

The economics of climate change

C 175 - Christian Traeger

Part 3: Environmental Policy Instruments

Suggested background reading for emerging questions:

Kolstad, Charles D. (2000), “Environmental Economics”, Oxford University Press, New York.

Varian, Hal R. (any edition...), “Intermediate Microeconomics – a modern approach”, W. W. Norton & Company, New York.

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Part 3: Policy Instruments

Introduction on Instrument Choice

Read: Section 4 of Congressional Budget Office (2003),
“The Economics of Climate Change: A Primer”

Problem description

- Problem is that actions taken by agents affect profit/welfare of other agents
- If the first group of agents does not take this into account when making decisions, there is an externality (external effect)
 - Production and consumption activities cause emissions of GHGs
 - GHGs cause enhanced greenhouse effect with all kinds of negative (and positive!!) welfare effects
- Total (global) welfare not maximised if we rely on 'the market' to solve the problem: too high emissions
- How can we correct for this externality?

Instrument choice

- Possible:
 - Market based instruments:
 - Bargaining
 - Tax/subsidy
 - Tradable permits
 - Other instruments:
 - Technology control (e.g. BATNEEC)
 - Damage control, prohibition
 - Liability

Instrument choice

- Which instrument is best?? Possible criteria:
 - Ecological accuracy
 - Static cost-effectiveness
 - Dynamic cost-effectiveness
 - Political acceptability (polluters)

Scientific/Ecological accuracy

- Aim is to achieve some emission target, or stock of GHGs in the atmosphere
- Instrument must make sure that we achieve this target!!
- Or perhaps there is a trade-off...?

Static cost-effectiveness

- Instrument is cost-effective if real resource cost of obtaining policy target is no greater than that of any other instrument
- Example: pollution abatement in production:
Necessary condition for abatement at least cost is that marginal abatement cost be equalized over all firms with positive emissions
- Why? -> Intuition!
- Formal derivation:
- Firm i 's abatement cost: $c_i(e_i)$, Government's target: $\sum_i e_i \leq E$, $i=1, \dots, N$

$$\min \sum_{i=1}^{N-1} c_i(e_i) + c_N \left(E - \sum_{i=1}^{N-1} e_i \right) \quad \text{for all } i=1, \dots, N-1$$

- $c_i'(e_i) = c_N'(e_N) = c_j'(e_j)$ for all $i, j=1, \dots, N$
thus marginal costs same for all firms
- Market-based instruments (Pigouvian tax, tradable permits) are cost-effective instruments

Dynamic cost-effectiveness

- Important way to reduce emissions: new technologies
- How do policy instruments affect incentives to develop new technologies?
- Minimize costs to achieve a target over some time-horizon: dynamic efficiency

Political acceptability

- All policy goes via political systems
- Politicians sensitive for lobbying
 - “Climate policy is costly!!”
 - “If costs are high, industry will loose jobs!!”
- Policy (target + instrument chosen) must be acceptable for polluters