

**Participation of Firms in Voluntary Environmental  
Protection Programs: An Analysis of Corporate Social Responsibility and  
Capital Market Performance**

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Keywords: Environmental Policy, Voluntary Program, Event Study

JEL Code: G14 Q58

2009

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## ***1. Introduction and Literature Review***

The role and overall responsibility of the business community in the USA with regard to environmental protection reflects, at least in part, the evolving policy and regulatory framework set by the federal and state governments. Economic theory suggests that policy-makers set policy and regulatory instruments consistent with socially-optimal levels of environmental protection and that businesses operate in a manner fully compliant with the framework set by government for achieving these levels. This still is the mainstay of the environmental protection regime. Over the past ten years or more, the role of the business community beyond mere compliance has received increasing attention. Although there is no well agreed-upon definition of corporate social responsibility, examples of firms acting “green” are abundant. Examples include an internal carbon-trading regime introduced by British Petroleum, the Responsible Care Program initiated by the Chemical Industry and the establishment of the Socially Responsible Investment Funds. There is, in fact, a very extensive list of firm or industry environmental initiatives that go well beyond mere compliance with the law. A plethora of questions have arisen surrounding the issue. Do firms have additional moral and social responsibilities prompting them to devote resources to environmental protection above and beyond what is stipulated by the law? What are the motivations for doing so, and what is the frequency of such behavior? (Hay, Stavins and Vietor (ed), 2005).

Partly in response to the corporate social responsibility (CSR) movement, and partly to address the inadequacies of conventional means of environmental protection, the Environmental Protection Agency (EPA) has introduced voluntary environmental

programs which seek to recognize and reward above average environmental performance. The Environmental Leadership Program, Star-track Program and National Environmental Performance Track Program are of this form. These programs are characterized by the concept of tiered regulation, which has been described as the “tailoring of regulatory requirements to fit the particular circumstances surrounding regulated entities.”<sup>1</sup> Tailoring may include flexibility in compliance schedules, adjusting the frequency of inspections or monitoring requirements, or differentiating the level and form of sanctions. The effectiveness of voluntary programs as a policy instrument depends pivotally on whether firms can participate on a sustainable basis and whether the benefits (including rewards) are sufficient to justify the extra costs incurred by beyond-compliance activities. In this connection, an extensive literature has developed relating some measure of a firm’s economic performance with its performance regarding one or more dimensions of social responsibility.

One measure of firms’ economic performance is their stock prices. Since 1990s, there has been a series of econometric analysis that examines the effects of environmental news on stock prices using the event studies method. First used in the classic stock split event study by Fama, Fisher, Jensen, and Roll (1969), the event studies method remains “vibrant to this day” (Fama, 2010) and is widely used in the financial economics, corporate finance and law and economics literature. Over time, both the number of published event studies and a parallel literature on the methodology of event studies have been growing. While short-horizon methods are “relatively straightforward and trouble-free”, long-horizon tests with event windows over 12 months have serious limitations

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<sup>1</sup> “Tiering: A Practical Guide to the Use of Tiering as a Regulatory Alternative,” Project on Alternative Regulatory Approaches (Sept. 1981), 1.

(Khotari and Warner, 2006)<sup>2</sup>. Khotari and Warner (2006) maintain that more weight should be put on the results of short-horizon tests than long-horizon tests, as the former presents the “cleanest evidence we have on efficiency” (Fama, 1991). While more reliable than long-horizon tests, short-horizon tests also have several limitations, including issues about choice of models to the predict security’s returns (McWilliams and Siegel, 1997, 2000 and McWilliams et al. 1999), and misspecification of test statistics. Misspecification of test statistics can be caused by increasing variance of the security returns conditional on the event (Brown and Warner, 1985, and Corrado, 1989) leading to over-estimation of the effect of the event in question.

In terms of applying the event studies method to the environmental context, several studies have conducted short-horizon event studies around release of important environmental news (e.g. TRI, reception of an award, and environmental disaster). An influential study in this category is Hamilton’s 1995 study (Hamilton, 1995) of the announcement TRI data, which found significant negative cumulative abnormal returns during a 10 day window following the announcement of TRI. Cram and Koehler (2000) re-evaluated the Hamilton study using seemingly unrelated regressions and found that the

<sup>3</sup> Other event studies reached similar conclusions for other countries. Dasgupta, Laplante and Memingi (2001) studied the way in which capital markets in Argentina, Chile, Mexico and the Philippines reacted to information about a firm’s environmental performance. Their raw data were public recognition of firms’ superior or inferior

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<sup>2</sup> Long-horizon studies have an event window of 12 months or more. There is a large literature on long-horizon security price performance following corporate events. Problems of power and specification are critical for long-horizon studies, reducing their reliability (Khotari and Warner 2006).

<sup>3</sup> In an unpublished paper, Cram and Koehler (2000) re-evaluated Hamilton’s 1995 study using seemingly unrelated regression (SUR) to account for clustering of event dates for all TRI-reporting firms. They concluded that there is no effect of TRI data news release on the event day and the five day event window once contemporaneous correlation is accounted for, although cumulated abnormal returns for each individual firm on the event day are still significant.

environmental performances, drawn from articles in major business newspapers that addressed corporate environmental performance. A later study by Dasgupta, Hong, Laplante and Mamingi (2004) found similar results for the Republic of Korea. Gupta and Gordar (2005) found that weak environmental performance indicated by low environmental ratings of India's leading environmental NGO lower the return to the stocks of large pulp and paper, automobile, and chloralkali firms in India. Grand and D'Ella (2006) focused on Argentina and found that positive environmental news have no impact, while negative news do have an effect on average rates of return a few days following its appearance.

From the existing event studies that relate firm's stock prices to environmental information, the evidence is quite consistent in support of the hypothesis that negative environmental news hurts firm's financial performance. However, whether good environmental news improves firms' financial performance is less clear, which raises questions about using voluntary environmental programs to induce better environmental performance. The efficient market hypothesis suggests that both bad news and good news impact firms' financial performance through providing investors with new information. One distinguishing feature between good and bad environmental news is credibility. Bad news typically involve environmental accidents, court rulings and government regulatory actions, which is credible and easy to interpret for investors in term of posing imminent danger of litigation and potential liability for environmental damages. Good news, which can be announcements of environmentally friendly projects/ISO norms, and public recognition by government agencies or NGOs, can be less credible lacking transparent and consistent standards for awards.

This paper employs an event study method for firms having been awarded membership in the EPA's National Environmental Performance Track (NEPT) Program. Cumulative abnormal return is the dependent variable measuring firms' economic performance, while NEPT membership is the measurement of the environmental performance of firms. This paper finds significant positive shocks to the stock value in the 10 and 15 day event windows following the announcement of NEPT membership, providing strong evidence that acceptance to the NEPT adds to market capitalization of the accepted firms, thereby benefiting the shareholders. Compared to positive environmental news in the media, NEPT membership is a relatively more credible measure of the overall environmental performance of a firm. EPA has clear criteria of admission into the program and devotes considerable resources to screening applicants and monitoring NEPT members. In this manner, this paper lends insight into the effect of environmental performance on investors' short-term expectations of firms' future financial performance. The results should help inform environmental policy concerning the use of voluntary programs as a policy instrument as voluntary environmental programs have been employed in both developed and developing countries.

Besides the event study approach, there is a wealth of literature that uses more regression analysis to estimate the effect of some measure of CSR on firms' financial performance. Margolis and Walsh (2001) surveyed 95 studies, which measure the economic performance of firms in a variety of ways, including their cumulative abnormal returns, return on equity, assets, and sales. The variables used to measure some dimension of the commitment to CSR is diverse, including measures related to firms'

environmental performance, the products or services, corporate governance practices, and investments in countries that are considered to have less stringent policy/regulatory frameworks or labor practices. Frequently, the studies control for industry variables in which the firm operates, including the size of the firm, its debt-to-equity ratio, and the intensity of its R&D and advertising. According to Margolis and Walsh, slightly more than half (53%) of the studies found a positive relationship when CSR was used as an independent variable to explain financial performance. For the remaining studies, no relationship or a negative or mixed relationship was found. Most reviewers of the literature have concluded that the validity of such studies is often compromised due to problems with measurement, specification of estimating equations and omitted variable bias. Other problems include sampling bias and direction of causality. Margolis and Walsh found that “over half of the 95 studies examine exemplary, notorious, or very large firms” (Margolis and Walsh 2001). The direction of causality is hard to determine if one only finds a correlation between two variables.

ADD A PARAGRAPH ABOUT EVENT STUDIES, OUTLINING  
STRENGTHS AND WEAKNESSES.

## ***2. Corporate Social Responsibility and Capital Market Performance***

As noted above, there is no generally agreed-upon definition for CSR. Portney (Portney, 2005) proposed a definition for the purpose of analyzing CSR from an economic perspective: CSR is “a consistent pattern, at the very least, of private firms doing more than they are required to do under applicable laws and regulations governing the environment, worker safety and health, and investments in the communities in which they operate”. This definition, or definitions along these lines, are quite frequently used

by economists in analyzing CSR. Although some argue for incorporating the requirement that firms sacrifice shareholder value into the definition, Hay et al (2005) maintain that the best definition depends on the inquiry addressed. For the purpose of this study, Portney's definition seems more appropriate.

Heal (2005) views CSR's role as "anticipating and minimizing conflicts between corporations and society and its representatives, aligning private and social costs if differences are the source of the conflict, or minimizing distributional conflicts if these are the issue." In the realm of environmental protection, conflicts between corporations and society almost always derive from differences between private and social costs associated with pollution. This conflict needs to and eventually will be resolved or at least reduced, including through legislation and other government interventions. How this conflict is resolved or reduced has or will have an impact on the economic performance of firms. CSR compensates at least to some extent for market imperfections and is a supplement to government intervention.

Heal (2005) outlines the benefits from CSR programs, which can be broadly categorized as: reducing risk; improving relations with regulators; generating brand equity; improved human relations and employee productivity; and lower cost of capital. In terms of risk, pollution could lead to costs associated with tort and litigation, and the cost of conflicts with other groups in society, especially environmental NGOs. Tort and litigation can lead to financial loss, and conflicts with NGOs can depress earnings and share prices and give competitors an opportunity to gain market share. A positive relationship with regulators could be very important for heavily regulated industries. In



general, a regulatory decision in favor of a company with a strong reputation for socially responsible behavior will be greeted more positively than one in favor of a company seen as anti-social in its conduct, which likely influences regulators in their decisions.

In terms of brand equity, there is evidence that consumers' purchasing decisions are sensitive to companies' positions on CSR, which has implications for the value of a company's brand. CSR helps improve human relations and employee productivity through attracting talented personnel who care about the firm's image. Lower cost of capital refers to access to Socially Responsible Investment (SRI) Funds.<sup>5</sup>

Proponents maintain that CSR policy makes firms more attractive to investors and raises their profit in the long run through the mechanisms outlined above. Hence the connection between a firm's policies towards CSR and its position in the capital market. One of the first papers to examine the connection between CSR and capital markets was Hamilton's 1995 study of the announcement of TRI data. The EPA makes public a firm's self-assessment of its releases of toxic chemicals. Hamilton reviewed the press treatment of these announcements and their impact on share prices. He used event study methodology to identify how the announcement of toxic releases affected the stock market values of the firms concerned, relative to the market as a whole. He found a significant negative impact of the information releases on stock prices, with an average impact on a firm's stock market values of \$4.1 million. The size of the impact depends on the number of chemicals released by the firm, increasing by \$236,000 for each additional chemical.

### ***3. Methodology***

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<sup>5</sup> SRI now accounts for of the order of 12% of funds under professional management in the U.S. and a smaller but growing fraction in European countries (Heal, 2005).

This paper employs the standard event study method in finance to examine the reaction of investors to announcement of firms' participation in the NEPT Program, which is the event of interest. The event-study methodology is based on the efficient market hypothesis, i.e. capital markets operate efficiently to evaluate the impact of new information on expected future profits of the firms. In the case of the NEPT Program, membership applications are reviewed twice a year and decisions on acceptance are conveyed to facilities individually by regional EPA offices. When facilities are informed of their acceptance into the NEPT Program, some may choose to release a statement on their own. In any case, a news release event is usually organized at the EPA headquarters in Washington DC to announce the names of facilities admitted into the Program. In recent few years, the dates of the news releases were typically a few days or up to a month after the acceptance.

Event study analysis is widely used and the procedures are quite standard. Campbell et al (1997) and MacKinlay (1997) gave detailed descriptions of the methodology. The methodology involves five steps: event definition, including definition of the event and estimation windows; determining selection criteria for including firms in the study<sup>6</sup>; estimating normal performance within the estimation window and predicting normal returns during the event window in the absence of the event; calculation of the abnormal return and cumulative abnormal returns within the event window, and testing whether the abnormal return and cumulative abnormal return for all firms treated as a group are statistically different from zero.

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<sup>6</sup> The criteria may involve restrictions resulting from data availability such as listing on the NYSE or AMEX, and occurrence of other confounding events at the same time of the event of interest.

In the following analysis, abnormal returns are estimated using the market model which assumes a linear relationship between the return of any security to the return of the market portfolio<sup>7</sup>. The CRSP value-weighted index is used for the market portfolio.

$$R_{it} = \alpha_i + \beta_i R_{mt} + e_{it}$$

With  $E(e_{it}) = 0$  and  $Var(e_{it}) = \delta_{it}^2$

Where

$R_{it}$  -- returns on security;

$R_{mt}$  -- returns on the market portfolio

$t$  -- the time index,

$i$  -- index for security

This model is estimated drawing upon stock price data for the period 150 to 30 trading days prior to the events. The news release events usually occurred around 30 trading days after acceptance to the Program. Excluding the 30 trading days prior to the news release event eliminates possible effects from publicizing activities of individual firms upon notification of membership approval. Estimates of  $\alpha_i$  and  $\beta_i$  are used to predict a normal return for each security over the time of the event window. Abnormal

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<sup>7</sup> Other models include the constant return model and Capital Asset Pricing Model (CAPM). CAPM is an equilibrium theory where the expected return of a given asset is a linear function of its covariance with the return of the market portfolio. It was commonly used in 1970s but more recently there has been some statistical evidence against the CAPM based on US stock market data for the past 30 years. Therefore, use of the market model has been preferred.

Market model represents a potential improvement over the constant-mean-return model. By removing the portion of the return that is related to variation in the market's return, the variance of the abnormal return is reduced. This can lead to increased ability to detect event effects. The benefit from using the market model will depend upon the R<sup>2</sup> of the market-model regression. The higher the R<sup>2</sup>, the greater is the variance reduction of the abnormal return, and the larger is the gain. (Campbell, 1996)

return (AR) is defined as the difference between the normal return and the actual return.

For a single security  $i$  at a given time  $t$  AR is calculated as:

$$AR_{it} = R_{it} - \hat{\alpha}_i - \hat{\beta}_i R_{mt}$$

Under the null hypothesis that the given event has no impact on the mean or variance of returns, and the assumption of joint normality of the abnormal returns, the distribution for any single abnormal return observation is as follows:

$$AR_{it} \sim N(0, V_i)$$

$$V_i = \sigma^2(AR_{it}) = \sigma_{e_i}^2 + \frac{1}{L} \left[ 1 + \frac{(R_{mt} - \bar{R}_m)^2}{\sigma_m^2} \right]$$

The abnormal return observations are then aggregated along two dimensions – through time and across firms to draw overall inferences for the event of interest. During the period  $(T_2 - T_1)$ , the cumulative abnormal return for a given firm ( $i$ ) is aggregated as follows:

$$CAR_i(T_1, T_2) = \sum_{t=T_1}^{T_2} AR_{it}$$

Asymptotically the variance of the cumulative abnormal return for firm  $i$  is

$$\sigma_i^2(T_1, T_2) = (T_2 - T_1 + 1) \sigma_{e_i}^2$$

To test the null hypothesis of zero cumulative abnormal return, one can formulate a  $Z$  test as:

$$CAR_i(T_1, T_2) \sim N(0, \sigma_i^2(T_1, T_2)) :$$

$$Z = \frac{CAR}{(\sigma_i^2(T_1, T_2))^{1/2}} \sim N(0, 1)$$

An aggregation of interest can also be performed across both time and events. In that scenario, the average cumulative abnormal return for a subset of  $N$  events between two dates  $T_1$  and  $T_2$  is defined as:

$$CAAR(T_1, T_2) = \frac{1}{N} \sum_{i=1}^N CAR_i(T_1, T_2)$$

Where  $N$  is the number of events.

The variance of CAAR is:

$$Var(CAAR(T_1, T_2)) = \frac{1}{N^2} \sum_{i=1}^N \delta_i^2(T_1, T_2)$$

Under the null hypotheses that the abnormal returns are zero,

$$Z = \frac{CAAR(T_1, T_2)}{(\text{var}(CAAR(T_1, T_2)))^{1/2}} \sim N(0,1)$$

MacKinlay pointed out that this distributional result is asymptotic with respect to the number of securities  $N$  and the length of estimation window  $L$ .

#### **4. Data**

For some thirty years the US Government's policy approach to environmental protection has been characterized by technology-based regulations, ambient standards, environmental impact assessments, and information disclosure mandates. Based on powerful laws and tough regulations to curb pollution and to enforce the "polluter pay" principle, these instruments are largely highly centralized and inflexible (Hirsch 2001).<sup>8</sup> Despite considerable progress in protecting and improving the environment, it is increasingly recognized that new approaches could and should be employed.

The introduction of market-based instruments and other innovations during the

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<sup>8</sup> GET A BETTER CITE FOR THIS.

later half of the 1980s and the first half of the 1990s signaled a more flexible approach to environmental protection. The essence of these new initiatives was “tiering”, whereby regulatory requirements were tailored “to fit the particular circumstances surrounding regulated entities.”<sup>9</sup> More proactively, programs were introduced to recognize and reward above average environmental performance. These included the Environmental Leadership Program (ELP) and StarTrack programs, the forerunners of the National Environmental Performance Track (NEPT) Program. Under these programs, entities are encouraged by various forms of incentives and rewards to go beyond compliance; the rewards include reduced regulatory requirements and public recognition of corporate social responsibility.

The NEPT Program is a voluntary program that seeks to recognize, reward, and encourage facilities that exemplify “strong” or “top” environmental performance. Its “mission” has been described by EPA as improving environmental performance, transforming relationships, and encouraging innovation.<sup>10</sup> The four main goals of the Program are: (1) recognizing top environmental performance, (2) rewarding top environmental performance, (3) encouraging continuous environmental improvement, and (4) transforming relationships<sup>11</sup>.

EPA goes through a multi-stage admission process to ensure that accepted members of the Performance Track Program meet standards set for “top environmental performance.” The screening stages include active recruitment, review of application, and checks for violations. Applicants are required to meet Performance Track criteria in

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<sup>9</sup> “Tiering: A Practical Guide to the Use of Tiering as a Regulatory Alternative,” Project on Alternative Regulatory Approaches (Sep. 1981), 1.

<sup>10</sup> Progress Report, 3.

<sup>11</sup> [://www.epa.gov/performance-track](http://www.epa.gov/performance-track)

four areas: (1) establishing and maintaining a comprehensive environmental management system (EMS), (2) going beyond legal requirements by making commitments to continuous environmental improvement, (3) informing and seeking input from its local community about the facility's environmental performance, and (4) maintaining a record of sustained compliance with environmental requirements (EPA 2006). Yu and Coglianese (2006) examined the effectiveness of the EPA's screening process and found that it has succeeded in admitting relatively superior performers – as determined by three indicators (PCS -- permit compliance system, RSEI -- risk screening environmental indicators, and TRI -- toxic releases inventory) Yu and Coglianese utilized a database compiled by Booz Allen Hamilton from public and EPA sources, which contains information about 561 facilities that have ever applied to the NEPT from round 2 to round 7, including those rejected. Performance of those rejected is compared to those accepted in terms of the three indicators. While fewer firms have PCS and RSEI information, 200 firms in the database have TRI information. A panel analysis of the 200 firms over the 15 years from 1988 to 2002 yields statistically significant lower quantities of TRI released controlling for industry and firm characteristics.

The recruitment process is overseen by an EPA official, assisted by external contractors. Applications for Performance Track are accepted on a semi-annual basis, from February 1st to April 30th and from August 1st to October 31st.<sup>12</sup> Potential new members are contacted by program representatives, to appraise them of the benefits and application process. Follow-up contacts and information may lead to a formal letter of membership invitation from the Program Director. EPA's outreach activities supplement recruitment activities under the NEPT Program.

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<sup>12</sup> <http://www.epa.gov/performance-track/apps/app.htm>

Decisions on membership acceptance are conveyed to facilities in August and February, respectively. Once a facility is awarded membership, it is required to provide annual performance reports which, together with public outreach programs and selective site visits by EPA officials, ensures accountability. Memberships are for 3 years and subject to renewal afterwards. If the annual performance reports fail to be delivered as required or, together with site inspections, reveal problems in meeting NEPT standards, EPA may ask the facility to withdraw from the Program. Each year, around 20% of the members decide not to renew or not to submit an annual report, and drop out of the Program<sup>13</sup>. The combination of the stringent admission and renewal processes indicates that firms that are active members of NEPT have achieved higher environmental performance and committed to more improvement of environmental performance than non-members, which is also beyond the requirement of law. Thus membership of NEPT signals that firms are engaged in a form of CSR -- defined as “doing more than they are required to do under applicable laws and regulations governing the environment”.

Membership in the NEPT is publicized in a number of ways. While notification of membership is private, new members may choose to issue a press release.<sup>14</sup> Unfortunately, information about approval dates is only available for rounds 8 through 13<sup>15</sup>. EPA also issues news releases to announce new members soon after the approval

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<sup>13</sup> Interview 1/6/2006 with Julie K. Spyres, Director, Program Development and Member Services, National Environmental Performance Track, EPA.

<sup>14</sup> Interview 1/6/2006 with Julie K. Spyres, Director, Program Development and Member Services, National Environmental Performance Track, EPA.

<sup>15</sup> Industrial Economics Ltd. is a contractor that helps screen applications on behalf of the EPA. They maintain a database with all application information. The approval dates for round 8 through 13 are available. However, the dates for round 1 through 7 are not available from Industrial Economics.



dates. Further, EPA's website highlights new members and elected officials are informed, as are trade journals, helping to generate media coverage.

A search through LexisNexis shows that the NEPT Program received very little coverage in major newspapers, but a lot of coverage in news wires. From 2000 to 2007, the NEPT appeared only once in The Houston Chronicle (March 27, 2004, Saturday), regarding the Houston Port Authority. However, from 2000 to 2007, the NEPT appeared 99 times in newswires. Eight out of 13 news releases announcing new members were covered by news wires on the same day when the news events occurred. There were also news items that covered individual facilities following the news releases.

The lack of coverage of the NEPT Program in major newspapers is consistent with the economic theory of information provision developed by Downs (1957). Under the classical utility-maximizing framework, rational individuals have incentives to free ride on participation in political issues and demand relatively little information related to public policy issues. As a result, only selective media channels provide such information. The abundance of coverage of the NEPT Program in news wires suggests that environmental performance is an important consideration for investors and the business community in general, possibly due to its implications on firms' future earnings.

From 2000 to 2007, the Program admitted facilities through 13 rounds of membership applications and had about 450 active members. Membership had been increasing by about 11 percent annually. The NEPT Program is facility based; parent firm information is obtained from application forms posted online<sup>16</sup>. Stock price data and firm general information are obtained from the Center for Research in Security Prices (CRSP).

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<sup>16</sup> Application forms, and annual reports of the member facilities are stored online on a EPA website <http://www.epa.gov/performance-track/>.

The names of parent firms obtained from the NEPT website were matched manually with firms included in the CRSP. This means that only publicly traded companies were included in the sample. As shown in Table 1, which includes information about new members accepted into NEPT in each round, 54.5% of facilities were affiliated with publicly-traded parent firms in the NYSE, AMEX and NASDAQ stock markets. Table 1 does not include information about renewal, as it is not considered “news” to investors in the same sense that new memberships are.

Table 1: Summary of New Membership Information by Application Rounds

Round	Date of News Release	Date of Membership Approval	# Firm (with first event) <sup>1</sup>	Firm/event <sup>2</sup>	# of Facilities	% of total member facilities	Total New Members <sup>3</sup>
1	12/13/2000	n.a.	33	33	91	35.5%	256
2	8/1/2001	n.a.	5	13	18	75.0%	24
3	2/11/2002	n.a.	1	4	19	59.4%	32
4	8/23/2002	n.a.	3	10	14	60.9%	23
5	3/6/2003	n.a.	6	14	20	54.1%	37
6	8/22/2003	n.a.	4	7	9	36.0%	25
7	2/11/2004	n.a.	9	13	33	84.6%	39
8	8/30/2004	8/1/2004	5	9	11	57.9%	19
9	3/4/2005	2/1/2005	6	18	28	51.9%	54
10	8/24/2005	8/1/2005	4	16	34	87.2%	39
11	4/27/2006	2/1/2006	6	11	20	54.1%	37
12	10/25/2006	9/18/2006	6	13	18	56.3%	32
13	3/6/2007	2/13/2007	5	18	30	54.5%	55
<b>Total</b>			<b>93</b>	<b>179</b>	<b>345</b>	<b>51.3%</b>	<b>672</b>

Note:

1. This column only includes the number of firms that had a facility joining NEPT for the first time. If other facilities from the same firm join NEPT in later rounds of applications, the firm is not counted again.

2. This column includes firms that have facilities joining the NEPT in each given round. Repeats in later rounds are counted.

3. This column includes all new members that were ever accepted into the NEPT. Since some of them dropped out of the program, the total (672) is larger than the number of current members (450).

Many firms have multiple facilities in NEPT. Three hundred and five facilities, or sixty-eight percent of all active members, are affiliated with 53 firms (organizations) that have more than one facility in NEPT. Public firms with the largest number of facilities in the NEPT Program include Johnson & Johnson (39), 3M (17) and Lockheed Martin Corporation (11). Most other firms have 2 to 5 facilities in the NEPT. In order to examine the determinants of abnormal returns, firm-level data on industrial sector, size, and advertising and R&D expenditures were compiled.

Of the 93 publicly-traded firms with facilities that joined the NEPT Program, 87 firms had complete stock price data during the estimation and event windows.<sup>17</sup> Firms with facilities that joined during the fifth round (March 2003) were dropped due to a confounding event -- the Iraq War that began on March 19<sup>th</sup> 2003. This left 81 firms in the data set for the analysis of abnormal returns and their determinants. A high percentage of firms (90%) were in the manufacturing industry; pollution intensive industries account for 26% of the total. In the analysis that follows, 7 industries were categorized as pollution intensive: pulp and paper, chemical, petroleum, cement, iron and steel, non-ferrous metals and metal mining<sup>18</sup>.

The relatively high proportion of firms in pollution intensive industries reflects firms' concern about reducing risk and securing good relationships with the EPA as a regulator. According to an EPA survey, the primary reason for joining the NEPT is

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<sup>17</sup> CRSP only has stock price data up to Dec. 2006, hence firms in Round 13 were dropped.

<sup>18</sup> The definition of pollution intensive industries varies from one study to another. In general there are three approaches: (1) ranking pollution intensity according to abatement costs (Tobey 1977 and Low and Yeats 1992), (2) ranking according to toxic intensity (Lucas et al, 1992) and (3) ranking according to emission intensity (Gallagher and Ackerman 2000). These different definitions seem to yield similar lists of polluting industries.

gaining or securing a good collaborative relationship with EPA<sup>19</sup>. In terms of firm size, a majority of the firms had between 16,000 to 125,000 employees. In terms of advertising expense, the data may not be complete. Many firms do not report advertising expense but, rather, selling/general/administrative expenses in their income statements. Forty-three out of 81 firms reported no advertising expense. These firms are treated as having zero advertising expense in the analysis, which may have biased the results. R&D data is relatively more complete. Only 10 out of 81 firms reported no R&D expense.

Table 2: Summary Statistics of Publicly-Traded Member Firms (N=81)

Variable	Obs	Mean	Std. Dev.	Min	Max
Total number of participating facilities	81	3.27	5.43	1	40
Number of participating facilities in each round of application	81	1.81	2.51	1	20
Price of share (USD)	81	40.89	23.91	1.45	115.10
Shares outstanding (millions)	81	567.56	1066.17	1.03	6295.49
Total assets ( millions USD)	81	18314.26	20107.24	54.92	103946
Total sales (millions USD)	81	16100.34	18437.8	7.44	91685
Number of employees (thousands)	81	56.98	73.01	0.1	461
Advertising expense (millions USD)	81	263.76	689.90	0	3399
R & D expense (millions USD)	81	760.90	1266.42	0	6215.9
Manufacture industry	81	0.90	0.30	0	1
Metal mining	81	0.014	0.120	0	1
Pulp and paper	81	0.071	0.250	0	1
Chemical	81	0.143	0.352	0	1
Petroleum	81	0.029	0.168	0	1
Cement	81	0.014	0.120	0	1
Iron and steel	81	0.014	0.121	0	1
Non-ferrous metal	81	0.014	0.121	0	1

## 5. Results

Some participating firms had multiple facilities that joined the NEPT Program at different dates; they each had more than one event date. Since the application rounds are

<sup>19</sup> Interview 1/6/2006 with Julie K. Spyres, Director, Program Development and Member Services, National Environmental Performance Track, EPA.

only 6 months apart from each other, it is possible that investors do not value multiple events for the same firm equally. Therefore, two sets of analysis were conducted reflecting possible differentiation in the event impacts. The first set of analysis includes only event dates for firms that had facilities approved for membership in the NEPT Program for the first time. Another set of analysis included all event dates for participating firms.

Abnormal returns for the participating firms were calculated for five event windows. One event window only included the day when the news releases occurred (day 0). The underlying assumption is that the market is efficient and information about joining NEPT is reflected almost instantly in the stock prices. The second event window is defined over a period of 5 trading days from one day before the event (day -1) to the third trading day (day 3) after. Including one trading day immediately prior to the event is common in event studies, reflecting concerns over the possibility of information being leaked to the market before the occurrence of the actual events. In the same way as above, 10, 15 and 20 day event windows were defined.

Confounding events concerning the participating firms during the event windows were identified through coverage by the Wall Street Journal. Such events included major mergers and acquisitions, important news on earnings, developments on key products, etc., which could significantly affected the firms' returns. Firms with confounding events were excluded from the analysis -- the longer the event window, the more exclusions. Table 3 contains the estimations of abnormal returns for the event windows.

Table 3:. Abnormal Returns for Participating Firms

Event Window	# Observations	Firms with First Events	# Observations	Firms with All Events
Day 0	82	-0.0017 (-0.5667)	153	-0.0018 (-1.0588)
5 day event window	79	0.00325 (0.55272)	148	0.00069 (0.20235)
10 day window	75	0.0118 (1.0261)	140	0.0134** (2.00)
15 day window	72	0.0371** (2.1953)	136	0.0176* (1.8333)
20 day window	70	0.0337 (1.4978)	134	0.0096 (0.7619)

\*\* statistically significant at 5% level.

\* statistically significant at 10% level.

t-statistics are in parenthesis.

All estimates of abnormal returns are positive except for day 0. Over the 10 day event window, firms with all events experienced a positive cumulative abnormal return of 1.34% on average, which is significant at the 5% level. Over the 15 day event window, on average firms with first events experienced a positive cumulative abnormal return of 3.7% (significant at 5% level), while firms with all events experienced a positive cumulative abnormal return of 1.76% (significant at 10% level). These estimates are in a comparable range as those from other studies in North America, which typically vary from 0.3 to 2%<sup>20</sup>.

These results indicate that on the day of the news releases, the news did not cause significant average abnormal return among member firms. After the day of the news release, the news about NEPT membership continued to reach investors and caused significant average cumulative abnormal return during the 10 and 15 day event window. When the event window is as long as 20 days, the average cumulative abnormal returns

<sup>20</sup> Previous studies in North America include Hamilton (1995), Muoghalu (1990), Lanoie and Laplante (1994), Klassen and McLaughlin (1996), Konar and Cohen (1997), and Lanoie et al ( 1998). The Dasgupta et al 2000 and 2004 found abnormal returns as high as 20% in developing countries.

become insignificant again, possibly due to diminishing impact and more potential for other confounding information.

This is quite typical of the way that markets react to unexpected news. To illustrate,, unexpected interest rate changes by central banks are not instantaneously taken account of in stock prices but, rather, cause sustained movement of prices over periods from hours to months. Some economists and market practitioners have long disputed the efficient market hypothesis in its strong form. They believe that markets are subject to inefficiencies including the slow diffusion of information, the relatively great power of some market participants (e.g. financial institutions), and the existence of apparently sophisticated professional investors.

In the case of the NEPT Program, diffusion of information is likely an important issue. As mentioned earlier, the Program received little coverage in the general media but extensive coverage in news wires. Institutional investors are likely the ones that received this information first and subsequently passed it on to the rest of the market. Delays in media coverage may have also slowed down information diffusion. On the day of the event, 3 out of 11 news releases examined in the analysis were not reported by news wires yet subsequent coverage on individual firms was extensive. In summary, news of the NEPT events was likely spread among investors in the stock market not instantly but rather over a number of days.

The estimated average cumulative abnormal returns for firms with first events were more than twice as large as those for firms with all events, indicating that investors react to the first event much more strongly than to the later events. This is expected, as the abnormal returns are caused by membership announcements as “news” to the

investors. Repeated acceptance into the NEPT Program in later rounds would carry less weight than the first time.

Following the same methodology, abnormal returns for Rounds 8 to 12 were reestimated using approval dates as the event dates. None of the estimates of abnormal returns were significant. Earlier it was noted that some firms may have taken actions to publicize their membership upon notification of approval. If they did, these publicizing activities did not cause - at least for members joining in Rounds 8 to 12 - significant abnormal returns over the periods defined by the event windows.

The estimated cumulative abnormal returns can be translated into monetary terms. The stock market value of the cumulative abnormal returns was calculated by multiplying the estimated cumulative abnormal returns by the average stock price and shares outstanding during the event window. During the 15 day window, firms with facilities joining for the first time experienced an average gain of \$418 million. On average, having facilities join the NEPT Program (including repeated events in different rounds of application) is associated with an average gain of \$329 million.

As also mentioned earlier, joining the NEPT Program may impact firms' market value through various channels, including reduced risk and waste, improved relations with regulators, generating brand equity, improved human relations and employee productivity, and lower cost of capital. These mechanisms can be examined using the estimated cumulative abnormal returns and other relevant firm information. Potential of risk and waste reduction is greater for pollution intensive industries compared to non-pollution-intensive industries. If investors interpret the news of NEPT membership as a signal for reduced risk, the stock values of pollution intensive industries should



experience a greater positive shock than others. To examine the mechanism of generating brand equity, advertising expense was used as a proxy for brand equity. If NEPT membership increases brand equity, the more important the brand equity is relative to other assets, the greater is the gain from news of NEPT membership. Therefore, higher advertising expense should be associated with higher abnormal returns. R & D expense is a measure of a firm's investment in human capital. If NEPT membership helps attract talent and improve productivity, firms with higher R&D expense should receive bigger positive shocks to their stock values. Whether NEPT membership leads to lower cost of capital could be examined through firms' borrowing interest rates, but most firms do not report borrowing interest rates in the CRSP database.

In addition to the channels above, the impact of announcement of NEPT membership may also vary with firm size and the number of facilities joining the NEPT at each event date. Controlling for these factors, a linear regression model was estimated using the 15 day cumulative abnormal return in US dollars as the dependent variable and the independent variables of interest including dummy variables for pollution extensive industries, advertising expense and R&D expense. For estimating the standard errors, robust and clustered standard errors were calculated for the individual firms. Of the 136 firm/events with complete stock price information during the 15-day event window, 133 firm/events (74 firms) had complete general firm information. Table 4 presents results of linear regressions examining the factors which influenced the impact of the announcement of NEPT membership on stock values.

Table 4: Determinants of Cumulative Abnormal Returns<sup>a</sup>

	1	2	3
Constant	333007.8 (1.78)	-50491.5 (-0.27)	152321.2 (0.33)
Advertising expense	-170.3 (-0.38)	131.4 (0.36)	202.7 (0.40)
R&D	74 (0.24)	325.4 (1.26)	693.8* (1.89)
Chemical	-100060 (-1.12)	-266238 (-0.45)	-11188.6 (-0.01)
Paper	-94684.5 (-0.51)	87842.3 (0.22)	174750.6 (0.20)
Steel	-66852.3 (-0.33)	-210942.8 (-1.14)	1007881 (1.36)
Non-ferrous metal	-320970.1 (-1.71)	-165332.5 (-0.98)	1255011 (1.06)
Cement	-279736.2 (-1.49)	-145098.8 (-0.93)	-588234.5 (-0.90)
Petroleum	1264923 (1.15)	-126457.3 (-0.10)	-828201.4 (-0.73)
Metal mining	-336852.8* (-1.84)	678374.7*** (3.17)	2260077* (1.82)
# facilities joining on event date		179850.9*** (3.42)	95177.5 (1.31)
# employees		-3107.3 (-0.54)	766.2 (0.10)
Total sales		87.7*** (4.51)	101.7*** (-4.00)
Total assets		-78.8*** (-4.39)	-106.4*** (-3.04)
Dummies for application round			Yes
Dummies for rank of event <sup>b</sup>			Yes
# observations	133	133	133
# firms	74	74	74
R-squared	0.0037	0.07	0.39

a. Dependent variable is cumulative abnormal return in thousands USD; t-statistics are in parentheses.

b. For firms with multiple event dates, the event dates are ranked in time. The first event date is ranked first and so on.

\*\*\* significant at 1% level.

\*\* significant at 5% level.

\* significant at 10% level.

In Specification 1, no control variables were included for firm size and application time. The independent variables of interest are mostly insignificant, except

for metal mining which has a negative significant coefficient of -336853. This indicates that firms in metal mining have on average a lower cumulative abnormal return than firms in non-pollution-intensive industries; this is contrary to the hypothesis.

In Specification 2, firm size and number of facilities of each firm gaining NEPT membership at a given event time were controlled for. The coefficient for the metal mining industry become positive and significant, indicating a higher cumulative abnormal return of US \$678 million on average for firms in the metal mining industry compared to those in non-pollution-intensive industries. All control variables except number of employees have statistically significant coefficients. Having more facilities accepted into NEPT increases cumulative abnormal returns. On average, one more facility joining NEPT at a given event time is associated with an additional US \$180 million in cumulative abnormal returns.

Firms' total assets are inversely related to cumulative abnormal returns. A dollar increase in total assets is associated with a decrease of about 8 cents in cumulative abnormal returns. A possible explanation is that the larger the firm is the more factors there are affecting its stock value, which decreases the relative importance of news of NEPT membership and hence the impact on the stock value. In contrast, sales revenues are positively associated with cumulative abnormal returns -- a dollar increase in sales causes an increase of about 9 cents in cumulative abnormal returns. Holding total assets constant, a larger total sales revenue indicates a higher total asset turn-over ratio which measures a firm's efficiency in using its assets to generate sales. This may simply mean that better management increases gains from news about NEPT membership.

In Specification 3, time dummies for each application round and the number of event times for a given firm were controlled for, in addition to those included in Specification 2. The coefficients for metal mining industry, total assets and total sales remained unchanged in sign and significance. In addition, R& D expense became positive and significant. An additional dollar on R&D expense is associated with 69 cents more in cumulative abnormal returns. R&D expense is a proxy of firm's investment in human capital. This indicates that NEPT membership may be viewed as important in improving human relations and productivity by investors. The coefficients for the time dummies were mixed in sign and significance. The same is true for the number of event times for a given firm.

## ***6. Conclusion***

The NEPT Program represents an attempt by the EPA to use voluntary programs as a policy instrument to encourage firms to go beyond compliance in protecting the environment. The effectiveness of voluntary programs as a policy instrument depends on whether firms receive enough rewards to rationalize sustained participation. This paper investigates the stock market reactions to the news of NEPT membership. Significant positive shocks to the stock value were determined in the 10 and 15 day event windows following the announcement of NEPT membership. There is strong evidence that acceptance to the NEPT adds to market capitalization of the accepted firms, thereby benefiting the shareholders. Further, the paper explores determinants of shocks to the stock value through examining the hypothesis of CSR. There is strong evidence that R&D, as a proxy for investment in human capital, is a significant determinant of cumulative abnormal returns. As indicated earlier, this may result from a firm being able

to attract better quality employees and to raise overall productivity through joining the NEPT Program and improving its corporate image.

There is not much evidence supporting the hypothesis that reducing risk may be another channel by which NEPT membership causes positive shocks to stock value. NEPT members are required to make commitments on reducing pollution in two major areas. These commitments may not have been as credible an indication of risk reduction as actual performance would be. Also relative to the scale of risk of liability and tort faced by pollution-intensive industries, the reductions committed under the NEPT Program may not be sufficiently important. This may help explain the lack of significant larger positive cumulative abnormal returns for firms in pollution intensive industries.

The lack of evidence for the role of advertising expense as a proxy for brand name is puzzling. However, the fact that around 50% of the firms analyzed do not report advertising expense may have biased the results. Further, advertising expense is a very inadequate measurement of brand name. Firms with well established brand names will have less need to rely on advertising expenses to enhance their brand names; firms that do not have well-established brand names are more likely to spend on advertising.

These results suggest that firms have an incentive to join voluntary programs, through the stock price effect and positive returns to investors. However, it is unknown whether the pollution reduction resulting from the additional commitments under voluntary programs is socially optimal. They could be too little or too much. CSR theory offers an alternative approach for reaching socially-optimal levels of environmental protection, in addition to the government acting as a planner maximizing social welfare. Provided that the resulting pollution reduction brings us closer to the

socially optimal levels, voluntary environment programs can be an effective complement to performance-based instruments, which encourage firms to engage in beyond-compliance pollution reduction.

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## Appendix: List of All Firms in Sample Set

Name	# facilities
Round1: 12/13/2000	
Dana Corp	2
Eaton Corp	1
Ingersoll-Rand Co Ltd	2
Marathon Oil Corp	1
Bristol-Myers Squibb Co	2
Lockheed Martin Corp	9
Meadwestvaco Corp	1
Intl Paper Co	6
Johnson & Johnson	20
3M Co	7
Motorola Inc	3
CMS Energy Corp	1
Rohm And Haas Co	1
Cooper Tire & Rubber Co	1
Ryder System Inc	4
Hewlett-Packard Co	1
Baxter International In	2
Masco Corp	1
Fuji Photo Film -Adr	1
Interface Inc -Cl A	2
Sony Corp -Adr	1
Teradyne Inc	1
PNM Resources Inc	1
Baker Hughes Inc	1
Akzo Nobel Nv -Adr	1
Rio Tinto Group (Gbr) -	2
Sanmina-Sci Corp	1
Cytec Industries Inc	1
Concur Technologies Inc	1
Infineon Technologies A	1
Round 2: 8/1/2001	
Eaton Corp	1
Pfizer Inc	1
Johnson & Johnson	3
Louisiana-Pacific Corp	1
Temple-Inland Inc	1
Ibis Technology Corp	1
Concur Technologies Inc	1
Basf Ag -Adr	1
Round 3: 2/11/2002	
Chevron Corp	1
Intl Paper Co	1
Johnson & Johnson	7
Baxter International In	4

Snap-On Inc	1
Visteon Corp	1

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Round 4: 8/23/2002

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Honeywell International	1
Lockheed Martin Corp	1
Intl Paper Co	2
Pfizer Inc	1
Johnson & Johnson	2
Motorola Inc	1
Tdk Corp -Ads	1
Baker Hughes Inc	1
Rio Tinto Group (Gbr) -	1
Visteon Corp	1

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Round 6: 3/6/2003

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Caterpillar Inc	1
Johnson & Johnson	1
Baxter International In	1
Snap-On Inc	1
Lafarge North America I	2
Spartech Corp	1

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Round 7: 2/11/2004

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Timken Co	6
Texas Instruments Inc	1
Gillette Co	1
Dow Chemical	1
Lockheed Martin Corp	2
Johnson & Johnson	3
3m Co	2
Rohm And Haas Co	3
Unilever Nv -Adr	1
Nucor Corp	1
Valspar Corp	1
United States Steel Cor	1
Concur Technologies Inc	1
Rockwell Collins Inc	6

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Round 8: 8/30/2004

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Eastman Kodak Co	1
Intl Paper Co	1
Pfizer Inc	1
Motorola Inc	1
Georgia-Pacific Corp	1
Intl Rectifier Corp	2
Dupont Photomasks Inc	2
Visteon Corp	1
Rockwell Collins Inc	1

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Round 9: 3/4/2005

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Intl Paper Co	1
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Pfizer Inc	2
Johnson & Johnson	1
3M Co	2
Schering-Plough	1
Hewlett-Packard Co	2
Baxter International In	2
Xerox Corp	1
Fuji Photo Film -Adr	1
Weyerhaeuser Co	1
Interface Inc -Cl A	1
Spartech Corp	3
Baker Hughes Inc	1
Rockwell Collins Inc	1

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Round 10: 8/24/2005

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Coca-Cola Co	1
Eaton Corp	1
Applied Materials Inc	1
Lockheed Martin Corp	2
Intl Paper Co	4
Pfizer Inc	1
3M Co	4
Motorola Inc	1
Rohm And Haas Co	1
Schering-Plough	1
Fuji Photo Film -Adr	1
Louisiana-Pacific Corp	5
Hitachi Ltd -Adr	1
Monsanto Co	1

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Round 11: 4/27/2006

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Coca-Cola Co	1
United Technologies Cor	2
Pfizer Inc	1
Dover Corp	1
Stanley Works	2
Louisiana-Pacific Corp	2
Spartech Corp	1
Cytec Industries Inc	1

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Round 12: 10/25/2006

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Coca-Cola Co	1
Olin Corp	1
United Technologies Cor	2
Pfizer Inc	1
Johnson & Johnson	1
3M Co	1
Xerox Corp	2
Tyco International Ltd	1
Analog Devices	1
Alliant Techsystems Inc	1