

Lecture 5: Economic instruments (2): Lessons Equilibria, entry and exit impacts

- Purpose/objective
 - ▶ various instruments have different impacts on entry/exit decisions → economic equilibria
 - ▶ linkages to the RAM participation constraint
 - ▶ implications for choice of policy instruments

Eirik Romstad

School of Economics and Business
Norwegian University of Life Sciences
<http://www.nmbu.no/hh/>



Outline

- TP lessons
- The economic equilibrium concept
 - ▶ stability/predictability
 - ▶ economic optima (+ bit of behavioral economics)
 - ▶ the participation constraint
- Economic equilibria and the environment
 - ▶ stability in environmental policy
 - ▶ "pollution heaven" hypothesis
- Implications for choice of policy instruments
 - ▶ bads :: instruments that give exit (or at least do not encourage extra entry)
 - ▶ goods :: instruments that give entry (or at least do not promote exit)

Understanding $MAC(z)$ | $MC(q)$

- $MAC(z)$ [or $MC(q)$] :: least cost way of reducing emissions
 - ▶ reduce output (production of the market good)
 - ▶ change input use (to inputs with less of the polluting compounds)
 - ▶ = opportunity cost approach
- Efficiency aspects :: opportunity cost conducive for private MACs = social MACs (if other externalities are reflected in prices)
 - ▶ second best: correcting one externality
⇒ welfare loss if other externalities unaccounted for

Tradable permits - positives

- Emissions limited to the cap limit in national and sub-national (regional) programs
 - ▶ when monitoring and enforcement systems (lecture 8) in place
 - ▶ ... but leakages have occurred (and these may be desirable or undesirable)
- Significant (social) cost savings to other non-tax regulatory approaches
 - ▶ savings 15-90% of inflexible programs (non-tradable permits, technological requirements)
 - ▶ ... but less to flexible programs and similar to emission taxes (as expected \Leftarrow equivalence)

Tradable permits - negatives (1)

- Env. effectiveness and cost-effectiveness can be significantly compromised by interactions with other regulations
 - ▶ jurisdiction :: undesirable leakages
 - ▶ "green standards" :: permit price \downarrow \Rightarrow TP incentives for abatement/innovation weakened
 - ▶ market regulations (price controls in product markets)
- Permit price volatility
 - ▶ wants prices to fluctuate (info. content of prices)
 - ▶ ... but "excessive" price volatility above what is reasonable :: a case for price controls? NO

... tradable permits - negatives (2)

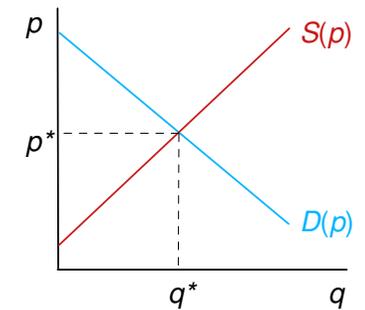
- Interactions with the financial system
 - ▶ grandfathering of permits \Rightarrow less revenues (compared to an emission tax)
 - ➔ counter measure: limit the degree of grand-fathering :: double-dividend (lecture 21)
- TP does not solve all problems
 - ▶ other market failures than emissions externalities (second-best arguments again) + Tinbergen 1 instrument per objective
 - ➔ ex.: TP creates innovation incentives, but does not capture spill-over effects

Economic equilibria (1)

- Intuition: an economic equilibrium occurs when no agent has any incentives to move from the current situation given the economic environment and his/her endowment (budget constraint, resources)
- Note: an economic equilibrium in a *myopic sense* does not mean that economic agents do not work to ease their budget constraint and change the economic environment, only that given the current situation, they seek to do the best possible

... economic equilibria (2)

- Equilibria come in many forms ranging from market equilibria for single goods to general equilibrium (where all prices are endogenous)
- Focus (for now) on the intuitive understanding (general equilibrium will be taught later)



p^* is the equilibrium price that makes supply and demand balance
:: $\{p^*, q^*\}$ market eq.

... economic equilibria (3)

- Rational expectations equilibria - producer side
 - ▶ adjusting production capacity is rarely instantaneous
 - ▶ producers with more exact predictions about future prices (and/or future relative prices) more likely to make a profit ⇒ more likely to remain in a competitive market
- Rational expectations equilibria - consumer side
 - ▶ more correct price expectations (includes future wages) make influence our possibilities for future choices

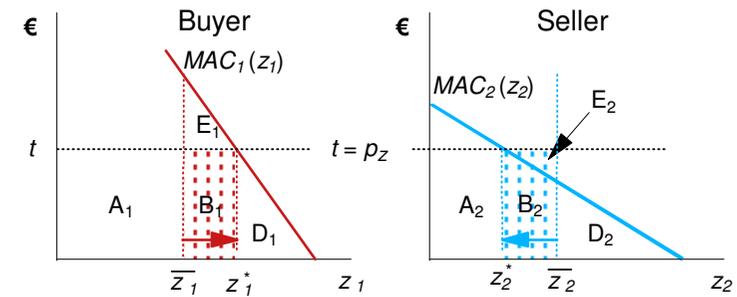
Equilibria and the environment (1)

- Stability in economic (and environmental) policy desirable
 - ▶ easier for agents to predict what happens
⇒ easier to make correct investments for the future (Kydland & Prescott, JPE 1977)
 - ▶ problem: many environmental issues (DDT, PCBs, asbestos, the climate) were non issues in the past
⇒ how to plan in an uncertain (economic) environment where new info becomes available over time
- Make principles upon which policy is based be stable

... eq. and the environment (2)

- Which principles should apply?
 - ▶ environment vs. the economy
 - cfr. emission taxes vs. TP
 - ▶ polluters pay principle???
 - PPP \Leftarrow fairness and distribution, not efficiency
 - ▶ nobody can be held liable for the unknown???
 - but who is responsible for cleaning up and compensating victims???)
- Economic instruments and equilibrium concepts
 - ▶ strong on the economic side
 - ▶ varying performance on the environmental side

Taxes or tradable permits (1)



Costs to society	Taxes	Tradable permits	Fixed permits
Firm 1 (Buyer)	D_1	D_1	$D_1 + B_1 + E_1$
Firm 2 (Seller)	$D_2 + B_2$	$D_2 + B_2$	D_2
Total	$D_1 + D_2 + B_2$	$D_1 + D_2 + B_2$	$D_1 + B_1 + E_1 + D_2$

... taxes or tradable permits (2)

- Emission taxes and tradable permits yield the same outcomes (repeat from lecture 4):
 - optimal emissions per firm (and hence the optimal aggregate emission level)
 - social costs (and hence net benefits)
 - as both satisfy the equi-marginal principle
- Trade and competitiveness:
 - cost savings to firms (cfr. figure on last slide) equals A_1 for buyers and $A_2 + E_2$ (= difference between revenues from selling permits less additional cleaning costs)

Trade impacts (1)

Firms' costs under "grandfathering"

Costs to the firms	Cost type	Tax	Trad. permit	Fixed permit
Firm 1 (buyer)	Cleaning	D_1	D_1	$D_1 + B_1 + E_1$
	Payments	$A_1 + B_1$	B_1	-
Firm 2 (seller)	Cleaning	$D_2 + B_2$	$D_2 + B_2$	D_2
	Payments	A_2	$-(B_2 + E_2)$	-
Total	Cleaning	$D_1 + D_2 + B_2$	$D_1 + D_2 + B_2$	$D_1 + B_1 + E_1 + D_2$
	Payments	$A_1 + B_1 + A_2$	$B_1 - (B_2 + E_2)$	-

... trade impacts (2)

- Early literature (Howe 1990s):
 - ▶ environmental regulations weak
⇒ no significant costs
 - ▶ no support for the "pollution heaven" hypothesis
- Recent literature (Greenstone *et al.* 2012)
 - ▶ 4.8% decline in factor productivity for regulated industries in the US (but US env.policies not strong on cost effectiveness)
 - ▶ ... but is it sufficient to make firms relocate?
 - ▶ = other things (market access, labor) matter more?

Policy implications (1)

- Taxes and subsidies the same at the margin
 - ▶ ... but TP lessons
- Environmental taxes reduce firms' profits
⇒ lead to exit from the industry ⇒ impacts:
 - ▶ adjustment at the margin as desired (= pollution is reduced for each firm/agent in the economy)
 - ▶ fewer firms/agents take part in the pollutive activity ⇒ further reductions in pollution
- Trade issues (split evidence)

... policy implications (2)

- Correcting for a positive externality
 - ▶ want more of the activity e subsidies
⇒ more entry
- A note on taxes and subsidies
 - ▶ a tax is a negative price
 - ▶ an environmental tax is a negative price put on a bad
 - ▶ a subsidy is a positive price (= a payment) put on a good
- Taxes are motivated for two reasons
 - ▶ correct prices (externality :: Pigou)
 - ▶ revenues to the government (but: revenue stability :: a tax that changes behavior will not bring in the same revenues as a tax that does not change behav.)

Summary

- Economic equilibria :: stability in the sense that no agent wants to move out of it given his/her set of constraints (budget, rules, norms)
- Equilibria and the environment
 - ▶ predictability
 - ▶ unresolved issues: dealing with liability / responsibility when knowledge about future environmental impacts are unknown
 - ▶ in env.econ: **TP, taxes/subsidies seek to correct prices and create incentives for agents acting env.responsible**
- Policy implications
 - ▶ goods :: use instruments that promote entry (or at least do not lead to extra exit)
 - ▶ bads :: use instruments that promote exit (or at least do not lead to extra entry)