "griller's rights" regime.
- But the distribution of benefits has switched in favor of the vegans. When BBQers had the property right, the BBQer utility was 62.5, and the vegan utility was 2.5.

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environmental
policy?
Private solutions
to market failures

Takeaways from simple example

- Efficient outcome achieved through the market
  - don't need regulation
- This is true regardless of who has the property right
- However, share of the social surplus going to each party varies with property right
  - your net utility is higher if you have the property right

Do we need environmental policy?
Private solutions to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example
Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

Steps for solving a Coase problem

1. Figure out who has the property right. Determine the outcome if no deal is reached. Compute the net benefits of each party under this outcome.

2. Determine the efficient outcome.
   - $MB = MC$ or just max total benefits.

3. Calculate the net benefits of each party under this outcome.

4. Compute the range of payments that would induce the property rights holder to move from the no-deal outcome to an agreement.
   - This will usually involve a payment from the party without the property rights to the one with it.

5. Check: For an agreement to be viable, each party has to be at least as well off as under no agreement, after accounting for side payments.

Do we need
environmental
policy?
Private solutions
to market failures

Cheshire Transaction

Do we need
environmental
policy?
Private solutions
to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example
Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

Coase and the Cheshire Transaction (c/o Hunt Allcott)

Figure: Gavin Powerplant, Cheshire, OH

Do we need environmental policy?
Private solutions to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example

Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

Gavin Power Plant

- Owned by American Electric Power (AEP)
- 2.6 GW
  - Enough power for 2 million people
- Original Cost: $650 million (nominal)
  - Replacement cost: ˜$3 billion ($nominal 2011)

Greenpeace protest (1984)

- NE states and Canada concerned about acid rain caused by sulfur dioxide emissions at Gavin.
- To raise awareness of this issue, Greenpeace activists, disguised as painters, jump off Gavin's smokestack.
- AEP replaces the tall smokestack at Gavin with two shorter stacks, each 830 feet tall.
- Now emissions fall in the village, closer to home.

Do we need environmental policy?
Private solutions to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example
Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

Gavin Power Plant (cont.)

- Owned by American Electric Power (AEP)
- 2.6 GW
  - Enough power for 2 million people
- Original Cost: $650 million (nominal)
  - Replacement cost: ˜$3 billion ($nominal 2011)
- FGD Installed 1994/1995
  - Total cost: $700 million.
- SCR Installed 2001
  - Controls NOx emissions
  - Byproduct: Sulfur Trioxide
  - Total cost was probably ˜$260 million

Do we need
environmental
policy?
Private solutions
to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example

Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

The Cheshire Transaction

- April 16, 2002: AEP acquires Cheshire
- Property owners receive 3.5x assessed value
  - Outside village: 2x assessed value
- Renters receive $5k for each year lived in Cheshire, up to $25k.
- Must sign a health waiver prohibiting them from suing AEP for future health problems
  - Must also sign a confidentiality agreement
- Cheshire residents over age of 71 able to remain in homes rent free until death.
- Original population: 221
  - Current population: ¡20
- Total settlement disbursed by AEP: $20 million
- Attorneys take about 1/3 of settlement money
- More info:
  http://www.cheshiretransaction.com/powerplant/sub/cng.html

Was the Cheshire Transaction a good thing?

Was the outcome welfare enhancing?

Do we need environmental policy?
Private solutions to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example
Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

Housing market

- Total payment was $20 M
- **Attorney's took 1/3, so really $13 M** (more on this later)
- Equal to 3.5X assessed value **in 1999**
- 90 households, 80 moved
- So payout is 13.33 M / 80 = $166 K
- Value of house is approx $47K

Do we need
environmental
policy?
Private solutions
to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example
Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

What about shutting down the plant?

Annual power plant profits =

Size (2,600 MW)
$\times$ Hours/ Year (8,760)
$\times$ Capacity factor (85%)
$\times$ Revenue - Cost ($40/MWh - $30MWh = $10/ MWh)
$194 million/ year

Who had the property right here?

(poll)

Do we need
environmental
policy?
Private solutions
to market failures

Who had the property right here?

(poll)
appears residents were entitled to more clean air

Do we need environmental policy?
Private solutions to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example
Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

Who had the property right here?

(poll)
appears residents were entitled to more clean air
Who should have the property right?

Who had the property right here?

(poll)

appears residents were entitled to more clean air

Who should have the property right?

There is only damage if people choose to move there: damages caused by a combination of sources and receptors.

Why doesn't this happen elsewhere?

What's unique about this setting?

Do we need
environmental
policy?
Private solutions
to market failures

Why doesn't this happen elsewhere?

What's unique about this setting?

- Cheshire is a very small town. Only one clear "source" and very few "receptors" to negotiate with.

- As the number of parties involved grows, it becomes costly / difficult to get everyone on board (free riding, hold up).

Do we need
environmental
policy?
Private solutions
to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example

Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

Transaction costs can also break Coasean logic

- In this example, AEP paid $20 million.
- But lawyer's took 1/3 of the money
- Just like a tax, this sort of transaction cost drives a wedge between willingness to pay and willingness to accept a deal, potentially precluding some socially beneficial trades.

Transaction costs can also break Coasean logic

- In this example, AEP paid $20 million.
- But lawyer's took 1/3 of the money
- Just like a tax, this sort of transaction cost drives a wedge between willingness to pay and willingness to accept a deal, potentially precluding some socially beneficial trades.

Let's go back to the grilling example. What would happen if every time a side payment occurred, we had to get the transaction notarized for $10?

Do we need
environmental
policy?
Private solutions
to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example

Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

If BBQers have the property right, how many days will they grill?

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Do we need
environmental
policy?
Private solutions
to market failures

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Total: Vegans	45	30	15	0
Marginal: BBQers		30	20	10
Marginal: Vegans		-15	-15	-15

- BBQers need to be paid $10 to cut back
- Neighbors would pay only $5 after notary fee.
- No deal possible (3 days of grilling)

Do we need
environmental
policy?
Private solutions
to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example

Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

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Do we need
environmental
policy?
Private solutions
to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example

Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

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- Vegans need to be paid $15 on day 1
- BBQers willing to pay $30, so difference is more than lawyer fee
- On day 2, only willing to pay $20
- No deal possible (1 days of grilling)

Punchline: Now outcome DOES depend on the property rights!

Do we need
environmental
policy?
Private solutions
to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example
Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

The limits of negotiation

Many real world situations escalate, rather than diffuse through side payments.

The Telegraph

- Who has the property right here?

Do we need
environmental
policy?
Private solutions
to market failures

The limits of negotiation

Many real world situations escalate, rather than diffuse through side payments.

The Telegraph

- Who has the property right here?
- How many of you have been in this situation? What did you do?

Do we need
environmental
policy?
Private solutions
to market failures

The limits of negotiation

Many real world situations escalate, rather than diffuse through side payments.

The Telegraph

- Who has the property right here?
- How many of you have been in this situation? What did you do?
- A video last year captured a breakdown in negotiation. Twitter

Do we need environmental policy?
Private solutions to market failures

Intro
Coase
Baker - doctor ex.
Neighbor example
Pigouvian solution
Market solution
Distribution of surplus
Summary
Cheshire
Transaction
Airplane example
Summary

Taking property rights back?

KNEE DEFENDER ™

- as small as a key

Protect yourself against reclining airplane seats

AP (2014) - "A United Airlines flight from Newark to Denver was diverted to Chicago's O'Hare International Airport after two passengers, both sitting in the "economy plus" section of the flight – which comes with extra legroom – began arguing because the man prevented the woman sitting in front of him from reclining her seat."

Do we need
environmental
policy?
Private solutions
to market failures

Intro

Coase
Baker - doctor ex.

Neighbor example
Pigouvian solution
Market solution
Distribution of surplus
Summary

Cheshire
Transaction
Airplane example
Summary

Formal statement of the Coase Theorem

- Bilateral negotiation regarding an externality between the generator and the recipient of an externality leads to the same efficient outcome regardless of initial assignment of property rights, as long as:
    1. no third-party impacts (two parties only)
    2. no transaction costs
    3. no income effects

Do we need environmental policy?
Private solutions to market failures

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Coase
Baker - doctor ex.

Neighbor example
Pigouvian solution
Market solution
Distribution of surplus
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Common (mis)interpretation: if we just assign property rights, markets will do the rest

- In the real world, transaction and negotiation costs are large and pervasive
- Externalities we care about often effect many many people.

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So why study the Coase Theorem?

- Useful to understand what would happen in a vacuum, in order to understand how far away from that ideal we are
- Much of Coase's work highlighted the importance of transaction costs in shaping outcomes
  - this is what won him the Nobel Prize
- More pragmatic interpretation: the best solution to an externality *may* not be regulation, but clear assignment of property rights
- Idea behind "free market environmentalism"
  - Those interested should checkout the Property and Environment Research Center in Bozeman, MT
- Policy implication:
  - Assign/ enforce property rights and reduce transaction costs
  - This is the idea behind cap-and-trade...