

INDUSTRY SELF-REGULATION AND ADVERSE SELECTION: A COMPARISON ACROSS FOUR TRADE ASSOCIATION PROGRAMS



Michael J. Lenox^{1*} and Jennifer Nash²

¹ Fuqua School of Business, Duke University, USA

² Kennedy School of Government, Harvard University, USA

In an attempt to avoid costly regulation and liability as a result of externalities, a number of trade associations have promoted industry self-regulation – the voluntary association of firms to control their collective behavior. However, previous studies have found that, without explicit sanctions for malfeasance, such self-regulatory programs are likely to attract more polluting firms. In this paper, we examine four environmental self-regulatory programs in the chemical, textile, and pulp and paper industries. Using a sample of over 4000 firms within these industries, we find evidence that in at least one program more polluting firms tended to join, while in another cleaner firms were more likely to join. We propose that differences in the structure of the programs drive the appearance of this form of adverse selection. In

particular, we speculate that only when self-regulatory programs have explicit sanctions for malfeasance may they avoid adverse selection problems. Copyright © 2003 John Wiley & Sons, Ltd and ERP Environment.

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INTRODUCTION

In an attempt to avoid costly regulation and liabilities as a result of environmental externalities, a number of trade associations have promoted industry self-regulation – the voluntary association of firms to control their collective behavior. Due to the collective nature of government regulation and stakeholder pressures, firms often find their reputations tied together with others within the industry (King *et al.*, 2001). Fatal accidents, damaging spills and the emission of toxic pollutants have consequences not only for the offending firm but all firms within an industry. As a consequence, efforts to unilaterally

* Correspondence to: Michael J. Lenox, Associate Professor of Business, Fuqua School of Business, Duke University, Box 90120, Durham, NC 27708, USA



address stakeholder concerns are often insufficient. Industry self-regulation serves as a mechanism to facilitate the collective improvement of environmental performance within an industry.

5 However, previous studies have found that such self-regulatory programs face a number of challenges (King and Lenox, 2000; Howard
 10 ¹ *et al.*, 2000). In particular, industry self-regulation is subject to adverse selection; i.e., lower quality firms will seek to participate. Without mechanisms for measuring and enforcing compliance with program objectives, poor performing firms will seek to join to gain the signaling and insurance benefits of membership without putting forth the required effort. Left unchecked, adverse selection will undermine self-regulatory programs as low quality firms join and reduce the differentiation benefits membership may provide.

20 In this paper, we investigate environmental self-regulatory programs in the chemical manufacturing, chemical distribution, textile, and pulp and paper industries. We examine whether these programs attract firms with superior environmental performance within the industry. We propose that differences in the structure of the programs drive the appearance of adverse selection. In particular, we speculate that only when self-regulatory programs have explicit sanctions for malfeasance may they avoid attracting more polluting firms.

25 Using a sample of over 4000 firms, we find evidence in two of the four programs studied of more polluting firms joining. Given the differences in industry structure and underlying production technologies across the industries studied, it is difficult to confidently assert what may be driving this adverse selection.
 30 However, our findings are consistent with our hypotheses that the structure of the self-regulatory programs drives selection. Only when members' compliance with program goals is monitored and non-compliant firms are expelled from the program do we expect the adverse selection problem to be mitigated.
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ENVIRONMENTAL SELF-REGULATORY PROGRAMS

In the last 20 years, environmental self-regulatory programs have proliferated in both the US and abroad (Nash and Ehrenfeld, 1997). Growing environmental regulations in industrialized nations and increasing environmental activism of consumers and the public in general have driven many industries to look for alternative strategies to deal with stakeholders. Industries have attempted to avoid costly government regulation and to placate concerned stakeholders by promising to reduce their environmental impacts voluntarily. As explained by Eastman Kodak CEOs, 'if industry doesn't take the lead on this issue, government will' (Deavenport, 1993, p. 11).

To facilitate these voluntary reductions, a number of industry-based trade associations have initiated self-regulatory programs and developed codes of practice. Codes of environmental management practice stipulate environmental goals for industry members beyond those required by government regulation. These codes include guidance as to how participating firms are to meet these goals and often require the adoption of specific practices or management systems. In most cases, these codes do not stipulate specific performance standards or emissions limits. Trade associations rely on a number of mechanisms to ensure compliance, including association oversight, external verification and peer pressure.

Four of the leading attempts by US industries to self-regulate their environmental performance include Responsible Care, sponsored by the American Chemistry Council, the Responsible Distribution Process of the National Association of Chemical Distributors, the Sustainable Forestry Initiative of the American Forest and Paper Association and Encouraging Environmental Excellence of the American Textile Manufacturers Institute. We consider each in turn.

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American Chemistry Council

The American Chemistry Council (formerly known as the Chemical Manufacturer's Association) was the first US trade association to develop an industry self-regulation initiative to address environmental performance. The ACC's board of directors adopted the program, called 'Responsible Care', in October 1989 in response to growing criticism of the industry and pervasive negative public opinion. The program attempted to improve the reputation of the chemical industry by improving the environmental performance of individual chemical firms (Nash and Ehrenfeld, 1997). Adoption of Responsible Care was required, as a condition of membership, for all firms that participate in the American Chemistry Council (ACC). Adoption consisted of two actions. First, the CEO was required to sign a set of ten Responsible Care guiding principles. These principles establish broad environmental objectives for firms. Second, every member was to implement six codes of management practice dealing with community awareness and emergency response, pollution prevention, process safety, employee health and safety, distribution and product stewardship. Together, these codes contained more than 100 individual management practices (Chemical Manufacturers Association, 1994).

National Association of Chemical Distributors

In 1991, the National Association of Chemical Distributors initiated its own code of management practice, called the Responsible Distribution Process (RDP). The National Association of Chemical Distributors (NACD) represents firms that ship, reformulate and distribute chemical products to end-users. All NACD members were required to adopt RDP as a condition of membership. The Responsible Distribution Process contained 32 management practices that focused on all aspects of chemical distribution, storage, reformulation and

sale (National Association of Chemical Distributors, 1997). RDP required that members regularly review with their suppliers the hazards associated with the products they handle and implement risk reduction measures. Members were to cease doing business with those suppliers whose practices were inconsistent with RDP principles. Members were further required to make clear commitments to pollution prevention and resource conservation.

American Textile Manufacturers Institute

A group of American Textile Manufacturers Institute members launched the Encouraging Environmental Excellence (E3) initiative in March 1992. Founding members hoped to publicize their environmental accomplishments and to distinguish their products from imports that might be produced under less environmentally responsible conditions (Fleming, 1999). About one-third of ATMI's membership voluntarily participated in the program (ATMI, 2003). Each ATMI member that chose to participate had to affirm senior management's commitment to environmental excellence. In addition, each member had to establish environmental objectives and set dates by which they would be achieved. Finally, firms were asked to work with suppliers and customers to address environmental issues, build employee education programs and develop emergency response plans.

American Forest and Paper Association

To address low public opinion and campaigns by environmental advocacy groups, the American Forest and Paper Association (AFPA) adopted the Sustainable Forestry Initiative (SFI) in 1994 (AFPA, 1998a). SFI required that members promote environmentally and economically responsible forestry practices, improve forest health and productivity and manage forests to protect their special qualities. In addition to these forestry-related initiatives, AFPA developed a set of principles

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aimed at improving the environmental health and safety practices of pulp and paper manufacturing facilities (AFPA, 1998b).

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THEORY AND HYPOTHESES

The success of a self-regulatory program is contingent on individual members being compelled to abide by program requirements. We assume that compliance is conditional on firms benefiting individually from participation in the self-regulatory effort. In particular, firms will participate in self-regulatory programs when doing so provides a signal to stakeholders about a firm's quality and when these stakeholders may subsequently reward firms for participation. For example, a number of firms have advertised their participation in trade-association-sponsored programs in an attempt to attract environmentally sensitive customers and to appease environmental advocacy groups. Some insurance providers offer lower premiums to firms that adopt codes. Adherence to a standard set of practices may provide evidence of due diligence in legal battles. Even if a firm's environmental performance is below the norm, its adherence to management practices adopted by other firms may demonstrate that it has not been willfully negligent (King and Baerwald, 1998).

Thus, firms will be attracted to self-regulatory programs as a way to differentiate themselves from others within the industry. Troubling, though, is that if there is no mechanism for screening members, these programs may be subject to adverse selection – bad firms will join to receive the insurance and signaling benefits of membership. In other words, industry self-regulatory programs will attract poor performers that benefit from participation without putting forth any real effort. While some firms will join with the intent of meeting program objectives, others may join to mask their poor performance.

King and Lenox (2000) argue that, without mechanisms for penalizing malfeasance, self-

regulatory programs are likely to be subject to adverse selection. Trade associations have employed a variety of informal mechanisms to encourage compliance with program requirements. For example, a number of trade associations convene meetings to share implementation experiences among members. Such meetings offer opportunities for members to compare their commitments and impose pressure on managers of firms that are falling behind. ACC organizes hundreds of meetings annually where progress toward Responsible Care goals is discussed (Rees, 1997). NACD, AFPA and ATMI also organize conferences and workshops where members address their progress in environmental auditing, environmental management systems and crisis management.

Such interpersonal communication can serve as a 'basic ingredient of sustained individual accountability' (Furger, 1997, p. 449). Neo-institutional sociologists claim that compliance may be achieved through informal mechanisms such as shaming and public exposure (Braithwaite, 1989) and the emergence of new norms and values that change members' preferences for collectively valued actions (Gunningham, 1995; Hoffman, 1997; Rees, 1997; Jennings and Zandbergen, 1995; Furger, 1997). The conferences and meetings convened by the trade associations provide a venue for individuals from firms to exert peer pressure on one another for compliance.

Previous empirical research casts doubt on the power of such informal sanctions to prevent adverse selection into industry self-regulatory programs, however (King and Lenox, 2000). In a study of ACC's Responsible Care program, King and Lenox (2000) found that the program attracted firms whose emissions of toxic chemicals were greater than those of other firms of similar size and type (King and Lenox, 2000). In other words, more polluting firms on average were more likely to be members. This behavior persisted over a seven-year period (1990–1996), suggesting that the problem was not attributable to an



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Table 1. Authority structures established by trade association codes (Nash and Ehrenfeld, 2001)

	ACC's Responsible Care	NACD's Responsible Distribution Process	ATMI's Encouraging Environmental Excellence	AFPA's Sustainable Forestry Initiative	
Code adoption required as condition of membership	✓	✓		✓	5
Members submit self-audited reports on progress	✓	✓	✓	✓	
Voluntary third party audits available	✓	✓		✓	10
Individual compliance revealed to association members	✓				
History of expulsion of members for non-compliance		✓		✓	

initial 'shake-out' period following the program's founding. Based on their findings, King and Lenox (2000) speculate that industry self-regulation will fail without explicit sanctions.

Self-regulatory programs are limited in the punishments they may administer, however. In the United States, monetary penalties such as fines are likely to raise antitrust concerns among government regulators. United States antitrust law does not allow firms collectively to boycott or to raise production costs for competitors, for fear that this may lead to price collusion (Maitland, 1985). Ultimately, participation in self-regulatory programs is voluntary. Any punishment must be willingly accepted by negligent members since those in violation may simply leave the program. Thus, the only explicit sanction available is expulsion.

We propose that the most viable way to avoid adverse selection is simply to expel non-compliant firms from the program. This means that self-regulatory organizations must (i) establish structures to monitor individual firm compliance with program objectives and (ii) establish procedures for removal of firms from the program. Only when rigid monitoring and sanctioning mechanisms are in place may poor performers be dissuaded from joining the self-regulatory program in the first place.

Proposition 1. Rigid monitoring and sanctioning mechanisms are needed to avoid adverse selection in industry self-regulatory programs.

Let us consider each of the four self-regulatory programs described earlier in detail. Table 1 summarizes the authority structures used by each trade association to ensure code compliance. The structures are similar in many ways. Program adoption is required for trade association membership in every case except E3. In terms of monitoring, all four trade associations required members to self-audit compliance with code requirements. The primary differences arise in the mechanisms in place for assessing these self-audits and ensuring compliance.

ACC members' self-audits were provided to a consultant hired by the trade association. The consultant compiled and reported information on the association as a whole but not on individual firm compliance (Nash, 2002). Starting in 1994, ACC members could voluntarily submit to an external certification of their environmental management systems. ACC contracted Verrico Associates, a private consultant, to develop a procedure to assess member's Responsible Care practices. Verrico's verification program was based on peer, as opposed to third party, review. Chemical industry managers from other firms came



into the plants of the member seeking review and offered their advice for improving Responsible Care practices (Nash, 2002).

While ACC chose a voluntary system, NACD required third party review of members' RDP policies as a condition of membership in the association. In 1994, the NACD board of directors voted to require members to mail their environmental self-audits to Underwriters Laboratories, a third party verifier, to ensure consistency with code requirements (Nash, 2002). These reports were not provided to the NACD, but the association was informed of non-compliance by Underwriters Laboratories.

In contrast, ATMI and AFPA did not require third party review or certification. ATMI members that participated in E3 were required to submit an annual report to the trade association that outlined the firm's environmental policy, objectives and plan of action. AFPA required members to submit annual reports to the association on their progress implementing SFI and environmental health and safety principles. In both cases, member companies' self-audits were reviewed by trade association staff members (Cantrell, 1999; Fleming, 1999). Similarly to ACC, AFPA did offer firms the opportunity to voluntarily submit to third party certification.

None of the trade associations published performance profiles of individual members. ACC and AFPA published performance reports based on information aggregated from all members that they shared with external advisory committees and concerned stakeholders such as environmental advocacy groups. In 1996, ACC began the practice of revealing the relative performance of lagging firms to a committee of Responsible Care members.

In terms of sanctions, two trade associations, NACD and AFPA, reported having expelled members for non-compliance with code requirements by 1996. After the first year of the program, NACD canceled the memberships of several companies that failed to submit their first self-assessments. The majority of these

firms later rejoined NACD after complying (Soriano, 1999). In 1994, NACD cancelled the memberships of three additional firms that failed to send their RDP audits to Underwriters Laboratories for review. AFPA has expelled 17 members for failing to implement the Sustainable Forestry Initiative (AFPA, 2003). While ACC had not officially asked any of its members to leave the association for failure to implement Responsible Care by 1996, it had targeted poor performers and required them to develop action plans.

To summarize, ATMI did not adopt explicit sanctioning mechanisms for non-compliant firms and participation in E3 was voluntary for association members. The ACC revealed individual member performance to a committee of association members and relied on informal peer pressure to insure compliance with Responsible Care. In contrast, AFPA and NACD relied on expulsion from the association. While all trade associations reserved the right to remove members, only AFPA and NACD had removed members as of 1996.

Based on our earlier proposition, we hypothesize that ACC's Responsible Care and ATMI's E3 programs were subject to adverse selection while AFPA's Sustainable Forestry Initiative and NACD Responsible Distribution Process programs were not.

Hypothesis 1. ACC's Responsible Care program was likely to attract more polluting firms.

Hypothesis 2. ATMI's Encouraging Environmental Excellence program was likely to attract more polluting firms.

Hypothesis 3. AFPA's Sustainable Forestry Initiative was likely to attract less polluting firms.

Hypothesis 4. NACD's Responsible Distribution Process program was likely to attract less polluting firms.

DATA AND MEASURES

To explore whether these industry self-regulatory programs were subject to adverse

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selection, we gathered data on firms in the US chemicals, textiles, and pulp and paper manufacturing sectors. These three sectors were chosen because they include the four industry self-regulatory programs that we are examining: the Responsible Care and Responsible Distribution Process codes in the chemical industry, the E3 program in the textiles industry and the Sustainable Forestry Initiative involving the pulp and paper industry. Data were collected for 1996, the first year for which data are available for each of the codes.

Using data from the Dun and Bradstreet Million Dollar Disk and the EPA's Toxic Release Inventory (TRI), we identified a population of 4090 firms of which 2562 were chemical firms, 541 were textile firms and 1108 were pulp and paper firms. A handful of firms (~200) manufacture in more than one of these segments. Firms were coded as to whether they participated in each of the industry self-regulatory programs in 1996. *Responsible Care* was assigned a value of 'one' for participants in the Responsible Care Program and 'zero' otherwise. Responsible Distribution Process, E3 and Sustainable Forestry Initiative participants were coded in the same way. We also created a binary variable to indicate that a firm participates in an industry self-regulatory program. *ISR Participation* was assigned a value of 'one' if and only if the firm was a member of one of the four codes under study. All data on participation were gathered from the sponsoring trade associations.

Environmental performance data were collected from the EPA's Toxic Release Inventory (TRI). The TRI contains data on the annual release, transfer and treatment of over 300 toxic chemicals from US manufacturing facilities. We measure total facility emissions as the sum of all chemical releases, weighting each chemical by its toxicity. Following King and Lenox (2000), we then create a measure of *relative* facility emissions to correct for expected differences in emissions due to facility size and the product being manufactured (see the Appendix). We create a firm-level measure of

environmental performance (*Relative Emissions*) by calculating the weighted average of these facility-level scores using the percentage of total production that each facility represented for the company as the weight.

$$(\text{Relative Emissions})_m = \log \sum_{i \text{ in } n} (s_{it}/s_{nt}) \text{RE}_{it}$$

where s_{it} is facility i size in year t , s_{nt} is firm n size in year t and RE_{it} is the measure of relative facility emissions described in the Appendix.

In essence, this variable measures the degree to which a firm emits more toxic chemicals than expected given the size and the specific industry segments of its facilities. In this way, this measure captures whether a firm is more polluting relative to other firms in its industry.

In addition to *Relative Emissions*, we control for a number of additional factors that probably influence the decision to participate in an industry self-regulatory effort. Firms that operate in more polluting industry segments are likely to be under greater scrutiny regardless of their performance within their segment. Thus, high-performing firms that operate in dirtier segments of the broader industry will have more to gain from differentiating themselves from dirtier firms within their segment. All else being equal, we therefore expect firms in more polluting segments to be more likely to join self-regulatory efforts. Following King and Lenox (2000), we calculate the dirtiness of the sectors a firm operates in (*Sector Emissions*) as the average toxicity-weighted emissions for the sectors in which the firm operates divided by the average number of employees for these sectors.

Other controls include whether the firm is foreign owned, the degree to which the firm is focused within one industry segment, and the number of manufacturing plants a firm owns. *Foreign* is coded as 'one' when the firm has a non-US owner and 'zero' otherwise. Previous research has proposed that foreign-owned facilities are placed under greater scrutiny in domestic markets and therefore would



Table 2. Descriptive statistics

Variable	Description	Mean	Standard deviation	Minimum	Maximum	
5	ISR participant	Whether or not a firm participates in an industry sponsored self-regulatory program	0.08	0.27	0	1
	Responsible Care	Whether or not a firm participates in ACC's Responsible Care	0.05	0.21	0	1
	Responsible Distributors	Whether or not a firm participates in NACD's Responsible Distribution Process	0.01	0.09	0	1
10	E3	Whether or not a firm participates in ATMI's E3 program	0.01	0.09	0	1
	SFI	Whether or not a firm participates in AFPA's Sustainable Forestry Initiative	0.02	0.13	0	1
	Relative emissions	Average relative emissions of facilities based on sector and size	-0.03	0.65	-4.56	3.47
15	Sector emissions	Average total emissions of sector	4.04	14.78	0	404.92
	Foreign	Whether or not a firm is foreign owned	0.03	0.18	0	1
	Focus	Ratio of industry specific production to total production	0.90	0.24	0.01	1
	Plants	Number of a firm's manufacturing facilities	3.92	11.09	1	315
20	<i>n</i> = 4090.					

gain more from positively differentiating themselves from others by joining the self-regulatory programs (King and Shaver, 2001). Firm ownership data were gathered from the Dun and Bradstreet Million Dollar Disk.

Focus is calculated as the percentage of a firm's plants that are chemical, textile, or pulp and paper plants, respectively. Previous research has proposed that firms that generate most of their production in a target industry are more likely to be associated with that industry and are therefore more likely to participate in that industry's self-regulatory effort (King and Lenox, 2000).

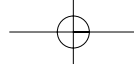
Finally, *Plants* is included to control for firm size. It is likely that larger firms with more manufacturing plants are more likely to participate in self-regulatory efforts due to the greater attention they attract and the leadership role they often take within the industry. *Plants* is measured simply as the number of manufacturing facilities that a firm owns in the US. See Tables 2 and 3 for description statistics and correlations for our measures.

ANALYSIS AND RESULTS

Our first model specifies the likelihood that a firm will participate in a trade-association-sponsored industry self-regulatory program. We estimate the following Probit model:

$$\Pr(\text{ISR Participant} = 1) = \Phi\{\beta_0 + \beta_1 \text{Relative Emissions} + \beta_2 \text{Sector Emissions} + \beta_3 \text{Foreign} + \beta_4 \text{Focus} + \beta_5 \text{Plants} + \beta_6 \text{Chemical Industry} + \beta_7 \text{Textile Industry} + \beta_8 \text{Pulp and Paper Industry}\}$$

We include the industry-level dummy variables (*Chemical Industry*, *Textile Industry* and *Pulp and Paper Industry*) to control for industry effects. In Table 4, we present two specifications of our Probit model. In Model 1, we examine the overall effect of *Relative Emissions* on participation in industry self-regulatory programs. We find no evidence of general systemic adverse selection, i.e. that more polluting firms are more likely to participate. This is not



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Table 3. Correlations

	1	2	3	4	5	6	7	8	9	10
1. ISR participant	1.00									
2. Responsible Care	0.75*	1.00								
3. Responsible Distributors	0.31*	-0.02	1.00							
4. E3	0.30*	0.01	-0.01	1.00						
5. SFI	0.47*	0.00	-0.01	-0.01	1.00					
6. Relative emissions	0.01	0.03*	0.00	-0.01	-0.03*	1.00				
7. Sector emissions	0.15*	0.16*	0.05*	-0.02	0.03*	-0.02	1.00			
8. Foreign	0.10*	0.12*	-0.02	0.00	0.02	0.00	0.02	1.00		
9. Focus	-0.07*	-0.10*	0.02	-0.01	0.00	-0.01	-0.04*	-0.15*	1.00	
10. Plants	0.31*	0.35*	-0.01	0.05*	0.09*	0.01	0.05*	0.13*	-0.45*	1.00

$n = 4090$, * $p < 0.01$.

Table 4. Probit estimates of ISR participation

	1	2
<i>Intercept</i>	-2.846*** (0.234)	-2.858*** (0.235)
Relative emissions	0.001 (0.047)	
Relative emissions × chemical industry		0.112* (0.061)
Relative emissions × textile industry		-0.198 (0.163)
Relative emissions × pulp and paper industry		-0.165* (0.089)
Sector emissions	0.010*** (0.002)	0.010*** (0.002)
Foreign	0.490*** (0.139)	0.471*** (0.140)
Focus	0.741*** (0.161)	0.744*** (0.161)
Plants	0.038*** (0.003)	0.038*** (0.003)
Chemical industry	0.458** (0.151)	0.471** (0.151)
Textile industry	0.356* (0.153)	0.354* (0.154)
Pulp and paper industry	0.478*** (0.150)	0.478*** (0.150)
n	4090	4090
χ^2 (df)	310.06 (8)***	318.13 (10)***
R^2 (pseudo)	0.1375	0.1412

Standard errors in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ (two-tailed test).

surprising, since we hypothesize that the presence of adverse selection should vary across industry programs.

We do find that firms in more polluting segments, foreign-owned firms, larger firms and firms more focused within the industry tend to be more likely to join. As we suggested earlier, firms in industry segments that are more polluting are likely to feel greater pressure to join self-regulatory efforts. Larger firms with more manufacturing facilities may find themselves under great scrutiny from advocacy groups and other stakeholders. Larger firms may also realize economies of scale in complying with program objectives. Firms that produce more in the given target industry may seek membership since they are more closely identified with the industry and its environmental record.

The foreign-owned firm effect is particularly interesting. The magnitude of the effect is relatively large and significant. Thus foreign firms likely gain more from participating in self-regulatory programs than domestic firms. This suggests that participation likely serves, at least in part, as a signal for good behavior. Information asymmetries between stakeholders and firms are likely more pronounced in the case of foreign-owned firms. As a consequence, there is less opportunity for foreign

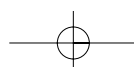




Table 5. Probit estimates of participation in individual self-regulatory programs

	ACC's Responsible Care	NACD's RDP ^a	ATMI's E3	AFPA's SFI	
5	<i>Intercept</i>	-2.155*** (0.178)	-2.539*** (0.420)	-2.020*** (0.436)	-2.552*** (0.321)
	Relative emissions	0.134* (0.067)	0.009 (0.098)	-0.195 (0.164)	-0.140 [†] (0.092)
	Sector emissions	0.008*** (0.001)	0.004* (0.002)	-0.094 (0.077)	0.055*** (0.008)
10	Foreign	0.618*** (0.158)		0.147 (0.524)	0.334 (0.326)
	Focus	0.379* (0.183)	0.356 (0.420)	0.418 (0.448)	0.835** (0.326)
	Plants	0.035*** (0.003)	-0.007 (0.014)	0.017** (0.006)	0.020*** (0.005)
15	<i>n</i>	2562	2562	541	1108
	χ^2 (df)	232.36 (5)***	5.05 (5)	8.27 (5)	74.40 (5)***
	R ² (pseudo)	0.1769	0.0141	0.0348	0.1356

Standard errors in parentheses.

[†] $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ (two-tailed test).

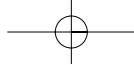
^aForeign did not vary across adopters of the chemical distributors code and thus was dropped.

firms to differentiate themselves. Industry self-regulation may be their best way to placate concerned stakeholders. Previous empirical findings are consistent with this effect (King and Shaver, 2001).

In Model 2, we relate *Relative Emissions* to our industry dummies. We begin to see an interesting story emerge. More polluting firms in the chemical industry are found to be significantly ($p < 0.05$) more likely to participate in industry self-regulation. We should note that the 'chemical industry' includes both manufacturers and distributors. There may very well be a difference in these two groups that is not captured in this particular model. Conversely, cleaner firms in the pulp and paper industry are found to be significantly ($p < 0.05$) more likely to participate. In the textile industry, we also find cleaner firms joining, though we are not confident in this estimate at the 95% confidence level. These findings suggest variance in the rise of adverse selection in self-regulatory programs. In the chemical industry, more polluting firms are joining, suggesting

adverse selection. In the pulp and paper industry, cleaner firms are joining.

To provide further evidence of the differences between programs, we split the sample by industry and look directly at participation in individual programs. In Table 5, we present the estimates for each self-regulatory program regressed against our set of independent variables. Our models for Responsible Distribution and E3 suggest that dirtier and cleaner firms join respectively, though we are not confident in these estimates at a 95% confidence level. In the case of Responsible Care, consistent with King and Lenox (2000), we find significant evidence that more polluting firms were more likely to join. In the case of the Sustainable Forestry Initiative, we find that cleaner firms were more likely to participate. In addition, we once again find that firms in dirtier segments of the industry, foreign-owned firms, large firms and firms focused in the industry were more likely to join. Hence, we find further evidence of variance with respect to the presence of adverse selection.



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DISCUSSION

In support of Hypothesis 1, we find evidence that, in 1996, participants in the American Chemistry Council's Responsible Care program were more polluting on average than other chemical firms in the United States. In support of Hypothesis 3, we find evidence that, in 1996, participants in the American Forest and Paper Association's Sustainable Forestry Initiative were less polluting on average than other pulp and paper companies in the United States. We did not find conclusive support for Hypotheses 2 and 4. We were not confident (at a 90% level) in our estimates of the effect of relative emissions on program membership.

Thus, we conclude that as of 1996 adverse selection had occurred in the Responsible Care program but not the Sustainable Forestry Initiative. What may explain its presence in Responsible Care and its absence from the Sustainable Forestry Initiative? We have proposed that the existence of mechanisms to screen members' compliance with program objectives and to eject members that fail to comply is the key difference. ACC to that point had relied on the 'velvet glove' of informal peer pressure by member firms, while the AFPA had a history of removing non-compliant members. We believe this subtle but important difference may explain our findings.

We should be cautious in our conclusions. We present evidence of a statistically significant difference in the environmental performance of participants in different self-regulatory programs. We have no way to test directly which program characteristics or aspects of industry structure may be driving this difference. We, in essence, have a sample of four – the four self-regulatory programs under study. Other factors may explain this outcome. For example, the relatively small number of pulp and paper firms participating in the Sustainable Forestry Initiative may make informal mechanisms more effective than in the much larger Responsible Care program. We cannot rule out such alternative hypotheses

without examining a larger number of self-regulatory programs across a comparably set of industries and contexts. The small number of environmental self-regulatory programs that have been established to date make such an analysis infeasible at this time.

CONCLUSION

In this paper, we explore the conditions under which industry self-regulation may be subject to adverse selection. We present evidence that circa 1996 relatively more polluting firms tended to participate in the American Chemistry Council's Responsible Care program, while relatively cleaner firms participated in the American Forest and Paper Association's Sustainable Forestry Initiative. We hypothesized that differences in the structure of the two programs are driving our findings. In particular, we propose that the failure of ACC to expel members for non-compliance during the period under study invited underperforming firms to join and to not invest in improvements.

We should recognize that the programs studied are evolving. In 1998 NACD voted to require that each member's implementation of RDP be verified by an approved third party (NACD, 2003). ACC will soon require third party verification of Responsible Care compliance as a condition of membership. It will begin raking its members based on their environmental performance and publish the results (Nash, 2003). By December 2007, member firms will be required to have facilities externally certified to a new Responsible Care management system that builds on the ISO 14001 international environmental management standard.

By our own arguments, we believe that the attraction of more polluting firms to the Responsible Care program will be attenuated as the ACC is more diligent in monitoring member firms and expelling non-compliant members. Through its recent changes, the ACC

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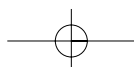
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may very well have solved the adverse selection problem. The changes in program structure in Responsible Care and other programs provide a valuable laboratory to explore the effectiveness of various monitoring and sanctioning schemes. The environmental performance data necessary to test the impact of these changes, using the approach taken in this paper, will not be available for a number of years.

Our findings have important implications for firm managers. On one hand, more polluting firms may seek to undermine program enforcement so as to allow their own entry. However, any benefit they receive will probably be temporary as their presence drives down the value of participation. On the other hand, firms with superior environmental performance should look to establish strict monitoring and sanctioning mechanisms to ensure that self-regulatory programs do not attract polluting firms that will dilute the value of membership. Less polluting firms gain from preventing adverse selection into self-regulatory programs.

The state may create incentives for firms to adopt strict governance structures by rewarding firms that participate in effective self-regulatory programs. For example, member firms could receive favorable consideration in permitting from regulatory agencies or be subject to less frequent inspections. The state could give preferential consideration to program members in procurement decisions. Regulators may ease the monitoring responsibilities of self-regulatory programs by requiring and verifying firm reports on environmental behavior. Of course, we only recommend that the state provide such benefits if the self-regulatory program has the governance structures in place to prevent adverse selection. The simple promise of these benefits may be sufficient to encourage high performing firms to seek strict monitoring and enforcement mechanisms.

As the popularity of industry self-regulation grows as an alternative or supplement to

traditional forms of government regulation, research is needed to explore the conditions under which effective industry self-regulation is possible. In this paper, we further understand of industry self-regulation by exploring whether the inclusion of sanctioning mechanisms is critical for the functioning of industry self-regulation. We find evidence supporting this proposition. We believe that the prospects for trade associations to lead industry self-regulation are contingent on the nature of the monitoring and compliance mechanisms brought to bear on non-compliant participants.

APPENDIX – RELATIVE ENVIRONMENTAL PERFORMANCE MEASURE¹

To correct for differences in toxicity between emitted chemicals, we follow King and Lenox (2000) and weight each chemical by its toxicity using the reportable quantities (RQ) database in the CERCLA statute. We construct aggregate releases for a given facility in a given year (E_{it}) by summing the weighted releases of the 246 chemicals that have been consistently a part of the TRI database.

$$E_{it} = \sum_{\forall c} w_c e_{cit} \quad (1)$$

where E_{it} is aggregate emissions for facility i in year t , w_c is the toxicity weight for chemical c in year t and e_{ci} is the pounds of emissions of chemical c .

Following King and Lenox (2000), we measure relative environmental performance at the facility level by estimating a production function relationship between facility size and aggregate toxic emissions for each four-digit Standard Industrial Classification (SIC) code within each year using standard OLS regression. We use employees to measure facility size because we have no measure of production

¹ Portions of this appendix have previously appeared in print (see King and Lenox, 2001).

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units or sales at the facility level. We estimate the following relationship for each industry:

$$\ln E_{it} = \alpha_{jt} + \beta_{1jt}(\ln s_{it}) + \beta_{2jt}(\ln s_{it})^2 + \varepsilon_{it} \quad (2)$$

where E_{it} is actual emissions for facility i in year t , s_{it} is facility size and α_{jt} , β_{1jt} and β_{2jt} are the estimated coefficients for sector j in year t .

The relative environmental performance of a facility (RE_{it}) is given by the standardized residual, or deviation, between observed and predicted emissions given the facility's size and industry sector. Thus, if a facility emits more than predicted given its size and SIC code, it will have a positive residual and a positive score for environmental impact.

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BIOGRAPHY

Michael J. Lenox (corresponding author) is Associate Professor of Business at the Fuqua School of Business, Duke University, Box 90120, Durham, NC 27708, USA

Tel.: +1 919 660-8025

Fax: +1 919 684-2818

E-mail: mlexox@duke.edu

Jennifer Nash is at the Kennedy School of Government, Harvard University, 79 JFK Street, Cambridge, MA 02138, USA

Tel.: +1 617 384-7325

Fax: +1 617 496-0036

E-mail: jennifer_nash@ksg.harvard.edu

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