

SHOULD THE MODEL FOR RISK-INFORMED REGULATION BE GAME THEORY RATHER THAN DECISION THEORY?

**Decision theory deals with optimal decisions
when playing against “nature” or “chance”**

**Game theory deals with optimal decisions
against an intelligent and adaptable adversary**

A GAME-THEORETIC APPROACH

In a repeated game, “the firm may have an incentive to comply with regulation even though its cost of compliance...exceeds the expected penalty for violation” (Harrington, 1988)

Scholz (1984) states that a cooperative equilibrium exists if:

Agencies “use cooperating enforcement against any cooperating firms and a deterrence strategy against firms that have...shown themselves unwilling to cooperate”

Firms are “concerned enough about future enforcement encounters to forgo short-term gains from evasion”

“The firm can substitute lower cost methods of goal attainment for what is technically required”

EMPIRICAL OBSERVATIONS

Regulators frequently establish cooperative relationships with the parties they regulate (Downing, 1983):

“Sources are given repeated opportunities to comply without penalty for failure”

“Compliance is delayed, often several years”

“Economic penalties are almost never imposed”

A THEORETICAL BASIS FOR RISK-INFORMED REGULATION

“Loosening of the standard” for firms that have been cooperative in the past can be optimal (Harford, 1991)

“Existing environmental regulations frequently require firms to ‘self-report’ their compliance status” (Malik, 1993):

Self-reporting is likely to be advantageous when regulators cannot easily or accurately monitor compliance

PRELIMINARY RESULTS

Even in a one-time problem, it can be optimal for regulators to offer loosened standards to regulated parties that voluntarily disclose risks that exceed the original standard

The regulator's optimal policy depends heavily on the probability p of successfully detecting a violation that is *not* disclosed voluntarily

If high values of p can be obtained at modest cost, then there is little benefit to providing incentives for voluntary disclosure

If the detection probability is low, then large incentives will be needed to encourage disclosure

PRELIMINARY RESULTS

Optimal policy depends on how steep the regulated party's compliance cost curve is

i.e., $c'(x)/c(x)$ increasing in magnitude of risk reduction x

If compliance cost grows rapidly as a function of risk (e.g., steeper than exponential), then smaller incentives may be adequate for parties with higher risk levels

Larger violations are much more costly to regulated parties, so they are willing to disclose violations even for relatively modest incentives

QUESTIONS

Can carefully designed incentives allow regulators greater confidence in risk analyses performed by regulated parties?

Under what circumstances can rewards for disclosure of risk information help to achieve more effective risk reduction?