Lecture 5 - supplment:



Asymmetric information, principal agent models, and RAMS

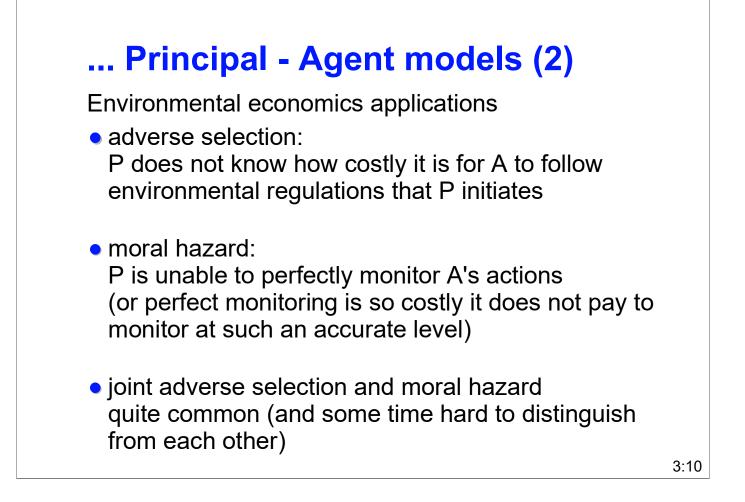
- Objectives
 - overview: principal agent models and asymmetric information
 - introduce resource allocation mechanisms (RAMs)
- Main findings
 - RAM modern version of PA
 - RAM focuses more on the message space

Principal - Agent models (1)

In environmental economics -<u>the principal (P) (the regulator)</u>: has coarser (less accurate) information than <u>the agents (A) (those to be regulated)</u>: who has more accurate information about him-/herself

Two types of P/A models:

- 1. Adverse selection models (hard for P to observe A's characteristics)
- 2. Moral hazard models (hard for P to observe A's actions)



Principal - Agent models (3) Principal: max social welfare choosing policy variables subject to: actions, a_i, of the various types of agents i given the chosen policy variable(s) Symbolically: Principal: max SWF(a_i) {var} s.t.(1): agents max V_i(p,M_i;z_i) ∀ i x I [agents' behavior] {x_i,z_i} s.t.(2): set of policy variable constraints [if quantity instr.] embedded in prices and money income [if taxes]

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RAMs (1)

Any economic system or mechanism is a communication process where messages are exchanged between economic agents.

Necessary features of resource allocation mechanisms (RAMs):

- 1. the participation constraint (individual rationality) is satisfied
- informational viability info. demand not exceeded (does not require P knowledge of A's private info.)
- 3. incentive compatibility is satisfied in A's self interest to act as P prescribes

... RAMs (2)

RAMs being a communication process (between P and A), this goes to the general notion of truth telling

Desirable features of RAMs (part 1):

4. informational efficiency met

- if a mechanism requires more costly information collection than necessary, costs can be saved by collecting information in a less costly fashion
- by the first welfare theorem, someone can be made better off without anyone made worse off, i.e., social welfare can be increased

This is related to desirable criterion 5

... RAMs (3)

Desirable features of RAMs (part 2):

- 5. social welfare is maximized = Pareto optimality (alternatively, social costs are minimized) is important as it measures the RAM's performance
 - but incentive compatibility and PO may not be jointly feasible
 - alternative: Second Best Pareto Optimality
- 6. the budget constraint of P is not exceeded the RAM is not so costly to P that P spends all of his/her allocated resources on pursuing the policy
 - if the budget constraint "bites" it implies that welfare is reduced -- what is most important?

... RAMs (4)

- moral hazard in PA resolved by incentive compatibility in RAMs
- adverse selection in PA resolved (partly) by the participation constraint in RAMs
- RAM insight: in practical environmental policy both incentive compatibility and the participation constraint need to be met for the RAM to yield a predictable outcome
- incentive compatibility is more important than PO (if not incentive compatible, what allocation will actually take place?)

• budget balancing of minor relevance in theory

but important in practice (f.ex. developing countries)

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... RAMs (5)

Same principle as for principal agent models (see P/A models (3)), but with the additional constraints Symbolically: Principal: max SWF(a_i) {var} s.t.(1): agents max $V_i(\mathbf{p}, M_i; z_i) \forall i \in I$ [agents' behavior] $\{\mathbf{x}_i, \mathbf{z}_i\}$ s.t.(2): set of policy constraints (or new price vector, \mathbf{p} , if policy is a price constraint [incentive comp. contr] s.t.(3): $V_i(\mathbf{p}, M_i; z_i) \geq V_{io}$ [part.constraint]

Example: tradable emission permits

- Necessary criteria (= predictable outcome)
- incentive compatibility OK
 - firms with $MAC(z') < MAC(z^*) = p^* \Rightarrow$ sell permits
 - firms with $MAC(z') > MAC(z^*) = p^* \Rightarrow$ buy permits
- participation constraint OK
 - from above (it pays to engage in trades given that MAC(z') ≠ MAC(z*))

informational viability OK

 does not require regulator access to agents' private information (= their MACs)

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