Lecture SUM: Summary on environmental regulations

- Purpose
  - assist you in getting "a bird's perspective" on how to formulate environmental policies
    - when&how to apply various model concepts
    - when&how to apply various instruments
  - help you to put what you (should) have learnt in perspective

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Outline

1. Introduction / motivation
2. The systems perspective
   - the impact of system boundaries
3. Economic instruments
4. Behavioral aspects
5. Institutional aspects
6. Summary

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1. Motivation for the course

- Assist you in developing a framework for selecting environmental policies
  - Cost effectiveness (equal MACs in optimum)
  - Core concepts (RAMs)
  - The impacts of agent behavior
  - Cooperative and noncooperative solutions
  - Point of instrument application
- See issues in a broader context
  - Purpose and implication of environmental regulation: to enhance social welfare
    - ➡ Pareto-relevancy
  - System boundaries
  - Transaction costs

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Introduction (1)

- Main focus of the course: Environmental issues:
  - Public bads/negative externalities (pollution) + public goods/positive externalities
- ... and how to deal with these problems:
  - The choice of policy instruments
  - The choice of (optimal) point of instrument application (OPIA)

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... introduction (2)

- Choice of policy instruments & PIA depends on:
  1. The characteristics of the environmental problem
  2. The assumptions about the human agent
     a. Types of rationality/behavioral assumptions
     b. Calculative capacity
  3. The characteristics of the social system/economy
     a. Principal-agent; agent-agent
     b. Agents as individuals, households, firms
     c. Endowments (wealth)
     d. Rights
     e. Transaction costs

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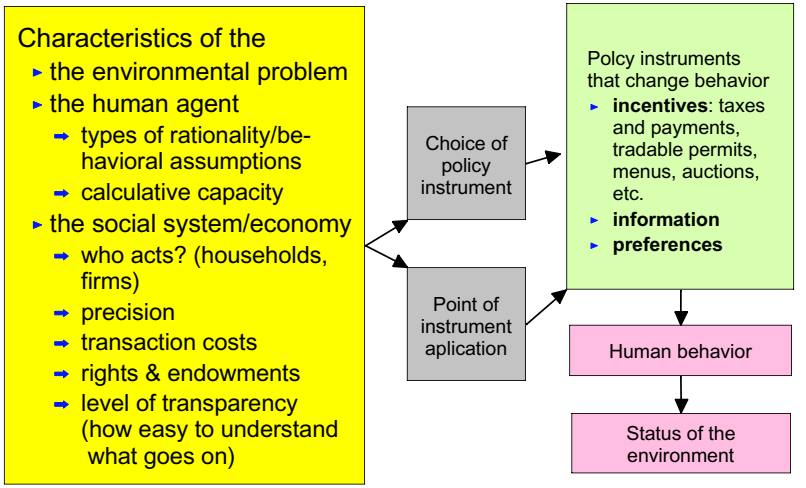
... introduction (3)



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Systems perspective (1)

- Characteristics of the environmental problem
  - systems perspective - mass flow
  - "point" vs. "nonpoint" emissions
  - homogenous or heterogenous emissions
  - local or global problem caused by emissions
  - type of damage
    - poisonous / non poisonous
    - gradual or immediate (visual) effect
    - risk and uncertainty (verifiability of effect(s))
  - many sources - one problem
  - one source - many problems
- Importance for
  - type of regulation / type of instrument / OPIA

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... systems perspective (2)

- Types of political/economic system:

Model I:	Agent-agent, zero TC (agents may be countries, firms, households, or individuals)
Model II:	Agent-agent, positive TC (agents as above)
Model III:	Principal-agent, positive TC (agents may be firms, households, or individuals)
Model IV:	Common property, positive TC
Model V	State property, postive TC

focus in course

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3. Economic instruments

- Asymmetric information - focus: truthtelling !!!
- Game theory and RAMs
- Standard economic (emission based instruments)
- Taxes vs. subsidies (environmental payments)
- Alternate policy instruments
  - voluntary agreements
  - auctions / menus
- Public finance / general equilibrium
- Summary

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Asymmetric information

- Most regulatory problems in env.econ characterized by asymmetric information
  - resolving the asymmetric info.problem key to designing env. regulations
  - truthtelling [... but it (usually) comes at a cost]
    - ➡ information rent extraction on behalf of the better informed party (distributional matter)
    - ➡ impacts on resource allocation (real welfare loss)
- RAMs as a communication device
  - the importance of the necessary criteria (participation constraint, info.viability and incentive compatibility) to make truthtelling occur

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Game theory and RAMs

- Game models with interaction
  - single shot games -- non-cooperative outcomes
  - repeated games -- support cooperative outcomes
  - non-repeated games -- possibilities for cooperation
  - understand implications of equilibrium solutions
- Principal-agent models
  - regulator (principal) & polluters (agents) relations
  - asymmetric info. (moral hazard, adv. selection)
- RAMs as a communication device (again)
- Using the "tools" = understand + solve problem, aware of limitations

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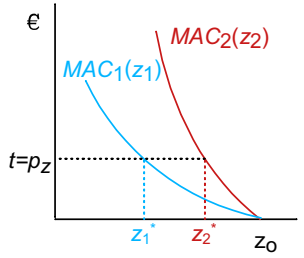
Std. economic instruments (1)

- Environmental (emission) taxes & tradable emission permits
  - characteristics (**cost effectiveness**):
    $MAC_i(z_i^*) = MAC_j(z_j^*)$ for all i,j
    evaluated at the optimum, z_k^*, $k=\{i,j\}$



Cost effectiveness important:

a. for the environment as it permits larger emissions reductions
b. for the ease of implementation as it decreases overall costs

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... std. economic instruments (2)

- When to use the various instruments
  - the Weitzman proposition
  - are conditions in place to apply (asymmetric information, monitoring and enforcement costs)
- How to use
  - public finance aspects (implications of double dividend/marginal cost of public funds)
  - implementation issues (legitimacy, evaluate costs of delayed implementation)
- Other considerations
  - possibility to differentiate (spatially)
  - entry/exit

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Taxes vs. subsidies

- at the margin, taxes and subsidies provide the same incentives
- ... but
  - entry/exit issues
  - fairness issues (polluters pay principle -- PPP)
  - what is the least costly solution (for large projects, note impact of general equilibrium / marginal costs of public funds)
- less troublesome to use subsidies to promote the production of public goods
  - counterpart to PPP: "provider gets principle"
  - awareness of rent seeking behavior

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Alternative instruments (1)

- Taxes and tradable permits on input factors that are linked to pollution
  - disadvantages
    - $MAC_i(z_i^*) \neq MAC_j(z_j^*)$
    - incentives removed from problem to be corrected
  - when to use
    - monitoring and enforcement is costly/-asymmetric information
    - documented linkage between input factor use and environmental problem
    - example: nonpoint source pollution (like agriculture)

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... alternative instruments (2)

- Menus
  - offer agent multiple choices, each with a "price"
  - obs. what agent chooses to learn about agent
- Auctions
  - formulate specifications (what to be delivered)
  - choose auction format (truthtelling)
- Voluntary agreements
  - $MAC_i(z_i^*) \neq MAC_j(z_j^*)$ and high transaction cost
  - risk of regulator giving agents "something for nothing"
  - when to use
    - new environmental problem (learning)
    - asymmetric information not a major issue

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Monitoring and enforcement

- Purpose: provide desired level of compliance at the least social costs
  (dual formulation: provide maximum level of compliance for a given level of social costs)
- Information issues
  - measurement errors on behalf of regulator
  - process control on behalf of agents
  - type I/II errors (not part of exam curriculum, but complicate matters)
- Possibility of reputation based models
  - is the industry to be regulated mobile or not?
  - entry/exit issues :: compliance rents

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Summary - core economics

- Asymmetric information
  - truthtelling (and its implications)
- There exists multiple instruments, tailored for various settings
- When choosing instruments, ask
  - what is the setting (asymmetric information, transaction costs, monitoring and enforcement issues)?
    - ➡ what kind of model(s) should be used to gain knowledge?
  - does the proposed regulation meet RAM criteria?

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... summary - core economics (2)

- Game theory
  - repated games ⇒ Folk theorem
  - non-repeated games ⇒ cooperation through sidepayments (difficult)
- The "core theory" gives you a tool box
  - use the tools wisely by considering each case on its own merits
  - identify information structure / repeated / non repeated
- Public finance and general equilibrium
  - when to use = risk of endogenous prices = "large" policies (pricetaking behavior breaks)

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4. Institutions - Rights and TCs (1)

- Rights has to be continuously defined
  - Rights define what becomes efficient (influences costs: *TC*s, *MEC*, *MAC*)
  - Rights influence who has to bear various costs (important both for distribution and resource allocation)
- The form of the regulation, may have very different *TC* and distributional effects
  - *TC* - classic case: NPS - input vs. emission taxes
  - Distribution: grandfathered tradable emission permits vs. emission taxes

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... institutions - rights and TCs (2)

- Rights and efficiency gets often mixed:
  - Taxes vs. subsidies
  - Victims "action" (pay?) in some cases cheapest
  - The problem of "moving victims"
  - The problem of moving polluters

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Behavioral assumptions (1)

- Consequences for the use of instruments

a)Type of instrument

- Economic - individual utility
- Legal - individual utility (punishment structure) or normative reasoning (building norms)
- Informational - individual utility (reduce info. costs, a response to satisficing) or evoking norms/empathy

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... behavioral assumptions (2)

- Consequences for the use of instruments (cont.)

  b) Control mechanisms
  - Control works differently dependent on whether motivation is "instrumental"/utility based or "intrinsic"/norm based
  - Control and trust

- Self-regulation (Ostrom insights)
  - successful self-regulation regimes: many common features of std. regulations = RAM criteria

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... behavioral assumptions (3)

- Consequences for the use of instruments (cont.)

  c) The logic applied by the principal must be in line with that of the agent

		The problem perceived by the agent	
		"I"	"We"
The logic behind regulation used	"I"	I	II
	"We"	III	IV

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5. Summary (1)

Choosing policy instruments
- agent characteristics:

- Behavioral assumptions:
  - The kind of rationality (rationalities) involved
  - Capacity to handle information
- Agent structures
  - Few - many
  - Large - small
  - Homogeneous - heterogeneous

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... 5. Summary (2)

Choosing policy instruments
- institution characteristics:

- **Rights** structure
- **Authority** structure (local community - national state - international agreement)
- **Distributional** effects and norms of fairness/ acceptability

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... 5. Summary (3)

Choosing policy instruments
- character of the environmental problem:

- Pollution (public bad)
  - type of emissions (local - global; homogeneous - heterogeneous; one - several types of emissions; 'point - nonpoint')
  - type of damages (toxic - non-toxic; accumulative - non-accumulative)

- Public goods
  - type of public good (discrete or relational; simple or complex; homogeneous or heterogeneous)

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... 5. Summary (4)

Choosing policy instruments
- cost structures (also depend on agents and system/institutional setting)

- Environmental costs

- Abatement costs (input substitution, changes in production technology, cleaning facilities)

- Transaction costs vs. precision

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