Journal of Management
2000, Vol. 26, No. 6, 1199–1216

Corporate Environmental Initiatives and Anticipated Firm Performance: The Differential Effects of Process-Driven Versus Product-Driven Greening Initiatives

K. Matthew Gilley
Oklahoma State University

Dan L. Worrell
Wallace N. Davidson III
Southern Illinois University

Abuzar El–Jelly
King Saud University

We investigate the influence of environmental initiatives on firms' anticipated economic performance using an event study methodology. Framing our arguments within an organizational reputation framework, we propose that, due to potential positive effects of these initiatives on firm performance (through increases in reputation), shareholders will react positively to announced environmental initiatives. Contrary to our hypothesis, we found no overall effect of announced environmental initiatives on stock returns. However, our findings indicate that reactions to product-driven initiatives are significantly different than reactions to process-driven ones. © 2000 Elsevier Science Inc. All rights reserved.

The impact of organizations on the natural environment has received much attention in both the popular press and academic literature in recent years. Mounting pressure from stakeholder groups has led the top executives of many firms to implement corporate environmental initiatives. The environment is now given a much higher priority in business decisions, and managers have new incentives to seize the initiative (Thomas, 1992). As evidence of the emphasis that firms place on environmental issues, over 97% of companies responding to a

Direct all correspondence to: K. Matthew Gilley, Department of Management, Oklahoma State University, College of Business, Stillwater, Oklahoma 74078; e-mail: <gilleyk@okstate.edu>.

recent survey indicated that they have environmental strategies in place (Stead & Stead, 1995).

Although many organizations have undertaken more environmentally sensitive activities, the performance effects of corporate environmental initiatives are still somewhat uncertain (White, 1992). Environmental issues offer opportunities for growth, but they also place constraints on behavior (Shrivastava, 1995a). Environmental initiatives may provide opportunities for organizations to build long term strategies that reduce costs, decrease liability exposure, increase efficiency, enhance stakeholder relations, and improve profitability (Dechant & Altman, 1994; Forte & Lamont, 1998; Greeno & Robinson, 1992; Porter & van der Linde, 1995; Saunders & McGovern, 1993; White, 1995). In addition, an enhanced public image, increased organizational innovation, and improved investor and employee relations may spur higher performance. However, the costs of reducing environmental impact may overshadow the resulting benefits, and organizational performance may actually decline (Walley & Whitehead, 1994; Williams, Medhurst, & Drew, 1993).

The purpose of this study is to empirically examine this issue by testing the potential influence of environmental initiatives on investors' perceptions of organizational performance. Using an event study methodology, we examine the anticipated firm performance implications of announced environmental initiatives. However, it is likely that not all environmental initiatives have the same perceived effect. Therefore, we identify and discuss two generic environmental initiatives: (1) those designed to improve organizational processes and (2) those concerned with improving the firm's products. To provide for a richer understanding of the anticipated performance effects of corporate environmental initiatives, we first examine greening announcements in general, and then we take a more fine-grained approach by examining differential effects of process-driven versus product-driven greening initiatives.

Organizational Environmentalism and Firm Outcomes

Several empirical examinations have studied the performance implications of environmental management in recent years, and most of these have used event study techniques. One of the earliest examinations of investors' reactions to public announcements of corporate environmental management was conducted by Shane and Spicer (1983). They tested the effect on share price of information about firms' pollution control performance and compliance costs. Their sample consisted of 72 firms in four historically "dirty" industries (pulp and paper, petroleum, steel, and electrical utilities). Using data disclosed by the Council on Economic Priorities (CEP), they found that announcements of superior pollution control performance were related to increases in shareholder wealth. Conversely, the share price of firms with poor pollution control performance dropped significantly on the day of the (negative) announcement. Due to the nature of stock market-based event studies, the observed change in share price that results from announced environmental activities is assumed to reflect the market's perception of the financial impact of that activity (McWilliams & Siegel, 1997).[1] Therefore,

the results of Shane and Spicer's (1983) study suggest that firms that improve their environmental performance also improve perceptions of their future economic performance.

Stevens (1984) also examined the potential influence of corporate environmental performance on shareholder wealth. Like Shane and Spicer (1983), his sample consisted of CEP data on 58 firms in the same four industries. He found that returns to shareholders of firms with high pollution control costs were consistently lower than those for firms with low pollution control costs. Hamilton (1995) examined shareholder reactions to environmental announcements made in the United States Environmental Protection Agency's Toxics Release Inventory (TRI). He, too, found a significant, negative stock market reaction to unfavorable environmental announcements. Another event study of interest was conducted by Klassen and McLaughlin (1996). Their findings indicate that environmental awards result in significant positive share price changes, and that those changes are even more positive for historically "clean" industries.

Basing their discussion on the resource-based view of the firm, Russo and Fouts (1997) also proposed that superior environmental performance leads to superior economic performance. However, their methods differ significantly from previous investigations of the subject. Departing from event study techniques, they examine the relationship between environmental performance and economic performance using multiple regression. Consistent with most previous research, their independent variable consisted of environmental classifications provided by a third party, and their findings revealed that environmental performance had a positive effect on economic performance. Finally, in a similar study, Hart and Ahuja (1994), again using third party data, found that emissions reductions by mining and manufacturing firms lead to significant improvements in firms' bottom lines.

From this review of the literature, it is clear that environmental performance and economic performance are not mutually exclusive. Both event studies and regression analyses have provided support for a positive relationship between the two. However, the bulk of previous work on the subject has relied on third-party (e.g., CEP or EPA) assessments of firms' pollution control performance as a measure of environmental performance in general. Little research has been conducted on the relationship between perceived economic performance and a broader variety of environmental initiatives using a sample consisting entirely of voluntary public disclosures by individual firms. Stories of this nature generally start out as a press release from the company. Although they most often appear in a third-party source, they are generally initiated by the company itself, rather than by an outside group. As a result, the announcement of these initiatives may serve as an important signal to shareholders about an organization's current and future intended environmental performance. Whether the perceived performance implications of a wide range of environmental initiatives will be regarded by the investment community in the same way as pollution control performance is an important empirical question that should be addressed. Therefore, although the primary focus of this article is on examining the perceived *differential* performance implications of different types of environmental initiatives, we also test the

direct relationship between environmental initiatives and perceptions of economic performance using self-disclosed, environmentally positive, public announcements.

Consistent with prior research, we propose that shareholders will react favorably to announcements of corporate environmental initiatives. Fombrun and Shanley (1990) found that both economic and noneconomic signals about firms emanating from the press, the firms themselves, the government, and others play an important role in shaping public opinion about a firm's reputation. More specifically, they found that firms' demonstrations of social concern (among other things) had an important effect on firm reputation. This firm reputation framework provides a foundation for the study of shareholder reactions to corporate environmental initiatives. Firms' public disclosures of their environmental enhancements likely serve an important reputation building function, because these are demonstrations of firms' social concern. As noted by Fombrun and Shanley, firms achieving higher levels of reputation performance will likely find it easier to "charge premium prices (Klein & Leffler, 1981; Milgrom & Roberts, 1986b), attract better applicants (Stigler, 1962), enhance their access to capital markets (Beatty & Ritter, 1986), and attract investors (Milgrom & Roberts, 1986a)" (1990: 233). In other words, firms with superior reputations should achieve higher levels of performance, resulting in higher stock prices. Thus, to the extent that announcements of environmental initiatives enhance a firm's reputation, the firm's share price should increase.

> ***H1:*** *Announcements of environmental initiatives will lead to increases in anticipated firm performance.*

Differential Effects of Type of Environmental Initiative

Although several studies have investigated the effect of environmental performance on anticipated economic performance, none have examined the *differential* effects of different types of environmental initiatives. On the contrary, most research has focused primarily on a single type of environmental announcement and its effects on shareholder wealth. Although these studies have enhanced our understanding of this important issue, a more fine-grained analysis is needed to help us draw more precise conclusions about the anticipated performance implications of different environmental initiatives (Klassen & McLaughlin, 1996).

To allow for a more fundamental understanding of this relationship, we propose that different types of environmental initiatives have unique implications for firm reputation and, therefore, for shareholders' perceptions of future firm performance. More specifically, investors' perceptions of the long run economic benefits of environmental initiatives may be dependent on the initiative's focus on enhancing the firm's production processes versus reducing the environmental impact of the firm's products or services. Therefore, we propose two generic types of environmental initiatives: *process-driven* initiatives and *product-driven* ones. Both types are designed to reduce environmental impact. However, each implies

a different method of doing so and should have a unique effect on investors' perceptions of future firm performance.

Process-driven Environmental Initiatives. The first type of environmental initiative is concerned with minimizing the environmental impact of a firm's processes, and may occur in several ways. One way firms pursue process-driven environmental initiatives is by using recycled or environmentally friendly inputs to production. Examples are Mobil's use of less harmful raw materials in foam production and Coca-Cola's decision to expand its use of recycled bottles. A second way that firms may pursue process-driven environmental initiatives is through redesigning their production and/or delivery systems. Conoco's increased use of safer, double-hulled oil tankers is one example. Third, process-driven greening initiatives may be embodied in waste reduction strategies. For example, between 1975 and 1990, Minnesota Mining and Manufacturing (3M) changed its processes to reduce harmful byproducts. This saved the company over $500 million in hazardous materials disposal costs and related expenditures (Hart & Ahuja, 1994). Thus, process-driven initiatives include changes to organizational processes, as well as changes to the materials used in production. Process-driven environmental initiatives primarily impact a firm's bottom line through cost reductions (Biddle, 1993). These initiatives may allow organizations to reduce their costs by using inputs more efficiently, reducing the use of hazardous materials, avoiding accidents and the accompanying litigation and cleanup, and eliminating unnecessary steps in production (Hart, 1995; Porter & van der Linde, 1995; Stead & Stead, 1992, 1995).

The potential reputation effects of process-driven environmental initiatives are likely to be low. In making a determination of the firm's reputation, stakeholders use the information that is *available* to them about the firm's activities (Fombrun & Shanley, 1990). However, many stakeholder groups will be unaware of the firm's process-driven changes, because information about such changes is generally not widely disseminated. Without considerable media attention or marketing efforts on the part of the firm, many process changes that firms make are unlikely to be included in the public's assessment. This is primarily a result of the fact that process changes are generally internal to the firm and are, therefore, less visible to all publics. As a consequence, the potential reputation-enhancing effects of process-driven greening are low; therefore, we expect shareholders to react less favorably to this type of environmental initiative.

Product-driven Environmental Initiatives. The second type of generic environmental initiative is product-driven and occurs in two ways: (1) when firms create new types of environmentally sound goods or services, or (2) when they reduce the environmental impact of their existing goods or services. There are many recent examples of product-driven greening, including Kodak's introduction of a recyclable camera, Procter & Gamble's many packaging-reduction initiatives, and Toyota's completely redesigned automobile that saves gasoline by combining electric and internal combustion engines (Arnst, Reed, McWilliams, & Weimer, 1997). This type of initiative may have an important effect on a firm's revenues by making the firm's products unique in the eyes of the consumer (Stead & Stead, 1995). By providing more environmentally sound products or services,

there are spillover effects that enhance the firm's reputation, thus increasing demand for the firm's other offerings (Saunders & McGovern, 1993).[2]

The potential reputation-enhancing ability of product-driven environmental initiatives is higher than that of process-driven ones. By their very nature, the introduction of new products or major changes to existing ones are relatively high-profile events (when compared with changes in organizational processes). Because of organizations' efforts to successfully market the new and/or improved products or services, a wide variety of stakeholder groups are made aware of product-driven environmental initiatives. This increased media visibility, combined with the firm's demonstration of its social concern, should have a significant impact on firm reputation (Fombrun & Shanley, 1990). In anticipation of the increase in performance associated with this, shareholders will react positively. By comparison, the often-obscure changes in organizational processes will have relatively less of an impact on firm reputation and shareholder wealth. Thus, we propose that investors will react more favorably to product-driven environmental initiatives.

> ***H2:*** *Announcements of product-driven environmental initiatives will have a more positive impact on anticipated firm performance than will announcements of process-driven initiatives.*

Research Methods

Sample

Our unit of analysis is the environmental announcement/event, and our sample comes from announcements published in the *Wall Street Journal* over the period 1983 through 1996. To screen for potentially confounding events, announcements were excluded from the sample if *any* other public announcement was made about the firm in question during the previous two trading days or on the day of the environmental announcement itself (see McWilliams & Siegel, 1997). Since all relevant information about a firm is fully incorporated into its share price within minutes of its disclosure, this "window" is likely sufficient. Also excluded were announcements about firms that were privately held (due to data availability issues) or for businesses that were divisions of other firms. This screening left a final sample of 71 announcements of corporate environmental initiatives. Of these, 39 were process-driven and 32 were product-driven. Unlike many prior investigations of the environmental performance-economic performance link, the firms in our sample come from a variety of both manufacturing and service industries. Overall, sixteen different two-digit SIC code industries were represented.

Measures

Environmental initiatives. Corporate environmental initiatives were defined as any organizational effort designed to reduce the impact of the firm's goods/services or processes on the environment. They were identified by search-

ing the *Wall Street Journal Printed Index*. Some key words searched for were "environment," "environmental," "greening," and "waste reduction."

Anticipated firm performance. We assessed anticipated firm performance using stock returns of the common stock for the firms in our sample. Our stock price data come from the CRSP tapes (Center for Research in Security Prices from the University of Chicago). Our assumption is that stock returns reflect the market's perception of the outcomes of firm strategy. The semi-strong form of the Efficient Markets Hypothesis (see Bromiley, Govekar, & Markus, 1988) holds that all currently available public information about a given firm is reflected in that firm's share price. Therefore, if "a change in the stock return follows an environmental event that signals the environmental performance of the firm to the public, then we can assume that the market imputes a change in the net present value of the firm because of that event" (Klassen & McLaughlin, 1996: 1204).[3] Accepting the semi-strong form of the Efficient Markets Hypothesis, we use stock returns as a measure of the market's perception of the future economic impact of the environmental initiative.

Type of greening initiative. To differentiate between the types of environmental initiatives, two trained raters (one assistant professor of management and one graduate student) read each of the printed announcements in their entirety and categorized them as being either process-driven or product-driven. The inter-rater reliability of this measure was 0.84. When differences occurred, the raters discussed the announcement and came to a consensus. It should be noted that no announcements of the installation of pollution control equipment were included in our sample. We feel that combining this type of post hoc initiative with more proactive/preventative ones blurs the conceptual distinction of process-driven initiatives. The installation of pollution control equipment is not a change to organizational processes themselves; instead, it is a reactive, end-of-pipe measure designed to (partially) offset the negative environmental effects of the firm's existing processes. Therefore, the motivation behind (and the anticipated performance implications of) this type of initiative is likely different than other, more proactive environmental initiatives. In our analyses, the type of greening initiative was scored dichotomously, with process-driven announcements receiving a value of 0 and product-driven announcements receiving a value of 1.

Control variables. In addition to controlling for any confounding events, two other control variables were used in an attempt to increase the validity of our findings. First, we controlled for the reputation of the firm in question at the time of the announcement, because it is likely that investors' reactions to environmental initiatives will be different for "clean" versus "dirty" firms. Essentially, this was included as a control variable because of "surprise" or "departure-from-normal" issues. Investors will be caught off guard by announcements of environmental initiatives by firms that have "dirty" reputations and will not be surprised by announcements by "cleaner" firms. As a result, the magnitude of investors' reactions to announcements by "clean" versus "dirty" firms may be altered, making a firm's environmental reputation an important control variable. To assess each firm's environmental reputation at the time of the greening announcements in our sample, we again searched the *Wall Street Journal*. Because it is a primary

source of financially relevant information for the investment community, we assumed that announcements in the *Wall Street Journal* played a major role in shaping investors' perceptions about firms' environmental reputations. For each firm in our sample, we gathered *all* environment-related announcements (broadly defined) printed in the *Wall Street Journal* for the five years immediately preceding the announced environmental initiative. The same two raters categorized the announcements as being positive, negative, or neutral. Inter-rater reliability was 0.93, and disagreements were again resolved by consensus. Favorable announcements were given a value of positive one and unfavorable announcements were given a value of negative one. Any neutral announcements were discarded. A firm's existing environmental reputation was then measured as the summation of all of its environmental announcements for the five-year period. The average firm had a score of 0.66, indicating a slightly positive reputation.

We also controlled for firm size, because investors may react differently to environmental announcements made by large versus small firms. For example, investors may view greening by smaller firms more favorably, because small firms may find it easier to implement greening initiatives, due to their higher levels of flexibility and lower levels of administrative burden. Firm size was measured as the log of sales the year of the announcement.

Analytical Techniques

As have many previous examinations of the relationship between anticipated economic performance and environmental performance, this study employs an event study methodology. To increase the strength of our design, we closely follow the guidelines for event study implementation outlined in McWilliams and Siegel's (1997) comprehensive investigation of this method.

With event study methodologies, regressing the returns of each firm's common stock against the returns of the stock market index provides a predictive model. We used this regression's parameters to predict the expected returns for the firm's stock, adjusted for market movements on the days immediately surrounding the announcement of greening activities. The actual common stock returns on these days are compared to the normal/expected returns, and the differences may be called abnormal returns. We then averaged these daily abnormal returns across firms to provide mean cumulative average abnormal returns (CAARs). See the Appendix for details. In the absence of news impacting the value of a firm's stock, a firm's cumulative abnormal return should be randomly distributed and insignificantly different from zero (Fama, 1970). If, however, news reaches the market that influences the firm's long run value, the abnormal return will be significantly different from zero.

To test the direct effect of environmental initiatives on anticipated economic performance (in other words, to determine the statistical significance of the CAARs), we used Dodd and Warner's (1983) test statistic, Z. Because the abnormal returns were not perfectly normally distributed (skewness = 0.84, kurtosis = 1.93), we also used a Wilcoxon sign rank test, because this nonparametric test does not rely on the assumption of normality. To test for the differential effects of process-driven versus product-driven environmental initiatives,

we divided the sample by type of initiative (process-driven vs. product-driven) and performed a *t* test for differences in means. We also used a nonparametric test, the Mann–Whitney Z-test, because of its robustness to possible violations of normality. Finally, using regression analyses, we examined the extent to which product- versus process-driven announcements influence the CAARs, controlling for firm reputation and firm size.

In each analysis, we examined a two-day event window, the day of the announcement and the day before. The rationale for this is that, although stock prices adjust quite quickly to reflect all publicly available information, some leakage of information may have occurred before public disclosure. Unlike many event studies, we chose a relatively short event window to more fully control for confounding information and reduce the likelihood of spurious results.

Finally, for each analysis, the critical p-value was relaxed to 0.10. This is due to our relatively small sample (especially with respect to our product- and process-driven subsamples) and a small-expected effect size (see Sauley & Bedeian, 1989).

Results

Means, standard deviations, and zero-order correlations for each of the variables in our analyses can be found in Table 1.

The results of our tests for the direct effect of announced environmental initiatives on anticipated firm performance are shown in section 1 of Table 2. The CAARs for the announcement period under investigation (Days −1–0) are not statistically significant. Therefore, contrary to hypothesis 1 and much prior research, our results suggest that, on average, corporate environmental initiatives have no direct effect on the market's perception of the firm's future economic performance.

The two remaining sections of Table 2 contain the results of our tests for the differential effects of process-driven versus product-driven environmental initiatives. Although no direct or overall effect of environmental initiatives on share price was found, it is nevertheless appropriate to examine these differential effects. Indeed, our inability to uncover a direct/overall effect may have occurred precisely because of the differential/moderating effect of type of initiative (see

Table 1. Descriptive Statistics and Correlations

	Mean	*S.D.*	*1*	*2*	*3*	*4*
1. Abnormal Return	0.01	0.25	1.00			
2. Product/Process-Driven[a]	0.45	0.50	.24*	1.00		
3. Company Reputation[b]	0.66	1.17	−.05	−.13	1.00	
4. Firm Size[c]	9.00	1.47	−.38**	−.15	.32*	1.00

*$p < .05$ **$p < .01$.

[a]Product-driven announcements received a value of 1, and process-driven ones received a value of 0.

[b]Summation of positive and negative environmental announcements for each firm.

[c]Measured as the log of sales the year of the announcement.

Table 2 Cummulative Abnormal Return for Days –1 to 0

	CAAR	*Z-Score*	*Wilcoxon Sign Rank Z*
1. Total Sample	.01	0.05	0.52
2. Sub-Samples			
Product-Driven	.56	1.23	1.10
Process-Driven	−.45	−1.83†	−2.13*
		T-Score	Mann-Whitney Z-Score
3. Difference in Product- vs Process-Driven Sub-Samples		2.03*	1.92†

†$p < .10$ *$p < .05$.

Bedeian & Mossholder, 1994). By aggregating the announcements, we may have been obscuring the relationships that exist. As shown in Section 2, stock market reactions to product-driven greening initiatives were positive, but not significant. However, stock market reactions to process-driven initiatives were significant and negative. As Section 3 of Table 2 highlights, the *t* test for the difference in the means of the reactions to the two types of greening initiatives was significant ($t = 2.03$, $p < .05$), indicating that there is a significant difference in investors' reactions to process-driven versus product-driven initiatives. The results of our nonparametric test were also significant ($Z = 1.92$, $p < .10$).

We also tested hypothesis 2 using regression analyses, and the results are found in Table 3. As shown, we first conducted a simple regression for type of environmental initiative (process-driven vs. product-driven), with the abnormal return being the dependent variable. We then inserted the control variables into the equation and examined the product/process variable for significance. In each case, the results support the hypothesis that investors react more favorably to

Table 3. Results of Regression Analyses (Dependent Variable is the Cumulative Abnormal Return)

Regression Number	*Intercept*	*Product/Process Driven*[a]	*Company Reputation*[b]	*Firm Size*[c]	*Adjusted R^2 (F)*
1	−0.45	1.01			.04
	(−1.34)	(2.03)*			(4.11)*
2	−0.42	1.00	−0.03		.03
	(−1.11)	(1.98)†	(−0.16)		(2.04)
3	4.63	0.78		−0.55	.16
	(2.90)**	(1.68)†		(−3.25)**	(7.60)***
4	4.92	0.82	0.18	−0.59	.15
	(3.01)**	(1.72)†	(.87)	(−3.35)**	(5.30)**

†$p < .10$ *p .05 **$p < .01$ ***$p < .001$.

[a]Product-driven announcements received a value of 1, and process-driven ones received a value of 0.

[b]Summation of positive and negative environmental announcements for each firm.

[c]Measured as the log of sales the year of the announcement.

product-driven initiatives. For the full model, the type of greening initiative was a significant predictor ($\beta = 0.82$, $p < .10$) of abnormal returns. The sign of the regression coefficient indicates that investors reacted more favorably to product-driven greening initiatives, providing support for hypothesis 2.

Discussion and Conclusions

Although several prior studies have examined the direct effects of corporate environmental management on anticipated economic performance, there has been no attention given to the way in which different environmental initiatives may potentially influence it. The current study fills this gap in the literature by not only examining the potential direct effect of greening initiatives on stock returns, but also by testing the differential effects of process-driven versus product-driven initiatives. The results indicate that, although there is no overall effect of announcements of corporate environmental initiatives on anticipated performance, the *type* of environmental initiative announced does make a difference. These results are discussed more fully below, as are their managerial implications, the limitations of the study, and some suggestions for future research.

Environmental Initiatives and Anticipated Firm Performance

Although many prior investigations have found a positive relationship between environmental performance and anticipated economic performance, our results suggest no overall relationship. One reason for this difference in findings may be our implementation of the event study methodology. Most prior studies of the relationship between economic performance and environmental performance that used event study techniques failed to mention their treatment of several important methodological issues, such as controlling for confounding events.

Furthermore, the samples used in prior research were quite different from the current one. First, their data were often from only a few industries. For example, both Shane and Spicer (1983) and Stevens (1984) used only pollution control data from four industries, all of which were in the manufacturing sector and were considered to be "dirty." Also, Hamilton's (1995) study only included manufacturing firms, and Hart and Ahuja (1994) only examined mining and manufacturing firms. Again, these samples consist of firms in industries that may be considered "dirty." In the current study, both manufacturers and service firms from sixteen industries were included in the sample, providing a broader cross-section of organizations. Many of these firms are not in the manufacturing sector and may be viewed by investors as "cleaner," thus yielding a different market reaction. In addition, most prior research relied on third-party announcements of (generally negative) environmental issues. Our sample, on the contrary, consisted only of reports of environmental *enhancements*. The contrast in findings between the current study and prior research of a main effect may imply that bad news has a stronger effect on stock price than does good news.

Although we found no overall effect of announced environmental initiatives on anticipated performance, a more fine-grained examination of the data reveals that corporate environmental initiatives indeed influence investors' perceptions of

future economic performance. After dividing the total sample into announcements of process-driven versus product-driven environmental initiatives, we found significant differences in anticipated future performance. More specifically, we found that investors reacted more positively to product-driven initiatives. From a reputation perspective, one reason for this finding may be that process-driven environmental enhancements do little to increase a firm's perceived reputation with stakeholders. The investment community was found to be less interested in organizational process changes and more interested in environmentally sound products or services. The potential reputation enhancing benefits of process-driven initiatives are not realized, translating into a negative market reaction. However, it should be noted that the market's negative reaction to process-driven environmental initiatives might occur *despite* potential marginal increases in firm reputation that could accompany them. Many types of process-driven greening initiatives are mandated by government agencies and may be viewed as punitive in nature, rather than as proactive steps taken by firms to improve their competitiveness. Thus, a negative market reaction may occur despite feelings that marginal enhancements to firm reputation may occur through process-driven initiatives.

On the contrary, investors' reactions indicate that the introduction of environmentally friendly new products, or changes to the environmental impact of existing products, may boost organizations' reputations, thereby enabling organizations to achieve environmentally sustainable differentiation strategies (Shrivastava, 1995b). By enhancing the environmental reputation of one of the organization's product/service lines, firms pursuing product-driven greening may actually stimulate sales of their other offerings. In addition, firms that engage in product-driven environmental initiatives may discover *process*-related enhancements that could marginally improve firm reputation. In other words, there may be spillover effects of product-driven greening that enhance firm performance beyond just sales of the environmentally sensitive product itself. Thus, product-driven greening initiatives seem to increase investors' perceptions of organizational performance, even if a particular product is itself unsuccessful. In this way, our results provide some support for Fombrun and Shanley's (1990) assertion that firms contributing to the social welfare will have better reputations. These increases in reputation, resulting from displays of social concern, manifest themselves in increases in share price.

Managerial Implications

Practicing managers must understand that all environmental strategies are not created equally. On the contrary, our study indicates that stock market reactions are significantly more positive to initiatives aimed at reducing the environmental impact of the firm's goods/services, perhaps because of the improvements in organizational reputation that can accompany them. Therefore, assuming that investors' reactions are indicative of firms' future economic performance, managers should seek to reduce the environmental impact of their existing products, as well as consider introducing new, environmentally friendly ones.

Our study suggests that the design and marketing of more environmentally sensitive products may be a better use of organizational resources than environment-related process changes. By channeling resources into environmental process enhancements instead of more traditional, value creating activities, we found that managers may actually be reducing their organization's anticipated future performance. This provides some support for Walley and Whitehead's assertions that managers should "seek to minimize the destruction of shareholder value that is likely to be caused by environmental costs rather than attempt to create value through environmental enhancements" (1994: 47). Therefore, it seems that organizations may want to reduce their emphasis on lowering costs by creating more environmentally friendly production processes, and instead concentrate on improving the environmental performance of their products or services.

This is not to say that managers should be unconcerned with the environmental impact of their processes. On the contrary, the results of prior research indicate that there may be organizational benefits that result from minimizing the emissions of harmful chemicals, for example. Furthermore, environmental initiatives likely have value in and of themselves. There are potentially far reaching social consequences associated with firms' environment-related decisions, and these consequences may not be captured by stock market reactions. On the other hand, it is possible that the investment community *does* understand these potential social consequences and builds those into their differential reactions. For example, as was mentioned previously, it is quite likely that product-driven initiatives will lead to improvements in the environmental impact of organizational *processes* themselves. Thus, market reactions may indicate that investors perceive more value in firms *beginning* their environmental initiatives with changes to their products, while also taking advantage of any process-related spillovers that occur. In other words, our findings may not suggest that the market will punish firms that reduce their process-related environmental impact. On the contrary our findings may indicate that investors prefer firms to begin with product enhancements, and then let the product-driven initiatives guide the firm's process changes. In this way, our results could suggest that the investment community is attempting to alter the way in which organizations expend their environment-related efforts.

Limitations

By following McWilliams and Siegel's (1997) recommendations for the proper implementation of event studies, we have been able to overcome many of the major weaknesses of this methodology. For example, we examined only a short event window (2 days), eliminated from our sample announced initiatives from firms with other relevant announcements during that window, and reported nonparametric test statistics. Nevertheless, only one individual collected the original announcements, and it is possible that some relevant announcements were excluded based on the judgment of a single person. In addition, as with any event study, our conclusions rely largely on the validity of the semi-strong form of the Efficient Markets Hypothesis. Although there is a large body of evidence supporting this hypothesis (Fama, 1991), it is still the subject of some debate (see Megginson, 1997).

Also, some of our measures may not adequately represent the phenomena under study. In particular, our measure of a firm's preexisting environmental reputation is imperfect, because it ignores the magnitude of the favorable and unfavorable environmental announcements. It is highly likely that certain negative announcements (such as major environmental crises like large-scale oil spills) have much more dramatic effects on firm reputation than do others. Thus, the "counting" method used to measure environmental reputation is oversimplified. Also, investors' reactions to announced environmental initiatives might depend partly on the importance of the event to the firm. Therefore, some measure of announcement magnitude (such as the cost of the initiative relative to firm size) should be incorporated into future studies.

Finally, although we extended our announcement window to include the day before the announcement, we may not have adequately captured the full extent of information leakage. Whether certain parties have advanced knowledge of public announcements, and the length of time they have that knowledge, is difficult to determine.

Future Research

There are several promising avenues for future management research on environmental issues. First, although much work has been conducted to determine the organizational outcomes of environmental initiatives, little work has focused on the antecedents of greening activities. Organizational slack, historical firm performance (both economic and social), industry competitiveness, and others may make important contributions to firms' decisions to pursue environmental initiatives. Understanding the causes of organizational greening may help us to better understand its consequences.

Second, it may be worthwhile to examine the influence of environmental initiatives on overall organizational effectiveness and *actual* long run performance. Following Venkatraman and Ramanujam's (1986) suggestion that management researchers should examine more than just financial performance, future research on organizational greening should consider the effects of environmental initiatives on such important outcomes as product quality and employee satisfaction. In addition, future investigations should attempt to determine whether stock market reactions are actually a good indication of the long run performance implications of organizational greening, an assumption inherent in our research.

Third, further refinement of the two types of environmental initiatives may be warranted, because process-driven and product-driven initiatives are each multidimensional concepts. For example, product-driven environmental initiatives may reduce the impact of a firm's products on the environment in at least two ways: when the products are *in use* and when they are being *disposed of*. Similarly, process-driven initiatives may be designed to either use *fewer* inputs to production or *safer* ones. Each of these may have unique performance implications and should be investigated in more detail.

Finally, a commonly accepted definition and measure of corporate environmental performance should be developed. Although third-party assessments and investors' reactions provide important insight into the issue, more work is needed

to specify what exactly is meant by "environmental performance" and how that performance can be most accurately measured. Without a common definition and measure of environmental performance, our understanding of its antecedents and consequences will be hindered.

Conclusion

Given the significant impact that today's organizations have on the natural environment, research into the performance implications of environmental enhancements is important. In this study, we have attempted to further understanding of the expected performance implications of greening initiatives. Our results indicate that, despite the lack of a direct effect of greening on perceived performance, different types of environmental initiatives have unique implications. Our findings indicate that investors react significantly more positively to announcements of product-driven environmental initiatives relative to process-driven ones.

Appendix

Event Study Methodology

We use event methodology to evaluate the stock market's reaction to these environmental initiatives. The event study methodology was originally developed by Fama, Fisher, Jensen and Roll (1969), and we use the procedure as adapted by Dodd and Warner (1983).

For each security i, we estimate the market model parameters, a_i and b_i (the intercept and slope), by regressing each firms stock returns against the return on the market over the days −220 to −20 (the announcement day being Day 0). This regression's purpose is to model how the firm's stock price behaves as the entire stock market moves up and down. We use the regression parameters to measure how the firm's stock price would normally move on Days −1 and 0 if there were no environmental initiatives announced. For each firm i, we can compute the abnormal return on day t by comparing the actual return on that day, R_{it} to the predicted returns, $a_i + b_iR_{mt}$. This means we compare how the firm's price actually changed compared to what was expected given how the market moved. The difference between actual and expected returns is called an abnormal return. The abnormal return is as shown in Eq. (1):

$$AR_{it} = R_{it} - (a_i + b_iR_{mt})$$

where: R_{it} = return on security i at time t;

a_i = ordinary least square (market model) intercept;

b_i = the ordinary least square (market model) slope; and

R_{mt} = the return on the market on day t as proxied by the equally weighted CRSP index.

To measure the abnormal return over a specific interval (say, Day −1 to 0), we sum the abnormal returns for firm i to obtain the cumulative abnormal return, CAR_I (Eq. (2):

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

A firm's CAR will be positive if the environmental initiative announced is expected to increase the firm's value. In this case, the actual stock price movement would be larger than the expected price change that was obtained from Eq. (1). A CAR will be negative if the market perceives that the initiative will decrease value. Here, the firm's actual stock price change would be less than the expected change.

For a sample of N securities, the cumulative average abnormal return, CAAR is (Eq. (3):

$$CAAR = \sum_{i=1}^{N} CAR_i \Big/ N$$

If one firm has a positive (negative) CAR, this could occur by chance (as in any statistical test). However, if across a sample of announced environmental initiatives, a large number of the firms' CARs are positive (negative), we compute a Z statistic to determine their significance. After computing each firm's CAR, we have averaged them across firms.

The Dodd and Warner (1983) technique uses a Z test to determine if a CAAR is significantly different from zero. To compute the Z statistic, we first standardize each abnormal return as shown in (4) by dividing the AR_{it} by its estimate for standard error, S_{it} determined from the regression (Eq. 4):

$$SAR_{it} = AR_{it} \Big/ S_{it}$$

To form the test statistic over the interval T_1 to T_2 (the starting and ending days used for announcement collection) we average the SAR_{it} over each day in the interval as in Eq. (5):

$$MSAR_i = \sum_{t=T_1}^{T_2} SAR_{it} \Big/ \sqrt{T_{2i} - T_{1i} + 1}$$

For the overall sample, the test statistic is (Eq. 6):

$$Z = \sum_{i=1}^{N} MSAR_t \Big/ \sqrt{N}$$

Notes

1. If stock markets are efficient, the market will anticipate the impact of an event on the firm currently and in the future. Since today's stock prices reflect future expected performance (see Brigham & Houston, 1999), when an event changes current stock prices, it is assumed to reflect changes in the market's expectations about the future. Whether or not markets are efficient and how strongly efficient is the subject of debate. However, after reviewing 180 studies on the subject, Fama concludes that, ". . . with respect to firm-specific events, the adjustment of stock prices to new information is efficient," and "event studies are the cleanest evidence we have on efficiency" (1991: 1602). Whether or not the market adjusts quickly to new information is also an important consideration. Fama also concludes that, "The typical result in event studies on daily data are that, on average, stock prices seem to adjust within a day to event announcements. The result is so common that this work now devotes little space to market efficiency" (1991: 1601).
2. Although many product-driven environmental initiatives necessitate changes in organizational processes (and vice versa), they are unique from process-driven ones, because the former is designed specifically to generate revenues (through reputation enhancements), whereas the latter seems to be primarily designed to reduce costs by changing the underlying processes of the company. Thus, the motivation behind the greening initiative, as well as the content of the initiative itself, is important in distinguishing product- from process-driven greening. For example, it is clear that Toyota must make drastic changes to many of its organizational processes if it is to successfully introduce its new, energy efficient car. However, the primary focus of this strategic initiative is not to enhance organizational efficiency, decrease liability exposure, or reduce the firm's use of hazardous materials. On the contrary, this greening initiative is more likely designed to stimulate sales through an enhanced environmental reputation. Therefore, product-driven environmental initiatives are unique from process-driven ones.
3. If an environmental initiative is expected to impact future cash flows or risk, it could change the net present value of the firm. If markets are efficient, the stock price will adjust. As in any present value computations, changes in expected cash flows that occur early will have a larger impact than changes in cash flows that occur later. Therefore, if an announced environmental initiative will not impact expected cash flows for, say, 15 years, then the impact on the firm's net present value and stock price will be negligible.

References

Arnst, C., Reed, S., McWilliams, G., & Weimer, D. 1997. When green begets green: Ecologically sound practices are helping the bottom line. *Business Week*, November, 10: 98–106.

Beatty, R. P., & Ritter, J. R. 1986. Investment banking, reputation, and underpricing of initial public offerings. *Journal of Financial Economics*, 15: 213–232.

Bedeian, A. G., & Mossholder, K. W. 1994. Simple question, not so simple answer: Interpreting interaction terms in moderated multiple regression. *Journal of Management*, 20: 159–165.

Biddle, D. 1993. Recycling for profit: The new green business frontier. *Harvard Business Review*, 71 (4): 145–156.

Brigham, E. F., & Houston, J. F. 1999. *Fundamentals of financial management: Concise edition*. Fort Worth, TX: Dryden.

Bromiley, P., Govekar, M., & Markus, A. 1988. On using event-study methodology in strategic management research. *Technovation*, 8: 25–42.

Dechant, K., & Altman, B. 1994. Environmental leadership: From compliance to competitive advantage. *Academy of Management Executive*, 8 (3): 7–20.

Dodd, P., & Warner, J. 1983. On corporate governance: A study of proxy contests. *Journal of Financial Economics*, 11: 401–438.

Fama, E. F. 1970. Efficient capital markets: A review of theory and empirical work. *Journal of Finance*, 25: 385–417.

Fama, E. F. 1991. Efficient capital markets: II. *Journal of Finance*, 46: 1575–1617.

Fama, E. F., Fisher, L., Jenson, M., & Roll, R. 1969. The adjustment of stock prices to new information. *International Economic Review*, 10: 1–21.

Fombrun, C., & Shanley, M. 1990. What's in a name? Reputation building and corporate strategy. *Academy of Management Journal*, 33: 233–258.

Forte, M., & Lamont, B. T. 1998. The bottom line effects of greening. *Academy of Management Executive*, 12 (1): 89–90.

Greeno, J. L., & Robinson, S. N. 1992. Rethinking corporate environmental management. *Columbia Journal of World Business*, 27 (3): 222–232.

Hamilton, J. T. 1995. Pollution as news: Media and stock market reactions to the Toxics Release Inventory data. *Journal of Environmental Economics and Management*, 28: 98–113.

Hart, S. L. 1995. A natural-resource-based view of the firm. *Academy of Management Review*, 20: 986–1014.

Hart, S. L., & Ahuja, G. 1994. *Does it pay to be green? An empirical examination of the relationship between pollution prevention and firm performance*. Paper presented at the annual meeting of the Academy of Management, Dallas.

Klassen, R. D., & McLaughlin, C. P. 1996. The impact of environmental management on firm performance. *Management Science*, 42: 1199–1214.

Klein, B., & Leffler, K. 1981. The role of market forces in assuring contractual performance. *Journal of Political Economy*, 89: 615–641.

McWilliams, A., & Siegel, D. 1997. Event studies in management research: Theoretical and empirical issues. *Academy of Management Journal*, 40: 626–657.

Megginson, W. L. 1997. *Corporate finance theory*. Reading, MA: Addison–Wesley.

Milgrom, P., & Roberts, J. 1986a. Relying on the information of interested parties. *Rand Journal of Economics*, 17: 18–32.

Milgrom, P., & Roberts, J. 1986b. Price and advertising signals of product quality. *Journal of Political Economy*, 94: 796–821.

Porter, M. E., & van der Linde, C. 1995. Green and competitive: Ending the stalemate. *Harvard Business Review*, 73 (5): 120–134.

Russo, M. V., & Fouts, P. A. 1997. A resource-based perspective on corporate environmental performance and profitability. *Academy of Management Journal*, 40: 534–559.

Sauley, K. S., & Bedeian, A. G. 1989. .05: A case of the tail wagging the distribution. *Journal of Management*, 15: 335–344.

Saunders, T., & McGovern, L. 1993. *The bottom line of green is black*. San Francisco: Harper.

Shane, P. B., & Spicer, B. H. 1983. Market response to environmental information produced outside the firm. *The Accounting Review*, 58 (3): 521–538.

Shrivastava, P. 1995a. Environmental technologies and competitive advantage. *Strategic Management Journal*, 16: 183–200.

Shrivastava, P. 1995b. The role of corporations in achieving ecological sustainability. *Academy of Management Review*, 20: 936–960.

Stead, W. E., & Stead, J. G. 1992. *Management for a small planet: Strategic decision making for the environment*. Newbury Park, CA: Sage Publications.

Stead, W. E., & Stead, J. G. 1995. An empirical investigation of sustainability strategy implementation in industrial organizations. In D. Collins & M. Starik (Eds.), *Corporate social performance and policy*, Supplement. 1: 43–66. Greenwich, CT: JAI Press.

Stevens, W. P. 1984. Market reaction to corporate environmental performance. In W.N. Schwartz (Ed.), *Advances in Accounting*, Greenwich, CT: JAI Press.

Stigler, G. J. 1962. Information in the labor market. *Journal of Political Economy*, 70: 49–73.

Thomas, L. M. 1992. The business community and the environment: An important partnership. *Business Horizons*, 35 (2): 21–24.

Venkatraman, N., & Ramanujam, V. 1986. Measurement of business performance in strategy research: A comparison of approaches. *Academy of Management Review*, 11: 801–814.

Walley, N., & Whitehead, B. 1994. It's not easy being green. *Harvard Business Review*, 72 (3): 46–52.

White, M. A. 1992. Effect of the green movement on investors. In T. F. P. Sullivan (Ed.), *The greening of American business: Making bottom-line sense of environmental responsibility*: 32–54. Rockville, MD: Government Institutes.

White, M. A. 1995. *Investor response to the Exxon Valdez oil spill*. Paper presented at the annual meeting of the Southern Finance Association, Sarasota, Florida.

Williams, H. E., Medhurst, J., & Drew, K. 1993. Corporate strategies for a sustainable future. In K. Fischer & J. Schot (Eds.), *Environmental strategies for industry: International perspectives on research needs and policy implications*: 117–146. Washington: Island Press.