

Exploring the Prospects for Industry Self-Regulation



T U C K
AT DARTMOUTH

Andrew King
Michael Lenox
Roy Radner
Myles Shaver
Ann Terlaak
Michael Barnett

Supported by NSF/EPA Grant: #99-063334

A Typology of Institutions

Public	State Government	Culture
Private	Firms	Norms, Cartels, & Management Standards

Centralized

Decentralized

(adapted from Ingram and Silverman, 2002)

THE STRATEGIC USE OF DECENTRALIZED INSTITUTIONS: EXPLORING CERTIFICATION WITH THE ISO 14001 MANAGEMENT STANDARD

Andrew King
Tuck School of B.
Dartmouth College

Mike Lenox
Fuqua School of B.
Duke University

Ann Terlaak
School of Business
U of Wisconsin

Examples of Certified Management Standards

- ISO 9000, QS 9000, AS 9000, TL 9000, etc.
- ISO 13485, OHSAS 18001
- ISO 14001
- SA 8000
- SIE CMM, IEEE SESC
- Equator Principles

The Nutshell of Today's Talk

- Institutions arise to solve exchange problems.
- ISO 14000 seems to help solve a type of “asymmetric information” problem by providing a means of credibly communicating efforts to improve environmental performance to ongoing exchange partners.

ISO 14001

- 14001 addresses existence & certification of EMS
- Adoption began in 1996
- Adopters come from a wide range of industries
- Visible third part certification
 - ◆ Certification entails repeated audits that ensure that company meets the ISO 14001 requirements

ISO 14001 Requirements

- System Requirements
 - ◆ Development, Implement, Document

- Management Requirements
 - ◆ Support, Policy, Planning, Control, Review

- Resource Requirements
 - ◆ Resource, Personnel, Infrastructure, Culture

Expected Role of ISO 14001

- “Operational Improvement”
- “Distinguish companies...that are committed to environmental excellence”

Testimony of TAC members before U.S. Congress, 1996

An Exchange View of ISO 14001

- Asymmetric information can harm both supplier and buyer. Suppliers use ISO 14001 to solve asymmetric information.
- Proposition A) Use greater when more chance of asymmetric information or more chance of opportunism
- Proposition B) Certification provides some real information about unobserved organizational attributes

A) Use greater when more chance of asymmetric information or more chance of opportunism.

- Greater propensity for suppliers to certify with the ISO 14001 management standard when :
 - ◆ potential buyers are physically distant,
 - ◆ potential buyers are located in foreign countries, or
 - ◆ suppliers and buyers have ongoing vertical relationships.

B) Certification provides information about unobserved organizational attributes.

- Information to monitor supplier improvement
 - ◆ Existence of a functioning EMS
 - ◆ Performance improvement

- Information to select superior suppliers
 - ◆ Relatively superior performance

Empirical Analysis

OECD – June 14, 2005

Summary of Data Sources

- Toxic Release Inventory (TRI)
- McGraw Hill Directory of ISO 14001 certified US facilities
- Dun and Bradstreet
- Input - Output tables from the U.S. Bureau of Economic Analysis
- IRS data and U.S. Census Data

Sample

- ISO 14000 Certification (95-01)
 - ◆ 7899 facilities, 633 adopters, 46052 observations

- Improvement analysis (1995-2002) :
 - ◆ 7904 facilities, 46951 observations

Independent Variables

Distance to Buyer	Log miles to nearest possible major buyer as determined by I/O tables
Foreign Buyer	Percentage of exports of shipments for 4 digit SIC
Vertically Integrated Buyer	Dummy indicating if corporation owns focal facility as well as potential buyer
Ongoing Vert. Relationship	Tendency of industry to be vertically integrated

Control Variables

Env.Performance	Relative toxicity weighted releases
EMS	Firm has functioning EMS
RC Participant	Dummy: 1 if facility owned by RC firm
ISO 9000 Certified	Dummy: 1 if facility is ISO 9000 certified

Control Variables (Cont.)

Offsite Waste Transfer	Dummy: 1 if transfers waste to non-POTW
POTW Waste Transfer	Dummy: 1 if transfers waste to POTW
Auto Supplier	Dummy: 1 if supplies auto assembler
Industry Waste Gen.	Log avg. waste generation for industry
Regulatory Stringency	Meyer's measure of reg. intensity
Affluence	Log average IRS income in zip code
RC Industry	Percentage of RC participants in SIC

Control Variables (Cont.)

Facility Size	Log of facility employees
Foreign Owned	Dummy: 1 if facility has foreign parent
Firm Size	Count of facilities in firm

Predicting Certification (in the panel analysis)

- $P_{it+1} = F(Z) = F(a_i + \mathbf{bX}_{it})$
- where P is the probability that facility i will certify with ISO 14001 in the next year ($t+1$).
- \mathbf{X}_{it} represents the characteristics of the i_{th} facility in year t .
- Facility random effects are measured as a_i
- As soon as a facility is certified, it is no longer at risk to certify, and we remove it from the sample.

Modeling Certification (96-02)

<i>Dependent Variable</i> <i>Sample</i>	Model 1	Model 2	Model 3	
	ISO 14001	ISO 14001	EMS	ISO 14001
	Panel ('95-'01)	Cross Section ('95)	Cross Section ('95)	EMS Only
Distance to Buyer	0.04 * (0.01)	0.06 ** (0.02)	0.01 (0.06)	0.07 * (0.03)
Foreign Buyer	0.06 (0.03)	0.12 * (0.04)	0.06 (0.07)	0.21 ** (0.07)
Vertically Integrated Buyer	0.13 * (0.05)	0.20 * (0.07)	0.03 (0.04)	0.26 * (0.10)
Industry Vertical Relationship	0.21 ** (0.06)	0.34 ** (0.08)	-0.14 * (0.06)	0.34 * (0.12)
Environmental Performance	-0.05 * (0.02)	-0.10 ** (0.02)	-0.15 ** (0.02)	-0.17 ** (0.04)
EMS _(t-1)	0.14 ** (0.04)	0.15 * (0.05)		
Responsible Care Participant	-0.13 (0.07)	-0.12 (0.09)	0.21 ** (0.06)	-0.07 (0.13)
ISO 9000 Certified	0.32 ** (0.04)	0.11 (0.07)	0.17 ** (0.05)	0.17 (0.09)
Auto Supplier	0.43 ** (0.11)	0.85 ** (0.14)	-0.22 (0.11)	0.99 ** (0.18)
Offsite Waste Transfer	0.13 (0.07)	0.24 ** (0.08)	0.24 ** (0.04)	0.43 * (0.14)
Regulatory Pressure	-0.55 (1.34)	-0.49 (1.63)	3.97 ** (1.00)	0.23 (2.25)
POTW Waste Transfer	0.10 * (0.04)	0.13 * (0.05)	0.16 ** (0.03)	-0.07 (0.07)
Industry Waste Gen.	-0.01 (0.02)	0.03 (0.02)	0.14 ** (0.02)	0.04 (0.04)
Affluence	0.06 (0.07)	0.10 (0.08)	0.06 (0.06)	0.09 (0.12)
RC Industry	-1.11 ** (0.26)	-1.40 * (0.32)	-0.52 (0.20)	-1.62 * (0.44)
Facility Size	0.16 ** (0.02)	0.19 ** (0.03)	0.17 ** (0.02)	0.20 * (0.04)
Foreign Owned	0.33 ** (0.08)	0.31 * (0.10)	0.06 (0.07)	0.25 (0.14)
Firm Size	0.08 ** (0.02)	0.08 ** (0.02)	0.05 ** (0.01)	0.06 * (0.03)
Diffusion of ISO 14K	1.86 ** (0.32)			
Industry Dummies	included	included	included	included
Year Dummies	included			
Observations	7895(46052)	7899	7899	3300
Rho ^a				0.08
Chi Square (d.f)	919.22(38) **	629.85(31) **		297.50(30) **

** p < 0.001 , * p < 0.01

Predicting Certification (96-02)

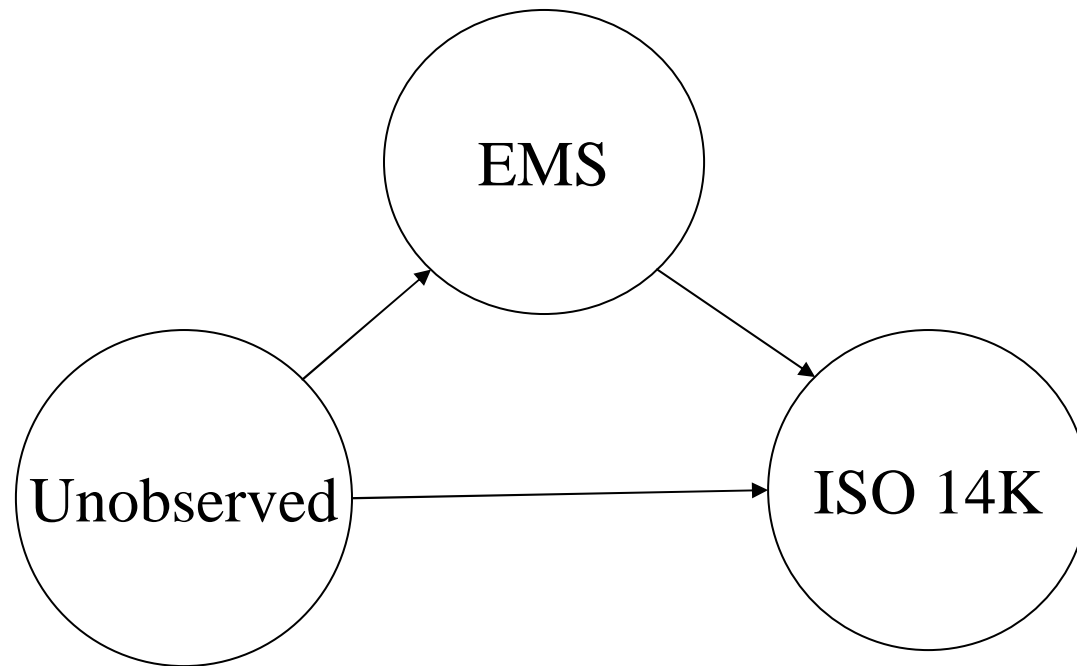
	Model 1 (Panel)		Model 2 (95)	
Distance to Buyer	0.04	*	0.06	*
Foreign Buyer	0.06		0.12	*
Vertically Integrated Buyer	0.13	*	0.20	*
Ind. Vert. Relationship	0.21	**	0.34	**
EMS _(t-1)	0.14	**	0.15	**
Diffusion of ISO 14K	1.86	**		
Controls	Included		Included	
Industry FE	Included		Included	
Year FE	Included			

** p < 0.001 , * p < 0.01

Impact Analysis

Auto Supplier	219.7%
Foreign Owned	57.8%
Ind. Vertical Relationship	49.3%
Offsite Waste Transfer	30.5%
Vertically Integrated Buyer	27.9%
Facility Size	27.7%
EMS _(t-1)	22.1%
POTW Waste Transfer	19.3%
Foreign Buyer	17.3%

Potential Estimation Problem – Separating Adoption of an EMS & Certification



Selection Corrected Modeling of Certification

	EMS	ISO 14001
Distance to Buyer	0.01	0.07 *
Foreign Buyer	0.06	0.21 **
Vertically Integrated Buyer	0.03	0.26 *
Industry Vertical Relationship	-0.14 *	0.34 *
Environmental Performance	-0.15 **	-0.17 **
Responsible Care Participant	0.21 **	-0.07
ISO 9000 Certified	0.17 **	0.17
Auto Supplier	-0.22	0.99 **
Offsite Waste Transfer	0.24 **	0.43 *
Regulatory Pressure	3.97 **	0.23
POTW Waste Transfer	0.16 **	-0.07
Industry Waste Gen.	0.14 **	0.04
Affluence	0.06	0.09
RC Industry	-0.52	-1.62 *
Facility Size	0.17 **	0.20 *

Analyzing if ISO 14001 Reveals Organizational Env. Attributes

	Model 4 Probit	Model 5 Regression	Model 6 Regression
Dependent Variable	EMS	Environmental Perform _(t+1)	Environmental Performance
ISO 14000 Cert.	0.30 ** (0.07)	0.03 (0.02)	-0.18 ** (0.06)
EMS		0.05 ** (0.01)	
Env.Performance		0.37 ** (0.00)	

** p < 0.001, * p < 0.01

Summary of Findings

- Asymmetric information increases the propensity to certify.
- ISO 14001 does not provide a signal of superior performance.
- ISO 14000 may allow buyers to better monitor supplier improvement efforts.

Implications

- Use of institution may be different than that intended by its creators. The institution's meaning is “enacted” by the interaction of numerous economic agents.
- Fundamental paradox in design of CMS:
 - ◆ the more it provides improvement, the less it can be a signal of superior “quality”.

Thank you!