Environmental Management Systems:
Regulatory and Market-based Incentives in the U.S.

Madhu Khanna
University of Illinois at Urbana-Champaign

Wilma Anton
University of Central Florida
A Transformation in the Approach Towards Environmental Protection

From “Government Push”
  – Mandatory Command and Control
  – Adversarial
  – Reactive approach by firms

to “Corporate Self Regulation”
  – Trade Association Programs, e.g. Responsible Care
  – Standardized Environmental Management Systems e.g. ISO 14001
  – Firm structured EMSs
Corporate Environmental Management:
A Cooperative Approach to Environmental Protection

- Environmental Management Systems (EMSs) –
  - Internally motivated proactive effort at environmental self-regulation
  - Integrating environmental decisions into business decisions
  - Application of Total Quality Management to improving environmental performance

- Growing interest among regulators in
  - promoting EMSs to improve environmental performance
  - determining the factors that motivate firms to adopt EMSs
  - examining the effectiveness of EMSs in improving environmental performance of firms
Purpose of this Research

To develop an empirical framework to

• examine the economic motivations for S&P 500 firms to adopt a system of practices, and

• determine the type of firms more likely to adopt a more comprehensive EMS

using observable firm-specific characteristics that proxy for the regulatory and market-based pressures
Environmental Management Systems

• Components of EMSs being evaluated here:
  – having an environmental staff
  – senior management commitment
  – applying TQM principles to environmental management
  – setting internal environmental policies/standards
  – rewarding employee efforts
  – conducting environmental audits
  – setting aside funds for environmental remediation and insurance
  – environmental reporting
  – evaluating environmental risks when choosing partners, clients and suppliers
Motivations for Environmental Management

• Incentives
  – Cost savings due to increased efficiency of input-use
  – Threat of existing and anticipated mandatory regulations and environmental liabilities
  – Concerns about consumer preferences
  – Competitive pressure
  – Concerns about investor reactions

• Disincentives
  – Costs of information gathering, tracking pollution, auditing, training employees, coordinating
Data

• 335 observations from S&P 500
  • 176 firms for 1995 and 159 for 1994
• Environmental Management Practice Data: Corporate Environmental Profiles Directory - Investors Research Responsibility Center
• Toxic Releases Data - EPA
• Financial Data - S&P Compustat
• Superfund sites, Inspections and Civil Penalties – EPA databases
# Adoption of Environmental Management Practices

<table>
<thead>
<tr>
<th>Variable</th>
<th>% of adopters</th>
<th>Description of the Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff</td>
<td>47</td>
<td>Environmental staff of more than 50</td>
</tr>
<tr>
<td>Directors</td>
<td>46</td>
<td>More than 3 environmental directors</td>
</tr>
<tr>
<td>Policy</td>
<td>92</td>
<td>Formal written policy and codes of conduct on environmental issues</td>
</tr>
<tr>
<td>Corp. Stds.</td>
<td>39</td>
<td>Uniform standards to environmental practices worldwide</td>
</tr>
<tr>
<td>TQM</td>
<td>70</td>
<td>TQM philosophy to environmental management</td>
</tr>
<tr>
<td>Payments</td>
<td>61</td>
<td>Incentive compensation to employees whose efforts lead to achievement of specific environmental goals</td>
</tr>
<tr>
<td>Audits</td>
<td>90</td>
<td>Audits to assess compliance with environmental regulations</td>
</tr>
<tr>
<td>Suppliers</td>
<td>52</td>
<td>Evaluates its environmental risks when selecting its suppliers</td>
</tr>
<tr>
<td>Partners</td>
<td>39</td>
<td>Evaluates its environmental risks when selecting its partners</td>
</tr>
<tr>
<td>Clients</td>
<td>11</td>
<td>Evaluates its environmental risks when selecting its clients</td>
</tr>
<tr>
<td>Report</td>
<td>37</td>
<td>Releases reports about its environmental performance and activities</td>
</tr>
<tr>
<td>Reserves</td>
<td>47</td>
<td>Funds to cover the costs of penalties for environmental violation or remediation activities</td>
</tr>
<tr>
<td>Insurance</td>
<td>44</td>
<td>Insurance to meet unexpected environmental liabilities</td>
</tr>
</tbody>
</table>
Extent of Corporate Environmental Management

[Bar chart showing the extent of various aspects of corporate environmental management, such as Staff, Directors, Policy, Payments, Corp. Stds., TQM, Audits, Suppliers, Partners, Clients, Report, Reserves, and Insurance, with varying percentages.]
Variability in Degree of Corporate Environmentalism

![Bar chart showing variability in degree of corporate environmentalism. The x-axis represents the number of practices, ranging from 0 to 13, while the y-axis represents the percentage (%). The chart displays the distribution of practices across different companies, indicating variability in their environmental commitment.]
Empirical Methodology

• Dependent Variable: Quality of Environmental Management
  – Proxied by number of environmental practices adopted

• Two approaches:
  – Cardinal measure of comprehensiveness of the management system
    • Negative Binomial Model/Poisson
  – Ordinal measure of quality of management
    • Ordered Probit Model
  – Explanatory variables are lagged by 5 years
Hypotheses: Quality of EMS likely to be higher for firms

- Facing higher costs of compliance/liabilities
  - Number of inspections, penalties, Superfund sites, PACE
- Facing greater threat of anticipated regulation or benefit from shaping future regulations
  - Hazardous air pollutant emissions
- In closer contact with consumers – producing final goods
- More dependent on capital markets – assets/sales ratio
- With market power – Herfindahl index
- Facing greater public pressure for environmental performance/more pollution intensive – on-site releases/sales
- Lower costs of adopting an EMS
  - Innovative (R&D expenditures), age of assets
### Determinants of Corporate Environmental Management

<table>
<thead>
<tr>
<th>Indep. Variables</th>
<th>Poisson</th>
<th>OP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>1.91***</td>
<td>2.27***</td>
</tr>
<tr>
<td><strong>A. Existing or Anticipated Regulatory Pressure</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Civil Penalty</td>
<td>0.30E-01</td>
<td>-0.38E-01</td>
</tr>
<tr>
<td>Inspections</td>
<td>0.89E-01</td>
<td>0.52E-01</td>
</tr>
<tr>
<td>Industry PACE-Sales</td>
<td>0.076**</td>
<td>0.26**</td>
</tr>
<tr>
<td>No. of Superfund sites</td>
<td>0.53E-02*</td>
<td>0.19E-01*</td>
</tr>
<tr>
<td>No. of Superfund sites sqd.</td>
<td>-0.48E-04^</td>
<td>-0.13E-03</td>
</tr>
<tr>
<td>HAP-On-Site Releases</td>
<td>0.50*</td>
<td>1.32^</td>
</tr>
<tr>
<td>HAP-On-Site Releases sqd.</td>
<td>-0.56*</td>
<td>-1.53^</td>
</tr>
<tr>
<td><strong>B. Market Pressure</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final goods</td>
<td>0.27***</td>
<td>0.60***</td>
</tr>
<tr>
<td>HHI</td>
<td>0.45E-04^</td>
<td>0.84E-04</td>
</tr>
<tr>
<td>Multinational status</td>
<td>0.28***</td>
<td>0.61**</td>
</tr>
<tr>
<td>Sales-Asset</td>
<td>-0.16***</td>
<td>-0.28*</td>
</tr>
<tr>
<td><strong>C. Firm Attributes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On-site Toxic Releases-Output Ratio</td>
<td>0.14E-01**</td>
<td>0.38E-04**</td>
</tr>
<tr>
<td>Off-site Toxic Releases-Output Ratio</td>
<td>-0.16***</td>
<td>-0.39E-03***</td>
</tr>
<tr>
<td>Age of assets</td>
<td>-0.59***</td>
<td>-1.43**</td>
</tr>
<tr>
<td>R&amp;D expenditures</td>
<td>0.83-01***</td>
<td>0.38E-03***</td>
</tr>
<tr>
<td>?</td>
<td>0.50E-02</td>
<td></td>
</tr>
<tr>
<td>Log likelihood values</td>
<td>-822.73</td>
<td>-764.42</td>
</tr>
</tbody>
</table>
Figure 1: Determinants of the Comprehensiveness of Environmental Management

Count of Practices Adopted

13
12
11
10
9
8
7
6
5
4
3
2
1
0

Poisson Model

Ordered Probit

Probability of adopting at least 7 practices

100%
75%
50%
25%

Off-site Transfers/Sales
Sales-Asset Ratio
On-Site Releases/Sales
Multinational
Final Good
Regulatory
Findings: Motivators of EMS Adoption

- Costs of compliance and threat of liabilities and not a desire to improve compliance with existing regulations
- High costs of anticipated regulations
- Producing final goods and facing global competition
- Public pressure/inefficient production system
- Low sales/asset - greater dependence on capital markets
- High costs/infeasibility of off-site transfers
- Market-based pressures more important than regulatory pressures for the comprehensiveness of the EMS adopted
Policy Implications

• Public policy can play a role in inducing corporate environmentalism by providing
  – A credible threat of mandatory regulations
  – An option to control pollution voluntarily and avoid higher costs of mandatory regulations
  – Tangible incentives (public recognition)
  – Environmental information to consumers and investors

• Need to stimulate market-based pressures to induce strategic environmentalism