# Undergraduate Program in Central European Studies

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# Environmental Policy in the Central European Context

Time: Tuesday 5:30 pm
Location: Coffee Heaven, Můstek

**Professor: Jana Krajcova (JK), email: jana.krajcova@cerge-ei.cz**
**Guest Professor: Andreas Ortmann (AO), email: aortmann@yahoo.com**
**See also: http://home.cerge-ei.cz/richmanova/TeachingUPCES.html**
**(and http://home.cerge-ei.cz/ortmann/UpcesCourse/UpcesCourse.html for Spring 2009 course)**

## Lecture 6 - Non-interventionist solutions to the Externality problem – Self-regulation

### Readings for Lecture 6:

#### Required readings

Potoski, Prakash, Green Clubs and Voluntary Governance: ISO 14001 and Firms' Regulatory Compliance **(P&P AJPS)**

Potoski, Prakash, Covenants with Weak Swords: 14001 and Facilities' Environmental Performance **(P&P JPAM)**

Evans, Gilpatric, McKee, Vossler, Managerial Incentives for Compliance with environmental information disclosure programs (Cherry, Chapter 13)

#### Optional readings

Prakash, Potoski, Racing to the Bottom? Trade, Environmental Governance, and ISO 14001

Clark, Friesen, Muller, The Good, The Bad, And The Regulator: An Experimental Test of Two Conditional Audit Schemes

**VOLUNTARY ENVIRONMENTAL PORGRAMS**
(based mainly on the two Potoski and Prakash articles)

**Regulation**

- governmental authority permits, prescribes or prohibits private actor's behavior
- **Command and control** approach = a traditional style of regulation, prescribing legally binding performance standards (emission limits, or use of specific production technologies)
- government regulators then **monitor** firms' compliance with standards and **sanction** those found not complying
- **command and control** (as e.g. US Clean Air Act, see below) technology forcing regulation may bring about **high compliance costs** which, as some firms may complain, hurts productivity and profits; **resource** and **enforcement intensive**
    - → even though it *"may be more effective than no regulation* [the evidence suggests that it has been successful in reducing pollution]*, its high costs* [compliance, monitoring and enforcement costs] *suggest there might be other tools such as voluntary programs that can supplement command and control" [P&P AJPS]*

**Voluntary programs**

- tools for governments and nongovernmental actors to improve the environmental and regulatory performance of firms
- sponsored by governments, business groups and nongovernmental organizations (NGOs)
- theoretically, can be conceptualized as "**club goods**": clubs set standards of conduct targeted to produce public benefits by changing members' behavior.
- members incur specific private cost to produce public goods and in exchange receive excludable (to nonmembers) and nonrivalrous (club) benefits (affiliation with club's positive brand name, credit for pro-environmental activities)
- club sponsors develop, monitor and enforce the membership standards
- adopting the standards generally imposes nontrivial costs on members (so it is generally not a payment to the club but rather a cost of adopting and adhering to clubs requirements)
- cost of joining the club and adhering to its standards are offset by the tangible and/or intangible benefits from club's positive brand reputation
- successful clubs induce members to voluntarily undertake progressive environmental action beyond what would they have taken unilaterally
- member benefits: positive brand identity/organizational reputations → monetary rewards (demand for environmentally friendly products) or nonmonetary rewards (avoiding negative publicity from protesting environmental group)
- P&P investigate ISO 14001 in light of the club theory (central question is whether joining ISO 14001 reduces the amount of time member facilities spend out of compliance with government regulations…but more on that later…)

An interesting question is: **How can that "brand-name" be maintained?** (i.e., how can it be made sure that the brand-name is not being exploited?

This is a question of institutional design … i.e. the way it is assured "that members comply with program obligations, particularly if they contain three central components: third-party monitoring, public disclosure of audit information, and sanctioning by program sponsors. … Table 1 summarizes the different monitoring and enforcement programs." (P&P JPAM, p.748)



**Table 1.** Voluntary programs and firms' environmental performance.

| | Program Features | | | |
|---|---|---|---|---|
| Program Type | Monitoring | Public Disclosure | Sanctioning | Effect on Participants' Environmental Performance |
| No swords Responsible care | No | No | No | No improvement (King & Lenox, 2000) |
| Weak swords ISO 14001 | Yes | No | No | Improved performance as reported in this paper |
| Medium swords 33/50, EMAS | Yes | Yes | No | Improved performance for 33/50 (Khanna & Damon, 1999). Likely improved performance for other programs |
| Strong swords Performance track | Yes | Yes | Yes | No empirical study yet, improved performance is very likely |

**Examples:**

**Strong sword:** the EPA's Performance Track (JPAM 748)

> *"In addition to third-party audits of its EMS, the EPA requires "each [Performance Track] member facility completes an **Annual Performance Report** in which it demonstrates **to EPA and the public** its environmental accomplishments over the year, its continued high level of environmental performance, and its maintenance of the Performance Track membership criteria" (Environmental Protection Agency, 2004). Program **membership has to be renewed every three years** and members **not adhering to program obligations are under a credible threat of not getting readmitted** to the program."*

**Medium sword:** the EPA's 33/50 program and the European Union's Environmental Management and Audit System (EMAS) … (JPAM 748 – 9)

> *"Although they do not provide for sanctioning by the sponsoring organization, they are likely to curb shirking because, with public disclosure of audit information, external audiences and the firm's takeholders can punish the shirkers for failing to live up to their commitments as program members. The EPA's 33/50 program and the European Union's Environmental Management and Audit System (EMAS) are examples of "medium sword" programs. In both these programs, firms are subjected* ***to third-party audits*** *and the information on their environmental performance is available to the* ***public.*** *Because it is* ***not clear how the sponsoring organization sanctions shirkers****, we place them in the medium sword category."*

**Weak sword:** ISO 14001 (JPAM 749)

> "The ISO, the sponsoring organization, is **not known to aggressively sanction the shirkers.** Importantly, the **absence of public disclosure** of audit information weakens stakeholders' ability to sanction shirking. The key question is: Can a 'weak sword' program that provides only for third-party audits create incentives for participating firms to improve their environmental performance?"

[See the answer in Table 1 seems affirmative which prompts the interesting question, how can that be? What are the mechanisms that seem to make people to engage in compliance when non-compliance seems costless?]

The goods we are dealing with are here called "post-experience goods" with "Potemkin attributes" – consumers (stakeholders) experience the consequences of the goods belatedly [not at the time when they consume them] and they want assurance that the production process that firms have adopted is not (environmentally) problematic. But consumers (stakeholders) cannot find out by themselves …

**Wikipedia: Post-experience goods**, also called credence goods, are goods for which it is difficult for consumers to ascertain the quality even *after* they have consumed them, such as vitamin supplements. Potential consumers of these goods may require third-party information, provided by private rating agencies or government bodies.

So what audit and certification schemes are there?

**First-party** – self-certification
**Second-party** – certification from other unit within company
**Third party** – certification by an external auditor but paid for by the company
**Fourth party** – certification by an external auditor but not paid for by the company

"First-party is the least credible, while fourth party the most credible. In reality, very few voluntary programs have fourth-party oversight; third-party is considered the 'best practice." (JPAM 750)

Given that a third-party weak sword seems to have no external consequences, why would it be effective?

- the outside observer changes performance of team members (who might not want to look bad to other internal members of the organization)
- the outside observer might induce a "Hawthorne effect"

## From Wikipedia, the free encyclopedia

The **Hawthorne effect** is a form of reactivity, The term was coined in 1955 by Henry A. Landsberger[1] when analyzing older experiments from 1924-1932 at the Hawthorne Works (outside Chicago). Landsberger defined the *Hawthorne effect* as:

- a short-term improvement caused by observing worker performance.

Earlier researchers had concluded the short-term improvement was caused by teamwork when workers saw themselves as part of a study group or team. Others have broadened the definition to mean that people's behavior and performance change following any new or increased attention. Hence, the term *Hawthorne effect* no longer has a specific definition.

- it seems important that the outside observer is a third party that itself receives accreditation (JPAM 752)

**What is ISO 14001? [See JPAM 751 – 753; AJPS 237 – 239]**

### ISO – International Organization for Standardization

## About ISO (http://www.iso.org/iso/home.htm)

ISO (International Organization for Standardization) is the world's **largest developer** and publisher of **International Standards**. Between 1947 and the present day, ISO has published more than 17500 International Standards, ranging from standards for activities such as agriculture and construction, through mechanical engineering, to medical devices, to the newest information technology developments.

ISO is a **network** of the national standards institutes of **162 countries**, one member per country, with a Central Secretariat in Geneva, Switzerland, that coordinates the system.

ISO is a **non-governmental organization** that forms a bridge between the public and private sectors. On the one hand, many of its member institutes are part of the governmental structure of their countries, or are mandated by their government. On the other hand, other members have their roots uniquely in the private sector, having been set up by national partnerships of industry associations.

Therefore, ISO enables a **consensus** to be reached on solutions that meet both the requirements of business and **the broader needs of society**.

**ISO standards** are developed by technical committees, (subcommittees or project committees) comprising experts from the industrial, technical and business sectors which have asked for the standards, and which subsequently put them to use. These experts may be joined by representatives of government agencies, testing laboratories, consumer associations, non-governmental organizations and academic circles. Because ISO standards are **voluntary agreements**, they need to be based on a solid consensus of international expert opinion.

Consensus, which requires the resolution of substantial objections, is an essential procedural principle.

**Products:**

- ISO 9000 voluntary code for quality management
- ISO 14000 series for environmental standards
- many other areas… agriculture and construction, mechanical engineering, medical devices, IT…

**So again, What is ISO 14001?**

- a program launched in 1996 by the International [non-profit?] Organization for Standardization, an international body of national standards institutions
- "is perhaps the largest and most widely recognized voluntary environmental program in the world" (P&P); with over 36 000 registered facilities as of 2001
- about 50,000 certified facilities in about 120 countries (AJPS 238)
- original program that established its brand was called ISO 9000 (aimed at quality control)
- ISO 14001 program is part of the 14000 series and aimed at environmental concerns
    - 14001 guidelines standard must be adopted
    - 14020 and 14021 non-mandatory guidelines governing environmental labeling
    - 14030 non-mandatory guidelines governing environmental performance evaluations
    - 14040-43 and 14048-49 non-mandatory guidelines governing life-cycle assessment
- ISO 14001 program requires firms to
    - undertake initial comprehensive review of environmental practices and systems
    - formulate an action plan for environmental management
    - assign internal responsibilities for environmental issues, say who is in charge in case of problems
    - have a plan to correct environmental problems
- ISO 14001 program recommends strongly third-party audits and certification (by qualified certifiers)

## Appendix 1

### A Check List for Implementing ISO 14001 Management Systems

*Policy*
- Does the company have a documented environmental policy?
- Has the policy been approved by the top management? Is there a designated top manager in-charge of overseeing its implementation?
- Is the success in meeting policy objectives periodically reviewed?
- Does the policy require employees to adopt best available technology and commit to continual improvement?
- Does the policy meet or exceed legal requirements?

*Environmental Impact*
- Has the company assessed the environmental impact of its operations and products in terms of their likelihood and severity?
- Does the location of any facility require specific environmental consideration?
- Has the facility assessed the environmental impact if the production processes were to malfunction?

*Environmental Objectives*
- Have specific and measurable environmental targets been established?
- Is there a system for documenting relevant EMS and the targets they intend to achieve?
- Is progress towards various targets periodically tracked? Is there a system to take corrective action in the event targets are not being met?
- Is there a process to assess resources required to meet these targets?
- Does the facility identify specific personnel at various levels and make them responsible for achieving environmental targets?
- Do they have adequate resources to fulfill their responsibilities?
- Are employees directly and indirectly involved in the EMS implementation?

*Environmental Plan*
- Does the environmental planning involve stakeholders within and outside the firm?
- Is the plan periodically reviewed?
- Are there identified personnel who maintain the list of all applicable laws and regulations that pertain to facility operations?
- Is there a system of tracking compliance with these laws?

*Organizational Alignment*
- Is the EMS integrated with the organization's strategic plan and business plan?
- Is there a process to resolve conflicts between environmental and non-environmental objective?
- Does the top management regularly communicate to organizational personnel about environmental issues?
- Does the organization recognize and reward contribution to establishing and implementing EMS?

*Source:* Sayre (1996).

**P&P AJPS (Green clubs and Voluntary Governance…)**

- central question is whether joining ISO 14001 reduces the amount of time member facilities spend out of compliance with government regulations
- interviews with managers of ISO 14001 certified facilities and with US environmental regulators → show that ISO 14001 **requires members to adopt extensive (and costly) environmental management systems** (EMS), for which they enjoy a **strong positive brand reputation**
- **COSTS:** The monetary and nonmonetary **costs** of establishing EMS, having it certified and maintaining it, are **nontrivial**. In monetary terms, the initial cost of establishing an EMS and having it audited by a third party can range from $25,000 to over $100,000 per facility (Kolk 2000) (a moderate sized firm has about 10 facilities). The ongoing costs of

maintaining ISO 14001 certification are also important, including the time, money, and expertise for day-to-day operations and preparing for future annual recertification audits.

- **BENEFITS:** primary excludable benefit is **brand identity**; members can use ISO 14001 as an important external relations tool (thanks to its size); effective EMS can help to identify and correct regulatory problems before they become violations
- **PROBLEMS/OBJECTIONS** [discuss]**:**
    - ISO 14001 is sponsored by a nonprofit, nongovernmental organization and was developed with heavy input from multinational corporations. Environmental groups are suspicious of self-regulation, particularly in light of recent scandals in the accounting industry.
    - ISO 14001 has loose boundary conditions: all firms are eligible for ISO 14001 membership, even those with poor compliance records, so long as they are willing to take on the costs of establishing and maintaining a certifiable EMS. Contrast this with some state and federal government voluntary programs (the so-called performance track programs) that are limited only to firms with established records of superior performance.
    - Because membership does not require investment in assets specific to ISO 14001, firms may have incentives to behave opportunistically by joining ISO 14001 without following its mandate (Williamson 1985).
    - ISO 14001 does seem to not have mechanisms for sanctioning members who fail comply with club standards, although it does require annual recertification audits.
    - ISO 14001 does not require members to demonstrate improvements in regulatory compliance to maintain membership. It only seeks their commitment to do so and views the establishment and maintenance of an EMS as evidence of such commitment.
    - the evidence on environmental performance of green clubs in the literature is, in general, mixed [see P&P AJPS, p 239]
- quasi-experimental empirical analysis of almost 3700 firms regulated under the US Clean Air Act, a sample of (ISO 14001) certified and noncertified firms and their compliance records

> **Clean Air Act** (see http://www.epa.gov/air/caa/)
> The Clean Air Act is the law that defines EPA's (Environmental Protection Agency) responsibilities for protecting and improving the nation's air quality and the stratospheric ozone layer. The last major change in the law, the Clean Air Act Amendments of 1990, was enacted by Congress in 1990. Legislation passed since then has made several minor changes.

- Controlling for non-random assignment between certification and non-certifications (some of the observed and unobserved factors that influence joining ISO 14001 are also likely to influence regulatory performance)

**MOTIVIATIONS FOR JOINING ISO 14001**

- frequent government inspections
- enforcement actions against facility/penalties
- facility's size
- pollution emissions
- local context (education)
- compliance history

- nature of government mandatory regulations (regulatory relief programs/immunity protection for info uncovered in self-audits)

**FACTORS INFLUENCING REGULATORY COMPLIANCE**

- frequent government inspections
- estimated probability of joining ISO 14001
- nature of government regulations (state audit protection, state EMS program/non-EMS program, enforcement flexibility/how many penalized)

- The results imply that as a group **ISO 14001 certified facilities have better compliance records** than if they had not joined the program. Importantly, this result persists even while controlling for facilities' compliance histories as well as addressing potential endogeneity issues between facilities' regulatory performance and their decision to join ISO 14001
    - certified spend about 11.4% out of compliance, whereas non-certified about 12.5%
    - moreover, ISO 14001 produces a greater reduction in noncompliance for those which spent more time in the past out of compliance
- As to **probability of joining ISO 14001**
    - **only about 4% of the facilities in the sample joined ISO 14001**
    - the relation between time out-of-compliance and ISO registration follows an inverted U-shaped curve => facilities always in or always out of complianance are least likely to join ISO 14001
    - low emission facilities are least likely to join, moderate and high emission facilities are roughly equally more likely
    - number of inspections increases the probability of joining
    - facilities in more educated neighborhoods are more likely to join (perhaps they care more for environment and are more likely to recognize and interpret positive brand reputation)
    - in states with more stringent regulations more likely to join (perhaps adopting EMS helps to meet higher regulatory standards)
    - most other government programs, laws and regulations appear to have little influence
    - larger facilities are more likely to join
- no data on membership in other voluntary programs, which might also affected the result
- do not claim that voluntary programs can replace mandatory regulations, or that voluntary programs would be still effective with weaker mandatory regulations, rather could say that effective voluntary regulation may complement command and control

**P&P JPAM (Covenants with Weak Swords…)**

- extension of the analysis from the earlier paper
- an empirical analysis of the effect of ISO 14001 certification on firms' environmental performance using a sample of over 3,000 facilities regulated as "major sources" under the U.S. Clean Air Act.

- improving on existing studies of ISO 14001 efficacy by expanding the sample size and by controlling for potential endogeneity problems between facilities' decision to join ISO 14001 and their environmental performance.
- "Our analysis suggests that ISO 14001-certified facilities have better environmental performance — they reduced their pollution emissions faster—compared to non-participants. Our analysis suggests that even a relatively "weak sword" program such as ISO 14001, whose enforcement mechanism is based on third-party audits without public disclosure of audit information, can mitigate shirking in voluntary programs."

"Our central concern is to examine whether joining ISO 14001 improves facilities' environmental performance (reduces pollution emissions). Thus:

*$H_o$ (Null Hypothesis): Facilities with and without ISO 14001 certificates will demonstrate comparable levels of improvements in environmental performance.*

*$H_a$ (Alternative Hypothesis): Facilities with ISO 14001 certificates will demonstrate superior environmental performance to non-participants."*

"To test our central hypothesis, we compare the environmental performance of ISO 14001-certified and non-certified facilities, controlling for non-random assignment between certification and non-certification along with other intervening factors. Our focus is on facilities regulated under U.S. state and federal air pollution regulations. Facilities in our sample meet air pollution emissions thresholds in order to be tracked by the EPA's Toxics Release Inventory (TRI) program and are classified as "major sources" under federal clean air laws. Information on facilities' regulatory compliance comes from the Aerometric Information Retrieval System (AIRS) subsystem of the EPA's Integrated Data for Enforcement Analysis (IDEA) system. Emissions data are from the TRI database. Other measures are drawn from Dun and Bradstreet's Million Dollar Directory and other sources as discussed below. Our sample contains 3,709 facilities, 151 (4%) of which were ISO 14001-certified as of December 2001. Almost 90% of the facilities list a manufacturing code as their primary Standard Industrial Classification (SIC) code, with about 18% in chemical manufacturing (SIC 28)."

For definition of (the four) dependent and the many independent variables, see the text …

Essentially they weigh the emissions data with two measures of toxicity (following two precedents, see p. 754 top paragraph), and they do it for emissions reductions directly (the two columns to the right in Tables 2 and 3) and also for logged emissions reductions) the two columns to the left in Tables 2 and 3). The authors use four dependent variables to show the robustness of their results (ideally, they would like to get the same results for all of their four dependent variables … )

They also use all kinds of explanatory variables …(similar as in the first paper, see above)

- **facility and industry characteristics**
  - facility size
  - dummy (company headquarters = 0) for single site or branch
  - emissions at t (initial level is obviously important)
  - emissions squared (to control whether the decision to join ISO 14001 varies across emission levels)
  - dummies for two-digit SIC code
- **compliance history**

    - inspections at t
    - enforcement actions at t
    - rate of regulatory compliance
    - rate of regulatory compliance squared (to control whether the decision to join ISO 14001 varies across levels of compliance)
- **regulatory and social context**
    - state audit protection (will you be punished if you rat on yourself?)
    - state litigiousness (ratio of environmental court cases to TRI [toxic release inventory] facilities in each state)
    - dummy hazardous air regulations (1 if tougher than EPA min criteria)
    - presence of environmental groups
    - residents' education
    - minorities
    - percentage of population making more than $75,000

The authors face two important problems …(similar as in the first paper)

- the number of certified sites in their sample is about 4 percent only (that means a matching procedure – where you match similar companies of one kind with similar companies of the other kind – is not possible)
- in addition, facilities' decisions about whether to participate in ISO 14001 are likely to be endogenous to their environmental performance … that is, "some of the observed and unobserved factors that influence joining ISO 14001 are also likely to influence the amount of pollution facilities emit … " (p. 756)

… fortunately, econometricians have found ways to get a handle on those issues … (well, at least to some extent)

One consequence is that Tables 2 and 3 both show two kinds of analyses for the four dependent variables

- at the top is always the "treatment effects" (or, outcome) analysis (which is what we are ultimately interested in) – for this they use essentially OLS regressions
- at the bottom there is always the "selection equation" for joining ISO 14001 – for this they use a probit model

Some key results … (drawing on pp. 759 – 763 and in particular Table 2)

- selection equation model (estimating probability of joining)
    - compliance coefficients jointly significant
        - compl positive
        - compl squared negative
        - interpretation: you are least likely to join if you are always in, or always out, of compliance; for those out of compliance about half of the year, predicted probability of joining ISO 14001 doubles (?)
    - emissions coefficients jointly significant
        - emissions positive
        - emissions squared negative
        - interpretation: low-pollution facilities least likely to join, moderate and high-polluting facilities more likely (with about the same probability)
    - inspections significant
        - a two-standard deviation increase in the number of inspections doubles predicted probability of joining ISO 14001

  - regulatory enforcement actions
    - seems to crowd out willingness to join …
    - "For the most part, government policies do not have strong effects on which facilities join ISO 14001 … " (p. 762)
  - "Facility and neighborhood characteristics are significant … " (p.762)
- treatment effects (estimating the effect of joining ISO 14001 on facilities environmental performance)
  - coefficient on ISO 14001 significant in 3 out of 4 cases considered
    - "These analyses provide some evidence that, compared to non-certified facilities, ISO 14001-certified facilities experienced significantly *larger* reductions in pollution emissions, controlling for other factors and the endogeneity between facilities' decisions to join ISO 14001 and their
    - environmental performance." (p. 763)
  - not surprising some of the other factors have explanatory power, somewhat in line of the results for the selection model

"While Responsible Care — a covenant without swords — did not improve participants' environmental performance (King & Lenox, 2000), our study finds that ISO 14001, a covenant with a weak sword, improved participants' environmental performance. The discriminating variable in the design of the two programs is third-party audits"

> **Responsible Care®** is the chemical industry's global voluntary initiative under which companies, through their national associations, work together to continuously improve their health, safety and environmental performance, and to communicate with stakeholders about their products and processes. (http://www.responsiblecare.org/page.asp?p=6341&l=1)

**Optional reading:**

*American Journal of Political Science [AJPS]* vol. 50, no. 2, 350 – 364 (2006)

# Racing to the Bottom? Trade, Environmental Governance, and ISO 14001

**Aseem Prakash** University of Washington
**Matthew Potoski** Iowa State University

*Globalization critics argue that international trade spurs a race to the bottom among national environmental standards. ISO 14001 is the most widely adopted voluntary environmental regulation which encourages firms to take environmental action beyond what domestic government regulations require. Drawing on a panel study of 108 countries over seven years, we investigate conditions under which trade linkages can encourage ISO 14001 adoption, thereby countering environmental races to the bottom. We find that trade linkages encourage ISO 14001 adoption if countries' major export markets have adopted this voluntary regulation.*

- an empirical test for Vogel's (1995) "California effect" where trade serves as a vehicle for transmitting importing countries regulatory standards to exporting countries

- their results suggest high levels of adoption of ISO 14001 in the importing countries encourage firms in the exporting countries to adopt this voluntary environmental program (That's a confirmation, with qualification, of the Vogel' conjecture. Hence, fears of a regulatory race to the bottom where developing countries' exporters exploit their allegedly less stringent environmental standards to capture markets in developed countries, seem unwarranted.)

## Evans, Gilpatric, McKee, Vossler, Managerial Incentives for Compliance with environmental information disclosure programs (Cherry, Chapter 13)

Voluntary programs … one the hand …

On the other hand … mandatory information disclosure programs such as The EPA's Toxics Release Inventory (TRI) or Energy Star

Mandatory information disclosure programs require that the firm report information that could be damaging … (e.g., reputationally).

Reporting, while being done on the firm level to EPA etc., is initiated within firms by individuals … clearly, that means there is all kinds of potential for moral and other dilemmas.
This is what this chapter is about …

**Do firms report?**
- Old Government Accountability Office data from 1991 suggest that about one third of firms that should have reported did not
- Intentionally or unintentionally (they did not know) – see Brehm & Hamilton's (1996) analysis of TRI compliance of facilities in Minnesota
    - Facility size may be important factor in compliance (evidence is not quite clear)

- " …**the literature has overlooked the possible role of a firm's internal organizational structure in creating a divergence between manager incentives and the objectives of an information disclosure program**. " (p. 245)

- many (most?) internal reward structures (including promotion ladders) imply that division managers are playing a **rank-order tournament game** (for promotion e.g.; these tournaments are characterized by the evaluation of individual performance relative to the performance of competitors.)
    - division managers are being evaluated **relative to others' perfor**mance
    - **give incentives to move ahead via malfeasance** such as cost savings through unreported toxics releases: "if managers can increase their *apparent* output (such as profits from their division) by increasing emissions or reducing care (and thus increasing the probability of accidental emissions) and if this behavior is **sufficiently costly for the firm to monitor and prevent** such that monitoring is imperfect, then any compensation that rewards managers for higher output will generate both the intended incentive for them to exert greater work effort, but also an incentive to engage in malfeasance." (p. 246) ⇔ trade off
    - give **incentives to undermine information disclosure programs**
- " the most significant line of research in tournament settings involves the exploration of "influence activities"> behavior that arises when workers can influence the choice of

superiors regarding who is promoted through actions that are non-productive (bribery, sabotage,…); such behavior is costly to firm because it dulls worker's incentives to exert productive effort to win the tournament
- **"malfeasance** in the form of **non-compliance with regulatory mandates**, including **failing to disclose information accurately**, imposes directly costs on the firm that may significantly exceed those resulting **from dulled incentives.**" (p. 246)
- "environmental malfeasance of course also entails **important social costs** that do not arise from influence activities within a firm and that are clearly of significant concern to regulators." (p. 246)

An experimental test of malfeasance and compliance based on Gilpatric (2005), one of the authors of this chapter:
- Malfeasance = a behavior that is inconsistent with the firm's objectives
- **x** - the firm's (= owner-manager's) **optimal total emissions level**
- **z** - l**evel of emissions that is optimal to report** (at the firm level) to the environmental authority, z≤ x.
- N divisions, each of which has a designated manager, who also is in charge to report her division's emissions to the owner-manager
- $\hat{x}_i$**- optimal level of emissions from the perspective of the manager** of division i
- $\hat{z}_i$ **-** level of **emissions reported by the manager** of division i, $\hat{z}_i \leq \hat{x}_i$
- The owner-manager reports what has been reported to by the managers of the divisions, $\hat{z}$ (sum)
- $\hat{x}$ -- **actual level of emissions** (the owner-manager may not know this, or may not want to know this)
- Opportunities for non-compliance:
  - may result from false reporting of owner-manager
  - may result from false reporting of division managers
- managers are engaged in malfeasance if
  - emit more than optimal from firm's perspective
  - fail to report their actual emissions

Table 13.1 summarizes … the possible cases:

*Table 13.1* Potential cheating and non-compliance cases

| *Case* | *Relationship between* $x$ *and* $\hat{x}$ | *Relationship between* $\hat{x}$ *and* $\hat{z}$ | *Are managers cheating?* | *Is firm compliant with reporting requirement?* |
|---|---|---|---|---|
| 1 | $\hat{x} > x$ | $\hat{z} = \hat{x}$ | Yes | Yes |
| 2 | $\hat{x} > x$ | $\hat{z} < \hat{x}$ | Yes | No |
| 3 | $\hat{x} = x$ | $\hat{z} < \hat{x}$ | Yes | No |
| 4 | $\hat{x} = x$ | $\hat{z} = \hat{x}$ | No | Yes |

Cases 2 and 3 trivial (and it is second case that the authors study in their experiment)
"Note that even in cases 1 and 4 where the firm is compliant with the reporting requirements, the level of emissions need not equal the socially optimal level." (p. 247)

Hypotheses about managerial behavior are derived from Gilpatric (2005), assumptions:
- Division managers are told to emit no more than $x_i$

- Division managers can improve their output by $\hat{x}_i > x_i$
- Since **audits are costly they are done with probability η**
- Managers **found** to have emitted $\hat{x}_i > x_i$ or to have **misreported**, are **disqualified** from winning the tournament (ha!) and may face **additional sanctions** (e.g., being fined or fired)

"Because managers face the same penalty if found to have cheated regardless of the magnitude of cheating there is no marginal deterrent and the manager's decision reduces to choosing $x_i$ as directed by the firm or cheating by choosing $\hat{x}_i$ **. In this setting malfeasance always consists of both emitting more than is optimal for the firm and failing to truthfully report emissions** (case 2 above)." (p. 248) So, **case 2** is what the authors concentrate on….

With cheating being modeled as increasing output by a constant (scaling up), the model makes some intuitive comparative-static predictions:

- the likelihood of cheating depends on
  - the payoffs of the tournament
  - the variance of output
  - the probability of cheating being detected (something that's being tested in the experiment)
  - number of contestants
  - the penalty for cheating (something that's being tested in the experiment)
- (what does your intuition tell you about the causalities?)

The model making intuitive comparative-static predictions is one thing, people acting accordingly is possibly another … hence an experiment …
… again .., if we find that subjects' behavior gives us some confidence that the model's predictions are reasonable for some parameterizations, then we might test confidence in implementing other parameterizations …

Of course, the standard concern of calibration ("parallelism") comes up again … "
"We establish parallelism through ensuring that the essential features of the field environment are captured in the laboratory." (p. 251)

The experiment implements one specific parameterization:

- three contestants compete in a rank-order tournament
- players choose whether or not to "cheat"
- players choose the "high" or the "low" distribution of outputs (p. 252: "the choice of a draw from the high distribution corresponds with the decision to cheat, for example by emitting more than permitted in order to increase productivity but falsely reporting lower emissions." (p. 252)
- random audits
- outside penalty
- the non-disqualified participant with the highest output wins the tournament and receives the highest payoff (19 lab-dollars, vs 7 dollars or less if they are caught cheating)
  … etc.

Here is the design matrix:

*Table 13.2* Design parameters by treatment

| *Treatment* | *N per contest* | *Audit prob. η* | *Payoffs: (Win, not win, ineligible)* | *Payoff spread (s)* | *Penalty (r)* | *Predicted prob. of cheating (ρ)* |
|---|---|---|---|---|---|---|
| 1 | 3 | 0.10 | (19,7,7) | 12 | 0 | 1.00 |
| 2 | 3 | 0.20 | (19,7,7) | 12 | 0 | 0.76 |
| 3 | 3 | 0.32 | (19,7,7) | 12 | 0 | 0.29 |
| 4 | 3 | 0.20 | (19,7,2) | 12 | 5 | 0.27 |
| 5 | 3 | 0.30 | (19,7,2) | 12 | 5 | 0.00 |
| 6 | 3 | 0.50 | (19,7,7) | 12 | 0 | 0.00 |

Implementation details:

- participants are randomly and anonymously reassigned to tournament groups (so as to get close to the one-shot nature of the theory)
- the instructions use neutral language (e.g., no talk here about environmental compliance, audits, or the like – audits, for example, are represented as computer "checks"; p. 253)
- average earnings $`15 for 30 – 60 minutes

**The results** are summarized here …

- "our results are generally supportive of the theory as it predicts responses to changes in the audit probability" (p. 254)
- but not completely in line with theory as predicted and observed probabilities of cheating are statistically different



*Table 13.3* Observed cheating in experiments

| *Treatment* | *No. of subjects* | *No. of periods* | *Observed prob. of cheating* | *Predicted Prob. of cheating* | *Wilcoxon Test: observed vs. predicted (z-statistic)* |
|---|---|---|---|---|---|
| 1 | 15 | 30 | 0.74 | 1.00 | –3.26 |
| 2 | 18 | 20 | 0.63 | 0.76 | –1.55 |
| 3 | 18 | 20 | 0.42 | 0.29 | 2.16 |
| 4 | 18 | 20 | 0.53 | 0.27 | 2.94 |
| 5 | 12 | 30 | 0.54 | 0.00 | 3.07 |
| 6 | 15 | 30 | 0.46 | 0.00 | 3.41 |

Audit probability goes from 20 % (treatment 2) -> 32 % (treatment 3) => Observed probability of cheating does what? (This effect also confirmed and quantified in the regression results)

"The effect of an outside penalty appears to be less pronounced." (p. 254; see also discussion of regression on p. 255: "Consistent with our non-parametric test results, the presence of the penalty has no statistically significant effect in the law and economics literature where some studies find that increased penalties for criminal offenses (such as the death penalty), have little or no deterrent effect on crime rates.")

- if and idnidvidual was audited in the previous perios , he is more likely to cheat => gambler's fallacy behavior, the presence of which at least partially explains why observed cheating is lower than predicted for low audit probabilities and higher than predicted for high audit probabilities

> **From Wikipedia, the free encyclopedia**
>
> The **gambler's fallacy**, also known as the **Monte Carlo fallacy** or the **fallacy of the maturity of chances**, is the belief that if deviations from expected behavior are observed in repeated independent trials of some random process then these deviations are likely to be evened out by opposite deviations in the future. For example, if a fair coin is tossed repeatedly and tails comes up a larger number of times than is expected, a gambler may incorrectly believe that this means that heads is more likely in future tosses. Such an expectation could be mistakenly referred to as being *due*.

- also, the proportion of wins by disqualification (of the opponent) and proportion of wins by cheating decreases/increases, respectively, the probability of cheating;

**CONCLUSION**

- optimal intensity of regulatory enforcement efforts depends on the magnitude of monitoring and enforcement within firms
- there are systematic links between the organizational structure of the firm and its overall malfeasance and reporting behavior; method of compensation of divisional leaders and the number and size of divisions will affect the level of firm's compliance

⇨ one can improve the efficiency of the audit process through the use of systematic or endogenous audits

- research on tax compliance (e.g. Alm and McKee 1998, 2004) suggests that firms and individuals respond in predictable ways to the elements of audit regimes
- "Even if compliance with the reporting requirement is perfect, the owner-manager could benefit from releases that lower cost of production if the releases are reported to public with sufficient lag (collect profits and exit the firm prior to the release of information) => reporting period should be shortened and audit resources optimized through the use of staggered reporting dates."
- important difference from tax compliance: noncompliance may result in damages that are not easily reversed
- TRI have potential to achieve significant improvements, the extent to which that potential is realized depends on the extent to which the information is accurate and timely…..

**Optional reading**

**Clark, Friesen, Muller -- The Good, The Bad, And The Regulator: An Experimental Test of Two Conditional Audit Schemes**

**Abstract**

Conditional audit rules are designed to achieve regulatory compliance with fewer inspections than required by random auditing. A regulator places individuals into audit pools that differ in probability of audit or severity of fine and specified transition rules between pools. Future pool assignment Is conditional on current audit results. We conduct an experiment to compare two specific schemes –

Harrington's Past-Compliance Targeting and Friesen's Optimal Targeting – against random auditing. We find a production possibility frontier between compliance and minimizing inspections. Optimal targeting generates the lowest inspection rates as predicted, but random auditing the highest compliance. Past – compliance targeting is intermediate.

see Figure 1 (p.73) and Figure 2 (p.74) for the PCT and OT auditing schemes

- transition rules between audit groups can augment the stick for present compliance (avoiding the fines) with the carrot of future placement in preferable audit groups
- by placing fewer restrictions on the optimal design of transition rules the OT claims to require even fewer inspections than PCT
- in theory, both mechanisms should achieve a given level of compliance with fewer inspections than random auditing (even fewer with OT than with PCT), the results however suggest that Random Auditing seems most effective at achieving compliance but at high cost in inspection rates (OT most effective in minimizing inspections but at the cost in the (non-)compliance; PCT achieves almost as much compliance as RA while requiring almost as few inspections as OT