

Coase and Voluntary Approaches

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Spring 2024

Paris School of Economics

Goals for the Course

A brief survey of big themes in environmental economics:

- For those of you that will work in policy: A broad framework for how to think about environmental issues.
 - Practice thinking through the effects of policies, and attempting to quantify them.
- For those of you continuing in research: Spark your interest to pursue some topics in more depth.

Course Schedule

- Today: Voluntary and Decentralized Approaches to Environmental Problems
- Feb 13: Non-market valuation: The Regulator's Problem
- Feb 20: NO CLASS: Submit topics for final paper
 - Optional but highly recommended: email me 1 paragraph with the policy you'd like to study, the main costs and benefits you will consider, and any relevant literature you've found.
- Feb 27: Sustainability and Resource Management (Note room change: 2-21)
- March 5: Environment, Development, and Technological Change (back in 2-01)
- April 1: Final papers due
 - Mandatory: Peer review

Outline for Today

- Meta-Skills: How to read and write for economists
- Externalities and the Coase Theorem
 - Payments for Ecosystem Services
 - Carbon Offsets
- Private Provision of Public Goods
 - Green Consumption
 - Fair Trade

Meta-Skills: Reading

How to *Actively* Read an Empirical Paper

- Read the Intro
- Look at the Figures
- Review the rest

If you can answer these questions, I am satisfied:

- What is the research question?
- Why does it matter?
- How do they answer it?
- What are possible shortcomings?

Note: review papers are different

Meta Skills: Writing

If you can't clearly convey your argument, it doesn't matter if you are right.

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I should know the answers to these questions by the end of the intro (ideally by the end of the second paragraph).

- What is the research question?
- Why does it matter?
- How do you answer it?

Good papers have:

- A Title
- A Thesis: Why am I reading this?
 - Make a claim and defend it.
 - Lit reviews are not just summaries of other papers.
 - Policy analysis should reach a conclusion about the policy.
- A clear structure: Make an outline
 - Each paragraph serves a purpose (what is the topic sentence?)
 - Each sentence serves a purpose (how does it relate to the topic sentence?)
 - Each word serves a purpose (can this be written more clearly/concisely?)

Good Papers Have:

- No spelling or grammatical errors!
 - Use ChatGPT! It isn't good enough to do this project for you, but it can help, especially with copy editing.
 - Other tools I use:
 - <https://hemingwayapp.com/>
 - <https://www.connectedpapers.com/>
 - Mandatory: Exchange papers with another student. Both your names go on the final draft.
- Examples:
<https://www.givewell.org/research/intervention-reports/March-2021-version>

The Coase Theorem

Review of Externalities

Definition: One agent (person, firm) makes a choices that *directly* affect another agent's 'utility'.

$$\max_E U_A(x_A, E, p) \quad (1)$$

$$U_B(x_B, E, p)$$

Suppress notation on everything except E. A's maximization will result in:

$$U'_A(E^*) = 0 \quad (2)$$

Marginal benefits (to A) of consuming more E are zero.

Review of Efficiency

Pareto Efficiency: Any reallocation of resources cannot make one person better off, without making anyone else worse off.

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Kaldor-Hicks Criterion: Could the winners theoretically compensate the losers to make everyone better off.

- Does the allocation where person A maximizes their self interest satisfy Pareto Efficiency? Is a Kaldor-Hicks improvement possible?

Social Welfare Functions

We'll represent efficiency as the allocations that maximize a (possibly weighted) social welfare function.

$$\max_E W = \max_E U_A(E) + U_B(E) \quad (3)$$

$$U'_A(E^o) = -U'_B(E^o) \quad (4)$$

Equates the marginal benefits of E to A with the marginal damages to B.

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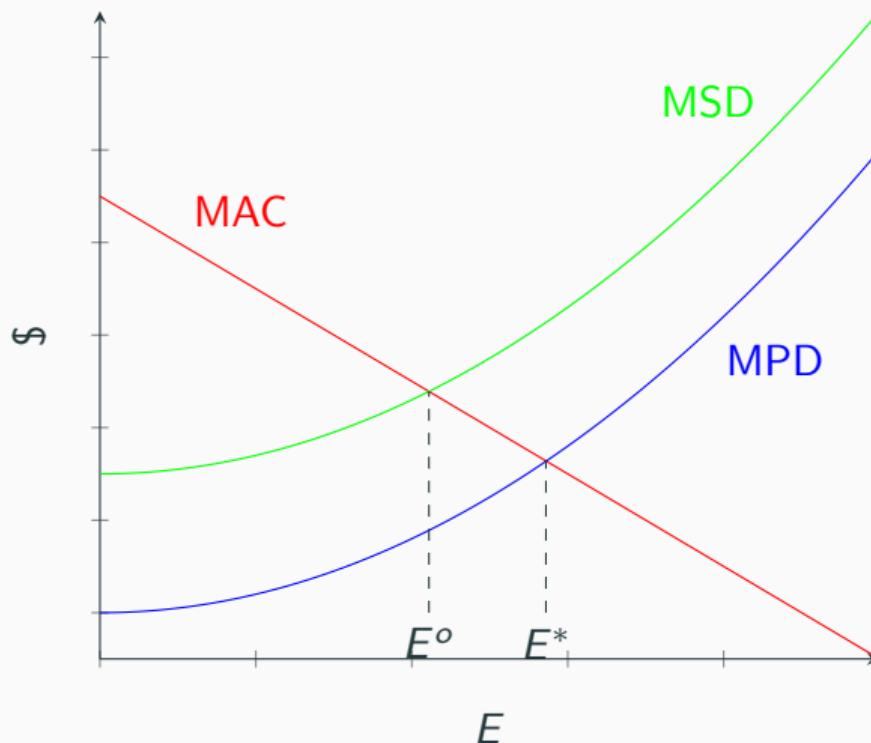
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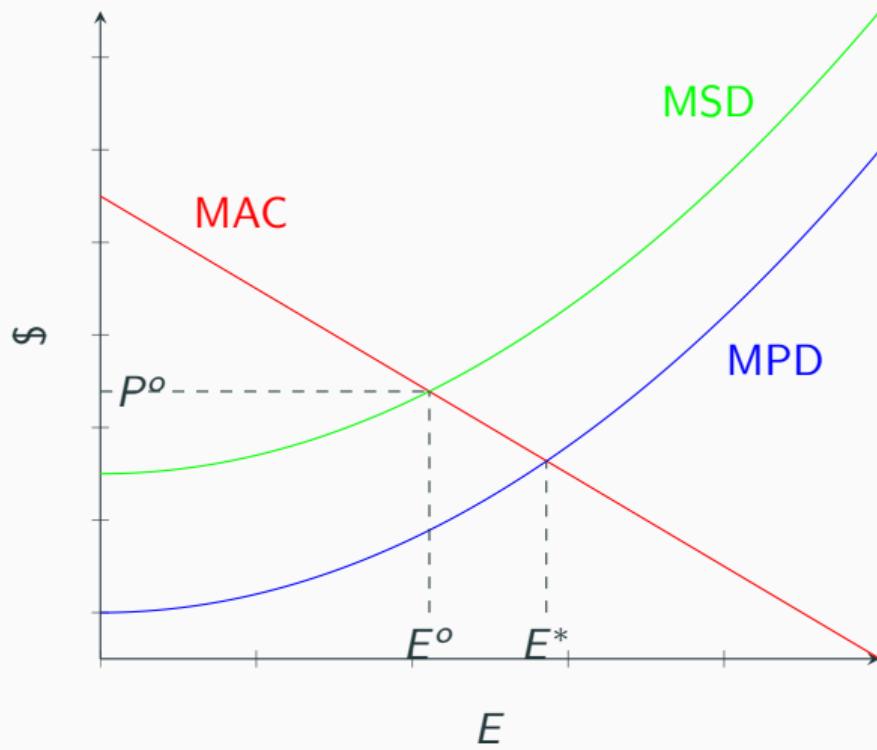
- Is this allocation Pareto Efficient? Is a Kaldor-Hicks improvement possible?

MACs and Damage Functions



Pigouvian Taxation

Pigou (1920). The Economics of Welfare.



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$$\max_E U_A(E) - p^* E \quad (5)$$

$$U'_A(E) = p^*$$

$$p^* = -U'_B(E)$$

- Requires knowledge of abatement costs and damage functions
 - See Weitzman (1973) for treatment of uncertainty.
- Planner's ability to levy a tax on each unit of emissions.
 - Big literature on optimal regulation of non-point sources.
 - How would incomplete enforcement change the optimal tax?

The Coase Theorem

Coase (1960). The Problem of Social Cost. The Journal of Law and Economics

- A critique of Pigou

Why should we care about voluntary approaches?

- Libertarianism: All else equal we'd like to reduce coercion.
- Governance Failures: Principal-agent or political economy constraints.
- Asymmetric Information: We'd like individuals to reveal their true values for goods.

Coase Formally

B has the right to a clean environment (strict liability). A can offer to compensate B for the pollution with a payment T :

$$\max_E U_A(E) - T \quad (6)$$

$$U_B(E) + T \geq U_B(0)$$

The second line can be thought of as a participation constraint. Choose T so that B is better off relative to their outside option.

$$\max_E U_A(E) - U_B(0) + U_B(E) \quad (7)$$

$$U'_A(E) = -U'_B(E)$$

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What if A has the right to pollute?

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What if A has the right to pollute?

$$\max_E U_A(E) + U_B(E) - U_B(E^*) \quad (7)$$

$$U'_A(E) = -U'_B(E) \quad (8)$$

E remains unchanged - all that changes is who gets the transfer!

A Farmer and A Rancher

Rancher wants to expand the size of his herd which will result in benefits $\$B$.

This will cause additional crop damages of $\$C$ to a farmer.

Scenario 1: Farmer owns the land and can sue rancher for crop damage.

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- Rancher will offer farmer a side payment for permission to graze if $B - T > C$.
- T could be the cost of building a fence to keep the cattle out! Or buying the farmers land!
- Note that if $B < C$, the rancher doesn't expand.

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Scenario 2: Rancher owns the land - they doesn't have to listen to the farmer.

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- If $B > C$, rancher still expands his herd, but now farmer gets nothing.
- If $B < C$, now farmer offers a side payment (or to build a fence or to buy the land).
- In either case, if $B > C$, rancher expands, if not, they don't.

Key Assumptions

- Property rights are well-defined and enforceable.
 - Right to clean water? How clean?
- No transaction costs
 - Legal, administrative, conflict aversion, coordination costs
- Perfect information
 - Rules out moral hazard/bluffs
- No wealth effects
 - Receiving the transfer doesn't change my abatement costs or damages.
- 'Rationality'

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Which of these also apply to Pigouvian taxation?

Is it realistic?

Wrong question.

Like other economic models, it's too simple to describe reality, but gives us a short list of explanations for why the model doesn't match what we see.

– Byrne Hobart

What happens when the assumptions fail?

Arguably Coase's entire point is that there ARE often large transaction costs

- "...a very unrealistic assumption. In order to carry out a market transaction it is necessary to discover who it is that one wishes to deal with, to inform people that one wishes to deal and on what terms, to conduct negotiations leading up to a bargain, to draw up the contract, to undertake the inspection needed to make sure that the terms of the contract are being observed, and so on. 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."

Transaction Costs

Now in general it will matter how property rights are assigned.

Several possibilities:

- Mergers/Acquisitions
- Government intervention
- Do nothing?

Focus on Property Rights

What does it mean to 'own' something?

- Property rights are a bundle of rights
 - E.g. owning an apartment in Paris. Gives me the right to live there or rent it, but I can't paint it purple, turn it into a dance studio, or evict a tenant without following other procedures.
- Sometimes there is a great deal of uncertainty.

In environmental contexts we usually focus on one of two regimes:

- Polluter Pays - strict liability - right to a clean environment
- Pollutee Pays - laissez faire - no regulation

But sometimes (e.g. with new technologies) it is not clear what the relevant rights are.

Focus on Distributional Issues

The traditional approach has tended to obscure the nature of the choice that has to be made. The question is commonly thought of as one in which A inflicts harm on B and what has to be decided is: how should we restrain A? But this is wrong. We are dealing with a problem of a reciprocal nature. To avoid the harm to B would inflict harm on A. The real question that has to be decided is: should A be allowed to harm B or should B be allowed to harm A? The problem is to avoid the more serious harm.

– Coase (1960)

Environmental Issues are ALWAYS Distributional Issues

Key Conceptual Tool: Identify the Winners and the Losers

- If A doesn't benefit from pollution they wouldn't be polluting.
- If B isn't harmed by pollution, it's not really pollution.

What would a Coasian bargain look like?

- Why doesn't it occur?

Focus on Efficiency

Sometimes regulations are missing despite the presence of clear externalities

- Are transaction costs too high or benefits too low?

How much would you pay to avoid:

- Someone cuts you in line at the grocery store
- Neighbors having a loud party
- Dog poop on the sidewalk

What would be the cost of enforcing the associated property rights?

Examples



Dow Chemical buys a town

State, City Announce Landmark Agreement To Safeguard New York City Drinking Water

*New 15-Year Water Supply Permit Allows New York City to Continue Acquisition
of Sensitive Watershed Land to Protect Largest Unfiltered Drinking Water Supply
in the World; Broad Agreement Resolves Numerous Issues to Assist with
Economic Vitality of Watershed Communities*

New York City buys out farmers upstate to protect its drinking water

The case for conservation leasing

Federal rules make it illegal for environmentalists to lease oil- and gas-rich lands in order to protect them. It's time for that to change.



Mint Images / Art Wolfe / Getty

Conservationists bid on oil rights.

To Conform with Recent Supreme Court Decision, EPA and Army Amend “Waters of the United States” Rule

August 29, 2023

Contact Information

EPA Press Office (press@epa.gov)

WASHINGTON – Today, the U.S. Environmental Protection Agency (EPA) and the U.S. Department of the Army (the agencies) announced a final rule amending the 2023 definition of “waters of the United States” to conform with the recent Supreme Court decision in *Sackett v. EPA*. The agencies are committed to following the law and implementing the Clean Water Act to deliver the essential protections that safeguard the nation’s waters from pollution and degradation. This action provides the clarity that is needed to advance these goals, while moving forward with infrastructure projects, economic opportunities, and agricultural activities.

Ambiguity in property rights established in the Clean Water Act?

Find the Coasian Bargain

For each: identify the relevant property rights and the externality. Suggest a Coasian bargain that could make all parties better off:

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- Two students are roommates - one is scared of getting COVID, the other refuses to get vaccinated.

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- Two students are roommates - one is scared of getting COVID, the other refuses to get vaccinated.
- Donald Trump is running for president. Many people don't want him to.

Sam Bankman-Fried Mulled Paying Trump \$5 Billion Not to Run for President, Says Michael Lewis

Promoting his newest book, author Michael Lewis revealed a startling detail about Bankman-Fried's political engagements.



By [Andrew Asmakov](#)

Oct 2, 2023

3 min read



Payments for Ecosystem Services

Payments for Ecosystem Services

Key Idea: 'Natural Capital' provides a wide range of 'services' to humans

- Trees convert CO₂ to oxygen
- Soil filters groundwater
- Beach dunes protect against storm surges
- Wilderness provides recreation opportunities

Certain land uses provide private benefits, but degrade natural capital and impair the flow of services

- Clearing trees/vegetation for firewood
- Farmers using too much pesticide
- Development on wetlands

PES: Pay the landowner to provide the ecosystem service instead

Money (Not) to Burn: Crop Burning in Punjab

Farmers in Punjab burn crop stubble at the end of planting season.



- Cheaper than renting machinery, labor.
- Sends a massive plume of smoke over densely populated areas.
- Proposal: Pay farmers not to burn.

Jack, Jayachandran, and Kala's approach: Offer farmers an upfront payment to abstain from burning their stubble, monitoring results using satellite data.

- Back of envelope estimates suggest a cost of $\approx \$4,400/\text{life saved}$.

Carbon Offsets

Firm A wants to lower their carbon emissions

- They can install expensive machinery or cut back on production
- But person/firm B could reduce their emissions at a lower cost
- Firm A can pay person B to reduce their emissions and claim 'credit' for the reductions

Additionality: In absence of the payment, firm B would have had higher emissions.

- This relies on a counterfactual

Cash for Carbon

Jayachandran et al offer payments to landowners in Uganda to conserve their forests using an RCT.

	Cut any trees in the past year	Allow others to gather firewood from own forest	Increased patrolling of the forest in last 2 years	Has any fence around land with natural forest	IHS of food expend. in past 30 days	IHS of non-food expend. in past 30 days
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment group	-0.140*** [0.034]	-0.170*** [0.033]	0.109*** [0.039]	0.036 [0.033]	0.065 [0.074]	0.156** [0.066]
Lee bound (lower)	-0.161*** [0.034]	-0.185*** [0.033]	0.094** [0.039]	0.007 [0.033]	-0.029 [0.070]	0.053 [0.064]
Lee bound (upper)	-0.104*** [0.033]	-0.148*** [0.032]	0.132*** [0.039]	0.055 [0.034]	0.144* [0.075]	0.215*** [0.064]
Control group mean	0.453	0.427	0.378	0.667	2.524	4.363
Control group SD	[0.498]	[0.495]	[0.485]	[0.472]	[1.177]	[1.354]
Observations	1018	9767	984	1020	1020	1020
Observations (Lee bounds)	994	957	965	998	998	998

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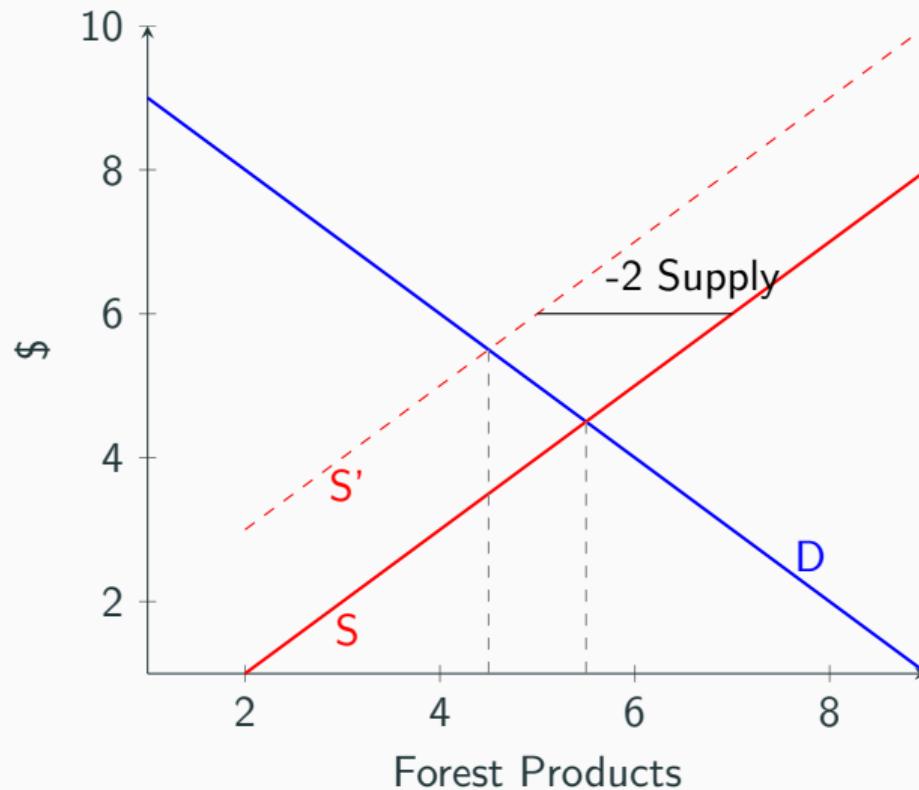
Scenario	Benefit per MT of CO ₂ (\$)	Cost per MT of CO ₂ (\$)	Benefit-cost ratio
1. Base case: Program effects undone over 4 years	1.11	0.46	2.4
2. Program effects undone immediately	0.37	0.46	0.8
3. Deforestation resumes at normal rate (permanent delay)	0.74	0.05	14.8
4. Base case except using effect size from PFO-level analysis	1.11	0.63	1.8
5. Program effects accumulate for final 6 months	1.11	0.34	3.2
6. Average time until emissions is halved to 5 years	1.17	0.46	2.6
7. Average time until emissions doubled to 20 years	1.00	0.46	2.2
8. Monitoring rate of 1 spot check per day per staff person	1.11	0.53	2.1

Offset Issues: Spillovers

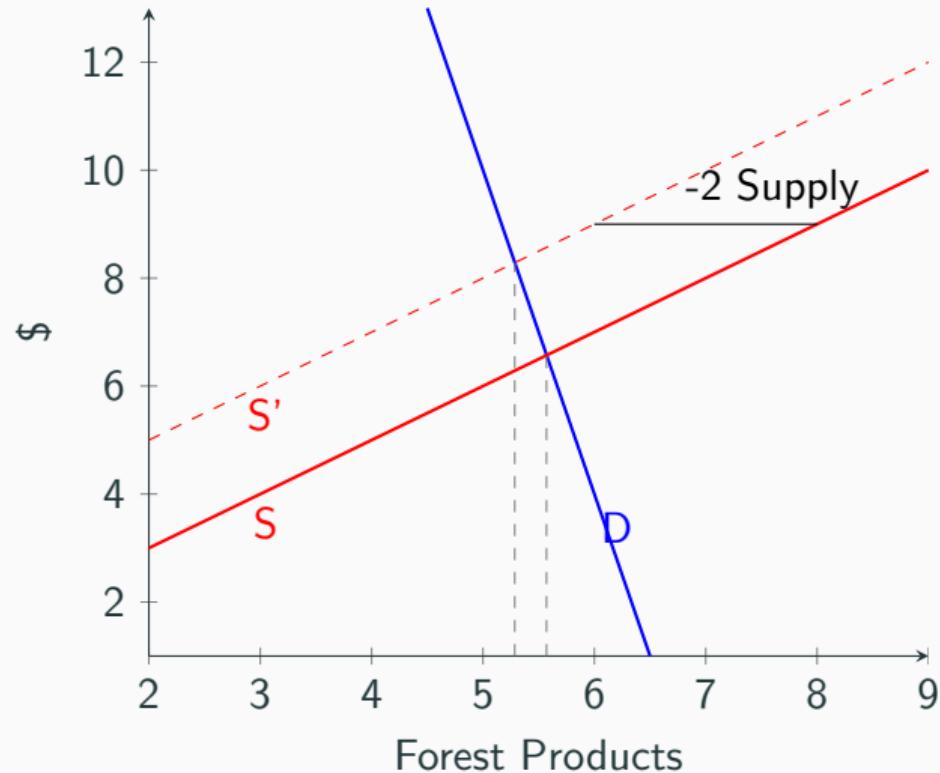
Intuition: Some of the forest products removed from the market will be replaced by other producers

- No reason spillovers need to be local!
- This tends to be worse in a voluntary program since spillovers to non-participants are likely.
- Problem can be very bad if demand is inelastic or supply is elastic.

Offset Issues: Spillovers



Offset Issues: Spillovers



Offset Issues: Moral Hazard

B wants to pay A not to pollute.

$$\max_E U_A(E) + T \quad (9)$$

$$U_B(E) - T \geq U_B(E^*) \quad (10)$$

B chooses T such that they will be better off than under A's baseline emissions E^* .

Offset Issues: Moral Hazard

A convinces B that it would emit at much higher rates in absence of payment:

$$\max_E U_A(E) + T \quad (9)$$

$$U_B(E) - T \geq U_B(E^H) \quad (10)$$

Since B is worse off under E^H than E^* this increases the size of T.

- If the size of T is constrained (e.g. a fixed program budget) then this will decrease emission reductions (relative to perfect information).
- In an offsets program, firm B claims credit for $E^H - E^o$ reductions, when in they only reduced emissions $E^* - E^o$.
 - If the offsets are an alternative to complying with regulations, then the program has increased emissions.

Offset Issues: Adverse Selection

Offsetter offers T for projects with expected emissions reduction of E , but hard to measure actual reductions.

Two types of projects: Half reduce emissions by $E^L < E$ for cost $c_L < T$, half reduce emissions by $E^H > E$ for cost $c_H > T$.

- Actual emissions reductions will be E^L . T is too high, wastes resources.
- If offsetter claims E emissions, actual emission reductions have increased.
- Calel et al: Do Carbon Offsets Offset Carbon?
 - More than 50% of wind turbine projects in India funded by Clean Development Mechanism would have happened without funding.

Takeaways

- Voluntary PES/Coasian programs have a lot of intuitive appeal and practical successes!
- But many potential problems to be aware of:
 - Issues of additionality (moral hazard, adverse selection, spillovers) can be thought of as transaction costs or information frictions - how do we monitor and enforce that the quantity of E is actually delivered as promised.
- Still an important benchmark/conceptual tool
 - What are the relevant property rights?
 - Who are the winners and losers?
 - Is there a way to make everyone better off?

Voluntary Provision of Public Goods

Public Goods Review

	Non-Excludable	Excludable
Non-Depletable	Public Goods	Club Goods
Depletable	Common Resources	Private Goods

- Depletable: If I consume it, does it diminish others ability to consume it?
- Excludability: Can I prevent others from consuming it?
 - Combination of non-depletable and non-excludable leads to 'free riding' - I can consume the good without paying for it.
- Examples: Knowledge, National Defense, Clean Environment
- Public bads (e.g. Air Pollution) can often be viewed as the failure to provide a public good (Abatement)
 - Externalities can appear in all four quadrants

Public Goods

Public good $E = \sum_i e_i$ provided at cost $c(E)$. Optimal level satisfies:

$$\max_E \sum_i U_i(E) - c(E) \quad (11)$$

$$c'(E^o) = \sum_i U'_i(E^o) \quad (12)$$

Marginal cost of provision equals the *sum* of the marginal benefits.

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Marginal cost of provision equals the *sum* of the marginal benefits. Individual solves:

$$\max_{e_i} U_i(e_i + \sum_{j \neq i} e_j) - c(e_i) \quad (13)$$

$$U'(e_i^* + \sum_{j \neq i} e_j^*) = c'(e_i^*)$$

Since cost function applies to all agents, $c'(e_i^*) = c'(e_j^*) \quad \forall j$.

$$\sum_i U'(E^*) = \sum_i c'(e_i^*) > c'(e_i^*). \quad (14)$$

Lindahl Pricing

There is a (not very realistic) decentralized solution to the public goods problem. Each individual pays a ‘personalized price’ for the public good:

$$\max_{e_i} U_i(e_i + \sum_{j \neq i} e_j) - p_i e_i \quad (15)$$

$$U'_i(e_i^* + \sum_{j \neq i} e_j^*) = p_i$$

$$\sum_i U'_i(E^*) = \sum_i p_i. \quad (16)$$

If we set $p_i = \frac{U'_i(E^*)}{\sum_j U'_j(E^*)} c'(E^*)$, each individual pays for their share of the marginal benefits, and optimal provision is achieved.

- Requires excludability and a great deal of knowledge!
- Important benchmark for incentive-compatible contributions.

Voluntary and Information Based Approaches

Can be appealing due to difficulty passing coercive policies:

- Corporate Social Responsibility
 - Green procurement/fair trade
- Voluntary/Mandatory Information Disclosure
 - Eco-labelling
 - Toxics Release Inventory (USA)
- Goal setting
 - Paris Agreement

Theory of Green Consumption

From Kotchen (2000) - Think of fair trade coffee. A consumer has preferences:

$$U_i(x_i, E) \tag{17}$$

3 goods: x : regular coffee, E : donation to the environment, g : gives coffee + environment

- Consumer drinks 'green coffee' if it is cheaper than regular coffee + equivalent environmental donation.
- How does introduction of g affect aggregate provision of the environmental good?
 - What if some consumers substitute from E to g ?
 - What happens if government provides E ?
 - Crowding out: under some circumstances gov't funding substitutes private 1:1
 - Crowding in also possible! See Wagner and Kotchen (2023)

Responsible Sourcing

Why do companies participate?

- Altruism
- Reduce liability/bad press: Nike sweatshops in the 90s, Bangladesh factory collapse 2013
- Attract more skilled/productive workers?
- Advertising/increase demand

Alfaro-Urena et al: Responsible Sourcing? Theory and Evidence from Costa Rica

- Non-binding/hot air/greenwashing
- Raise wages for low wage workers
 - Lower demand for low wage workers? Depends on monopsony in local labor markets
 - Decreased sales?
- Spillovers to non-exposed workers?

Example: Panasonic 2016 RS Policy

1-3 Working Hours

Suppliers shall ensure the workers' working hours, day off, and annual leaves appropriately managed, so that it does not infringe statutory limits.

<Specific action items>

- A workweek shall not exceed 60 hours per week, including overtime work, except in emergency or unusual situations. Any local law or regulation shall apply if it is stricter than this provision.
- Scheduled and actual annual working hours shall not exceed the statutory limit.
- Workers shall be allowed to take at least one day off per seven working days.

1-4 Decent Wages

Suppliers shall pay workers at least the statutory minimum wage and shall not unreasonably reduce wages.

<Specific action items>

- Suppliers shall comply with all applicable wage related laws and regulations, including those relating to minimum wages, overtime work, and legally mandated benefits.
- Suppliers shall pay extra wages for overtime work in accordance with local laws.
- Suppliers shall not reduce wages as a disciplinary measure.
- Suppliers shall provide workers understandable and accurate wage statements that include sufficient information to verify compensation for work performed by the date of payment.
- Suppliers shall pay wages and allowances to all workers based on local laws without any delay.

1-5 Humane Treatment

Suppliers shall respect human rights of workers and treat workers in a humane manner.

<Specific action items>

- Suppliers shall not treat workers in harsh and inhumane manner, including any harassment, sexual abuse, corporal punishment, mental or physical coercion, and verbal abuse.
- Suppliers shall clearly define disciplinary policies and procedures and communicate to workers.

1-6 Elimination of Discrimination

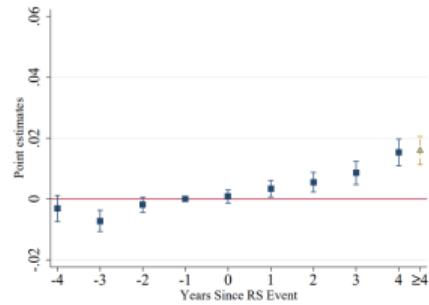
Suppliers shall endeavor to eliminate discrimination in recruitment and employment, and ensure equal opportunities and fair treatment.

<Specific action items>

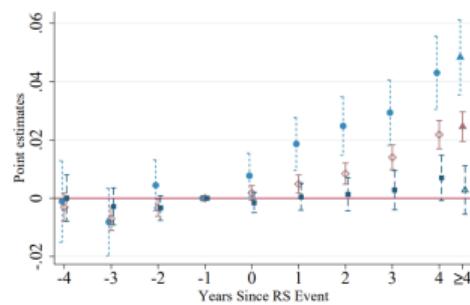
- Suppliers shall not engage in discrimination based on race, color, age, gender, sexual orientation, gender identity and expression, ethnicity or national origin, disability, pregnancy, religion, political affiliation, union membership, covered veteran status, protected genetic information, or marital

Responsible Sourcing?

Figure 2: Worker-Level Effects of Exposure to MNE RS Rollouts on Labor Earnings



(A) All Workers



(B) Heterogeneity by Initial Worker Earnings

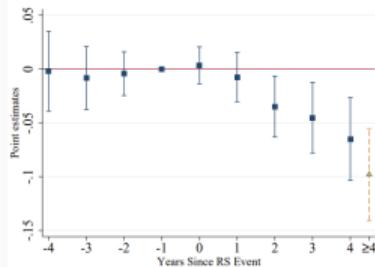
Notes: Figure plots estimates from the worker-level event-study specification (20). Estimates in Panels A and B correspond to column 4 of Panels A and B in Appendix Table B5, respectively. The outcome is the log of worker annual earnings divided by the number of months of employment, restricted to worker-months with full-time employment. In Panel B, we implement a heterogeneity analysis based on the quartile of a worker's initial earnings. We group workers based on their quartile in the distribution of (inflation-adjusted) monthly earnings in the first year we observe each worker since 2006. 95% confidence intervals are based on standard errors clustered at the firm level. See Section 4 for discussion.

Wages increase for exposed low wage workers

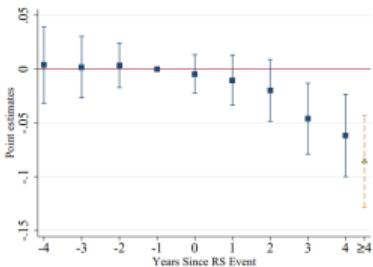
Responsible Sourcing?

Figures

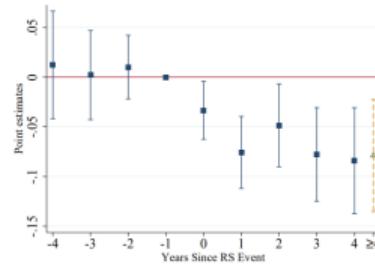
Figure 1: Supplier-Level Effects of Exposure to MNE RS Rollouts



(A) Supplier Annual Total Sales



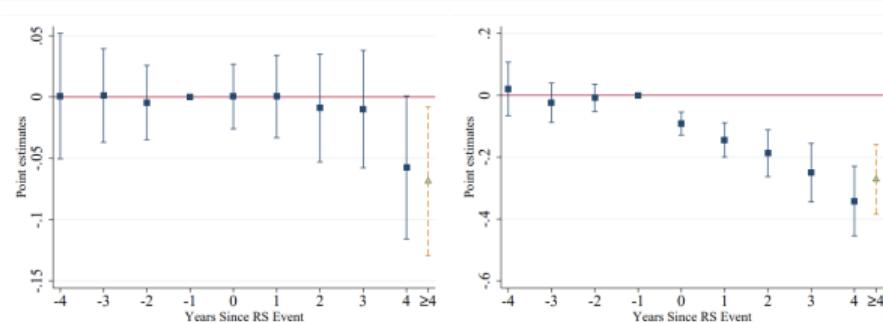
(B) Supplier Employment



(C) Employment Ratio of Low- vs. High-Wage Workers

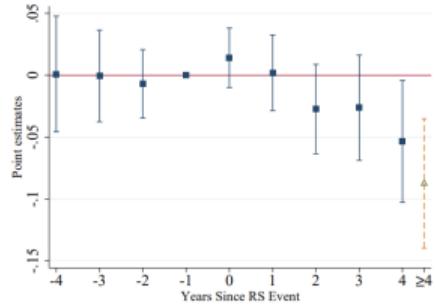
Sales to the MNE decrease, hiring of low-wage workers decreases

Responsible Sourcing?



(A) Intensive Margin among Complying Suppliers

(B) Total Sales to RS-Active MNEs (Int. + Ext. Margin)

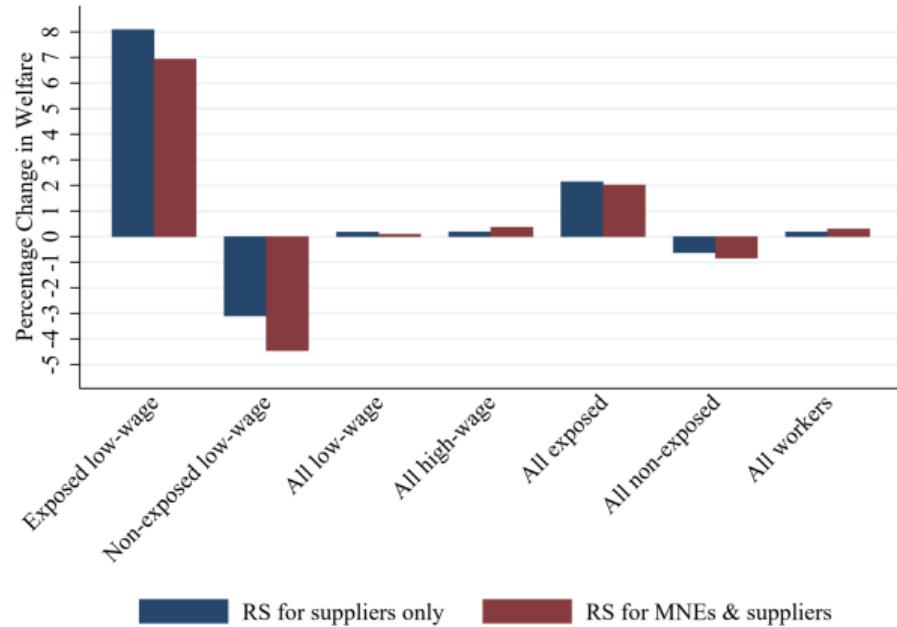


(C) Supplier Sales to Other (Non-RS) Buyers

Not selling more to other MNEs either

Responsible Sourcing?

Figure 4: Welfare Incidence of RS in CR



Large welfare increases to exposed workers, mostly offset by non-exposed workers

Club Goods

Many public goods are at least partially excludable

- Roads or public transit funded by user fees
- Some knowledge is tacit, embodied in employees
- Tiebout sorting: Local public goods funded by property taxes, individuals can 'vote with their feet'.



Climate Clubs

Nordhaus (2015): Climate Clubs: Overcoming Free-Riding in International Climate Policy

- CO2 is a global public bad: emissions reductions are non-excludable and non-depletable
- Any country that undertakes emissions reductions provides benefits to the rest of the world
- Westphalian system: All international treaties are voluntary

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- Westphalian system: All international treaties are voluntary

Climate Clubs:

- Members agree to undertake emissions reductions
- Penalty for non-participants: A tariff on all imports
- Relatively low tariffs can support fairly high carbon prices!

Climate Clubs

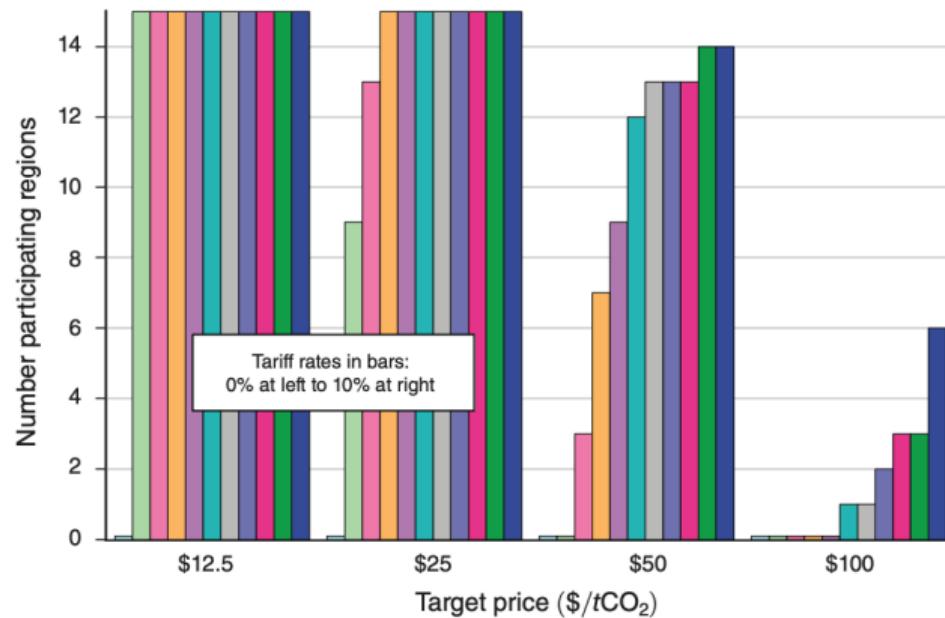


FIGURE 3. NUMBER OF PARTICIPATING REGIONS BY INTERNATIONAL TARGET CARBON PRICE AND TARIFF RATE

Notes: This and the following figures have the following structure. The four sets of bars are the model results for four different global SCCs, running from left to right as shown on the bottom. The 11 bars within each set are the penalty tariff rates, running from 0 percent to 10 percent. Note that each set has zero participants for a 0 percent tariff. The vertical scale here is the number of participants, while the following graphs show other important results.

Takeaways: Public Goods

Many public goods will be at least partially privately provided

- Motives range from altruism to self-interest
- Doesn't always improve welfare!
- Can complicate the argument for government action