Investor’s Perception of Value Creation in Environmental Strategies: The Impact of Past Environmental Performance on Future Stock Market Returns

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Abstract
In this paper we test whether investors incorporate into stock market prices the future increase or decrease in firm value due to corporate strategies that cause better or worse firm environmental performance. We report strong evidence that low-polluter companies have substantial abnormal positive returns in the subsequent years after the environmental information was publicized while in the same period of time, high-polluter companies have no abnormal returns (positive or negative). On the contrary, we find exactly the opposite results when we analyze stock market behavior the exact same day the environmental information was publicly released. This is, for this exact publication date high polluter companies have significant negative abnormal returns while low-polluter companies have abnormal returns that are not statistically different than zero. Overall, our results are consistent with a world in which investors have been slow to properly evaluate future increases in firm value associated with current good firm environmental performance while on the other hand investors have correctly discounted the future negative financial effects corresponding to high-polluter companies.

Key words: Stock Market Performance; Environmental Performance; Toxic releases

JEL Code: G14, G30

1. Introduction

Stock market miswriting of individual corporate strategies is subject of relentless debate. Executives of public companies often complain about investor’s pressure to focus inefficiently on short term financial results while academics have failed to provide a consistent corpus of evidence supporting stock market myopia. In this paper we investigate thoroughly stock market appraisal of one type of firm strategy of increasing relevance: Firm environmental performance. We look at stock market performance of low-polluter and high-polluter companies both when the environmental information becomes public and up to seven years later to evaluate whether stock market did properly price “green” and “black” strategies.

Contradictory results in prior research suggest that investors have an ambivalent stance towards environmental firm performance. They clearly value higher financial performance, but it is unclear whether they regard environmental activities as conducive to such performance. In fact, prior research has failed to show that environmental proactively of firms is valued by investors unless it reduces rather clear risks of environmental fines and sanctions. This is somehow striking taking into account that other research strongly suggests that environmental and financial performance are positively linked, particularly for firms that are proactive. Our
current research therefore takes a closer look at this phenomenon and particularly attempts to expose whether there is indeed a pattern in terms of investors being outright negatively disposed towards current environmental firm activities, but still bid up these firm shares in later periods when the (supposedly) positive effects of these activities translate into unexpected financial gains. In other words, we examine whether shareholders do not clearly understand the positive or negative value implications of environmental policies.

For this purpose, we apply standard financial techniques to identify the existence (or lack of) of positive unexpected abnormal returns for those companies that were characterized in the past by superior firm environmental performance. If investors did not understand in the past the positive value implications of good firm environmental performance, we should be able to identify positive unexpected excess returns, as indeed we find below in our empirical analysis. In a similar manner, if investors do not fully incorporate into stock market prices future negative results due to particularly poor environmental performance; we should find negative abnormal returns in those companies labeled in the past as environmental laggards. However, in our results below we fail to find significant negative abnormal returns for this type of companies. This could indicate that investors have no problem in quickly recognizing (and pricing accordingly) the negative value implications attributed to low firm environmental performance.

The contribution of this paper to the Environmental Management Literature is therefore two-fold: On one hand we add further evidence about the positive link between firm financial performance and good environmental practices. Of greater significance and , we show how investor’s perception about the effect of environmental performance on firm value is asymmetric with respect to the consideration of negative and positive effects. Investors correctly anticipate future negative effects due to current poor environmental performance but fail to fully incorporate into current market prices future value creation corresponding to those companies with outstanding pro-environmental policies. In this regard we are also contributing to a wider management literature in the stock market evaluation of business strategies.

The rest of the paper is structured as follows: Section II briefly goes over the abundant empirical literature about the linkage between environmental and financial firm performance. Section III provides theoretical reasons to explain the asymmetry in investor’s perceptions. Section IV details the data construction process and Section V discusses our empirical results. Section VI carries out some empirical robustness test while Section VII concludes with some implications for future research.

2. Analytical Framework

It seems that a consensus is being built in the environmental management literature that pro-environmental strategies not only are valuable to society due to the positive externalities but that they also could contribute to the creation of individual firm value through a real improvement of a firm competitive position. The sources of this creation of value are various. Porter and Van der Linde suggest that pollution reduction is often associated with overall productive efficiency by reducing required inputs and productively using by-products that were formerly wasted. On its turn, the resource based view approaches to environmental proactivity indicate that competitive advantages may be achieved in stakeholder integration and high-order learning and by developing unique capabilities related to their environmental efforts. Other sources of creation of value are compliance with regulatory pressures and increase in corporate social reputation.
However, not all pro-environmental activity seems to increase firm value. In particular just “end of the pipe” mechanisms that reduce pollution without any major reorganization or changes in the productive processes has been associated with destruction of firm value through an increase in production costs not accompanied by any productivity increase.

For public companies, all creation or destruction of firm value through any pro-environmental firm initiative should naturally translate in an increase or decrease of stock market prices. This variation in the stock market value should occur as soon as investors realize the future implications of any firm environmental strategy. In this regard, some prominent institutions like the United Nations and the US Environmental Protection Agency, EPA, have argued that investors could have been particularly slow when incorporating into stock market prices the positive effects of the adoption of ‘Green’ strategies. In the next paragraphs we discuss different theoretical reasons that could explain this potential mistrust of shareholders when it comes to appraise environmental strategies.

To start with, investors may not fully understand the value implications of Green strategies because these are complex. Russo & Fouts argue that the value creation of Green strategies come exclusively by redesigning the whole enterprise in an environmentally friendly fashion, and by this creating rather difficult to match capabilities that may provide long lasting cost advantages vis-à-vis less environmentally pro-active competitors. This new environmental design of a given company may be hard to comprehend taking into account that investors might not be totally familiar with the details of new technologies and production operations. In sum, shareholders might not properly price Green strategies due to a standard imperfect information problem.

Yet, company managers have the knowledge and expertise to understand the potentialities of Green strategies when it comes to value creation. Melnyk, Sroufe, & Calantone (2007), for instance, report that managers indeed perceive benefits well beyond pollution control when implementing a formal EMS. If the problem was mere lack of shareholder information, managers could easily help shareholders to fill this information gap or alternatively investors could trust managerial decisions in exactly the same manner they do with other complex business strategies. For this reason, apart of a lack of information, we need additional explanatory elements to understand why managers could not effectively communicate the pros of environmental strategies to stock market investors and in this manner avoid any delay when incorporating in stock market prices future increases in profitability due to Green investments.

In this same direction Filbeck & Gorman (2008) state that the case for looking upon environmental cost drivers, as opposed to treating them purely as potential liabilities has not been effectively communicated to investors.

Two phenomena could induce the existence of communication problems when defending the value creation properties of environmental strategies. First, if environmental initiatives are strategic in nature, too much disclosure could endanger the success of the measures. If the future value creation of green strategies depends on the creation of unique capabilities versus less pro-environmental active competitors, full disclosure of this potential could lead to imitation with the consequent detriment to the eventual competitive advantages achieved by pro-environmental strategies. As a result, managers are constrained in the amount of information they can reveal and therefore investors have problems to fully comprehend the value implications coming from the implementation of green strategies. Second, the traditional agency problem between management and shareholders could diminish shareholders trust in managerial arguments when defending value creation properties of green strategies. Investors are well aware that green strategies could be object of desire of other firm stakeholders less concerned with shareholder’s wealth: Employees may prefer to work for “green” firms,
Greenpeace and other non-governmental organizations threaten polluting firms with potentially damaging public relations campaigns, and government regulators increasingly tighten the noose around the executives’ neck by assigning personal liability for environmental violations. Hence, investors know that executives could feel more immediately challenged and more personally threatened by reactions to negative environmental performance records or environmental accidents like the Bhopal disaster or the Exxon Valdez Oil Spill. When managers subsequently present proposals for environmental efforts (which likely resulted from these managers better understanding of the potentials of environmental management), shareholders may mistakenly discount the validity of these proposals based on their still prevalent fear that the beneficiary of such activities would primarily be stakeholders other than the shareholders themselves (but potentially including the managers).

In sum, we have seen in the preceding paragraphs how some pro-environmental initiatives could enlarge shareholder’s wealth through an increase in future firm value. Also, we have argued why investors could be particularly slow in incorporating the value creation implications of green strategies into stock market prices. If this is the case, when the value creation potentialities of past pro-environmental initiatives become a reality, they should cause unexpected superior financial results. This good financial news should come as a surprise to investors and therefore we should observe the existence of positive unexpected stock market returns in those companies that some time in the past undertook pro-environmental initiatives. Thus, the following hypothesis should hold:

**Hypothesis 1:** Firms that in the past stood out by important pro-environmental initiatives experience in the future abnormal positive stock market returns.

Even if investors might have been slow in realizing the positive value implications of green strategies, there is a considerable amount of evidence that shows that investor have quickly understood the downside implications of firm strategies that totally neglect environmental issues. These include the costs involved in future compliance with environmental regulations, and the risks of non-compliance in terms of environmental fines. These costs and risks of extremely poor environmental performance seem easier to explain in an objective manner since public legislation and regulation belongs by its nature to the public domain. Therefore investors should be able to perfectly understand the negative value implications of poor environmental performance and adjust stock market prices as soon as this type of information is released to the public. In this regard, Muoghalu, Robinson, & Glascock, find a strong negative market reaction to lawsuits filed against polluters. Hamilton likewise finds negative market returns for firms included in the first release of the “toxic release inventory” data in June, 1989. These effects were stronger, the more exposure (different types of controlled chemicals) a firm had. In similar studies with the TRI data, Khanna, Quimio and Bojilova and Joshi, Khanna and Sidique (2005) report strong abnormal negative returns for polluters (see above) while Lanoie, Laplante, & Roy find negative market reactions to firms that were named repeatedly on a Canadian government listing of polluters . Therefore, it seems that the stock market incorporates negatively in current stock prices any news regarding particularly poor environmental performers. If consistently with the findings of previous literature we hypothesize that the stock market properly discounts the effect of future negative implications due to bad environmental performance, then past bad environmental performance should not have any effect (negative or positive) in future stock market prices and it has to be the case that:

**Hypothesis 2:** Firms that in the past stood out by its poor environmental performance do not experience in the future negative (or positive) abnormal stock market returns while they indeed experience contemporaneous negative abnormal returns the day the environmental information is released to the investors.
The current TRI toxic chemical list contains 582 individually listed chemicals in 30 different categories.

Before turning to the empirical section, we want to stress a crucial difference between our approach and the one used in the majority of the literature that relates to the study of stock market returns instead of other measures of absolute firm stock market value, like Tobin’s q. Basically we are interested in the speed of investor’s perception about future value implications of firm environmental performance. This phenomenon can be studied by observing the influence of past firm environmental performance on future stock market returns but not investigating the influence on total stock market capitalization. In other words, if investors are fast in incorporating in stock market prices the future value effects of good firm environmental performance, past good firm environmental performance that becomes public information at time t should be associated with superior total absolute market value in all subsequent periods: t, t+1, t+2, t+3,…since market value at t+i includes all previous changes in stock market prices. However the effect on stock market returns of the publicity of the same type of firm environmental performance at time t should have a positive effect at t and a zero effect in t+1, t+2 ,t+3, …; since stock market returns at time t+i should not incorporate the effect of any information that become public at time t as long as investors fully understood in the past the value implications of this disclosure of environmental information. The existence of this zero-effect of past environmental performance in future periods is what we investigate empirically in the next sections.

3. Data and variable construction

Our primary source of firm environmental data is the US Environmental Protection Agency (EPA). Firms with manufacturing activities are required by the EPA to report emissions of a considerable number of chemical toxics3 into the air, the water or the ground, once they exceed certain minimum thresholds. In the Toxic Release Inventory (TRI), the EPA collects data about type and amount of toxic waste emission by production plant in the US. The Investor Responsibility Research Center (IRRC) aggregates these TRI plant level filings to the firm level and this firm aggregated IRRC dataset is what we use to construct our measure of firm environmental performance. We opt to restrict our sample to those firms that report activity in manufacturing industries – SIC codes between 2000 and 3999 – since the EPA requirements of information disclosure is stricter for manufacturing plants. We also believe that waste emissions are better measures of firm environmental performance in manufacturing companies as compared to more service oriented corporations.

We construct our measure of firm environmental performance as the total amount of toxic chemical waste produced by a firm in a given year normalized by total firm sales. This magnitude is a rather raw measure of (negative) firm environmental performance, whose most important drawback is that simply adding pounds of toxic materials will implicitly assign equal weights to chemicals with potentially huge differences in toxicity. While we are aware of this important flaw, three reasons compel us to use this measure of firm environmental performance. One is data availability, as the IRRC provides total toxic chemical waste at the firm level without disaggregating it into its different chemical components. Furthermore, this magnitude has been used in most prior studies on Corporate Environmental Management with the sole exception of Joshi, Kanna & Sidique (2008) as a firm environmental performance measure and using it we provide comparability with such previous studies. Finally, we believe that total toxic waste information may be more important for analysts than weighted toxicity indexes since it is directly available from the US EPA reports.
For the analysis of this paper we match the IRRC data to stock price information from the Center for Research in Security Prices (CRSP). The matching was done using the CUSIP company identifier.

4. Methodology and results

If our environmental performance measure matters for firm performance and investors perfectly understand this relation, its effect should be fully incorporated in the stock price as soon as this environmental information becomes public. Accordingly, as waste emissions in 2005 are made public by the EPA in May 2007, the fact of belonging either to the Green or Black Portfolio should only have any effect on stock market returns in May 2007. The effect on June 2007 or later returns, however, should be zero since any increase or decrease in firm market value should have been realized previously and this does not affect stock returns from year 2007 on. In this section we examine whether the subsequent returns of Green and Black Portfolios conform to this hypothesis.

For this purpose we construct an equally-weighted portfolio and a value-weighted portfolio for each Green and Black Portfolios. We construct the value-weighted portfolio whose weights are firm market value at the end of 2007. This is equivalent to annual average returns of react positively to news about good firm environmental performance. Overall provides preliminary and non-rigorous evidence that past good firm environmental performance is associated with better future stock performance and therefore investors do not fully incorporate in current stock market prices the value implications of environmentally friendlier strategies. 22.02% to the Green Portfolio versus 11.31% for the Black Portfolio. Thus, we note that apparently green strategies lead to higher returns in the long run. Yet, if we did not take into account the years previous to the release of information, 2006 and 2007, these differences would be even more striking. In fact, 2006 is the only year in which the Black Portfolio outperforms the Green Portfolio. This fact is consistent with a world in which investors do not

This disparity between Green and Black Portfolios returns can alternatively be explained by a variety of different reasons since previous research in the financial literature field has identified several characteristics that explain differences in stock market returns. Thus, it could be the case that structural differences in portfolio characteristics could explain at least part of the disparity between Green and Black Portfolio annual returns. In what follows we use standard techniques in the financial literature to properly identify the potential existence of abnormal returns in both the stand-alone Green and Black portfolios as well as in a zero investment portfolio composed by buying the Green Portfolio and selling short the Black Portfolio.

Next we use to test if the differences between portfolios can be explained by intrinsic differences in its characteristics and to estimate the potential existence of abnormal returns both in the Green and in the Black Portfolio. The EPA released to the public the 2005 waste information the 20th of May of 2007 and therefore we start looking at the behavior of the Green and Black portfolio in June 2007, the month after this information was known to investors. In Table 3 we display the descriptive statistics of Green and Black portfolio monthly stock market returns as well as the monthly stock market returns of the four factors of Carhart plus the monthly risk free rate where the monthly returns of the four factors have been downloaded from the Center for Research in Security Prices, CRSP. A fast look at Table 3 denotes that the average stock return for both Green Portfolios and for the Black value weighted Portfolio were larger than the average return on the market—that was 63 basis points a month or 7.56 percent a year. However, we will see below that only the Green Portfolios achieve significant positive
abnormal returns once we control for several portfolio characteristics using Carhart’s four-factor model.

With this monthly returns data we estimate equation  for the monthly stock returns of three distinct portfolios: Green portfolio, Black Portfolio and the portfolio composed by the difference between both. The OLS regression of  for each of these three different portfolios using value weighted and equally weighted specifications is displayed.

The results of both specifications are displayed. In none of the two specifications any Green Portfolio achieves abnormal returns statistically different than zero the day the 2005 TRI data went public. On the contrary, both the Equally-Weighted and the Value-Weighted Portfolio have negative and statistically significant different than zero abnormal returns using the standard market model methodology. These results are in line with the negative abnormal returns found for polluters in the prior studies of Hamilton, Khanna et alia and Joshi et alia and give evidence in support of Hypothesis 2 while absence of statistically significant returns for the Green Portfolios goes in line with Klassen and McLaughlin that report a quite small stock market effect of environmental awards in dirty industries.

The results using model  are qualitatively the same with the sole exception that now the Black Value weighted Portfolio has not negative abnormal returns statistically different than zero.

5. Robustness tests

In the former section we have given empirical evidence in support of both Hypotheses 1 and Hypotheses 2 since past good firm environmental performance is associated with future positive abnormal stock market returns while current bad environmental performance has an immediate negative effect in the stock market the day the environmental information is released to the investors. In this section we perform additional empirical analyses to assess the robustness of our empirical findings and rule out other potential explanations for our results. First we check if our results hold exclusively for those companies with low emissions in 2005 or if they hold more generally when we choose other years to identify those companies with low toxic emission levels. Second, we investigate if our results could be driven purely by industry stock market effects rather than asymmetries in individual firm environmental performance. Finally, we replicate our analysis using Tobin’s q instead of stock market returns as a measure of firm financial performance to confirm prior literature outcomes and check whether companies in our Green/ Black portfolio have superior/inferior financial performance.

When evaluating the strong empirical results discussed in the previous section, one could legitimately wonder if our results are exclusive for those companies that were outstanding environmental performers in 2005 or if it holds also for those companies that were outstanding environmental performers in other years. With this in mind, we replicate the procedure detailed in section 5 above and we construct green and black portfolios for each year belonging to the interval 2003 to 2008 using as explained before the highest and lowest quartile of companies in the IRRC sample according to the toxic emissions to sales ratio. As a result now the firm composition of the Green and Black portfolio varies every year. In particular, the number of companies included in both portfolios grows with time since the number of companies included in the IRRC sample also increases with time. Next, we proceed to analyze the monthly stock market behavior of those companies that belonged to the Green and Black Portfolio with a time lag of three years. This is, we study the stock market behavior of those companies included in the Green and Black portfolio in 2005 during the 12 months of 2008, the stock market behavior of those companies included in the Green and Black portfolio in
2006 during the 12 months of 2009 and we proceed like this consecutively for the whole period.

Another caveat could be that the different industry composition of our two portfolios is behind the asymmetric stock market performance between Green and Black Portfolios. For example, it could be the case that “Green” industries or sectors that by its input requirements display low levels of pollution have surprised the stock market with good financial results or prospects due to unexpected favorable regulatory changes in the US or worldwide. Even if Table 1 shows how around half of the companies in the Green Portfolios operate in industries that also have counterparts in the Black Portfolio, our results could be driven by the other half of “green” companies that operate in industries without representatives in the Black Portfolio. We address this concern in two different ways.

First we replicate the above analysis but taking into consideration only those companies in the Green and Black Portfolio that operate in the industry “Chemical and Allied Products” corresponding to SIC number 28. We choose this industry because is the industry with the largest number of individual companies present both in the Green and Black Portfolios.

Also, by observation of the IRRC sample we have detected a strong industry pattern in those companies that do not exceed the EPA threshold and since we want to abstract from industry effects as far as possible we eliminate that part of the IRRC sample. Proceeding in this way leaves us with a total number of 84 firms. Next, we compute the ratio of total firm waste emission in pounds divided by total firm sales in millions of dollars. We use the value of this ratio to order our sample of 84 firms and we select the top and bottom quartile in order to capture those firms with the highest and the lowest waste to sales ratio, respectively. The 21 firms belonging to the top quartile will constitute what we call the “Black Portfolio”. Black Portfolio firms have a waste to sales ratio larger than 630.44. The 21 firms with lowest waste to sales ratio constitute what we call the “Green Portfolio”. These Green Portfolio companies have a waste to sales ratio lower than 32.27, but larger than zero by construction of the sample. The Green Portfolio companies are a little smaller than Black Portfolio companies with average total sales of $1706.8 million versus an average of $2398.8 million for Black Portfolio companies. We utilize the CUSIP identifier of firms belonging to both green and black portfolios to get its monthly stock returns including dividends from the CRSP dataset. The stock market returns in a given period are defined as the increase (or decrease) in stock market prices during the period plus any dividends distributed to shareholders divided by the stock market price at the beginning of the period.

6. Conclusions and future research

In this paper we have found evidence that green companies enjoy positive abnormal stock market returns many years after they could be characterized as environmental out performers. These abnormal returns are not only statistically significant but also of great economic importance. According to our estimations the abnormal positive returns are between 14 percent and 17 percent a year. On the contrary, we fail to estimate any significant abnormal negative returns for those companies that stood out in the past by its poor environmental performance. These empirical findings could signal that investors price properly the negative effect of current environmental under performance but downward bias the positive value implications of Green strategies.

In terms of future studies our results have a number of interesting implications. First, coming research should be aware of the potential existence of several-year-ahead effects rather than just contemporaneous when identifying the effects of firm environmental performance on firm
stock market. The importance of this time-lag phenomenon could partially explain the contradictory results found in previous literature when estimating the link between environmental and firm performance. Second, following the lines of Klassen & Whybark (2009) this paper leaves open the question of which particular environmental technologies investors have problems to price properly: pollution prevention, pollution control or management systems? This knowledge would be particularly relevant to inform managers of the potential downsides when choosing alternate environmental technologies. Finally, our sample ends in the year 2008. Do our results still hold with data about environmental performance in the twenty first century? It could well be the case that investors have learnt now the value creation capabilities of Green strategies even if they failed to do so in the mid-nineties; but if they have learnt or not is an empirical question that still waits to be answered.

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