Managers’ Green Investment and Related Disclosure 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 shareholders in their company make green investments even when this reduces shareholder value. Moreover, managers voluntarily disclose to potential investors that they have made such green investments and tend to focus their disclosures on the societal benefits of their investment rather than on the cost to the company. Finally, the cost of the green investment to the managers and other current shareholders is lower when the managers disclose their green investment because potential investors’ standardized bids for the company are higher when managers disclose their green investments than when they do not. Moreover, 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 managers and potential investors trading off personal wealth for societal benefits and help explain why managers’ voluntary disclosures often focus on the benefits to society and to the company rather than on the cost to the company. In addition, our study demonstrates the benefits of using experiments to study important corporate social responsibility issues that are difficult to address using archival data.
1. 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 et al. 2005, Dhaliwal et al. 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 et al. 2008, Kolstad 2007) and some in the popular business press (Grow et al. 2005, Friedman et al. 2005) continue to argue that true corporate social responsibility requires that companies be willing to sacrifice profits in the social interest. Benebou and Tirole (2010, 2) recently adopted this latter view by noting that “A standard definition of CSR is that it is about sacrificing profits in the social interest. For there to be sacrifice, the firm must go beyond its legal and contractual obligations, on a voluntary basis.”

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 report whatever CSR information they choose and slant information they do provide as they choose. Such noisy disclosures make it very difficult 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 the related future outcomes 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). This 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 require that managers first make a green investments that lowers shareholder value.

We find that manager participants often make unprofitable green investments even though this decreases their and other current shareholder participants’ payoffs.¹ In addition, managers who make a unprofitable green investment often disclose to potential investors that they have done so and focus their disclosure on the societal benefits of the investment rather than

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.
on the cost to the company. One reason that managers provide such disclosures may be that, as our results demonstrate, the costs of the unprofitable green investment borne by the managers and other current shareholders is lower when managers disclose their green investments because the potential investors standardized bids for the company are higher when managers disclose their green investments. Finally, we provide some evidence that the cost of the green investment borne by the managers and other current shareholders is lower 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 lower 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 an agency 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 could be viewed positively 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 difficult to study satisfactorily using archival data.
Sections 2 and 3 of the paper provide background information and present our hypotheses. We then describe the experiment in Section 4 and report our results in Section 5. The paper concludes with a discussion of the results and our conclusions in Section 6.

2. 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 related efforts. 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. 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

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2 Although most CSR disclosures are voluntary, domestic U.S. public companies are required to disclose any material risks resulting from the legislative, regulatory, business, market, or physical impact of climate change (SEC, 2010. Commission Guidance Regarding Disclosure Related to Climate Change).
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 et al. (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. Given this, we

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3 Although some companies use independent third parties to verify their adherence to a specific CSR reporting framework, this appears to be the exception. 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.
would expect corporate managers to put a positive spin on the information they disclose. Consistent with this expectation, casual examination of actual CSR reports suggests that managers purposefully highlight both the benefits of their CSR activities to society and to the company, while often remaining silent about the associated costs to the company. For example, Coca-Cola reports in its 2008/2009 Sustainability Report that “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 is typical of how CSR information is presented 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 investment decisions and the related reactions of investors.

Wealth maximizing managers would only make green investments that maximize shareholder value, and any positive environmental effect would simply be a side benefit of those investments. We do not consider such cases in our study because firms would be expected to make such green investments and investors would be expected to react positively (Karnani
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.

To examine our research questions, we design an experimental market setting in which the combined effect of the financial costs and financial benefits to the company always has 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 feature of our experiment because this means that the effect of any green investment on the firm’s cash flows is negative with certainty. Consequently, 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. In addition, any disclosures that 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 managers, other current shareholders also bear a direct financial cost when managers make an unprofitable green investment.

3. 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 et al. 2010), attract or motivate employees (Balakrisnan et al. 2011, Bhattacharya et al. 2008), lower the cost of equity capital (Dhaliwal et al. 2011) or reduce the risk of governmental regulation. Based on such standard economic arguments, researchers have mostly focused on establishing 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 et al. (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. An 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
Individuals often contribute personal wealth to charitable causes, and to green causes specifically (Giving USA Foundation 2010). However, corporate settings are more complex than settings in which individuals 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 who value the associated societal benefits 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 to increase the amount of their investment, while the second effect provides a possible reason for them to decrease the amount of their green investment. Because the corporate setting we use in our experiment introduces these two new opposing forces 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?

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4 Barnea and Rubin (2010) point out that it is not even possible to know the overall amount of firms’ CSR expenditures, noting 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.”
If 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 disclose the decision at all. In our setting, potential investors know for certain that the cost of any green 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 want to maximize their personal wealth are indifferent regarding whether a green investment was made and any related disclosures are irrelevant for firm value.

However, if 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 investors were willing to bear part, but not all, of the cost of a green investment made by the sole owner of a company. In addition, 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. Again, the higher prices paid by customers reduced, but did not fully offset, the cost to the firm of the charitable contribution. 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:

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.
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 they made an unprofitable green investment, they then also 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 made 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 because the societal benefits associated with the green investment have no effect on their personal wealth and the net cost to the firm of the investment is already reflected in the after-investment distribution of cash flows they use to value the company.

Of course, if some potential investors value the societal benefits of managers’ green investments as predicted in Hypothesis 2, they may forgo some personal wealth and pay more for the company when managers disclose that they have made a green investment than when they do not. If so, managers may try to focus their disclosures more on the societal benefits to frame the investment more positively. In contrast, managers would likely downplay the cost to the firm because focusing on the cost would frame the investment more negatively (see Levin et al. (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.

4. Experiment

4.1 Overview of Experiment

We conducted our experimental markets using z-tree software in a networked computer lab (Fischbacher 2007). We recruited 90 volunteer participants on a first-come first-served basis from a lab participant pool of approximately 1,300 individuals. Our 90 participants were 55% male and averaged 21 years of age. Three experimental sessions with 30 participants each were conducted. 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 below).

In each of the three sessions, participants were randomly assigned to one of three roles: 1) a manager who was a shareholder in the company, 2) another current shareholder in the company, or 3) one of three potential investors in the company. These randomly assigned roles as a manager, a current shareholder, or a potential investor 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 our 3 experimental sessions, resulting in a total of 18 groups. Thus, our 90 participants consisted of 18 managers (one per group), 18 current investors (one per group) and 54 potential investors (three per group). With 20 periods in each session, this resulted in 360 observations (investment and reporting decisions) from managers (18 managers x 20 periods) and 360 observations (winning bids) from the potential investors (one winning bid for each of the 18 groups of three investors 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.

At the start of each period, the manager and the other current shareholder each owned one-half of the company. This ownership structure captures forces in our experimental setting that are important in actual corporate settings. Specifically, this ownership structure provides managers with 1) a personal financial deterrent against investing in the unprofitable green project, 2) a deterrent against investing in the unprofitable green project because of a fiduciary responsibility to the other current shareholder, and 3) an 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.

Managers in our study decided whether to make a green investment and what to disclose about their green investment choice to potential investors. Potential investors then placed bids to purchase the company. Both managers and potential investors knew that any amount of green investment that was made had a real societal benefit in reducing carbon emissions because they knew that the full amount of any 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. 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.

### 4.2 Detailed Experimental Procedures

A time-line of the steps in the experiment is provided in Figure 1. As shown in Step 1 of Figure 1, 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. Possible green investment amounts ranged from $0 to $20 in $1.00 increments.

The company’s before-investment earnings for each period were 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 ($25-$35). This smaller $5 range is referred to as the “before-investment earnings range”. In the second stage, the before-investment earnings amount (i.e., a single specific earnings amount) was randomly drawn from the uniformly distributed smaller $5 before investment earnings range. This specific amount is the before-investment earnings amount that managers saw before making their green investment decision. As described in more detail later, the company’s before-investment earnings were selected using this two-stage process to limit the inferences potential investors could make regarding whether a green investment had been made.

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 amount contributed to Carbonfund.org.

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6 See [www.carbonfund.org](http://www.carbonfund.org) for additional information
Carbonfund.org. (hereafter referred to as the societal benefit associated with the investment). In other words, every $1 of green investment the manager made to reduce carbon emissions resulted in a net cost to the company of $.50. 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.

(Figure 1)

As shown in Step 2 of Figure 1, after the managers made their investment decision, they decided what information, if any, to disclose about their decision to the potential investors and the other current shareholder. 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

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7 We recognize that not all individuals view the reduction in carbon emissions caused by the contribution to Carbonfund.org when managers invest in the green project as resulting in the same amount of societal benefit, or even any societal benefit at all. However, describing the amount of the green investment as the “societal benefit” is at least partially justified because unless participants valued the effect of the contribution on society there would be no reason to ever make a green investment in the experiment. That is, managers’ expected payoffs in the experiment were always higher if they never made a green investment. For this reason and to facilitate exposition, we refer to the amount of a manager’s green investment as the societal benefit.
The computer program ensured that any report the manager made to the investors was truthful.  

(Table 1)

Any disclosure managers chose to make was provided to the potential investors, along with the $5 range of possible after-investment earnings. This $5 range of after-investment cash flows was obtained by subtracting the cost to the company of any green investment the manager made from the $5 before-investment range described above.

As shown in Step 3 of Figure 1, after receiving the $5.00 range of equally likely after-investment company earnings and any report that 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

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8 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. 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.

9 For example, assume that the $5 before-investment range $27-$32. If the manager made a green investment of $2 that cost the company $1, the after-investment earnings range shown to the potential investors would be $26-$31.
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).\footnote{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.}

As shown in Step 4, 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 is shared evenly by the manager and the other current shareholder as 50% owners, potential investors knew that their bidding decisions would affect the wealth of both the manager and the other current shareholder.

As shown in Step 5, after the winning bid was determined, potential investors 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.

Finally, as shown in Step 6, participants’ payoffs for the period were determined and paid. 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 six steps described above were repeated for each of the 20 periods in each of the three experimental sessions. 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 participation fee and their payoff amount for this randomly selected period.

4.3 Procedures to Limit Investor Inferences

Two features of the experimental procedures outlined above were designed specifically to limit the inferences investors could make about whether a green investment was made or about the amount or cost of any investment. First, the managers knew the underlying $10 distribution from which the smaller $5 before-investment earnings ranges were selected, but the potential investors were never provided any information about this larger initial distribution. Using a fairly wide range of randomly selected smaller distributions drawn from the larger distribution ensured that there was significant variation in the distributions potential investors received across periods.\footnote{In each period of each session, a separate randomly determined $5 before-investment earnings distribution was randomly drawn from the underlying range of $25 to $35 for each of the six managers. Then a separate before-investment actual earnings amount was drawn randomly from this randomly determined $5 before-investment earnings distribution. With 20 periods in each session, this resulted in a total of 120 randomly determined $5 before-investment distributions and randomly determined before-investment actual earnings amounts (6 managers x 20 periods). These 120 separate $5 before-investment distributions and before investment actual earnings amounts were used in each of the three experimental sessions to limit any differences across experimental sessions.} 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. In addition, had potential investors known that the underlying range was from $25-$35, they would have been able to infer the amount of any green investment for some randomly drawn smaller distributions because the after-investment distribution could have included an amount below $25. For example, a green investment with a cost to the company of $2 could have resulted in a range of $23-$28 being shown to potential investors, allowing the investors to infer that the manager had made a green investment with a cost to the company of $2.

Second, 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. 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 net 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. Because we are interested in potential investors’ reaction to the specific information that managers choose to disclose, it was important that investors not be able to infer information about managers’ green investment decisions beyond that disclosed by the managers.

12 This reflects the asymmetric information regarding the net cost of green investments between managers and potential investors.
We took the steps described above to limit the inferences investors could make about the manager’s green investment decision despite the fact that any report managers provided to investors about their investment decision was irrelevant for how a wealth-maximizing investor would value the company. As explained earlier, a wealth-maximizing investor would base his or her bids exclusively on the after-investment distribution of cash flows. However, because our hypotheses are based on the assumption that some potential investors value the societal benefits associated with green investments, it was important that they could not infer information about managers’ green investments beyond that which managers chose to disclose.

Although we believe our procedures severely limited any inferences investors could make about the manager’s green investment, we cannot be absolutely sure that investors were not able to infer any information about the manager’s green investment as they gained experience in the market after multiple periods. However, to the extent investors were able to infer any information regarding manager’s green investments beyond that managers chose to disclose, it would only work against our ability to find differences in investors’ bidding behavior across different disclosures.

5. Results

5.1 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)
Recall that the neoclassical economic theory predicts that wealth maximizing managers will never make a green investment and that managers’ disclosures will have no effect on wealth maximizing potential investors’ behavior because they will base their bids exclusively on the after-investment earnings distribution. 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 managers’ disclosure (Panel B of Table 3), it appears that managers made some report types more often than others, which could reflect their expectations that 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.

5.2 Test of Research Question

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. Panel A of Table 3, reports 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%). Seventeen of the 18 managers (94%) made a green investment, with 5 managers making more than 15 investments, 4 making 11 to 15, 3 making 6 to 10, and 5 making 5 or less, for an average of 10.6 investments in each of the 20 periods. Because the 95% confidence internal for the proportion of managers who chose to make a green investment (.50 ± .052) does not include zero, we conclude that the frequency of green investment (50% of cases) is significantly greater than zero.

Given the frequency of green investment and the clear financial disincentive against making such an investment in our experiment, it is very unlikely that the large number of cases
in which managers made a green investment were random errors. In addition, Martin (2012) finds that, in a similar setting, 47% of managers make a less profitable green investment, while only 6.5% of managers make a less profitable non-green investment. Further evidence on this issue is provided later when we discuss our post experiment questionnaire data.

5.3 Test of Hypothesis 1

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 \((z=2.05, p=.02)\).\(^{13}\)

5.4 Test of Hypothesis 2

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. Table 4 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

\(^{13}\) Because our hypotheses make directional predictions, all reported p-values are one-tailed unless otherwise specified.
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. 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 Hypothesis 2 by comparing Share Value for cases in which the manager reported that they made a green investment versus cases in which they made no report (see Table 4).15 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). As shown in Panel A of Table 5, 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 = $2.03$ from Table 4) than when managers made no report (Share Value = $1.48$ from Table 4).16 This result is consistent with investors

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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 and H4.

15 We use all cases in which managers made no report (n=56 in Table 4) for this test because when potential investors received no report they had no way of knowing whether the manager had or had not made a green investment.

16 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 and H4, 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 and H4.
responding favorably to managers’ disclosure that they made a green investment because of its associated societal benefits.

(Table 5)

As further evidence that investors responded favorably to managers’ disclosure that they made a green investment, we examined whether Share Value increased as the disclosed amount of investment increased. As shown in Panel B of Table 5, we find that Share Value is significantly positively associated with the disclosed amount of the investment, with Share Value increasing approximately $0.11 for each $1.00 increase in investment (t=1.69 p=.05). Thus, not only is Share Value higher when a green investment is disclosed, it also increases as the disclosed amount of the investment increases.

Despite the positive relation between Share Value and disclosed green investment amounts, investment data for cases in which the investment was not disclosed suggest that managers did not always expect potential investors to react favorably for all levels of green investment. As shown in Table 4, the “Average Green Investment” amounts appear 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.\textsuperscript{17} All other comparisons of investment amounts across the four types of reports are not significant. While these results suggest that managers may not have always expected investors to bid more as the amount of the investment increased, we can only directly test investor reaction to \textit{disclosed} green investment amounts, and for these cases, we find that investors reacted more positively to larger investment amounts.

\textbf{5.5 Test of Hypothesis 3}

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 of the investment to the company. 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.

We used two comparisons of report types from the data reported in Panel B of 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 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

\textsuperscript{17} As further evidence that managers expected larger amounts of investment to be viewed less favorably than smaller amounts of investment, we examined managers’ responses to a post experiment question that asked them to rate how they thought investors would respond to all possible levels of investment ($0 through $20 in one dollar increments) on a seven point Likert scale with endpoints of 0 (Very Unfavorably) and 6 (Very Favorably) and a midpoint of 3 (neither favorable or unfavorable). Managers gave an average rating of 4.22 for investment amounts of $5 and below, indicating that believed that investor reaction would be favorable for such lower investment amounts. However, managers gave an average rating of 1.43 for all investment amounts above $5, indicating that they believed that investor reaction would be unfavorable for such higher investment amounts. Average ratings decreased monotonically from $0 to $20, with the switch from favorable to unfavorable ratings occurring at $6 of investment.
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 their disclosures on the societal benefits than on the cost to the company. However, for the second comparison, the proportion of reports is not significantly different \( z = 0.492 \) 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, there is a potential explanation for this result. Because Hypothesis 4 is closely related to Hypothesis 3, we defer discussion of this explanation until after we report our tests of Hypothesis 4.

5.6 Test 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. 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 only on the societal benefits than when they also provided specific information about the cost to the company. We used the same two comparisons we used to test Hypothesis 3 to test Hypothesis 4 because these comparisons provide the cleanest tests of the hypothesis.

For the first comparison, as can be seen in Panel C of Table 5, Share Value was significantly higher \( t = 1.68, p = .05 \) when managers’ disclosure focused on the societal benefit \( (n = 56, \text{Share Value} = $2.18 \text{ from Table 4}) \) than when they also reported the specific cost to the
In other words, consistent with Hypothesis 4, 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, as shown in Panel D of Table 5, for the second comparison there was no significant difference ($t = .07$) 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 = $2.18$).

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). Although we did not anticipate this result, there appears to be a reasonable explanation. 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 negatively because such disclosure makes salient an additional positive aspect of the green investment, namely the reduction in energy costs associated with the green investment. In our setting, 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 positive aspect of any green investment was made salient 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 may explain why the first comparisons provided support for Hypotheses 3 and 4, while our second comparisons did not.

5.7 Post Experiment Questions
We have suggested that some managers made green investments because they value the associated societal benefits. We have also suggested that potential investors’ bidding behavior was at least partially driven by the value they place on the societal benefits of a green investment. Although actual behavior in the experiment provides the strongest support for this interpretation of our results, we corroborate this interpretation with data from our post experiment questionnaire. Managers and potential investors rated their willingness to contribute to environmental causes on a 7 point Likert scale with endpoints of 0 “Not Willing” and 6 “Very High Willingness”, and a midpoint of 3 “Moderate Willingness.” Responses to this question indicate that both managers and potential investors have, on average, a greater than moderate willingness to contribute to green causes (mean manager response = 3.83 and mean potential investor response = 3.55).

Our post experiment questionnaire data also provide corroborating evidence that managers’ reporting decisions were driven by their expectations regarding potential investors’ reaction. Managers rated the extent to which their reporting choice was influenced by their concern about potential investor reaction using a 7 point Likert scale with endpoints of 0 “No Influence” and 6 “Very High Influence,” and a midpoint of 3 “Moderate Influence”. Their average response was 3.56, suggesting that their expectations regarding potential investor reaction had a greater than moderate influence on their reporting choice.

5.8 Cost of Green Investment to Managers and Current Shareholders

Although our results show that potential investors respond more favorably to certain report types than others, we note that in all cases in which the manager chose to make a green investment, the manager and the current shareholder nevertheless bore a significant financial cost. Specifically, as shown in Table 6, the winning bid was negatively affected (t=-17.40,
p<.001) by the amount of green investment after controlling for the before-investment earnings range. In addition, when the association between the winning bid and the amount of the green investment is examined separately for each possible report type, the amount of the winning bid was negatively affected by the amount of green investment for each report type (all t’s>2.59, p’s<.01).

(Table 6)

In addition, as shown in Table 6 the size of the negative coefficient associated with the investment amount across the different report types is consistent with the previously reported results. Specifically, the coefficient is more negative for reports that focus on the cost of the green investment (-$.99) and when no report was made (-$1.09) than for reports that disclosed the societal benefits of the green investment (-$.85, -$1.00, -$1.07).

5.9 Trend analysis

With 20 periods in our experiment, some of the results reported above could have weakened or strengthened over the course of the experiment. To test for this, we re-tested our research question and hypotheses using data from the first ten periods only and then data from the last ten periods only. We find that all previously reported results and statistical inferences hold for both the first and the second half of our experiment. While the statistical inferences for our research question and hypotheses are unchanged, we note a slight decline in the rate of investment from the first half to the second half of our experiment. However, the rate of investment remained well above the economic prediction of zero in the second half of the experiment (44% in the second half versus 55% in the first half).

5.10 Additional analysis
The analyses reported above have focused on 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 that surprising given our experimental setting.

In actual corporate environments investors typically cannot ascertain whether green investments are profitable or unprofitable, and thus we would not expect managers to explicitly disclose that they did not make any green investments. Rather, real-world managers who have not made an unprofitable green investments will likely remain silent (i.e., make no report). In contrast, in our experiment managers knew that investors were aware that any green investment the manager made was always unprofitable. Although this was an important design feature for examining our research questions, this could have introduced a negative investor reaction to green investing that would not be present in real world settings in which green investments could be profitable or unprofitable. This, in turn, could make managers more likely to disclose that they did not make a green investment and cause investors to react more positively to this disclosure.
These two effects could explain why many managers who did not make a green investment disclosed that they did not, as well as potential investors’ positive reaction to such reports.\textsuperscript{18}

It is important to note that, while this potential negative investor reaction is likely to explain the results for cases in which managers did not make a green investment, there are two reasons why this works against finding support for our main hypotheses, all of which relate to cases in which managers did make a green investment. First, investors reacting negatively toward unprofitable green investments works against our finding that potential investors responded more favorably to disclosure of an unprofitable green investment than to no report about a green investment (Hypothesis 2). Second, faced with a potential negative investor reaction, managers who made an unprofitable green investment would be less likely to disclose that they had done so and this works against our finding that managers who made an unprofitable green investment were very likely to disclose that they had done so (Hypothesis 1).

We note one final aspect of our results. Potential investors reacted less favorably to no report than to 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 that the manager made a green investment versus

\textsuperscript{18} Our post experiment questionnaire provides additional evidence supporting our argument that managers expected that potential investors would respond more favorably to a report that no green investment was made than to no report. Managers rated how favorably or unfavorably they expected investors to react to either a report that no green investment was made or to no report on a 7 point Likert scale with endpoints of 0 “Very Unfavorably” to 6 “Very Favorably”, and a midpoint of 3 “Neither Favorably or Unfavorably.” The average response for a report that no green investment was made (4.44) indicates that, on average, managers expected potential investors to react favorably to such a report. The average response for no report (1.89) indicates that managers, on average, expected no report to be viewed unfavorably. The difference between the two responses was highly significant (t=5.25, p<.001).
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 disclosing only that a green investment was made (i.e., no amounts were disclosed) to reports disclosing 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, the report also informs potential investors of the net cost to the company of that investment. As reported earlier, Share Value is significantly higher ($t = 1.68, p=.05$) for reports disclosing only that a green investment was made ($n=56, \text{Share Value}=$2.18$) than for those disclosing both that a green investment was made as well as the net cost to the company of the green investment ($n=33, \text{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 has an effect on potential investors’ bidding behavior beyond any potential effect of uncertainty resolution. 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.

6. Discussion and Conclusions

Debate continues 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 limited and voluntary disclosure of socially desirable investments makes it impossible to reliably separate unprofitable
from profitable investments. We overcome this difficulty by designing an experiment in which the socially desirable 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 many managers willingly 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. Although disclosures regarding an unprofitable green investment are irrelevant for firm value in our setting, most managers who made unprofitable green investments voluntarily disclosed that they had done so to potential investors, and potential investors responded more favorably to this disclosure than to no report. Finally, we provide some evidence that more managers focused their specific voluntary disclosures on the societal benefits of their green investment than on the cost to the company, and that potential investors responded more favorably to the former than the latter.

Our study contributes to the broader CSR literature by providing evidence that managers may, in fact, “overinvest” in some CSR activities. Of course, such overinvestment would be viewed as an agency problem by those who believe that company managers should only take socially responsible actions if such actions maximize shareholder value. However, for those who 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, our results could be viewed positively 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 lower 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 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 setting 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
eexternal 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.

We note that our experimental setting is somewhat unusual in that we did not
exogenously manipulate whether managers invested in the unprofitable green investment or what
reports they made to potential investors. Rather we allowed our managers to decide whether to
make an unprofitable green investment and what information to report about their investment
choice to potential investors. We did so because forcing participants into roles that they would
not naturally assume in a market setting such as ours could have yielded results that differ
significantly from behavior in the natural environment.19 That is, we consciously traded off
tighter experimental control for better generalizability.

Of course, any experiment still raises the usual questions regarding the generalizability of
the results to the field. Because the participants in our experiment were not practicing corporate
managers or sophisticated investors and the financial stakes in the experiment were not as large
as those in the field, we cannot be sure that our results would generalize to field settings.
However, there are no obvious reasons to assume that corporate managers would not have
preferences for societal benefits as strong as those of the participants in our experiments. In fact,
there are reasons to believe that corporate managers may have stronger preference given that
they have access to more resources and may feel an obligation to a broader group of stakeholders

19 For example, consider a participant who is assigned to a condition in which s/he had made an unprofitable green
investment when s/he is a strictly economic type who never would do this. As a result, s/he may provide no
disclosure to potential investors because s/he believes making an unprofitable investment is wrong and s/he does
not want investors to know s/he has done so. In contrast, if a participant chooses to make a green investment
because s/he believes it is the right thing to do, s/he may want to let investors know s/he has done so.
than just current shareholders (Moser and Martin 2012). Our participants had no such external pressure to make green investments. Regarding our investor participants, the prevalence of socially responsible investment funds suggests that many actual institutional and individual investors value firms’ CSR activities. Regarding the size of the financial stakes, there is evidence that the results of experiments using smaller financial stakes generalize fairly well to settings with larger financial stakes (Kachelmeier and Shehata 1992, see also Camerer 2011 and Falk and Heckman 2009 for general discussions of the generalizability of experiments to the field).

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. Despite some concerns regarding the generalizability of our results as discussed above, given that no archival data are currently available to test our questions as directly as we were able to in our experiment, we hope that our study spurs future research using experiments, archival data, or other research approaches to extend or modify our findings.
References


Figure 1 – Steps in the Experiment

Step 1: Manager sees before-investment earnings and makes investment choice.

Step 2: Manager chooses a report.

Step 3: Potential investors see after-investment earnings distribution and bid for company.

Step 4: Winning bidder is determined.

Step 5: Actual after-investment earnings are revealed.

Step 6: Participant payoffs are determined.
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 – Managers’ Green Investment and Reporting Decisions

Panel A – Frequency and Percent of Managers’ Green Investment Amounts

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<th>Green Investment Amount(^a)</th>
<th>Frequency(^b)</th>
<th>% of total investment decisions</th>
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<td>1</td>
<td>0.28%</td>
</tr>
<tr>
<td>$14</td>
<td>1</td>
<td>0.28%</td>
</tr>
<tr>
<td>$15</td>
<td>3</td>
<td>0.83%</td>
</tr>
<tr>
<td>$18</td>
<td>2</td>
<td>0.55%</td>
</tr>
<tr>
<td>$20</td>
<td>30</td>
<td>8.33%</td>
</tr>
<tr>
<td>Subtotal - Green Investment</td>
<td>180</td>
<td>50.00%</td>
</tr>
<tr>
<td>Total</td>
<td>360</td>
<td>100.00%</td>
</tr>
</tbody>
</table>

Notes:
\(^a\) Possible investment amounts ranged from $0 to $20 in one dollar increments
\(^b\) Frequency = the total number of instances in which a manager made a green investment decision and provided investors with the specified type of report
\(^c\) See Table 1 for a more detailed explanation of the information contained in each type of report

Panel B – Frequency and Percent of Manager Reports

<table>
<thead>
<tr>
<th>No Green Investment (50% of 360 cases)</th>
<th>Frequency(^b)</th>
<th>% of total reports</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Report(^c)</td>
<td>32</td>
<td>17.78%</td>
</tr>
<tr>
<td>No Green Investment(^c)</td>
<td>148</td>
<td>82.22%</td>
</tr>
<tr>
<td>All No Green Investment</td>
<td>180</td>
<td>100.00%</td>
</tr>
<tr>
<td>Green Investment (50% of 360 cases)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green Investment Not Disclosed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Report</td>
<td>25</td>
<td>13.89%</td>
</tr>
<tr>
<td>Disclosed Green Investment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green Investment(^c)</td>
<td>56</td>
<td>31.11%</td>
</tr>
<tr>
<td>Green Investment Amount(^c)</td>
<td>31</td>
<td>17.22%</td>
</tr>
<tr>
<td>Green Investment Amount and Cost(^c)</td>
<td>35</td>
<td>19.44%</td>
</tr>
<tr>
<td>Green Investment and Cost(^c)</td>
<td>33</td>
<td>18.33%</td>
</tr>
<tr>
<td>Subtotal – Disclosed Green Investment</td>
<td>155</td>
<td>86.11%</td>
</tr>
<tr>
<td>All Green Investment</td>
<td>180</td>
<td>100.00%</td>
</tr>
</tbody>
</table>
Table 4 – Summary of Results by Type of Manager’s Report

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

Notes:

<sup>a</sup> 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.

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

<sup>c</sup> Average green investment = the mean of the amounts managers chose to invest in reducing carbon emissions.

<sup>d</sup> 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.

<sup>e</sup> Average after-investment earnings range = mean of before-investment earnings ranges less the costs of investment to firm.

<sup>f</sup> Average winning bid = the mean of the highest bids that potential investors made for the company.

<sup>g</sup> 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.

<sup>h</sup> See Table 1 for a more detailed explanation of the information contained in each type of report.
<table>
<thead>
<tr>
<th>Panel A – Test of H2</th>
<th>Panel B – Additional test for H2</th>
<th>Panel C – H4 (First Comparison)</th>
<th>Panel D – H4 (Second Comparison)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependant Variable: Share Value</strong></td>
<td><strong>Dependant Variable: Share Value</strong></td>
<td><strong>Dependant Variable: Share Value</strong></td>
<td><strong>Dependant Variable: Share Value</strong></td>
</tr>
<tr>
<td>Constant</td>
<td>1.48***</td>
<td>(0.26)</td>
<td>Constant</td>
</tr>
<tr>
<td>Green disclosure$^b$</td>
<td>0.55**</td>
<td>(0.30)</td>
<td>Investment Amount$^c$</td>
</tr>
<tr>
<td>Number of participants</td>
<td>50</td>
<td>Number of observations</td>
<td>65</td>
</tr>
</tbody>
</table>

Notes:

***, **, * Statistically significant at the 1%, 5% and 10% levels, respectively (one-tailed for predicted signs).

Standard errors are presented in parentheses and estimated with Huber-White corrected standard errors clustered by participant.

$^a$ Share Value 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.

$^b$ Green disclosure is equal to one if the manager’s report disclosed that a green investment had been made, and equal to zero if the manager gave no report.

$^c$ Investment amount is equal to the amount of their company’s earnings that a manager invested to reduce carbon emissions.

$^d$ For this comparison, cost to company is equal to one if the report to investors is “Green Investment and Cost” and zero if the report to investors is “Green Investment”.

$^e$ For this comparison, cost to company is equal to one if the report to investors is “Green Investment Amount and Cost” and zero if the report to investors is “Green Investment Amount”.

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<table>
<thead>
<tr>
<th>Dependent Variable: Winning Bid&lt;sup&gt;d&lt;/sup&gt;</th>
<th>Overall</th>
<th>No Report&lt;sup&gt;d&lt;/sup&gt;</th>
<th>Green Investment Only&lt;sup&gt;d&lt;/sup&gt;</th>
<th>Green Investment Amount&lt;sup&gt;d&lt;/sup&gt;</th>
<th>Green Investment Amount and Cost&lt;sup&gt;d&lt;/sup&gt;</th>
<th>Green Investment Cost&lt;sup&gt;d&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>2.35</td>
<td>-12.07</td>
<td>6.61</td>
<td>15.53**</td>
<td>5.08</td>
<td>-.40</td>
</tr>
<tr>
<td></td>
<td>(3.06)</td>
<td>(8.46)</td>
<td>(6.79)</td>
<td>(6.89)</td>
<td>(4.21)</td>
<td>(3.19)</td>
</tr>
<tr>
<td>Cost of investment&lt;sup&gt;b&lt;/sup&gt;</td>
<td>-.93***</td>
<td>-1.09***</td>
<td>-.85***</td>
<td>-.70***</td>
<td>-.78***</td>
<td>-.99***</td>
</tr>
<tr>
<td></td>
<td>(.03)</td>
<td>(.09)</td>
<td>(.08)</td>
<td>(.27)</td>
<td>(.12)</td>
<td>(.14)</td>
</tr>
<tr>
<td>Before-invest earnings range&lt;sup&gt;c&lt;/sup&gt;</td>
<td>.98***</td>
<td>1.53***</td>
<td>.82***</td>
<td>.51**</td>
<td>.88***</td>
<td>1.07**</td>
</tr>
<tr>
<td></td>
<td>(.11)</td>
<td>(.32)</td>
<td>(.24)</td>
<td>(.25)</td>
<td>(.15)</td>
<td>(.11)</td>
</tr>
<tr>
<td>Number of participants</td>
<td>49</td>
<td>19</td>
<td>30</td>
<td>24</td>
<td>22</td>
<td>21</td>
</tr>
<tr>
<td>Number of observations</td>
<td>178</td>
<td>24</td>
<td>56</td>
<td>31</td>
<td>34</td>
<td>33</td>
</tr>
</tbody>
</table>

Notes:
***, **, * Statistically significant at the 1%, 5% and 10% levels, respectively (one-tailed for predicted signs).
Standard errors are presented in parentheses and estimated with Huber-White corrected standard errors clustered by participant.
<sup>a</sup> Winning bid is equal to the highest bid placed by one of the three potential investors in each group.
<sup>b</sup> The cost of the investment to the company, which is 50% of the amount of investment.
<sup>c</sup> The before-investment earnings range is equal to the lower point of the randomly determined $5 before investment range. This variable controls for the variability in the earnings range shown to potential investors that is not caused by differing amounts of investment.
<sup>d</sup> 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