

Managers' Green Investment and Related Disclosures Decisions

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Abstract

We use experimental markets to examine whether preferences for societal benefits lead managers to invest in unprofitable green projects, what information they disclose regarding such investments, and how investors react to those disclosures. We find that managers who are also shareholders in their company make green investments even when they know this reduces shareholder value, thereby decreasing their own and other current shareholders' payoffs. Moreover, managers voluntarily disclose to potential investors that they have made such unprofitable green investments and tend to focus their disclosures on the societal benefits of their green investment rather than on the cost to the company. Finally, potential investors' bids for the company reward managers and other current shareholders more when managers disclose their green investments than when they do not, and this result is stronger when managers' disclosures focus on the societal benefits of their investment rather than on the cost to the company. These results are consistent with both managers and potential investors trading off personal wealth for societal benefits and help explain why, given the current voluntary reporting environment, company managers often focus their disclosures of environmental investments on the benefits to society and to the company rather than on the cost to the company. In addition to these specific results, our study demonstrates the benefits of using experiments to study important corporate social responsibility issues that are difficult to address using archival data.

I. Introduction

Most companies try to project an image of corporate social responsibility (CSR), especially regarding environmental issues. However, there continues to be considerable debate about what it means to be socially responsible. For example, do companies make socially responsible investments in green projects only when this maximizes shareholder value or do they sometimes invest in such projects even when this decreases shareholder value? It is common in the economics, finance and accounting literatures (e.g., Friedman 1970, Shank, Manullanl and Hill 2005, Dhaliwal, Li, Tsang and Yang 2011) and even sometimes in the popular business press (Karnani 2010) to argue or assume that companies would never invest in any socially responsible activities unless such investments increase shareholder value. In contrast, researchers in other fields (e.g., Reinhardt, Stavins and Vietor 2008, Kolstad 2007) and some in the popular business press (Grow, Hamm and Lee 2005, Friedman, Mackey and Rodgers 2005) continue to argue that true corporate social responsibility requires that companies be willing to sacrifice profits in the social interest.

There is little debate about the first type of investment in socially responsible activities because, when the goals of maximizing shareholder value and being socially responsible are aligned, both society and shareholders benefit. However, despite the continuing debate about the second type of CSR, very little is known about 1) whether company managers who are also shareholders in their company sometimes invest in activities that benefit society at the expense of shareholder value, 2) if they do, what, if any, information they disclose to investors about such investments, or 3) how investors react to managers' disclosures of such activities. One reason that so little is known about these issues is that they are very difficult to study using field data. CSR disclosures are voluntary, and therefore corporate managers can include or exclude

whatever CSR information they choose and slant any information they do provide in any manner they choose. Such noisy disclosures make it impossible to reliably determine whether companies' CSR investments maximize or reduce company profits. Even if company managers were required to fully and accurately disclose all of their CSR investments, the uncertainty regarding future outcomes related to such investments would make it difficult to use archival data to assess whether such actions were originally "expected to" maximize shareholder value.

We use an experiment to overcome the limitations of using field data to address the CSR questions raised above. Specifically, we examine a particular type of CSR activity, green investing, in an experimental market setting in which the company manager and all current and potential shareholders know for certain that the financial cost to the company of a green investment always exceeds the financial benefit (i.e., the investment is always unprofitable). Using a green investment that is always unprofitable is an essential design feature of our experiment because if the green investment could have been profitable, we could not address our research questions, which begin with whether managers ever make green investments that lower shareholder value. As indicated above, the current lack of reliable field data regarding the profitability of real-world CSR investments makes it nearly impossible to address our research questions satisfactorily using archival data.

We find that manager participants often make unprofitable green investments even though this decreases their and other current shareholder participants' payoffs.¹ In addition, most managers who make an unprofitable green investment disclose to potential investors that they have done so and focus their disclosure on the societal benefits of the investment rather than on the cost to the company. Managers appear to provide such disclosures because, as our results demonstrate, potential investors' bids for the company reward managers and other current

shareholders more when managers disclose their green investments than when they do not. Finally, investors reward managers and other current shareholders more when managers' disclosures of their unprofitable green investments focus on the societal benefits of their investment rather than on the cost to the company.

The contributions of our study are threefold. First, our results show that managers can craft disclosures of their CSR investments in ways that encourage investors to help offset the cost of those investments to the manager and other current shareholders. This helps explain why company managers tend to disclose the societal benefits of their investments, while often downplaying the cost of such investments to shareholders. Second, for those who believe that company managers should only invest in activities that benefit society when such investments also maximize shareholder value, our results identify a problem (i.e., managers making green investments at the expense of shareholders). However, to those who believe that company managers should invest in activities that benefit society even when this lowers shareholder value, our results can be viewed as quite heartening because they suggest that managers sometimes act in the interest of society even when this lowers their and other current shareholders' personal wealth. Finally, our study demonstrates the advantages of using experiments to examine important CSR issues that are very difficult to study satisfactorily using archival data.

Sections II and III of the paper provide background information and present our hypotheses. We then describe the experiment in Section IV and report our results in Section V. The paper concludes with a discussion of the results and our conclusions in Section VI.

II. Background

Corporate interest in conducting business in a more environmentally friendly or sustainable way has increased substantially in recent years. A 2010 global survey of 766 CEO's

finds that 93% believe that sustainability issues will be critical to the future success of their business, 91% report that their company will employ some type of new technology (renewable energy, energy efficiency, information and communication technologies) to address sustainability issues over the next five years, and 66% see climate change as the global development issue most critical to address for the future success of their business (UN Global Compact-Accenture CEO Study 2010).

Not only are companies increasingly focused on environmental issues, many are also disclosing their efforts to do so. Although such disclosures of green investments and other forms of CSR are not required, most large companies now voluntarily issue a CSR report that includes at least some information regarding environmental performance.² The KPMG International Survey of CSR (2008) reports that 80 percent of the 250 largest global companies and 78 percent of the 100 largest US companies are now engaging in some type of voluntary CSR disclosure. Most such CSR disclosures relate to the impact of corporate activities on society (e.g., the extent of carbon emissions or the energy cost savings from improved efficiency) rather than to the overall financial impact of such activities on company profits (Jose and Lee, 2007). In this way CSR disclosures differ from most other disclosures typically studied by accounting researchers, which usually are intended to provide information regarding the financial impact of actions or events on company earnings to help investors or creditors assess the effect on future cash flows.

CSR disclosures may, in part, be a response to a large and growing group of investors who wish to invest in socially responsible companies. The Social Investment Forum (2010) estimates that \$3.07 trillion of the \$25.2 trillion being professionally managed in the US in 2010 was invested using criteria based on social responsibility. In addition, the Social Investment Forum estimates that the amount of money being invested using socially responsible criteria

grew at a 13% rate per year from 2007 to 2009, with over 250 separate socially responsible mutual funds now available. Such statistics suggest that some investors, like many others in the general population, value the societal benefits associated with CSR activities. In a review of the literature assessing the performance of socially responsible investment (SRI) funds, Renneboog, Ter Horst and Zhang (2008) conclude that “in the US and UK, there is little evidence that the risk adjusted returns of SRI funds are different from those of conventional funds.” However, because there is some evidence that SRI funds in Continental Europe and Asia-Pacific underperform benchmark portfolios, their overall conclusion is that “the existing studies hint but do not unequivocally demonstrate that SRI investors are willing to accept suboptimal financial performance to pursue social or ethical objectives.”

Because CSR reports are voluntary and typically not verified by an independent third party, managers have a great deal of leeway in the information they disclose.³ Given this, we would expect corporate managers to put a positive spin on the information they choose to disclose. Consistent with this expectation, casual examination of actual CSR reports suggests that managers purposefully choose to highlight both the benefits of their CSR activities to society and to the company, while often downplaying the associated costs to the company. For example, Coca-Cola’s 2008/2009 Sustainability Report includes information about one of the steps that Coca-Cola has taken to reduce their carbon footprint, stating : “In 2009, our Company office in Belgium made significant lighting, heating and cooling efficiency upgrades and switched to 100 percent renewable energy, reducing its ecological footprint by more than 25 percent.” This example is typical of how CSR information is presented in CSR reports in that it includes information about efficiency and the positive environmental impact without ever mentioning the

cost to the company. It appears that corporate managers believe that they and their shareholders can benefit from slanting their disclosures in this manner.

Because managers can selectively disclose the benefits and/or costs of their CSR activities, it is difficult to use field data to draw reliable conclusions about the impact of such activities on the company's profits or cash flows. In turn, it is difficult to use field data to reliably determine whether investors' reactions to CSR disclosures are driven by the impact on the company or by investors' preferences for the associated societal benefits. We overcome these difficulties by removing all economic incentives for managers to invest in CSR activities in our experimental setting, thereby allowing us to isolate and measure the effect of preferences for societal benefits on managers' CSR decisions and the related reactions of investors.

If financial incentives were the only motivation for making green investments, managers who are shareholders in their company would only make such investments when this maximizes shareholder value. Consequently, any positive impact of such investments on the environment and society would simply be a side benefit of managers' decisions to maximize shareholder value. We are not interested in such cases in our study because there is general agreement that firms would make such green investments and that investors would react positively (Karnani 2010). Examining such cases would not allow us to answer our research questions which require that we first establish that some managers invest in green projects even when this lowers shareholder value, and therefore their own and other current shareholders' wealth.

In order to examine our research questions, we design an experimental market setting in which the financial cost to the company of any green investment always exceeds the financial benefit, and in which the combined effect of the financial costs and financial benefits to the company have a direct negative effect on the firm's current cash flows but no effect on the firm's

future cash flows. Having an effect only on current cash flows is an essential design feature because this means that the effect of any green investment on the firm's cash flows is negative with certainty. This critical design feature allows us to investigate our first research question, which is whether managers sometimes make green investments that reduce shareholder value.

In our setting, neoclassical economic theory makes an unambiguous prediction that managers who are also shareholders in the company will never make a green investment because doing so will reduce their personal wealth. Neoclassical economic theory also assumes that, in our setting, any disclosures managers make about their green investments are irrelevant for firm value because potential investors already know the possible distribution of cash flows after any green investment by the manager and therefore will value the firm based only on this after-investment distribution of cash flows.

We distinguish between “potential investors” and “current shareholders” in our study and measure investor reaction based on the stock price set by the potential investors. That is, in our experimental setting, the other current shareholders do not play a direct role in setting the stock price. However, as explained further later, it was important to include other current shareholders in our design to reflect the fact that, like the managers themselves, other current shareholders also bear a direct financial cost any time the manager makes an unprofitable green investment.

III. Development of Research Question and Hypotheses

There are a variety of reasons why managers might choose to engage in socially desirable activities such as green investing. The standard economic view is that financial incentives drive these decisions. In other words, companies “do well by doing good” (Karnani 2010). For example, being more socially responsible could add customers, increase sales, or increase pricing power (Lev, Petrovits, and Radhakrishnan 2010), attract or motivate employees (Balakrisnan,

Sprinkle and Williamson 2011, Bhattacharya, Sen and Korschun 2008), lower the cost of equity capital (Dhaliwal, Li, Tsang and Yang 2011) or reduce the risk of governmental regulation. Based on such standard economic arguments, empirical studies have focused on trying to establish a positive association between corporate social responsibility and measures of financial performance. Based on a meta-analysis of 251 such studies over the last 40 years, Margolis, Elfenbein and Walsh (2009) conclude that “the overall effect is positive but small...and the results for the 106 studies for the past decade are even smaller.” Of the 251 studies, 59% reported a non-significant result, 28% found a positive result, 2% a negative result, and the remaining 10% did not report sample size or significance.

The small positive association or more frequent failure to establish a reliable association between corporate social responsibility and financial performance suggests that improved financial performance may not be the only reason company managers engage in socially desirable activities. One alternative possibility is that managers sometimes over-invest in CSR (Barnea and Rubin 2010). That is, in addition to financial incentives, some managers may value the societal benefits (versus only considering the firm’s financial costs and benefits) of green investments, and thus might sometimes pursue unprofitable green projects. Even when an overall positive relation between CSR and financial performance is found with archival data, it is still possible that some unprofitable CSR activities are offset by other profitable CSR activities. Providing direct evidence of unprofitable CSR activities with archival data is difficult because it is impossible to reliably separate unprofitable green projects from profitable ones using the available field data.⁴ However, using an experiment, we can design a setting in which the financial cost of investing in a green project always exceeds the financial benefits, thereby allowing a clean test of whether managers value the societal benefits of such investments.

There is considerable evidence that individuals contribute personal wealth to charitable causes, and to green causes specifically (Giving USA Foundation 2010). In a setting in which managers were also the sole owners of their firm, Martin (2009) provides experimental evidence that some managers are willing to contribute a portion of their firm's earnings to a green cause even though this reduces firm profit and therefore their personal payoff from selling the firm's stock. Martin's setting captures one critical trade off that managers face when deciding whether to invest in an unprofitable green project because his manager participants had to give up personal wealth to achieve societal benefits. Likewise, the widespread charitable giving by individuals provides further evidence that many individuals are willing to forego personal wealth for societal benefits.

However, corporate settings are typically more complex than the setting examined by Martin (2009) or the situation faced by individuals who choose to make personal charitable contributions. Specifically, corporate managers are often only partial owners of their firm. Consequently, when managers make an unprofitable green investment, a portion of the cost of the investment is shifted to the other current shareholders of the firm. This has two potential effects: 1) managers may be more likely to invest in unprofitable green projects because they personally bear only part of the cost, and 2) managers may be less likely to invest in unprofitable green projects because they are reluctant to harm another party (i.e., other current shareholders). The first effect provides a financial incentive to managers who are already inclined to make green investments to increase the amount of their investment, while the second effect provides a possible psychological reason for them to decrease the amount of their green investment. Consequently, although we expect that, as in previous studies, some managers will value the societal benefits of green investments, the fact that the more complex corporate setting we use in

our experiment introduces two new forces, one of which could reduce the amount of green investment, means that we cannot predict with certainty that some managers will make unprofitable green investments. Therefore, we use a research question to examine this issue.

Research Question: *Will some managers who value the societal benefits associated with green investing invest in an unprofitable green project even though this reduces their own and other current shareholders' wealth?*

If the answer to the research question above is that some managers choose to invest in an unprofitable green project, they then can also choose how much, if any, information to disclose to investors about their investment. The managers' initial decision is whether to even disclose that an unprofitable green investment has been made.⁵ In our setting, potential investors know for certain that any green investment is unprofitable and also that the cost of any such investment is already reflected in the after-investment distribution of possible cash flows that they see before bidding on the company's stock. Therefore, potential investors who are only concerned with maximizing their personal wealth will be indifferent as to whether a green investment was made and, consequently, any disclosures provided by managers about their investments would be irrelevant for firm value.

However, if like some managers, some potential investors value the societal benefits associated with green investing, they may respond positively to disclosure that a green investment was made. Consistent with this view, Martin (2009) found that, although investors reduced their bids for a company's stock when they knew that the manager of the company contributed to a green cause, they did so by less than the full amount of the contribution. In other words, investors were willing to bear part, but not all, of the cost of the contribution made by the managers. In another related study, Elfenbein et al. (2010) used data from eBay auctions to show that customers were more likely to buy, and pay higher prices for, items for which the

seller had committed to donate a portion of the sales proceeds to charity than identical items for which the seller had not made such a commitment. Consistent with Martin's results, the higher prices paid by customers in the Elfenbein et al. study reduced the cost to the firm of the charitable contribution but did not fully offset it. These results suggest that managers who undertake unprofitable green initiatives because they personally value the associated societal benefits may want to disclose that they have done so to investors in the hopes of capturing any potential positive investor reaction. This leads to our first and second hypotheses:

Hypothesis 1: *Managers who make an unprofitable green investment will disclose to investors that they have done so.*

Hypothesis 2: *Holding the distribution of possible cash flows constant, potential investors will respond more favorably to disclosure of an unprofitable green investment than to no report about green investing.*

If managers decide to disclose that a green investment has been made, they also can decide how much detail to disclose about the investment. For example, managers could disclose information emphasizing the societal benefit from reducing carbon emissions (i.e., the amount of the green investment to reduce carbon emissions), the net cost of the green investment to the company (e.g., the amount of the investment minus any related energy cost savings), or both. In our setting, purely wealth-maximizing potential investors should not be influenced by any such additional disclosures. This is because in our setting the societal benefits associated with the green investment have no effect on the personal wealth of potential investors' because the net cost to the firm of the green investment is already incorporated into the after-investment distribution of cash flows that they use to value the company. Of course, if in addition to personal wealth, potential investors value the societal benefits of managers' green investments as predicted in Hypothesis 2 and discussed further below, they can choose to forego some personal

wealth by paying more for the company when managers disclose that they have made a green investment than when they do not.

If potential investors react more favorably to disclosure versus no disclosure of managers' green investments because of the associated societal benefits (Hypothesis 2), managers may try to focus their disclosures more directly on the societal benefits to portray the investment in a more positive light. In contrast, managers would likely downplay the cost to the firm because focusing on the cost would frame the green investment in a more negative light (see Levin, Schneider and Gaeth, 1998 for a review of the related framing literature). Thus, we expect that managers who disclose their green investment will focus on the societal benefits and downplay the costs to the firm and that investors will react positively to such disclosures. This leads to our third and fourth hypotheses:

Hypothesis 3: *Managers' disclosures of green investments will more often focus on the societal benefits of unprofitable green investments than on the cost to the company.*

Hypothesis 4: *Potential investors will react more favorably to disclosures that focus on the societal benefits of unprofitable green investments than on disclosures that focus on the costs to the company of such investments.*

IV. Experiment

Overview

We designed an experimental market setting using z-tree software to test the research question and hypotheses specified above (Fischbacher 2007). Three experimental sessions with 30 participants each were conducted in a networked computer lab. The 90 volunteer participants were recruited on a first come-first serve basis from a pool of approximately 1300 individuals who had signed up as potential participants in studies to be conducted in the lab throughout the year. Our participants were 55% male and averaged 21 years of age. Each experimental session

lasted approximately 90 minutes and consisted of 20 independent periods. At the conclusion of each session, one of the 20 periods was randomly selected and participants were paid their \$5 participation fee plus their earnings for the randomly selected payment period. Participants' earnings depended on the decisions that they and other participants made during the experiment (details provided later).

Participants assumed the role of a manager who was a shareholder in the company, another current shareholder in the company, or a potential investor in the company. Each period, managers learned the amount of earnings for the company before they made any green investment (hereafter referred to as the company's "before-investment earnings") and then decided whether to invest a portion of those earnings to reduce carbon emissions. At the start of each period, the manager and the other current shareholder each owned one-half of the company. This is an important feature of our design because it captures forces in our experimental setting that could play an important role in managers' green investment decisions in actual corporate settings. Specifically, this ownership structure provides managers with 1) a financial deterrent against investing in the unprofitable green project because any investment lowers their personal wealth, 2) a possible psychological deterrent against investing in the unprofitable green project because any investment reduces the wealth of the other current shareholder (i.e., other-regarding behavior), and 3) a possible incentive to invest in the unprofitable green project because the manager can shift half of the cost of the investment to the other current shareholder. Including these forces in our experimental setting allows us to more convincingly generalize our experimental results to actual corporate settings in which managers decisions affect their own wealth and the wealth of other current shareholders.

After the managers made their investment decision, they also decided what information, if any, to disclose about their decision to the potential investors and the other current shareholder. The cost of the managers' green investment was then subtracted from the distribution of before-investment earnings to arrive at the distribution of after-investment earnings. This distribution of after-investment earnings, along with any disclosure the manager chose to provide, was provided to the potential investors and the other current shareholder. Then each of the potential investors submitted a bid that specified the price s/he was willing to pay for the company. The potential investor making the highest bid purchased the company from the manager and current shareholder. Because the amount paid by the potential investor who purchased the company was shared evenly by the manager and the other current shareholder as 50% owners, potential investors knew that their bidding decisions could affect the wealth of both the manager and the other current shareholder. After the market outcome was determined, the potential investor who purchased the company received a liquidating dividend equal to the actual after-investment earnings of the company and all participants' payoffs for the period were determined.

Detailed Procedures

Participants' randomly assigned roles as a manager, current shareholder, or potential investor in the company were constant throughout the experiment. Each period, one manager was randomly matched with one current shareholder and three potential investors, creating a group of 5 participants. There were 6 such groups of 5 in each of the 3 experimental sessions, resulting in a total of 18 groups. With 20 periods in each session, this resulted in a total of 360 group-level observations (18 groups x 20 periods). Because managers, current shareholders and

potential investors were randomly re-matched into new 5-member groups each period, they never knew with whom they were matched at any point in their experimental session.

Managers' decisions

Each period began with the manager learning the company's actual before-investment earnings for that period. The before-investment earnings amounts were randomly drawn from a uniformly distributed distribution of earnings ranging from \$25-\$35.⁶ This distribution was known by the manager but not known by the potential investors or the other current shareholder to prevent them from ascertaining whether the manager had made a green investment and the amount without the manager disclosing this information.⁷ After learning the company's actual before-investment earnings amount, the manager decided what amount, if any, of these earnings to invest to reduce carbon emissions. Possible green investment amounts ranged from \$0 to \$20 in \$1.00 increments.

Because any amount of green investment also reduced the company's energy costs, the net cost of the green investment to the company was always less than the societal benefit associated with the investment to reduce carbon emissions. In other words, every \$1 of green investment the manager made to reduce carbon emissions resulted in a net cost to the company of less than \$1. This design feature reflects the fact that in many cases green investments have both societal benefits and financial benefits for the company and that in some cases the benefits to society exceed the costs to the company. Managers making a green investment knew that their investment reduced the company's energy cost by an amount equal to 50% of their investment, but this exact percent of cost reduction was not known by the company's potential investors. This reflects the asymmetric information regarding the net cost of green investments between managers and potential investors and, more importantly, prevents potential investors

from learning the exact amount of the green investment unless the manager chooses to disclose this information.⁸ Because we are interested in potential investors' reaction to the specific information that managers choose to disclose, it was critical that investors not be able to infer any information about managers' green investment decisions beyond that disclosed by the managers.

Managers knew that any amount of green investment they made had a real societal benefit because they knew that the full amount of their green investment would be donated by the researchers to Carbonfund.org, a real non-profit environmental organization that invests contributions in renewable energy and reforestation projects that reduce the amount of greenhouse gases in the environment.⁹ After the experiment was completed, the actual dollar amount of the green investment made by managers for the randomly selected payment period was contributed to Carbonfund.org.

After making their green investment decision, managers also decided whether to report any information about their decision to the potential investors. Managers chose one of the reporting options shown in Table 1 depending on whether they chose to make a green investment. If they made a green investment, they could 1) send no report, 2) disclose that they made an investment to reduce carbon emissions without any amounts, 3) disclose that they made an investment to reduce carbon emissions along with the amount of the investment, 4) disclose that they made an investment to reduce carbon emissions along with both the amount of investment and the related cost to the company, and 5) disclose that they made an investment to reduce carbon emissions along with only the net cost to the company. If they did not make a green investment, they could 1) send no report, or 2) send a report indicating that they did not make an investment to reduce carbon emissions. Table 1 provides the exact wording used on the

computer screens for each type of report. The computer program ensured that any report the manager made to the investors was truthful. That is, managers were only allowed to truthfully report whether they invested to reduce carbon emissions, and if they chose to report the amount of their green investment or the cost to the company of their green investment, these amounts had to be reported truthfully as well.¹⁰

(Table 1)

Investors' decisions

Each period, the three potential investors and the current shareholder received a uniformly-distributed, \$5.00 range of equally likely after-investment company earnings. As explained earlier, the distribution of possible after-investment earnings represents the distribution of before-investment earnings minus the company's net cost of the green investment.¹¹ The current shareholder and potential investors knew that the actual after-investment earnings amount was equally likely to be any amount (in one cent increments) within the \$5.00 range. As was the case for managers, potential investors also knew that managers' green investments had a real societal benefit because the amount of green investment for the randomly selected payment period would be paid by the researchers to Carbonfund.org.

At the start of each period, the manager and the other current shareholder each owned one-half of the company. Potential investors knew that the investor who purchased the company would receive the actual after-investment earnings amount as a liquidating dividend at the end of the period. After receiving the \$5.00 range of equally likely after-investment company earnings and any report the manager chose to provide, each potential investor submitted a bid indicating the price s/he was willing to pay for the entire company. At the start of each period, each potential investor received a \$30.00 endowment amount, which along with the \$5.00

participation fee could be used to purchase the company. The potential investor making the highest bid purchased the company from the manager and current shareholder. In the event of a tie for the highest bid, the computer randomly determined which potential investor making a highest bid purchased the company. At the conclusion of each period, potential investors were required to repay half of their endowment (i.e., repay \$15).¹²

After the market outcome was determined, potential investors learned the actual after-investment earnings amount. That is, they learned which specific amount from the \$5.00 distribution of equally likely after-investment earnings was the actual after-investment company earnings amount. This amount was paid as a liquidating dividend to the potential investor who purchased the company.

Participant payoffs and post-experiment questionnaire

Participants' payoffs were determined as specified in Table 2. Because managers initially owned one-half of the firm, they received 50% of selling price of the company (i.e., the winning bid) + their \$5 participation fee. Potential investors' payoff depended on whether they purchased the company (i.e., made the winning bid). Potential investors who purchased the company received the liquidating dividend (i.e., the actual company earnings) - the price they paid to buy the company + their \$5 participation fee + \$15 (\$30 endowment -\$15 repayment). Potential investors who did not purchase the company received their \$5 participation fee + \$15 (\$30 endowment -\$15 repayment). Because current shareholders initially owned one-half of the company, they received 50% of the selling price of the company + their \$5 participation fee.

(Table 2)

The procedures described above were repeated in each period of the experiment. After all periods were completed, participants completed a post-experiment questionnaire, a volunteer

participant drew a number from a container holding the numbers 1 through 20 to determine the payment period, and participants received their payoff amount for this randomly selected period.

V. Results

Overview

As indicated earlier, our experimental design yielded 360 group-level responses (i.e., 18 groups x 20 periods). Summary data of our results are presented in Panels A and B of Table 3, which reports the frequency and percentage of green investments by amount of green investment (Panel A) and frequency and percentage of report type (Panel B).

(Table 3)

Keep in mind that the neoclassical economic predictions are that wealth maximizing managers will never make a green investment and that report type will have no effect on wealth maximizing potential investors' behavior because they will base their bids exclusively on the after-investment earnings range. As can be seen in Panel A of Table 3, contrary to the first economic prediction, managers made a green investment 50% of the time (180 out of 360 cases). Regarding report type (Panel B of Table 3), it appears that managers made some report types more often than others, which may reflect their expectations that, contingent on the amount of their investment, potential investors will react more favorably to some report types than others. We discuss these issues in more detail below in conjunction with the tests of our research question and hypotheses.

Tests of Research Question and Hypotheses

Our research question asks whether some managers would make a green investment even though this decreased their own and the other current shareholder's payoff. As explained above,

the neoclassical economic prediction is that wealth maximizing managers will *never* make an unprofitable green investment. The data used to test our research question are reported in Panel A of Table 3, which shows the frequency of green investment by amount of investment. The amount invested in the green project exceeded zero in 50% of cases (180 out of 360). Most of the investments were for smaller amounts, i.e., \$1.00 (16.7%) or \$2.00 (9.2%), but the next highest percentage was for the maximum possible amount of \$20.00 (8.3%). Because the 95% confidence interval for the proportion of managers who chose to make a green investment ($.50 \pm .052$) does not include zero, we conclude that the frequency of green investment (50% of cases) is significantly greater than zero.

Given the large number of cases in which the manager made a green investment (180 out of 360), at least 9 of the 18 managers had to make a green investment, and the number of managers making an investment would be more than 9 unless all 9 of these managers made a green investment in each of the 20 periods of the experiment ($9 \times 20 = 180$). In fact, 17 of the 18 managers (94%) made a green investment, with 5 making more than 15 investments, 4 making more than 10, 3 making more than 5, and 5 making less than 5, for an average of 10.6 investments in each of the 20 periods. Given these data and the clear financial disincentive in our experiment for wealth-maximizing managers to make a green investment, it is very unlikely that the large number of cases in which managers made a green investment were random errors.

In addition to the tests reported above, we used managers' responses to two post-experiment questions to provide further evidence that cases of investments were not mistakes or random noise. The first question asked managers to rate their concern for environmental issues such as global warming on a seven point Likert scale with endpoints of 0 (No Concern) and 6 (Very High Concern). The average response for cases in which a green investment was made

(4.06) is significantly higher ($t = 2.27, p = .012$) than for cases in which no green investment was made (3.72). The second question asked managers to rate their willingness to contribute to environmental causes on a seven point Likert scale with endpoints of 0 (Not Willing) and 6 (Very High Willingness). The average response for cases in which a green investment was made (4.07) is significantly higher ($t = 3.80, p < .001$) than for cases in which no green investment was made (3.59). These results not only provide evidence that managers' investment decisions were neither random choices nor mistakes, but also provide evidence that they were conscious decisions based on the societal benefits associated with the investments.

Hypothesis 1 predicts that managers who make a green investment will disclose to investors that they have done so. As can be seen in Panel B of Table 3, consistent with this prediction, managers disclosed their green investment in 155 of the 180 cases (86%) in which they made a green investment. To formally test Hypothesis 1, we use a conservative test that compares the proportion of cases that disclosed the green investment (86%) to 80%, which is the expected proportion of such reports if managers chose their reports randomly (i.e., if they made 20% of each of the five possible types of reports, four of which disclosed the green investment). The proportion of cases in which the green investment was disclosed was significantly greater than would be expected if choices were random ($z=2.05, p=.02$).¹³

Hypothesis 2 predicts that investors will respond more favorably to disclosure of a green investment than to no report regarding the manager's green investing decision. To test this hypothesis we use the data presented in Table 4, which reports data by type of report managers made to investors. For each type of report, the table shows the frequency, the average before-investment earnings, the managers' average green investment, the average cost of the investment to the company (i.e., the investment amount reduced by the 50% cost savings), the average after-

investment earnings range, the average winning bid, and the average “Share Value.” The “Share Value” measure was calculated by subtracting the lowest value in the \$5 distribution of the after-investment cash flows from the winning bid for the company. This standardizes the winning bid to remove the effect of the variance in the distributions of after-investment earnings across report types because of differing amounts of investment across report types (see Table 4). For purposes of testing H2, we excluded two of the 360 observations from the data reported in Table 4 because they were extreme outliers, resulting in 358 overall observations.¹⁴

(Table 4)

We test whether Share Value is higher for cases in which the manager reported that they made a green investment than in cases in which they made no report (see Table 4). For this and all subsequent analyses involving Share Value, we use the Huber-White method to estimate robust standard errors after adjusting for non-independence caused by repeated measures (Huber 1967; White 1982). Consistent with Hypothesis 2, Share Value was significantly higher ($t = 1.79$ $p < .04$) when managers disclosed that they made a green investment (Share Value = \$2.03) than when managers made no report (Share Value = \$1.48).¹⁵ In other words, Share Value is 37% higher when managers disclosed that they had made an unprofitable green investment that lowered their own and the other current shareholder’s payoff. This result is consistent with investors rewarding managers for making green investments because of the associated societal benefits.

As further evidence that investors rewarded managers based on the societal benefits associated with green investments, we examined whether Share Value varied predictably with the amount of investment. Specifically we tested whether Share Value increased as the disclosed amount of the investment increased. We find that Share Value is significantly positively

associated with the disclosed amount of the investment, with Share Value increasing approximately \$.11 for each \$1 increase in investment ($t=1.69$ $p=.05$). This is consistent with investors rewarding managers based on the societal benefits associated with green investing, because not only is Share Value higher when a green investment is disclosed, it also increases as the disclosed amount of the investment increases.

While the test reported above shows that Share Value increases as the level of investment increases, we could only relate investor reaction (in the form of Share Value) to the amount of investment when managers chose to disclose the amount of their investment. That is, when managers did not disclose the amount of their investment, potential investors had no way to respond based on the amount of the investment, and consequently we have no way to examine investor reaction. Interestingly, there is some evidence in our data that managers did not always expect a positive relation between investor reaction and amount invested, particularly for large amounts of investment. As shown in Table 4, the “Average Green Investment” amount appears to be larger for managers who invested and did not disclose the amount of their investment (No Report = \$10.66 and Green Investment Only = \$7.91) than for those managers who invested and disclosed the amount of their investment (Green Investment Amount = \$3.35 and Green Investment Amount and Cost = \$3.82). A statistical comparison of the amounts invested by each of these different report types finds that the amount invested when “No Report” was made (\$10.66) is significantly higher than the amount invested when either the “Green Investment Amount” report (\$3.35, $t=-3.82$, $p<.01$) or “Green Investment Amount and Cost” report (\$3.82, $t=-3.41$, $p<.01$) was made. All other comparisons of investment amounts across the four types of reports were not significant.¹⁶ While this provides modest evidence suggesting that managers may not have always expected investors to bid more as the amount of the investment increased,

as indicated earlier, we can only test investor reaction to the investment amounts that managers chose to disclose. For this subset of amounts, our analysis shows that investors reacted more positively to larger investment amounts.

Hypothesis 3 predicts that managers who disclose their green investment will focus their disclosure on the societal benefits of their investment more often than on the cost to the company of their investment. To test this hypothesis, we examined the specific types of reports that managers chose to make to the investors. As reported earlier in Panel B of Table 3, in 155 of the 180 cases (86 %) in which managers made a green investment, they also disclosed to investors that they had done so. Of these 155 cases, the number of times that managers made each specific type of report is as follows: 1) that they made an investment to reduce carbon emissions without any amounts, 56 times ($56/155 = 36\%$), 2) that they made an investment to reduce carbon emissions along with the amount of the investment, 31 times ($31/155 = 20\%$), 3) that they made an investment to reduce carbon emissions along with both the amount of investment and the related cost to the company, 35 times ($35/155 = 23\%$), and 4) that they made an investment to reduce carbon emissions along with only the cost to the company, 33 times ($33/155 = 21\%$).

We used two comparisons of report types from the data reported in Table 3 to test Hypothesis 3. First we compared Green Investment ($n = 56$) to Green Investment and Cost ($n = 33$) and then we compared Green Investment Amount ($n = 31$) to Green Investment Amount and Cost ($n = 35$). We used these comparisons of report types because the only difference between each of the two report types in each comparison is cost information. For both comparisons we compared the proportion of the first type of report (the one that focused on the Societal Benefits without the cost) to 50%, the expected proportion of the first type of report if report types were purely random. For the first comparison, there were significantly more ($z = 2.44, p < .01$)

reports that focused on the societal benefits ($56/89 = 63\%$) of the green investment than those that also disclosed specific information about the cost to the company ($33/89 = 37\%$). This result is consistent with managers more often focusing on the societal benefits than on the cost to the company. However, for the second comparison, the proportion of reports is not significantly different ($z = 0.492$, ns) for the two report types ($31/66 = 47\%$ and $35/66 = 53\%$) and therefore this result is not consistent with Hypothesis 3. Although this analysis only provides support for Hypothesis 3 using one of our two comparisons, further consideration may offer an explanation for this result. Because Hypothesis 4 is closely related to Hypothesis 3, we defer our discussion of this possible explanation until after we report our tests of Hypothesis 4.

Hypothesis 4 predicts that investors will react more favorably to disclosures that focus on the societal benefits of green investments than those that focus on the cost to the company. To test Hypothesis 4, we used the same approach we used to test Hypothesis 2. That is, we tested whether Share Value (i.e., winning bid – lowest value in the \$5 distribution of the after-investment earnings) was higher for cases in which the managers' disclosure focused on the societal benefits than when managers' disclosure provided additional specific information about the cost to the company. We used the same comparisons we used to test Hypothesis 3 to test Hypothesis 4 because these provided the cleanest tests of the hypothesis. For the first comparison, as can be seen in Table 4, consistent with Hypothesis 4, Share Value was significantly higher ($t = 1.68$, $p = .05$) when managers' disclosure focused on the societal benefit ($n = 56$, Share Value = \$2.18) than when they also reported the specific cost to the company ($n = 33$, Share Value = \$1.49). In other words, Share Value was 46% higher when managers' disclosures focused only on the societal benefit, indicating that investors reacted more favorably to disclosures that focused on the societal benefits of the green investment than those that also

reported the cost to the company. However, for the second comparison there was no significant difference ($t = .07$, ns) when managers' disclosure focused on the societal benefit ($n = 31$, Share Value = \$2.21) than when they also reported the specific cost to the company ($n = 33$, Share Value = \$1.49).

The pattern of results reported above for Hypotheses 3 and 4 suggests that managers may not always expect cost information to lead to a negative reaction by investors as suggested in Hypothesis 3, and that investors may not always react negatively to any cost information as predicted in Hypothesis 4. In fact, our results show that disclosing specific cost information does not lead to a negative reaction when the associated societal benefit is simultaneously disclosed (i.e., for the second comparison for tests of Hypotheses 3 and 4). While we did not anticipate this result, there appears to be a plausible explanation for it. One reason why cost information that is disclosed along with the amount of the societal benefit (as in the second comparisons in our tests of Hypotheses 3 and 4) may not be viewed as negative is that such disclosure highlights an additional positive aspect of the green investment in our setting, namely the reduction in energy costs associated with the green investment. In other words, while any green investment had a net cost to the company, the amount of the societal benefit was twice as high as the net cost to the company, and this fact was highlighted when the report included information about both the specific amount of the societal benefit and the cost to the company (as in the second comparison in our tests of Hypotheses 3 and 4). This additional positive aspect of any green investment was highlighted when the specific amount of societal benefit was disclosed (as in the *second* comparison in our tests of Hypotheses 3 and 4) but not when the specific amount of the societal benefit was not disclosed (as in the *first* comparisons in our tests of Hypotheses 3 and 4).

Thus, this may explain why the first comparisons provided support for Hypotheses 3 and 4, while our second comparisons did not.

Cost of Green Investment

Although our results show that potential investors respond more favorably to certain report types than others, we note an additional important aspect of our results. As expected, in all cases in which the manager chose to make a green investment, the manager and the current shareholder bore a significant economic cost. Controlling for the before-investment earnings range, the amount of the green investment had a significant negative effect on the winning bid ($t=-17.40$, $p<.001$). In addition, when the association between the amount of the green investment and winning bid is examined separately for each possible report type, the amount of the green investment has a significant negative effect on the winning bid for each possible report type (all $t's>2.59$, $p's<.01$).

Moreover, the size of the negative coefficient associated with the investment amount across the different report types is consistent with our other findings. That is, the coefficient is more negative for reports that focus on the cost of the green investment and when no report was made than for reports that disclosed the societal benefits of the green investment. The specific estimates of the reduction in manager and current shareholder payoffs for each dollar of net cost of green investment to the company by report type are as follows: No Report = $-\$1.09$, Green Investment Only = $-\$.85$, Green Investment Amount = $-\$.70$, Green Investment Amount and Cost = $-\$.78$, Green Investment and Cost = $-\$.99$.

Additional analysis

Our analysis up to this point has focused on our main research questions which involve the 50% of cases in which the manager chose to make a green investment. We now consider the

other 180 out of 360 cases (50%) in which the manager chose not to invest. As can be seen in Panel B of Table 3, in 148 of these 180 cases (82%), managers chose to disclose that they did not make a green investment, while in the remaining 32 cases managers chose to make no report. Moreover, as can be seen in Table 4, potential investors reacted more favorably ($t = 1.83, p < .04$) when managers disclosed that no green investment had been made ($n = 148$, Share Value = \$1.99) than when they made no report ($n = 32$, Share Value = \$1.21). Initially, we were surprised by these results because we expected that managers who chose not to make a green investment would make no report to investors as appears to be the case in real-world corporate reporting settings. However, as we discuss next, in hindsight these results are not really surprising given an important feature of our experimental setting.

In actual corporate environments we would not expect managers to explicitly disclose that they did not make any green investments because investors can never be sure whether such investments are profitable or unprofitable. Therefore, real-world managers who have not made any green investments will likely remain silent (i.e., make no report) rather than explicitly state that they did not invest in any green activities. In contrast, in our experiment managers know that investors were aware that any green investment was always unprofitable. Although this was design feature was necessary to examine our research questions, making the green investment always unprofitable in our experiment may have introduced a negative psychological reaction to green investing that would not be present in real world settings when green investments are not always unprofitable. This potential negative psychological reaction could make managers more likely to disclose that they did not make a green investment and cause investors to react more positively to knowing that the manager did not make a green investment. These two effects

could explain why the majority of managers who did not make a green investment disclosed that they did not, and potential investors' positive reaction to such reports.

While this potential negative psychological reaction to knowing that the green investment is always unprofitable is likely to explain our results for cases in which managers *did not* make a green investment, it works against finding support for our main hypotheses, all of which relate to cases in which managers *did* make a green investment. This is because the potential negative reaction would make managers who did make a green investment less likely to disclose that they had done so, and lead investors to react more negatively to knowing that a green investment was made. The first effect (that managers would be less likely to disclose that they had made a green investment) works against finding that managers who make an unprofitable green investment will disclose to investors that they have done so (Hypothesis 1). The second effect (that investors would react more negatively to knowing that a green investment was made) works against finding that potential investors will respond more favorably to disclosure of an unprofitable green investment than to no report about green investing (Hypothesis 2).

To summarize the discussion above, our design choice to make any green investment unprofitable may have had some effects on behavior that differ from those we would expect in real world settings in which green investment could be either profitable or unprofitable. However, these effects work against finding support for our main hypotheses. That is, although our design choice to make any green investment unprofitable may explain our results for cases in which managers did not make a green investment, it actually works against our main findings that managers frequently invested in unprofitable green projects and voluntarily disclosed such investments to potential investors, who then bid more for the company when the manager made such disclosures.

One final issue regarding our results relates to the finding that investors react less favorably to no report than to both disclosure that a green investment was made and to disclosure that no green investment was made. This suggests that resolving uncertainty or simply being forthcoming with information about whether a green investment was made could help explain why potential investors responded more favorably to reports indicating that the manager made a green investment versus no report (see tests of Hypothesis 2). While we cannot entirely dismiss this possibility, the results for the first test of Hypothesis 4 show that this cannot explain our overall pattern of results.

Specifically, in our first test of Hypothesis 4, we compared reports that disclosed only that a green investment was made (i.e., no amounts were disclosed) to reports that disclosed that a green investment was made and the net cost of the investment to the company. Both of these reports inform potential investors that an unprofitable investment was made, but in the second case, potential investors also know the net cost to the company of that investment. As reported earlier, we find that Share Value is significantly higher ($t = 1.68$, $p=.05$) for reports that disclose only that a green investment was made ($n=56$, Share Value=\$2.18) than for those that disclose both that a green investment was made as well as the net cost to the company of the green investment ($n=33$, Share Value=\$1.49). This finding indicates that framing the report in terms of societal benefits (i.e., a green investment was made) versus the net cost to the company of that investment has an effect on potential investors' bidding behavior beyond any potential effect of uncertainty resolution or the degree to which managers are perceived as forthcoming regarding their unprofitable green investments. In fact, the report that includes the net cost to the company resolves more uncertainty and is more forthcoming than the report that only indicates that a green investment was made; and therefore the finding that the former is received less favorably

than the latter is in the opposite direction of that expected if uncertainty resolution or perceptions of managers willingness to provide information were driving potential investors bidding behavior.

VI. Discussion and Conclusions

There continues to be debate about whether company managers only act in the social interest when this maximizes shareholder value or whether they sometimes do so at the expense of shareholder value. This question is very difficult to answer with field data because the voluntary disclosure of socially desirable actions makes it impossible to reliably separate unprofitable from profitable actions. We overcome this difficulty by designing an experiment in which the socially desirable action (making a green investment) is always unprofitable. This allows us to examine whether managers make unprofitable green investments, what information they disclose to potential investors about their unprofitable green investments, and how potential investors react to such disclosures.

We find that a significant number of managers are willing to make unprofitable green investments because of the associated societal benefits even though this reduces shareholder value, thereby lowering their own and other current shareholders' financial payoffs. In our experimental setting any disclosures regarding an unprofitable green investment is irrelevant for firm value because such disclosures have no implications for cash flows beyond those already reflected in the information available to the potential investors. Despite this, most managers who made unprofitable green investments voluntarily disclosed that they have done so to potential investors, and potential investors responded more favorably to this disclosure than to no report. Finally, more managers focused their specific voluntary disclosures on the societal benefits of

their green investment than on the cost to the company, and potential investors responded more favorably to the former than the latter.

Our study contributes to the broader CSR literature by addressing an important issue that is very difficult to address with archival data. Our findings suggest that a considerable number of managers may, in fact, “overinvest” in some CSR activities. Of course, such overinvestment would be viewed as a problem by those who believe that company managers should only take socially responsible actions if they maximize shareholder value. However, not everyone shares this view. Some believe that companies have an obligation to be socially responsible (e.g., act responsibly regarding the environment, worker safety, the local community, etc.) even when this hurts the bottom line. Interestingly, those holding this view will find our results quite heartening because they suggest that corporate managers may sometimes act in the interest of society even when this lowers their personal wealth and the wealth of other shareholders.

Our results also suggest that managers can craft disclosures of their unprofitable investments that benefit society in ways that encourage investors to help offset the costs of such investments to the company. This finding helps explain why company managers tend to disclose the benefits of their environmental investments to society or to the company (e.g., the amount of reduction in carbon emissions or the company’s energy cost savings), while often remaining silent about or downplaying the costs of these investments to the company.

Finally, our study demonstrates the benefits of using experiments to examine important CSR issues. Using an experiment allowed us to examine unprofitable CSR investment decisions. Such decisions are almost impossible to study with archival data because 1) data on profitable versus unprofitable CSR investments, or even good data on overall CSR investments, are simply not available, and 2) any CSR data that do exist are subject to significant limitations because the

disclosures from which they are obtained are voluntary, unverified, and most likely slanted toward company and societal benefits with limited, if any, disclosure regarding costs to the company.

Using an experiment also allowed us to design a settings that removed the many confounding effects that can affect managers' CSR investment decisions and investors' reactions in actual corporate settings. For example, in actual CSR settings, potential future (and uncertain) benefits of current CSR investments such as positive customer or employee reactions could be used to justify currently unprofitable CSR investments. By making all costs and benefits certain and limiting them to the current period in our experiment, we were able to rule out such alternative explanations for managers' investment decisions and investors' reaction. Similarly, in actual corporate settings, some managers might invest in CSR projects because this boosts their reputation in the community or among special interest groups whose admiration they value (e.g., the Sierra Club). This could lead managers to make unprofitable CSR investments if such external personal reputational benefits exceed the financial costs they bear within the firm. Because our managers make their investment decisions anonymously, such external reputational benefits cannot explain the unprofitable CSR investments we observe in our experiment.

In our view, despite years of study and considerable philosophical debate regarding CSR issues, we understand very little about how managers actually make such decisions, what information they voluntarily disclose about those decisions, and how investors react to such disclosures. We believe our study demonstrates the benefits of using experiments to study these and other important CSR issues that have proved very difficult to examine using archival data.

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Table 1: Managers' reporting choices

Exact screen wording for reporting options when the manager chose to make a green investment.^a

1. No report
2. A portion of this periods' earnings have been invested to reduce carbon emissions.
3. \$ ___ of this periods' earnings have been invested to reduce carbon emissions.
4. \$ ___ of this periods' earnings have been invested to reduce carbon emissions at a cost to the company of \$___.
5. A portion of this periods' earnings have been invested to reduce carbon emissions at a cost to the company of \$___.

Exact screen wording for reporting options when the manager chose not to make a green investment:

1. No report
2. No amount of this periods' earnings have been invested to reduce carbon emissions.

^a All \$__ shown in the above reports represent the actual dollar amount of the green investment or the dollar amount of the cost to the company

Table 2: Calculation of payoffs

Manager's payoff

Because the manager initially owned one-half of the company, s/he receives one-half of the selling price of the company, which is equal to 50% of the highest bid made by any of the three potential investors and the participation fee. Thus, the manager's total payoff is:

Payoff = 50% of the selling price of the company + the \$5 participation fee.

Potential investors' payoff

If a potential investor purchased the company, s/he earns the amount of the actual after-investment earnings as the liquidating dividend minus the amount s/he paid for the company. In addition, the investor receives the participation fee plus the initial endowment minus the repayment of one-half of the endowment. Thus, the total payoff is:

Payoff = the liquidating dividend for the company - the purchase price of the company + \$5 participation fee + the \$30 endowment - \$15 (one-half of the endowment).

If a potential investor did not purchase the company, s/he receives the \$5 participation fee and retains one-half of the original endowment. Thus, the total payoff is:

Payoff = \$5 participation fee + the \$30 endowment - \$15 (one-half of the endowment).

Current investor's payoff

Because the current investor initially owned one-half of the company, s/he receives one-half of the selling price of the company, which is equal to 50% of the highest bid made by any of the three potential investors and the participation fee. Thus, the current investor's total payoff is:

Payoff = 50% of the selling price of the company + the \$5 participation fee.

Table 3
Panel A- Frequency and Percent of Managers' Green Investment
Amounts

| | Green Investment Amount ^a | Frequency ^b | % of total investment decisions |
|------------------------------------|--------------------------------------|------------------------|---------------------------------|
| No Green Investment | | | |
| | \$0 | 180 | 50.00% |
| Green Investment | | | |
| | \$1 | 60 | 16.67% |
| | \$2 | 33 | 9.17% |
| | \$3 | 13 | 3.61% |
| | \$4 | 6 | 1.67% |
| | \$5 | 13 | 3.61% |
| | \$6 | 4 | 1.11% |
| | \$7 | 4 | 1.11% |
| | \$8 | 1 | 0.28% |
| | \$9 | 1 | 0.28% |
| | \$10 | 8 | 2.22% |
| | \$12 | 1 | 0.28% |
| | \$14 | 1 | 0.28% |
| | \$15 | 3 | 0.83% |
| | \$18 | 2 | 0.55% |
| | \$20 | 30 | 8.33% |
| Subtotal - Green Investment | | 180 | 50.00% |
| Total | | 360 | 100.00% |

Panel B – Frequency and Percent of Manager Reports

| | Frequency ^b | % of total reports | |
|---|------------------------|--------------------|---------|
| No Green Investment (50% of 360 cases) | | | |
| No Report ^d | 32 | 17.78% | |
| No Green Investment | 148 | 82.22% | |
| All No Green Investment | 180 | 100.00% | |
| Green Investment (50% of 360 cases) | | | |
| Green Investment Not Disclosed | | | |
| No Report | 25 | 13.89% | |
| Disclosed Green Investment | | | |
| Green Investment ^d | 56 | 31.11% | |
| Green Investment Amount ^d | 31 | 17.22% | |
| Green Investment Amount and Cost ^d | 35 | 19.44% | |
| Green Investment and Cost ^d | 33 | 18.33% | |
| Subtotal – Disclosed Green Investment | | 155 | 86.11% |
| All Green Investment | | 180 | 100.00% |

Table 4 – Summary of Results by Type of Manager’s Report

| Report Type | Frequency^a | Average Before- investment Earnings Range^b | Average Green Investment^c | Average Cost of Investment to Firm^d | Average After- investment Earnings Range^e | Average Winning Bid^f | Average Share Value^g |
|---|------------------------------|--|---|---|---|--|--|
| No Green Investment ^h | 148 | \$27.42 – \$32.42 | \$0.00 | \$0.00 | \$27.42 – \$32.42 | \$29.40 | \$1.99 |
| No Reports | | | | | | | |
| No Report ^h – No Green Investment | 32 | \$27.69 - \$32.69 | \$0.00 | \$0.00 | \$27.69 - \$32.69 | \$28.89 | \$1.21 |
| No Report ^h – Green Investment | 24 | \$27.20 - \$32.20 | \$10.66 | \$5.33 | \$21.87 - \$26.87 | \$23.72 | \$1.85 |
| All No Reports | 56 | \$27.48 - \$32.48 | \$4.57 | \$2.29 | \$25.19 - \$30.19 | \$26.67 | \$1.48 |
| Disclosed Green Investment | | | | | | | |
| Green Investment Only ^h | 56 | \$27.36 - \$32.36 | \$7.91 | \$3.96 | \$23.40 - \$28.40 | \$25.58 | \$2.18 |
| Green Investment Amount ^h | 31 | \$27.98 - \$32.98 | \$3.35 | \$1.68 | \$26.30 - \$31.30 | \$28.51 | \$2.21 |
| Green Investment Amount and Cost ^h | 34 | \$27.92 - \$32.92 | \$3.82 | \$1.91 | \$26.01 - \$31.01 | \$28.19 | \$2.18 |
| Green Investment Cost ^h | 33 | \$27.55 - \$32.55 | \$4.70 | \$2.35 | \$25.20 - \$30.20 | \$26.70 | \$1.49 |
| All Disclosed Green Investment | 154 | \$27.65 - \$32.65 | \$5.40 | \$2.70 | \$24.95 – \$29.45 | \$26.99 | \$2.03 |
| Total | 358 | \$27.53 – \$32.53 | \$3.04 | \$1.52 | \$26.01 – \$31.01 | \$27.94 | \$1.93 |

Notes:

^a Frequency = number of instances in which a manager made a green investment decision and provided investors with the specified type of report. The total number of reports shown on this table (358) reflects the fact that two outliers were removed when performing analysis using the Share Value measure.

^b Average before-investment earnings range = the mean of the \$5 ranges that were randomly drawn from the uniformly distributed larger range of \$25 - \$35.

^c Average green investment = the mean of the amounts managers chose to invest in reducing carbon emissions.

^d Average cost of investment to firm = the mean of the net costs to the company of the green investment. The net cost to the company of the green investment is equal to the amount of the green investment less a 50% cost savings achieved through energy reduction.

^e Average after-investment earnings range = mean of before-investment earnings ranges less the costs of investment to firm.

^f Average winning bid = the mean of the highest bids that potential investors made for the company.

^g Average share value = the mean of the share value, which is the winning bid standardized by subtracting the lowest value in the \$5 range of after-investment earnings to adjust for differences in the distributions of after-investment earnings across report types resulting from differing amounts of investment across report types.

^h See Table 1 for a more detailed explanation of the information contained in each type of report.

Appendix A: Expected payoff for participants

Assumptions: 1) potential investors are risk neutral, 2) \$0 green investment, 3) expected value of liquidating dividend = \$30 (midpoint of the \$25 - \$35 range).

Potential Investors' payoff

Potential investor who purchased the company for its expected value

Expected value of the liquidating dividend (\$30) – purchase price for the company (\$30) + \$5 participation fee + the \$30 endowment - \$15 (one half of the endowment) = \$20

Potential investor who did not purchase the company

\$5 participation fee + the \$30 endowment - \$15 (one half of the endowment) = \$20

Manager's payoff

50% of the selling price for the company (\$15) + \$5 participation fee = \$20

Current Investor's payoff

50% of the selling price for the company (\$15) + \$5 participation fee = \$20

¹ From this point forward we drop the word “participant” when referring to the manager, current shareholder or potential investor participants in our experiment. That is, we refer to such participants simply as “managers”, “current shareholders” or “potential investors” to simplify and facilitate our exposition.

² Although most CSR disclosures are voluntary, public companies are required to disclose any material risks that they face from any source. Therefore, the SEC has recently pointed out that the *existing* risk disclosure requirements could result in the need to disclose possible risks resulting from the legislative, regulatory, business, market, or physical impact of climate change (SEC, 2010. Commission Guidance Regarding Disclosure Related to Climate Change).

³ Although some companies use independent third parties to verify their adherence to a specific CSR reporting framework, this appears to be the exception rather than the rule. For example, of the 100+ US firms that used the Global Reporting Initiative’s framework for CSR reporting in 2009, less than 10 used a third party to verify their reported level of adherence to the Global Reporting Initiative’s framework.

⁴ Barnea and Rubin (2010) point out that it is not even possible to know the overall amount of firms’ CSR expenditures much less whether any particular expenditure increases or decreases firm profit. Consequently, they note that “a major limitation of CSR studies is the latent CSR expenditure level.” (p. 71). Using CSR ratings by Kinder, Lydenberg and Domini as a possible proxy for CSR expenditures, they provide evidence that insiders’ ownership and leverage are negatively associated with these ratings, while institutional ownership is not. They interpret these findings as evidence of a possible conflict between different shareholders, with insiders inducing “firms to over-invest in CSR when they bear little of the cost of doing so.”

⁵ Although in some cases it is difficult to conceal a green investment (e.g., when the investment involves visible solar panels), in most cases investors would be unaware of firms’ green investments unless the manager disclosed them. For example, investors would not know if the company purchased renewable energy credits, invested in renewable power sources, purchased energy efficient fleets of vehicles, or built energy efficient office buildings or warehouses unless the managers disclosed such information.

⁶ To be more precise, the actual before-investment earnings amount was drawn from a uniformly distributed distribution ranging from \$25-\$35 in two stages. In the first stage, a distribution with a smaller \$5 range was randomly drawn from the uniformly distributed larger \$10 range (i.e., \$25-\$35). In the second stage, the actual before-investment earnings amount (i.e., a single specific earnings amount) was randomly drawn from the uniformly distributed smaller \$5 distribution. This specific amount is the actual before-investment earnings amount that managers were provided with before making their green investment decision. Potential investors were only provided with the smaller randomly drawn \$5 distribution in order to provide variation in the distributions they saw across periods. Had the same distribution been provided to potential investors each period, repeated observations may have allowed them to infer the distribution and therefore infer whether the manager had made a green investment. It was critical that investors not be able to ascertain any information about managers’ green investment decisions unless the managers chose to disclose such information.

⁷ If the potential investors had known the full range from \$25-\$35, they would have been able to infer the amount of any green investment by the manager because the after-investment range seen by the investors before bidding would have included an amount below \$25. For example, a green investment with a cost to the company of \$2

would have resulted in a range of \$23-\$33, allowing the investors to infer that the manager had made a green investment with a cost to the company of \$2.

⁸ If potential investors had been provided with the exact percent by which the manager's green investment reduced the company's cost (i.e., 50%), they would have been able to infer with certainty either the amount of the investment (i.e., the societal benefit) or the cost to the company whenever the manager chose to disclose either one of these in their reports. For example, if the manager's report disclosed that the green investment was \$2, potential investors would have been able to infer with certainty that the net cost to the company was \$1. Likewise if the manager's report disclosed that the cost to the company was \$1, potential investors would have been able to infer with certainty that the amount of the green investment was \$2.

⁹ See www.carbonfund.org for additional information

¹⁰ We required that all reports be truthful to ensure a clean test of investors' reaction to the content of the reports. We decided against allowing blatantly dishonest reporting (e.g., reporting that a green investment was made when none actually was) for two reasons: 1) investors reactions to the reports would have been confounded by their concerns regarding the credibility (versus the content) of the report, and 2) we were concerned that the amount of blatantly dishonest reporting and investors expectations of such reporting would have been higher in the experiment than in actual corporate settings where there would be future consequences if the lies were exposed. We note that our managers still had considerable leeway in what information they chose to disclose, ranging from disclosing no information to full information about their green investments and the cost to the company.

¹¹ For example, if the randomly drawn \$5 uniformly distributed before-investment earnings distribution ranged from \$28.25 - \$33.25 (see note 6) and the manager made a green investment of \$4 at a net cost to the company of \$2 (the green investment of \$4 minus the 50% energy cost reduction), then the after-investment uniformly distributed earnings distribution provided to the investors ranged from \$26.25 - \$31.25 (i.e., the before-investment distribution minus the net cost to the company of the green investment).

¹² Investors were required to repay \$15 (one-half of the initial \$30 endowment) in order to keep the expected payoffs for the participants in different roles roughly comparable. The following assumptions were made when calculating the expected payoffs: 1) potential investors are risk neutral, 2) \$0 green investment, 3) expected value of liquidating dividend = \$30 (midpoint of the \$25 - \$35 range). As shown in Appendix A, these assumptions yield an expected payoff of \$20 for all participants.

¹³ Because our hypotheses make directional predictions, all reported p-values are one-tailed unless otherwise specified.

¹⁴ The two outliers that we dropped from our data were both more than 6 standard deviations away from the mean Share Value (with the most extreme one being more than 9 standard deviations away). Because these two outliers arise from potential investors' bids they only affect our Share Value measure, and therefore are only removed to test H2.

¹⁵ Selection of a standard deviation cutoff of 5, 4, or 3 rather than 6 does not change our statistical inferences for our test of H2, except that a standard deviation cutoff of 4 or 5 results in removing one additional data point,

which moved the result for our test of H2 to marginal significance ($p=.065$). Removal of outliers has no implications for any tests other than H2.

¹⁶ As further evidence that managers expected larger amounts of investment to be viewed less favorably than smaller amounts of investment, we also examined manager response to a post experiment question that asked them to rate how they thought investors would respond to all of the possible levels of investment on a seven point Likert scale with endpoints of 0 (Very Unfavorably) and 6 (Very Favorably). Managers gave an average rating of 4.22 for investment amounts of \$5 and below, but an average rating of 1.43 for all investment amounts above \$5. However, since managers typically did not disclose such higher investment levels to potential investors, we cannot say for sure whether the managers' anticipation of a negative investor response was well-founded.