Environmental Economics in the Central European Context

Time: Tuesday 4pm – 7pm
Location: at CERGE-EI, Room # 11

Instructor: Jana Krajcova
Email: krajcova.janka@gmail.com
Reading materials: http://home.cerge-ei.cz/richmanova/Teaching.html

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

One methodological thing:

Possible Difficulties when employing Experimental Methods

based on two articles:

1. Levitt, S., D., List, J., A. (2009), Field experiments in economics: The past, the present, and the future, European Economic Review 53, 1-18
2. Greenstone, Gayer, Quasi-Experimental and Experimental Approaches to Environmental Economics

"The aim of the researcher is to estimate a causal effect of some action (a new government program, change in price,…), i.e. how outcomes differ when the action is taken vs. when it is not."

"The fundamental difficulty that arises is that either the action is taken or it is not—we never directly observe what would have happened in an alternative universe where a different action is taken. Thus, the construction of a control group becomes critical. Although we cannot observe what your outcome would have been had you not been treated, we can, for instance, observe outcomes for other similar individuals who were not treated."

Causal Hypothesis – What's the problem?

Illustrative Examples:

1) observational study analyzing the use of estrogen replacement therapy (ERT) to maintain the menopausal symptoms and their potential dangers such as higher incidence of heart disease, or
2) testing the impact of a new regulation which restricts pollution that can be produced by a company; what is the impact on health

- want to test a treatment effect (like e.g. receiving drug vs. placebo, exposure to high vs. low pollution and what their impact on health is)
- outcome may or may not respond to the treatment (=exposure to drug/high pollution)... this is what we'd like to find out BUT every individual has two potential outcomes and only one can be in fact observed (either exposed to "the treatment" or not)
- to isolate the effect of treatment – all other factors need to be held constant (ideally, we would want to observe the outcome for the same individual in both treatments – with and without drug/ exposed to high and to low pollution – not possible -> **Fundamental problem of Causal Inference)**

- ➔ can observe the health outcome for treated individuals (with drug/high pollution = **TREATMENT GROUP**) and for not-treated (no drug/low pollution = **CONTROL GROUP**) -> and we are looking for average difference in health outcome for **treated vs. untreated**...
- ➔ **PROBLEM** -> **SELECTION BIAS**: our individuals might have some "special characteristics" that affect both, selection to treatment AND the outcome of the treatment (women with healthier lifestyles taking ERT/people with lower income living in more polluted areas) -> the effect of special characteristics can be, in some situations validly assumed zero, in other situations it can be controlled for -> the researchers need to be aware of it to be able to make valid inferences!

  Ideally, if the researcher can select people to treatment vs. control group randomly that would take care of selection bias (that is why RANDOMIZATION is so important for many experiments). The problem arises when the selection for the treatment is not up to the researcher – individuals are exposed (to treatment) by nature, politics, accident … -> NON-RANDOM ASSIGNMENT => possible source of SELECTION BIAS

- ➔ Still can make VALID inferences under the assumption that the selectiom to the treatment is not related to any determinant of the outcome
  - **Example 1:** Observational studies of estrogen replacement therapy (ERT) concluded no direct causality between ERT and heart disease. **Problem:** Maybe women with healthier life style were more likely to participate, take ERT and therefore per se are less likely to have heart problems (reasons to believe that -> self-selection likely is a problem -> special characteristics might affect the results of an observational study) **Solution:** A randomized study -> Concluded that ERT substantially contributes to heart disease
  - **Example 2:** similarly, in the pollution example if the housing prices are significantly lower in the affected area and, therefore, it is colonized by poorer people with less healthy lifestyles, with less resources to spend on healthcare => if this fact is not taken into account the results may overestimate the effect of the treatment (i.e. of exposure to high pollution)
  - **Example 3:** If e.g. the government decides to enroll the unemployed in a special training program and selects randomly (or by some other rule, completely unrelated to their profession, abilities, education… anything that might affect their probability of success on the job market after the training) a half of the currently unemployed to receive the training (only a half for e.g. budgetary reasons, randomly to avoid e.g. accusations of discrimination) – their success after the training (if received) is not correlated with their selection for the group even though the assignment to treatment is not in control of the researcher who will analyze the data

Therefore, in Controlled Experiments (Field and Lab), a researcher typically uses **RANDOMIZATION** to avoid the problem of **SELECTION BIAS** -> **Randomized experiments**

- ➔ A classical experiment where subjects are randomly selected for treatment -> on average, individuals in treatment and in control group have (statistically) the same characteristics except of exposure to the treatment -> it is no longer the women themselves that decide whether to take the ERT or not, now it is under the control of the experimenter (like in the medical trials they accept the patients but part of them, randomly selected, receives the real drug, the rest receives placebo -> the **selection bias** disappears and the comparison of the outcomes in the two groups gives a credible estimate of the average effect of the treatment.

The use of randomized experiments in economics is growing rapidly, even in cases when randomization is not possible, the researcher can (under certain assumptions) deal with the selection bias ex post → an example to follow shortly.

VOLUNTARY ENVIRONMENTAL PORGRAMS

(based mainly on the two Potoski and Prakash articles)

Q: What is the principal question that the authors ask in the two related articles?

What is the main difference between the two articles (methodologically)?

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)
    - **Q: Which are the (obvious and already discussed) difficulties with this approach?**
    - government regulators then **monitor** firms' compliance with standards and **sanction** those found not complying
    - **command and control** (as e.g. US Clean Air Act) technology forcing regulation may bring about **high compliance costs** which, as some firms may complain, hurts productivity and profits; and it is **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

Q: Which voluntary programs do you know? How successful they are?

How these voluntary programs work? What are the membership costs? Benefits?

- 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.
- 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 club's requirements)
- 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)
- cost of joining the club and adhering to its standards is 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
  - → non-monetary rewards (avoiding negative publicity from protesting environmental group, positive reputation)
- the authors investigate ISO 14001 (one of the largest voluntary programs) in light of the club theory
  - → the central question of the article is whether joining ISO 14001 reduces the amount of time member facilities spend out of compliance with government regulations

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?)

Q: Which are the key features of a program to ensure members' compliance?

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

Examples:

…Table 1 summarizes the different monitoring and enforcement programs." (P&P JPAM, p.748)

…there are several examples already implemented – the question is, how efficient they have been… theoretically? Practically? What does the data show?

Q: Look at the table below which lists several real-world voluntary program. What does it say about the potential of individual programs to make a successful contribution to environmental protection?

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

1. **Strong sword:**
   - theoretically the most efficient one
   - practical example the **EPA's Performance Track** (JPAM 748)
   - despite having all the attributes for this being a successful program, it was terminated in 2009, as regulators were not really happy about the results... clearly, implementation matters as well…

*"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."*

Performance Track was terminated by EPA on May 14, 2009. At the time of termination, the program had a membership base of 547 facilities in 49 states and Puerto Rico.

http://www.epa.gov/performancetrack/

March 16, 2009

Obama May Kill EPA Performance Track, 'Green Club'

Within a week, President Obama is expected to terminate the Environmental Protection Agency's Performance Track program.

The Bush-era program allows companies who implement voluntary pollution controls to benefit from reduced environmental inspections and less stringent regulation. Companies complying with the program were in the so-called "Green Club."

Senior EPA officials signaled over the weekend that EPA Administrator Lisa Jackson would sign a memo terminating the order, perhaps as early as this week.

"**Smoke and Mirrors**," an investigative series from the Philadelphia Inquirer may have played a role in EPA's decision to reconsider Performance Track, a senior EPA official **told** the Inquirer.

The EPA official, who was involved in the decision to kill the program, told the Inquirer that voluntary programs like Performance Track can work, but that "this one wasn't doing what it was created to do."

Performance Track membership was nearly 550 companies during the Bush years, with a $4.7 million budget.

Last **September**, John Deere and Intel were among 40 new members of Performance Track.

Last **May**, EPA said that Performance Track members had achieved the following goals:

- Reduced greenhouse gas emissions by 309,780 metric tons;
- Increased the use of recycled materials for production processes by 559,991 tons; and
- Reduced water consumption by 5.2 billion gallons.

RELATED STORIES

EPA Performance Track Members Not Meeting Commitments

Corning Joins Performance Track, Coke & Baxter Add Facilities

Performance Track Members Reduce GHG Emissions Nearly 310,000 Tons

Club Owners: Partying Can Be Green Too

Motorsport Facility Installs Grey-Water Geothermal System

RELATED TOPICS

Efficiency

Emissions

Facilities

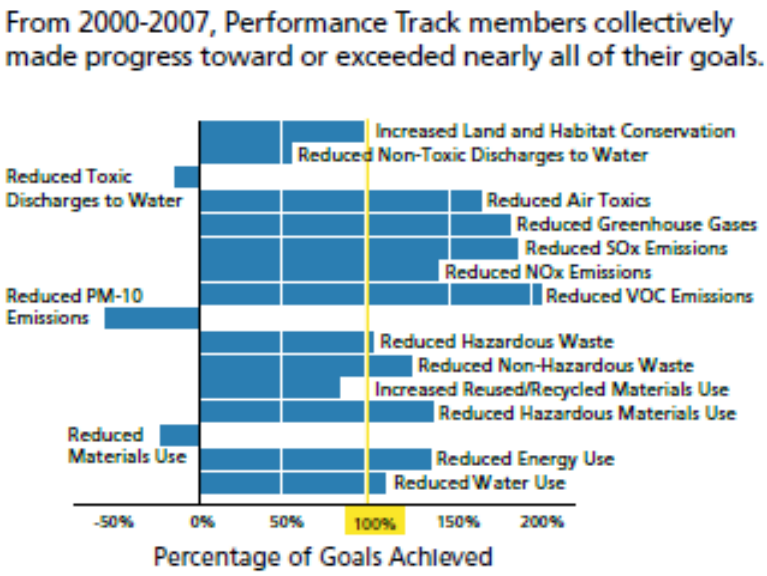
Feature

Government

Policy & Law

Pollution

Reader Comments



- 2007 report found **only 2 out of 30 surveyed members meeting all their environmental obligations**
- the program **lacked performance standards to measure progress and didn't offer a strategic plan** to connect activities to its goals
- also other voluntary programs questioned, as EPA had no idea which of them are successful because it **lacked any agency-wide policies on data collection or internal control** to measure progress
- The Philadelphia inquirer accused EPA of **not verifying environmental performance** of members, with **some members actually increasing their toxic releases**
- So, even though theoretically, this kind of voluntary program should work the best (strong incentives), it failed, likely because of poor enforcement of club standards [poor monitoring, lack of coordination, agency-wide policies, or direct recommendations, combined with poor data records, some of them non-verifiable] => **implementation matters!!!!**

2. Medium sword:

- the EPA's 33/50 program and the European Union's **Environmental Management and Audit System (EMAS)** … (JPAM 748 – 9)
- this one seems to have been implemented in a more successful way than the – theoretically stronger – EPA's Performance track

"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 stakeholders 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." [P&P]*

Q: Why do you think medium sword can work, i.e. why monitoring and disclosure can suffice to ensure program's standards?

EPA's 33/50 Program

Goals

EPA's 33/50 Program is a voluntary pollution prevention initiative announced early in 1991, that is intended to achieve real reductions in pollution in a relatively short time frame.

Under this program, EPA has identified **17 high priority toxic chemicals**. EPA's Administrator has set a goal of reducing the total amount of these chemicals released into the environment and transferred off-site **by 33 percent by the end of 1992** and **by 50 percent by the end of 1995**.

EPA is seeking reductions primarily through **pollution prevention practices**, going beyond regulatory requirements. EPA also will be encouraging industry to develop a preventive approach seeking continuous environmental improvement even beyond these reductions and these chemicals.

Implementation

EPA is **contacting companies** to provide them with information on the 33/50 Program and **to solicit their participation**. Companies are being **asked to identify and implement cost-effective pollution prevention practices** related to the 17 chemicals; and to develop **written commitments to publicly state their reduction goals and how they plan to achieve them**. Access to these written commitment statements will be made **available at a public docket** at EPA Headquarters.

Of the first round of 600 companies contacted in the spring of 1991, 236 companies had committed by June 1991 to achieve average reductions of 50% by 1995, for an overall reduction commitment of more than 200 million pounds.

Results

The 33/50 program surpassed expectations when it met the final 50% goal in 1994--a year ahead of schedule. Through their reductions, over 1300 companies who joined this initiative have both increased efficiency and created less waste, while saving both money and the environment

- As to actual (scientific) evaluation of the program, see e.g.:

Madhu Khanna and Lisa A Damon - EPA's Voluntary 33/50 Program: Impact on Toxic Releases and Economic Performance of Firms, Journal of Environmental Economics and Management, **Vol. 37 (1), January 1999, 1-25:**

Abstract

This paper examines the motivations for participation in the voluntary 33/50 Program and the program's impact on the toxic releases and economic performance of firms in the U.S. chemical industry. It demonstrates that the ***benefits due to public recognition and the potentially avoided costs of liabilities and compliance under mandatory environmental regulations provide strong incentives for participation.*** *After controlling for sample selection bias and the impact of other firm-*

> *specific characteristics, this paper shows that program* ***participation led to a statistically significant decline in toxic releases*** *over the period 1991–93. The program also had a statistically significant* ***negative impact on the current return on investment of firms, but its impact on the expected long run profitability of firms was positive and statistically significant****.*

---

3. 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?****"*

[no public disclosure, no sanctions]

[See the answer in Table 1 above - 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 …

➔ **Post-experience goods**, goods for which it is **difficult for consumers to ascertain the quality even *after* they have consumed them** (such as e.g. vitamin supplements).

➔ Potential consumers of these goods may require **third-party (expert) 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 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)

From psychology.about.com

This effect was first discovered and named by researchers at Harvard University who were studying the relationship between productivity and work environment. Researchers conducted these experiments at the Hawthorne Works plant of Western Electric. The study was originally commissioned to determine if increasing or decreasing the amount of light workers received increased or decreased worker productivity. The researchers found that productivity increased due to attention from the research team and not because of changes to the experimental variable.

Later research into the Hawthorne effect has suggested that the original results may have been overstated. In 2009, researchers at the University of Chicago reanalyzed the original data and found that other factors also played a role in productivity and that the effect originally described was weak at best.

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

[Note that "JPAM" or "AJPS" refers to the two articles, AJPS is the one on "compliance records, while JPAM is on environmental performance/emission reductions]

ISO – International Organization for Standardization

About ISO from http://www.iso.org/iso/home.htm

Q: Have you heard of ISO before? Do you recognize any of its programs?

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

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

ISO is a **non-governmental organization;** a bridge between the public and private sectors; many of its member institutes are part of the governmental structure or are mandated by their government, while other members have their roots uniquely in the private sector.

ISO standards are developed by technical committees, comprising experts from the industrial, technical and business sectors which have asked for the standards. These experts may be joined by representatives of government agencies, testing laboratories, consumer associations, non- governmental organizations and academic circles.

ISO standards are **voluntary agreements** therefore they need to be based on an expert consensus.

Examples of other ISO 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…

What P&P say on ISO 14001…

- 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);
- about 50,000 certified facilities in about 120 countries
- original program that established its brand was called ISO 9000 (aimed at **quality control**)

- ISO 14001 program is part of the 14000 series, it is aimed at environmental concerns
- 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 - Green clubs and Voluntary Governance… Regulatory Compliance (AJPS)

- central question is whether joining ISO 14001 reduces the **amount of time member facilities spend out of compliance** with government regulations
- improvement 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 [selection bias]

  => they **control for non-random assignment** between certification and non-certification along with other intervening factors.
- 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**

- 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

Q: Which are the main objections with respect to ISO 14001?

- **PROBLEMS/OBJECTIONS:**
  - 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 to 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]

- **What P&P do:** 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

Because of potential for selection bias **[Q: Can you explain why in this particular case?]** the authors employ a two-step procedure. First, they estimate the probability of joining the ISO to be able to control for selection bias. In the second step, they estimate the treatment effect.

MOTIVIATIONS FOR JOINING ISO 14001 (estimating probability of joining ISO, the most important factors)

- frequent government inspections
- enforcement actions against facility/penalties
- facility's size
- pollution emissions
- local context (education, wealth, minorities)
- compliance history
- nature of government mandatory regulations (regulatory relief programs/immunity protection for info uncovered in self-audits)

Q: Can you try to explain intuition behind the above factors, i.e. how do they affect the probability of joining the program? What will be the sign of each parameter (=direction of impact: increase/decrease)?

FACTORS INFLUENCING REGULATORY COMPLIANCE (estimating the treatment effect, the most important factors)

- 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)

Q: Can you try to explain intuition behind the above factors, i.e. how do they affect the efficiency of the program? What will be the sign of each parameter (=direction of impact: increase/decrease)?

Q: What do the authors conclude based on the results of their analysis? Is ISO 14001 a successful program, i.e. does it help to reduce the time out of compliance for participating firms?

HERE IS WHAT THEY FOUND…

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 [selection bias]

- certified spend about 11.4% out of compliance, whereas non-certified about 12.5% (the difference is statistically significant)
- moreover, ISO 14001 produces a greater reduction in noncompliance for those which spent more time in the past out of compliance

Q: See the table below and try to understand how to interpret the numbers – what do they suggest about the results of the analysis?

TABLE 2 Treatment Effects Analysis of Facilities Joining ISO 14001 and Their Regulatory Compliance

	Joining ISO 14001		Regulatory Compliance	
	Coefficients	Standard Errors	Coefficients	Standards Errors
Facility				
$Compliance_{1995-96}$	1.61**	.686	.2831**	.026
$Compliance_{1995-96}^2$	−1.74**	.754		
Inspections	.030**	.0143	.009**	.003
Enforcement Actions	−.008	.0162	.006	.004
Penalty	−3.00E-08	1.27E-07	1.47E-08	2.41E-08
$Emissions_{1995-96}$	2.06E-10**	6.86E-11		
$Emissions_{1995-96}^2$	−1.35E-20*	7.72E-21		
Number of Employees	9.26E-05**	0.000032	5.92E-06	5.96E-06
Branch	.112	.111	−.007	.014
Single	−.039	.144	−.0255	.016
ISO 14001			−.0768**	.034
SIC code dummies	Yes		Yes	
Policy context				
Litigiousness	.081	.128	.0757**	.022
Hazardous Air Regulations	.281**	.111	−.007	.012
Ambient Air Regulations	.022	.154	−.036**	.016
State audit protections	.020	.099	.060**	.011
State EMS programs	−.069	.124	−.060**	.014
State non-EMS program	.033	.118	−.009	.014
Regulatory Flexibility	−.002	.012	−.006**	.001
Environmental Groups	.027	.022	.0011	.002
Neighborhood context				
Education	1.44**	.665	−.094	.076
Income over $75,000	.0081	.031	.002	.004
Minorities	−.011	.056	.004	.006
Constant				
N	3709			
Rho	0.119			
Wald (independent eq.)	10.71**			
Wald (overall)	705.84**			

*p < .10, **p < .05, two-tailed tests.

As to **probability of joining ISO 14001**

- **only about 4% of the facilities in the sample joined ISO 14001**
- relation between time out-of-compliance and ISO registration follows an inverted U-shaped curve => facilities always in or always out of compliance are least likely to join ISO 14001 **Q: Can you explain why?**
- Low-emission facilities are least likely to join, moderate and high emission

facilities are roughly equally more likely [note the role of emissions and emissions squared]

- number of inspections increases the probability of joining **Why?**
- facilities in more educated neighborhoods are more likely to join (**Why?...** 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 (**Why?.....** 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 (might also have affected the result) [**possibility of a so-called substitution bias Can you explain?**]
- do not claim that voluntary programs can replace mandatory regulations, or that voluntary programs would be still effective with weaker mandatory regulations [**quite on the contrary – the stricter the regulation, the more likely firms join**], we could say that **effective voluntary regulation may complement command and control**

Now the other paper. The authors work with the same sample of firms just look at different measure of treatment effect – emission reductions. As the selection bias remains, the estimation method is the same as in the previous one.

Potoski and Prakash - Covenants with Weak Swords (JPAM)

- extension of the analysis from the earlier paper … whether joining ISO 14001 improves environmental performance (measured as reduced pollution emissions – vs. time in/out of compliance in the previously discussed 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.- same sample, different research question
- dependent variable(s) – pollution emissions weighted by two different measures of emissions' toxicity, then looking at absolute improvement and logged improvement... to check the **robustness** of the results.

Q: What do they find?

- *"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."*
- they compare the environmental performance of ISO 14001- certified and non-

certified facilities,

- the focus is on facilities regulated under U.S. state and federal air pollution regulations
    - facilities that 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.
    - the 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**

For more details on the (four) dependent and the many independent variables, see the text …

- the treatment effect [how does joining ISO 14001 improve pollution reductions]
- probability of joining ISO 14001 [estimating the selection into treatment]

Essentially they weigh the emissions data with two measures of toxicity, 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 qualitative results for all of their four dependent variables …)

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

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 (different industries – different impact)

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

Q: Can you try to explain intuition behind the above factors, i.e. how do they affect the efficiency of the program/probability of joining? What will be the sign of each parameter (=direction of impact: increase/decrease)?

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

- **sample size** - the number of certified sites in their sample is about 4% only (that means a matching procedure – where you match similar companies of one kind (ISO) with similar companies of the other kind (NON-ISO) – is not possible)
- **selection bias** - 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 handle those issues …

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, to estimate the probability of joining ISO
- stared parameters are those found statistically significant

Table 2. Treatment effects analysis of ISO 14001 certification on reductions in facilities' pollution emissions, emissions weighted by CERCLA toxicity measures.

	Logged Emissions Reduction		Emissions Reduction	
	Coefficient	Standard Error	Coefficient	Standard Error
Facility characteristics				
ISO 14001	1.342*	0.768	25.229**	11.289
Employees	0.0002**	0.0001	–0.001	0.002
Branch	–0.299	0.226	2.941	3.691
Single	–0.693	0.276	3.1819	4.5105
Facility regulatory context				
$\text{Inspections}_{95–96}$	0.146**	0.033	–0.265	0.547
$\text{Enforcement actions}_{95–96}$	0.070*	0.041	–0.034	0.676
$\text{Emissions}_{95–96}$	1.03E–09**	6.23E–11	4.645**	0.428
State policy context				
Litigiousness	–0.022	0.287	–5.3534	4.6835
Hazardous air regulations	0.066	0.174	1.4830	2.8425
Audit and immunity privileges	0.353**	0.166	–2.524	2.719
Environmental groups	–0.091**	0.032	0.675	0.522
Neighborhood context				
Education	3.905**	1.106	6.612	18.033
Minorities	–0.001	0.052	1.051	0.848
Wealth	–0.130**	0.059	–0.6880	0.9714
SIC code dummies (not shown)				
Constant	–0.72361	4.875767	–87.456	79.800
Selection equation for joining ISO 14001				
Facility characteristics				
Employees	0.00008**	3.99E–05	7.94E–05**	4.04E–05
Branch	0.1243	0.1353	0.1237	0.1355
Single	0.0586	0.1670	0.0451	0.1678
Facility regulatory context				
$\text{Inspections}_{95–96}$	0.0286**	0.0154	0.0318**	0.0152
$\text{Inspections}_{95\Delta 96}$	0.0046	0.0286	–0.0004	0.0284
$\text{Enforcement actions}_{95–96}$	0.0009	0.0318	0.0030	0.0317
$\text{Enforcement actions}_{95\Delta 96}$	–0.1303**	0.0565	–0.1223**	0.0554
$\text{Compliance}_{95\Delta 96}$	0.2436	0.2407	0.2470	0.2421
$\text{Compliance}_{95–96}$	1.2212†	0.8110	1.1617†	0.8155
$\text{Compliance}_{95–96}^2$	–1.2828†	0.8610	–1.2673†	0.8689
$\text{Emissions}_{95\Delta 96}$	6.30E–11	8.67E–11	9.79E–11	8.48E–11
$\text{Emissions}_{95–96}$	2.42E–10†	8.25E–11	2.06E–10†	7.31E–11
$\text{Emissions}_{95–96}^2$	–1.79E–20†	8.67E–21	–1.24E–20†	7.06E–21
State policy context				
Litigiousness	0.0713	0.1519	0.0941	0.1499
Hazardous air regulations	0.1913*	0.1048	0.1999**	0.1046
Audit and immunity privileges	–0.0444	0.0976	–0.0044	0.0118
Environmental groups	–0.0196	0.0185	–0.0228	0.0186
Neighborhood context				
Education	1.3074**	0.6254	1.3334**	0.6281
Minorities	0.0223	0.0322	0.0232	0.0315
Wealth	–0.0125	0.0310	–0.0134	0.0310
SIC code dummies (not shown)				
Constant	–8.7719**	2.7691	–8.8876	2.7810
N	3,052		3,052	
Rho	–.145*		–0.1202**	
Wald (independent equations)	2.78*		2.65*	
Wald (overall)	265.00**		224.04**	

** $p < .05$, * $p < .10$, † jointly significant $p < .05$.

Table 3. Treatment effects analysis of ISO 14001 certification on facilities' pollution emissions, emissions weighted by CHHI/RSEI toxicity measures.

	Logged Emissions Reduction		Emissions Reduction	
	Coefficient	Standard Error	Coefficient	Standard Error
Facility characteristics				
ISO 14001	0.1209	0.5470	58.319**	16.728
Employees	–2.2E–05	5.26E–05	0.0006	0.0022
Branch	–0.1953	0.1163	–3.3074	4.7803
Single	–0.1454	0.1422	–3.6704	5.8393
Facility regulatory context				
$\text{Inspections}_{95–96}$	–0.0187	0.0171	–2.086**	0.702
$\text{Enforcement actions}_{95–96}$	–0.0434**	0.0208	–2.769**	0.856
$\text{Emissions}_{95–96}$	3.91E–11*	2.09E–11	2.705**	0.508
State policy context				
Litigiousness	–0.0238	0.0897	2.794	6.211
Hazardous air regulations	–0.0291	0.0856	–3.677	3.679
Audit and immunity privileges	0.0210	0.0108	1.366	3.514
Environmental groups	0.0230	0.0164	0.225	0.674
Neighborhood context				
Education	0.2943	0.5712	–3.337	23.369
Minorities	0.0247	0.0265	–0.0003	1.089
Wealth	0.0066	0.0306	–1.507	1.258
SIC code dummies (not shown)				
Constant	–1.14	2.52	–13.761	103.465
Selection equation for joining ISO 14001				
Facility characteristics				
Employees	8.53E–05**	4.06E–05	7.680E–05**	4.040E–05
Branch	0.11	0.14	0.104	0.137
Single	0.07	0.17	0.073	0.169
Facility regulatory context				
$\text{Inspections}_{95–96}$	0.0330**	0.0154	0.016	1.230
$\text{Inspections}_{95\Delta 96}$	0.0034	0.0282	–0.016	0.028
$\text{Enforcement actions}_{95–96}$	0.0057	0.0302	0.016	0.028
$\text{Enforcement actions}_{95\Delta 96}$	–0.1265**	0.0558	–0.140**	0.055
$\text{Compliance}_{95\Delta 96}$	0.1510	0.2537	0.123	0.251
$\text{Compliance}_{95–96}$	1.1573†	0.8386	0.909†	0.834
$\text{Compliance}_{95–96}^2$	–1.2086†	0.8881	–0.906†	0.884
$\text{Emissions}_{95\Delta 96}$	–3.97E–11	2.71E–10	–1.57E–10	2.41E–10
$\text{Emissions}_{95–96}$	2.12E–10†	1.35E–10	1.94E–10†	1.23E–10
$\text{Emissions}_{95–96}^2$	–2.09E–20†	1.77E–20	–9.0E–21†	1.45E–20
State policy context				
Litigiousness	0.1099	0.1533	0.057	0.155
Hazardous air regulations	0.2016*	0.1092	0.185	0.108
Audit and immunity privileges	–0.0261	0.1016	–0.002	0.012
Environmental groups	–0.0236	0.0194	–0.019	0.019
Neighborhood context				
Education	1.5230**	0.658895	1.586	0.651
Minorities	0.03251	0.034454	0.028	0.033
Wealth	–0.01256	0.032753	–0.010	0.032
SIC code dummies (not shown)				
Constant	–9.84857	2.921174	–10.022	2.888
N	2910		2910	
Rho	–0.0714		–0.357	
Wald (independent equations)	0.33		7.02**	
Wald (overall)	274.0**		212.9**	

** $p < .05$, * $p < .10$, † jointly significant $p < .05$.

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

i) selection equation model [**estimating probability of joining**]

- compliance coefficients jointly significant
  - coefficient on compliance positive + on compliance squared negative, size of coefficients comparable
  - 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
  - coefficient on emissions positive + on emissions squared negative, size of coefficients – squared is much much smaller
  - 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 [important] … " (p.762)

… so the results on probability of joining as in the first paper [same analysis, same data]

ii) treatment effects [estimating the effect of joining ISO 14001 on facilities environmental performance~ emissions reduction]

- coefficient on ISO 14001 significant in 3 out of 4 cases considered
  - 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 [selection model] and their environmental performance." (p. 763)
- not surprising some of the other factors have explanatory power, somewhat in line with hthe 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"*

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

- ISO 14001 is an interesting case to study because it outlines process- or management-based standards that firms need to adopt.
- Environmentalists criticize the World Trade Organization (WTO) for preventing governments from imposing process standards on imports. These critics argue that the WTO's approach undermines domestic regulations because imports from countries with laws based on lax process standards (and therefore lower production costs) can flood a country with more stringent standards (Daly 1993). **Q: What do you think about this criticism? Do you agree? Disagree?** [so-called **race to the bottom**]
- Unlike governments, firms themselves can **voluntarily** impose process standards such as ISO 14001 on their suppliers, raising important questions about how international trade influences the adoption of a nongovernmental process regulation; i.e. can firms force stricter standards on their foreign suppliers? **Q: What do you think about this hypothesis? [Vogel's hypothesis]**
- one might expect that ISO 14001 adoption levels are comparable across countries… yet adoption levels differ… we examine whether this variation lends support to the race to the bottom thesis or whether it supports Vogel's argument
- If trade critics are correct, countries that are more integrated into global trading networks should have lower levels of ISO 14001 certifications, ceteris paribus. After all, trade should create disincentives for firms to voluntarily adopt regulations that increase their cost of production and coordination [compared to their external competitors], **Right?**
- And if Vogel's argument is correct, trade linkages should serve to support ISO adoption, particularly if ISO 14001 has been widely adopted in the country's key trading partners.
- The authors of this article **hypothesize that a country's ISO 14001 adoption rates will be encouraged if ISO 14001 has been widely adopted in its export markets** [thus that Vogel is right].
- Existing evidence:
  - governments may promote ISO 14001 if their economies substantially rely on exports (Roht-Arriaza 1997),
  - in some countries, firms actively encourage their foreign suppliers to adopt ISO

14001 (Christmann and Taylor 2001; Christini, Fetski, and Hendrickson 2004; UNCTAD 2000).

  - E.g., the U.S. auto industry requires first and second-tier suppliers, many of which are located abroad, to adopt ISO 14001 (Coglianese and Nash 2001).

- While voluntary regulatory programs such as ISO 14001 may have virtues, they invite much skepticism. **Recent scandals in the accounting industry have undermined public trust in voluntary regulations.** Environmentalists tend to be skeptical of voluntary regulations (Steinzor 1998), suggesting they **"greenwash" firms' poor environmental performance**. … several studies suggest that adopting ISO 14001[like P&P] induces firms to take considerable progressive environmental action that translates into pollution reduction and better compliance with government regulations

ANALYSIS

- examine a panel of 108 countries over seven years
- dependent variable is the number of ISO 14001 certified facilities in each country, from 1996 through 2002
- employ two measures to examine the effect of international trade on countries' ISO 14001 adoption rates
  - **Export Dependence** (total exports/GDP) ~ based on the argument that, irrespective of the exports' destination and the policies of the importing countries, greater export dependence leads to lower ISO 14001 adoption rates.
  - **Bilateral Trade Weighted by ISO Adoption** (exports to other countries, weighted by those countries' ISO 14001 adoption levels) ~ if the export destinations matter, the practices and norms of the importing countries can be transmitted back to the exporting country through trading channels
- Although trade is the primary variable of interest, the analysis controls for several factors that can be expected to influence ISO 14001 adoption
  - FDI (even though FDI location decisions are complex, FDI may serve as a vehicle to transmit environmental practices)
  - Networks: total number of INGOs (international nongovernmental organizations) citizens have joined and total number of IGOs (intergovernmental international organizations) that governments have joined (based on yearbook of International Organizations)
  - Common language (reduces the cost of transmitting ideas and norms)
  - Neighbors (ditto)
  - PPP adjusted GDP (proxy for size of the economy ~ number of certifiable firms)
  - (Share of) Manufacturing
  - Government Consumption ~ share of public sector
  - National Wealth (GDP per capita and GPD per capita squared)
  - Emissions
  - Countries' internal economic policy (more competitive economies more likely to use ISO), use Heritage Foundation Survey's index

TABLE 1 ISO 14001 Certification Rates, 1996–2002

Independent Variables	Coefficient	*Standard Error*
Export Dependence	.045	.124
Bilateral Trade weighted by ISO Adoption	.132**	.029
International Controls		
FDI	−.017	.073
Language	.118*	.047
Neighbor	.053	.041
IGO (intergovernmental organizations)	−.396	.282
INGO (nongovernmental organizations)	.503*	.248
Domestic Controls		
GDP	.807	.521
Manufacturing	−.012	.018
Per Capita GDP	1.475e−04**	5.732e−05
Per Capita GDP^2	−2.3114e−09*	7.512e−10
SO_2	−.018	.016
Regulations	.137	.086
Government Consumption	.016	.028
ISO 9000	.440**	.128
Fixed Effects (yes)		
Constant	−22.206*	10.992
N (108 countries, 7 years)	756	
χ^2	953	

**p < .01, *p < .05.

- Table 1 shows **that international trade influences ISO 14001 adoption through bilateral trade but not through structural trade**.
- Countries, whose export destinations have higher levels of ISO 14001 certifications, have higher certification levels themselves. (Increase bilateral trade from two standard deviations below its mean to two standard deviations above increases the number of ISO14001 certified facilities by about 25.1 holding the effects of other variables constant at their means.)
- The coefficient for structural trade, .045, is not statistically significant => it is not structural dependence on trade per se that creates incentives for firms to adopt ISO 14001. Instead, specific characteristics of trade linkages support the adoption of this nongovernmental regulation.
- **the results suggest that high levels of adoption of ISO 14001 in the importing countries encourage firms in the exporting countries to adopt this voluntary environmental program too.**
- 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.

Q: Political implication?

- The political implication then is that instead of opposing free trade across the board, environmental groups might leverage it to serve their goals. They could establish nongovernmental regimes (as in the forestry sector, Bartley 2003) and work on their widespread adoption in countries that absorb a substantial portion of the world's exports. In sum, by establishing the "right" institutions in critical export markets, environmentalists can strategically harness free trade to create supply chain-based environmental multipliers in developing countries (but see Clapp 1998) and thereby serve their environmental objectives.

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

Voluntary programs, such as, e.g., Energy star … one the one hand …

Energy Star

Energy Star is an international standard for energy efficient consumer products. It was first created as a United States government program by the Clinton Administration in 1992, but Australia, Canada, Japan, New Zealand, Taiwan and the European Union have also adopted the program. Devices carrying the Energy Star logo, such as computer products and peripherals, kitchen appliances, buildings and other products, generally use 20%–30% less energy than required by federal standards. Many European-targeted products are labeled using a different standard, TCO Certification from the Swedish Confederation of Professional Employees instead of Energy Star.

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

Toxics Release Inventory

From Wikipedia, the free encyclopedia

*The **Toxics Release Inventory** (TRI) is a publicly available database containing information on toxic chemical releases and other waste management activities in the United States.*

Summary of requirements

The database is available from the United States Environmental Protection Agency (EPA) and contains information reported annually by certain industry groups as well as federal facilities. Each year, companies across a wide range of industries (including chemical, mining, paper, oil and gas industries) that produce more than 25,000 pounds or handle more than 10,000 pounds of a listed toxic chemical must report it to the TRI. If

the company treats, recycles, disposes, or releases more than 500 pounds of that chemical into the environment (as opposed to just handling it), then they must provide a detailed inventory of that chemical's inventory.

The data in the Toxic Release Inventory is available to the public.

http://www.epa.gov/TRI/

there are similar such inventories around the world....e.g. EU European Pollutant Emissions Register (EPER)

- Mandatory information disclosure programs require that the firm reports 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 paper 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' performance**
    - **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) ⟶ a trade off
    - **incentives to undermine information disclosure programs**

- **"malfeasance** in the form of **non-compliance with regulatory mandates**, including **failing to disclose information accurately**, imposes direct 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 by the managers of the divisions, sum $\hat{\boldsymbol{z}}$
- $\hat{\boldsymbol{x}}$ **- actual level of emissions** (the owner-manager may not know 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 the 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 the 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 $\hat{x}_i > x_i$ (emitting more)
- Since **audits are costly they are done with probability η**
- Managers **found** to have emitted more than $\mathbf{x_i}$ or to have **misreported**, are **disqualified** from winning the tournament 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)

- Q: 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 …

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)

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?**

- the effect of an outside penalty appears to be less pronounced
- the presence of the penalty has no statistically significant effect; in line with 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 an individual was audited in the previous period , 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
- Information disclosure programs, such as TRI, have a 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…..