

Going Green: Market Reaction to CSR Newswire Releases

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Abstract

Voluntary disclosure theory predicts that an optimal disclosure decision should produce an overall net benefit for shareholders, and that such net benefit should decrease in public information availability. This study supports the predictions of disclosure theory in the context of climate change. Using voluntary disclosures made through the CSR newswire service, we find that managers' disclosure decisions involving greenhouse gas emissions produce positive returns to shareholders. This response varies negatively with company size and public information availability. For small companies in a limited public information environment, we find that mean adjusted share price increases significantly by 2.32 percent over days -2 to 2 around the CSR newswire release date. Our sample of disclosing companies received an aggregate market value boost from their CSR newswire releases of approximately ten billion dollars, independent of differences in public information availability.

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1 Introduction

Growing awareness of climate change has led to increased demands from individuals, advocacy groups, and government regulators for companies to provide additional information about their climate change strategies and plans for managing and reducing carbon emissions. These demands have resulted in companies allocating increased resources to communicating information about their carbon footprint to interested parties. Although users will soon have access to standardized carbon emissions data collected by the U.S. Environmental Protection Agency (EPA 2009) and the California Air Resources Board (CARB 2010), companies currently report most of their green information to interested parties voluntarily, either directly or through various non-governmental channels. Voluntary disclosure theory suggests that companies should make disclosure decisions in the best interests of shareholders, net of the costs of disclosure such as agency costs, proprietary disadvantage (Verrecchia 1983, Diamond and Verrecchia 1991, Lambert *et al.* 2007), and outsiders' knowledge of information uncertainty (Dye 1985). Voluntary disclosure theory also suggests that the net benefits of additional disclosure to shareholders should depend on the firm's information environment, in particular, the level of information available to outside shareholders. For example, when outside shareholders' information availability is low, the theory predicts a new disclosure about company activities should elicit more price response as traders look to benefit from the heretofore private information. On the other hand, a new disclosure should yield less price response when outside information availability is high, as traders have already priced into the stock their greater knowledge about company activities from competitive sources. Yohn (1998) confirms this prediction in the context of earnings announcements and finds that companies with less (more) public information availability yield

stronger (weaker) price reactions to earnings. Similarly, Freeman (1987) finds that smaller (larger) companies' shares respond more (less) around earnings announcements, reasoning that small-stock traders have higher per share information costs than large-stock traders. This leads to reduced public information availability for smaller companies, which increases the sensitivity of share price to new information.

In this study, we test the preceding propositions in the context of climate change disclosures and posit that shareholders should respond positively to voluntary climate change disclosures consistent with the net benefits intended by the disclosure, and that such response should vary with outside shareholders' (public) information availability. We capture the overall net benefit to the company as an increase in shareholder value, as shareholders' expectations interpreted broadly should embrace the business profit *and* the environmental and social consequences of managers' disclosure decisions; and we proxy for public information availability using company size and financial analyst variables. Our results are intended to contribute to a growing empirical literature (reviewed in section 2) on shareholders' recognition of and response to climate change disclosures. Company managers should be informed about the overall effects of their disclosure decisions; and shareholders, analysts, and investment managers should understand the shareholder valuation implications of companies' climate change disclosures.

Specifically, we examine shareholders' response to a unique set of disclosures about climate change made by U.S. companies through the *Corporate Social Responsibility* (CSR) newswire service. We study the CSR newswire service for several reasons. First, companies' CSR releases meet the criteria of a voluntary disclosure. Companies decide on the content, timing, and dissemination (CSR in this case) of a disclosure. Second, CSR newswire claims to be the global leader in disseminating news about corporate social responsibility and sustainability, currently with one-quarter of one million page views every month. This enables us to study a large sample of disclosures over several years for a wide range of industries made through a single channel. To

further strengthen our tests, we restrict our analysis to CSR releases about greenhouse gas (GHG) or carbon emissions, as recent evidence across Australia, Canada, and the United States (Chapple *et al.* 2011, Griffin *et al.* 2011, Matsumura *et al.* 2011) concludes that shareholders find GHG emissions as value relevant and price them as an off-balance sheet liability; whereas the literature reports sparse evidence on responses to other categories of non-financial disclosure, possibly because the content of such is more varied and the implications less clear. Eccles *et al.* (2011) also support this view based on the number of user hits from Bloomberg. They document that, of the many non-financial measures available to investors, information-intensive institutional investors such as hedge fund managers and sell-side analysts have the highest demand for GHG emissions amounts and environmental disclosure quality scores. Our results also contribute to a developing literature on newswires in general, and how they aid in price discovery in capital markets (Li and Ramesh 2010).

Third, CSR newswire conveys fresh information to users (see note 2), also a critical aspect of our research design. This differs from recent studies that rely on survey data, such as from the Carbon Disclosure Project (CDP). While CDP is another leading source of GHG data, investors and others receive information on large companies' emissions at best some nine to ten months after year end, by which time other channels, including CSR newswire, may have preempted much of the news content of that information. An alternative is to study companies' 8-K filings, as in Griffin *et al.* (2011). While 8-Ks reveal timely and potentially significant news because the filer has a regulatory obligation to disclose promptly and to meet a materiality threshold, evidence of a shareholder response to an 8-K does not imply that shareholders benefit from a voluntary disclosure, which is the purpose of this analysis. In fact, in the case of emission-intensive companies, the evidence suggests that 8-K climate change disclosures trigger a negative reaction on the average, inconsistent with the intended stock market outcome of a voluntary disclosure.

To summarize, our study adds to the literature by examining whether shareholders benefit when companies make decisions to disclose climate change information voluntarily, in our case, through the CSR newswire service. We view fact-based analysis of companies' voluntary disclosure decisions as an essential element of the climate change disclosure debate, which thus far has focused disproportionately on users' demands for additional information absent evidence that would buttress those demands (e.g., Coburn *et al.* 2011). To the best of our knowledge, the following results relating to the market effects of voluntary disclosures about carbon emissions are unique to the literature.

Our study first confirms the theoretical proposition that companies disclose voluntary climate change information in the interests of shareholders by documenting a significantly positive response to CSR newswire releases involving GHG emissions in the three day interval around the disclosure date. Second, our study finds that this response varies negatively with company size and public information availability. This result supports our second proposition that voluntary disclosure of GHG emissions data benefits companies more in environments with low public information availability. These results are also unchanged when we assess shareholder response in different ways, namely, stock return in excess of a market index, stock return relative to a non-event period, stock return relative to a matched sample of non-discloser companies, and stock return from a Fama and French (1993) four-factor model that controls for market return in excess of the risk free rate, company size, growth, and stock price momentum. We also challenge our results by testing whether a portfolio that is long (short) in companies with low (high) public information availability might earn a significant hedge portfolio return from possible mispricing. We find no evidence to suggest that investors exploit differences in companies' information environment to earn positive hedge fund returns, which is another way of understanding that investors recognize the benefits of climate change disclosures efficiently with an appropriate adjustment in shareholder value based on public information availability, although measurement

error could also explain this result. Finally, our results send a statistically reliable “it pays to be green” message to managers about the compatibility of green disclosure and shareholder value maximization. The discloser companies in our study received an aggregate boost in market value from their CSR newswire releases of approximately ten billion dollars, independent of differences in public information availability calculated as the sum over all CSR releases of the market value of stock i at CSR release day $t-1$ times the excess stock return on day 0.

Our study proceeds as follows. Section 2 discusses the literature. Section 3 describes the sample and data. Section 4 summarizes the results of testing for a market response, and section 5 concludes.

2 Related literature

We first discuss disclosure theory, as this helps us understand the objectives and expected consequences of voluntary disclosure for company shareholders. Verrecchia (1983) and Diamond and Verrecchia (1991) *inter alia* predict that disclosure decisions by managers should be value-enhancing for shareholders and part of a strategy that optimally trades off the benefits to shareholders against the costs to the company, where those costs include out-of-pocket costs, agency costs, litigation risk, and proprietary disadvantage. Others argue that a beneficial disclosure strategy should be value-enhancing through a reduction in the cost of capital (Lambert *et al.* 2007) or information asymmetry (Mensah *et al.* 2003), although others (e.g., Akins *et al.* 2011, Armstrong *et al.* 2011) contend that a reduction in the information component of cost of capital has limited impact on shares traded in competitive stock markets such as the NYSE and NASDAQ. Disclosure theory also considers the effects of adverse selection (Grossman and Hart 1980) and the prediction that shareholders in a voluntary disclosure setting who know that managers have private information may interpret the absence of a disclosure negatively compared to an otherwise similar company disclosure that reveals positive news. While it is beyond the scope of our study to examine otherwise identical non-disclosers, our design checks for possible non-discloser effects by

analyzing the returns of a matched sample of non-discloser companies around the disclosure dates of otherwise similar discloser companies.

Disclosure theory should also apply in the context of CSR newswire disclosures about climate change, because even though the objectives of green disclosure relate to business profit *and* broader considerations such as environmental and social goals, the intended consequences of meeting those goals are ultimately the same, namely, improved shareholder expectations about company performance and future cash flows. However, given the newness of the context and investors' changing views on corporate environmental and social responsibility, how climate change information links to shareholder value may be more difficult to detect relative to traditional financial statement measures such as earnings, although this mostly poses a design challenge. Overall, this literature predicts that companies will disclose voluntarily only when it is worthwhile to do so net of disclosure costs. This suggests a positive impact on shareholders (or a non-negative effect at a minimum), which is our first proposition.

Disclosure theory further posits that managers condition their disclosure decisions and strategies on attributes of the information environment. In capital markets with high public information availability (and low information asymmetry) investors update their beliefs about companies' prospects frequently and promptly, based on multiple channels of information, so that current prices reflect relatively well-formed expectations about future returns. In this setting, news elicits a limited price response, as much is known already through the other channels. In contrast, prices will be more responsive in an information environment with less frequent disclosure from fewer sources, assuming investor sophistication and information quality unchanged. Voluntary disclosure in such setting should therefore elicit a greater price response as investors update their uncertain expectations in response to the new information.

Empirical studies by Freeman (1987) and Yohn (1998) confirm the notion that stock price response differs on the basis of public information availability, although this is primarily in the

context of earnings announcements. Freeman (1987) proxies for public information availability using company size, and Yohn (1998) uses analyst following and size as the proxies for public information availability. This relation also occurs in the context of *mandated* disclosures about climate change in regulatory filings, wherein Griffin *et al.* (2011) find that more emission-intensive companies elicit less investor response than less-emission intensive companies around the 8-K filing date because the former group's shares trade in a richer information environment (as proxied by company size and the CDP disclosure quality score). Overall these studies support our second testable proposition – that shareholders' response to a voluntary CSR newswire disclosure should vary negatively with proxies for the level of public information availability.

Our study also builds upon a second stream of literature that relates green information to shareholder value. By showing an association between stock prices and an attribute of a green disclosure that varies across companies, several studies extrapolate this result to *infer* that shareholders use this information to set prices. By documenting significant associations between shareholder value or cost of capital and voluntary environmental or climate change disclosures, these studies support the inference that share prices adjust appropriately to green information conditional on an attribute of that information; such as the type (Hughes 2000), quality (Plumlee *et al.* 2008), and timing (Dhaliwal *et al.* 2010) of the disclosure.

More recently, Chapple *et al.* (2011), Griffin *et al.* (2011), and Matsumura *et al.* (2011) document a negative association between GHG emissions reported to the CDP and shareholder value, and conclude that investors price carbon emissions as an undisclosed off-balance sheet liability. Cormier and Magnan (1997) also document that investors price implicit environmental liabilities through reports on water pollution. Griffin *et al.* (2011) further contend and find that companies that do not report emissions to the CDP also show a negative relation between estimated GHG emissions and stock price, consistent with the fact that the CDP is only one of many channels of information about companies' carbon emissions. These studies, however, mostly document

cross-sectional associations between stock price or cost of capital and an environmental or climate change disclosure variable rather than a response that flows directly from the disclosure event *per se*.¹

A related set of studies examines the stock price response to environmental or climate change disclosures using a design similar to this paper. The focus of these studies, however, differs from the present paper, since the earlier papers address investors' response to company disclosures about one-off events. These include the Bhopal disaster (Blacconiere and Patten 1994), the passage of Superfund legislation (Blacconiere and Northcutt 1997), the Exxon oil spill (Patten and Nance 1998), the Placer Dome accident (Magness 2010), and the first-time issuance of a corporate sustainability report (Guidry and Patten 2010). Other studies examine environmental disclosures in financial reports (Murray *et al.* 2006, Jones *et al.* 2007).

With the possible exception of Guidry and Patten (2010), who find no market reaction to the issuance of an initial sustainability report by Australian companies, none of the events and/or disclosures studied so far would seem purely voluntary by the company. This absence of evidence about the consequences of specific, company-initiated, voluntary disclosures about climate change is surprising given that most advocates of increased green disclosure premise their argument on the expectation rather than the fact of a shareholder or company benefit from such disclosure (e.g., Coburn *et al.* 2011). The present study addresses this knowledge gap by using a unique data set of green disclosures made voluntarily by U.S. companies through the CSR newswire service.

¹ Another stream of literature investigates relations between environmental performance and environmental disclosure, arguing that environmental performance should influence the amount and quality of environmental disclosure. It is unclear from this literature, though, whether better environmental performers are better voluntary disclosers or worse voluntary disclosers. For example, Clarkson *et al.* (2011a) find a positive relation between environmental performance and disclosure based on a sample of Canadian companies. On the other hand, Clarkson *et al.* (2011b) find that pollution-intensive companies in Australia disclose more and better (more objective) information than their less pollution-intensive counterparts. Also,

3 Sample and data

We select the CSR newswire sample by searching all archived releases in www.csrwire.com as of December 31, 2010 that contain the phrases “greenhouse gas emissions”, “carbon emissions”, or “CO₂ emissions”, hereafter, collectively, GHG releases. This initial search identifies 575 GHG releases from a total of 18,588 CSR releases over 2000 through 2010. We then eliminate those that do not relate to a specific company (48 releases), do not have a *Compustat* or *CRSP* identifier (312 releases), and have missing total assets at the end of the current fiscal year from *Compustat* and/or missing stock return data around the disclosure event day from *CRSP* (43 releases). This results in a final CSR sample of 172 GHG releases by 84 companies over 2000-2010. Panels A and B of table 1 summarize the sample selection process. Panel B also shows the distribution of dates across months and years. While the observations do not cluster monthly, more disclosures occur over 2007 to 2010, consistent with companies’ response to increased public interest in green information and possibly through the growth efforts of CSR itself.²

Next, we select a matched control sample following a four-step process. The first step creates a merged data set from *Compustat* and *IBES* that includes all company-year observations in years 2000 through 2010 with data for total assets (*at* from *Compustat*) and the number of analysts following the company as of the end of each year (*numest* from *IBES*). In the second step, we select a matching company from the merged *Compustat/IBES* data set for each company in the CSR sample such that the company (a) is in the same sector as the CSR company (*gsector* from *Compustat*) and (b) minimizes the sum of squares of the absolute difference in log of total assets and number of analysts following in the year of the first CSR press release, that is, we choose a

² We also checked to verify that CSR newswire conveys fresh information to users. For each CSR release, we first examined the company’s website to determine whether the CSR release in our sample is new information for investors. In all but two cases, the company’s website (often in the news section) disclosed the CSR release on the same date. In two cases, the companies disclosed the same news on their websites one day before CSR newswire release date. Second, we searched *Direct Edgar* for company press releases about a CSR disclosure as an attachment to an 8-K filing. We found only one company that disclosed the same news in the 8-K. However, the 8-K filing date followed the day of CSR newswire release.

matching company that minimizes $(\text{Log } at_{\text{matched}} - \text{Log } at_{\text{CSR}})^2 + (\text{numest}_{\text{matched}} - \text{numest}_{\text{CSR}})^2$ from among all possible candidates in the merged *Compustat/IBES* data set. Third, we require that the matched company should not be in the CSR sample and not serve as a control for more than one CSR company. Fourth, we assign to the matched company a pseudo release date that corresponds to the release date of the CSR company.

To illustrate the four-step process, consider a CSR sample company “A” with a December 31 fiscal year end and GHG releases through CSR on Feb 1, 2005, July 1 2005, Mar 1 2006, and Oct 1 2009 (four company-year filings). We start by finding a matching company in the same *gsector* with the smallest log *at* and *numest* difference in fiscal 2005. We then tag the 2005 *Compustat/IBES* company observation, and create two matched company-year release dates in fiscal 2005 (one is for Feb 1, 2005, the other is for July 1, 2005). We then tag the two *Compustat/IBES* company observations with the smallest Log *at* and *numest* differences in 2006 and 2009, and assign the pseudo release dates Mar 1 2006 and Oct 1, 2009, respectively, to those two observations. In this way, we match four company-year observations in the CSR sample with four company-year observations in the *Compustat/IBES* data set. This procedure produces a final sample of 172 company-year GHG releases for 84 CSR companies and 172 matched company-year filings for 84 matched companies. We use the matched sample to control for the shareholder returns of an otherwise similar sample with the closest asset and analyst forecast attributes. The use of a matched set of pseudo release dates also checks for possible information transfer effects, which could be positive if the CSR disclosure conveys favorable industry (*gsector*) information or negative, for example, due to a possible adverse selection effect under the strict assumption that investors view the matched sample companies as those than could have made a GHG emission disclosure on the same day as the CSR company but chose not to do so.

Panel C of table 1 shows the distribution of industries and the mean asset size of each industry. As the panel shows, each industry matches well on size, and our sample is reasonably diverse

across the sectors, although the financial and energy sectors represent the most frequent number of observations, and industrials and materials sectors represent the least frequent. In the later analysis, we assess whether differences in these observation frequencies have an impact on our statistical tests.

Table 2 reports summary statistics for the CSR and matched samples, where we select the *Compustat* variables for each CSR release that correspond with the year of a CSR disclosure as per panel B of table 1. As panels A and B of table 2 indicate (and also panel C of table 1), the matching procedure produces two samples that are statistically indistinguishable in size (mean $\log at = 23.648$ for CSR versus 23.365 for matched) and analyst following (mean $numest = 15.264$ for CSR versus 14.972 for matched); and a two-sample t-test of difference in mean size or number of analysts is not significant. The two samples are statistically similar on the other descriptor variables as well, based also on a two-sample test of difference in the means. On the other hand, panel C shows that the CSR and matched samples are larger, more profitable, and have greater analyst following than the *Compustat* population in general (of 81,587 company/year observations in 2000-2010), which means that our results based on the CSR and matched samples are not representative of the larger population.

4 Results

Table 3 summarizes our initial results that test whether shareholders respond favorably to a CSR newswire release around the announcement date (days -1 to 1) (proposition 1). Panel A reports tests of whether mean market-adjusted return for the CSR sample (a) exceeds zero, (b) exceeds the mean market-adjusted return for the matched sample, and (c) exceeds the mean market-adjusted return for the CSR sample over a non-announcement interval (days -20 to 20, excluding days -1 to 1). We define market-adjusted return for company i as the common stock return on day t less the return on the *CRSP* value-weighted market index. As predicted, we find that shareholders on average respond positively to a CSR newswire release, by 0.468 percent over

the three day window. This amount is significantly different from zero based on a one-tailed t test (p-value = 0.042). We also find that the mean excess return from days -1 to 1 is significantly higher than the mean market-adjusted return over a non-announcement period (p-value = 0.027). Furthermore, the market-adjusted return for the CSR sample over the event period is significantly higher than the return for the matched sample (p-value = 0.098). We detect no significant response for the matched sample around the pseudo release date that corresponds to the release date of the CSR company. Hence, independent of company size or public information availability, the tests in panel A document a small but reliably positive shareholder response to a CSR newswire release.

Panel B of table 3 documents a significantly positive response using a multi-factor approach. We use the Fama and French (1993) four-factor model for this purpose and conduct the following regression:

$$R_t - rf_t = \alpha + \beta_1 RMRF_t + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 MOM_t + e_t, \quad (1)$$

where t refers to days -1 to 1, R_t is the stock return on day t , rf_t is the risk-free rate (measured as the one month Treasury bill rate); $RMRF_t$ (excess market factor) is the return of the value-weighted stock market portfolio minus the return on the one month Treasury bill; SMB_t , HML_t and MOM_t are portfolio returns on zero-investment, factor-mimicking portfolios for size, book-to-market equity, and stock return momentum, respectively; and e is the residual error. The intercept or alpha coefficient in the regression tests for an announcement effect after controlling for market return in excess of the risk free rate, company size, growth, and a momentum factor. Panel B reports a positive and significant alpha coefficient for this regression for the CSR sample (coef. = 0.00153, p-value = 0.075, robust standard error). Because of differences in industry composition (table 1, panel C), we also test for positive alpha where the regression standard errors adjust for return associations (clusters) within an industry. The results are more significant under this assumption (p-value = 0.034). Furthermore, we show that the alpha coefficient for the CSR sample is significantly higher than that for the matched sample under the clustered standard error. For the

matched sample, on the other hand, we find no significant and positive alpha coefficient. Finally, as a check on our results, we estimate model 1 where t refers to days -20 to 20, excluding days -1 to 1 for both the CSR sample and the matched sample. We should not observe a significant alpha under this alternative, and we do not (e.g., p -value = 0.533 and 0.471 under the clustered standard error for the CSR sample and the matched sample respectively). Overall, the results of table 3 confirm our first proposition from voluntary disclosure theory, namely, that CSR disclosures should be in the best interests of shareholders. Contrariwise, our results show no evidence of an overall detriment to shareholders following voluntary disclosures about green activities.

Next, to strengthen this initial result, we examine whether shareholders' response in the CSR announcement interval varies with an attribute of the information environment. This makes it more likely that the response relates to the climate change release and not an unrelated information item. In proposition 2, we predict a more positive response for smaller companies and companies that trade in an environment with less public information availability. We proxy for public information availability in three ways, namely, the number of analysts following the stock, absolute value of analysts' earnings forecasts errors, and standard deviation in analysts' earnings forecast (Brennan and Subrahmanyam 1995, Chung *et al.* 1995, Yohn 1998, Hong *et al.* 2000, Frankel and Li 2004, Zhang 2006). Because size can also be a systematic risk factor priced by investors to reflect *return* uncertainty, we concentrate on excess stock returns using the Fama and French (1993) model before partitioning on analyst forecast variables hypothesized to reflect *public information availability*, although we present results based on market-adjusted returns as well.

Table 4 present results partitioned by large and small company size and high and low information availability. We summarize the key results as follows. First, large companies do not show mean excess return over days -1 to 1 that is significantly greater than zero, the mean excess return over days -20 to 20 excluding days -1 to 1, or the mean excess return for the matched sample. Small companies, on the other hand, show significantly greater mean excess return over days -1 to

1 for all three significance benchmarks. The mean excess return difference between the large and small companies is also significant at less than 5 percent (p-value= 0.031).

Second, for companies with greater analyst coverage, and therefore high public information availability, we show that the mean excess return over days -1 to 1 is marginally significant for two significance tests (i.e., p-value = 0.091 when we test the mean excess return against zero, and p-value = 0.062 when we test the mean excess return against the return over the non-event period). The mean excess return over days -1 to 1, however, is not significantly different from the return for the matched sample. For companies with less available public information, we find that the mean excess return over days -1 to 1 is significant for all three significance tests. However, the return difference between the high and low information availability companies is not statistically significant.

Third, when we compare the mean excess return for the extreme groups of small companies with low public information availability and large companies with high public information availability, we show that the former experience a strong positive stock reaction over event days -1 to 1. Overall, these results support our second proposition that voluntary disclosure benefits companies more in environments with low public information availability.

Panel B of table 4 summarizes the alpha coefficients from a Fama and French (1993) four-factor model estimated over CSR release days -1 to 1, partitioned on company size and number of analysts following. First, similar to the results in panel A, in most tests, we find no significant alpha coefficients for large or high information availability companies. But we observe positive and significant alpha for both small and low information availability companies. Second, for the two extreme groups, we observe a positive and significant alpha for companies with low information availability/low size, and a positive but insignificant alpha for companies with high information availability/high size. Third, the table shows insignificant t-statistics for excess stock

returns over days -20 to 20, excluding days -1 to 1, thus indicating essentially zero returns over these days.

Table 4 uses the number of analysts following the stock as the proxy for public information availability. We also generate qualitatively unchanged results when we use standard deviation of analysts' forecasts as an alternative proxy for information availability. For example, untabulated results show that the mean excess return over days -1 to 1 is significantly greater than zero (p-value = 0.0618), or the mean excess return over the non-event period (p-value = 0.0358) for companies with greater than median standard deviation of analyst forecasts than companies with less than median standard deviation of analyst forecasts. The alpha coefficient is also significantly positive for companies with large standard deviation of analyst forecasts (coefficient = 0.00205, p-value = 0.060), and insignificant for companies with small standard deviation of analyst forecasts (coefficient = 0.00053, p-val = 0.553). The results are weaker when we use the absolute value of analyst forecast error as a third analyst-based proxy for public information availability.

Panel A of figure 1 plots the cumulative mean excess returns from day -10 to 10 for group 1 and compares this group with the matched group 1 sample of non-CSR release companies. This plot shows a positive response for the CSR group 1 (significantly different from zero over days -1 to 1 as per table 4), whereas the matched non-CSR group tends to show negative returns around the pseudo release date (although the mean is not significantly different from zero over days -1 to 1). Over days -2 to 2, the CSR group increases by 2.32 percent whereas the matched group decreases by 1.63 percent (and both these five-day excess returns are significantly different from zero). Also, beyond day 2, we observe no sign of a price reversal for the CSR sample. Overall, the evidence in table 4 confirms our second proposition that shareholders respond to CSR disclosures conditional on public information availability.

Second, we partition the sample into size and information availability terciles to check for a monotonic relation between shareholder response and size or information availability. Table 5

summarizes the results of estimating a Fama and French (1993) four-factor model for each of the six partitions. This analysis shows that the alpha coefficient increases monotonically as size decreases (panel A) or information availability decreases (panel C). These results, however, while significant across the information availability terciles are less pronounced across the size terciles. This occurs possibly because each regression already includes a size factor (*SMB*) to capture return uncertainty from that factor. Panels B and D of table 5 also show no relation between shareholder response and the partitioning variables for the non-CSR release matched sample over the same event days as the CSR sample. Panel B of figure 1 plots the alpha coefficients for the CSR sample from panels A and C. The plot clearly shows a monotonic relation between shareholders' response and size or public information availability.

Third, we add size (*Log at*) and/or number of analysts (*numest*) to the Fama and French (1993) four-factor model and report the results in table 6. This table shows that both additional factors vary negatively with shareholders' response (regressions 1 and 2). Regressions 1 and 2 also document positive and significant alphas, consistent with an overall significant response after controlling for size and public information availability (similar to panel B of table 3). Both factors together (regression 3) also significantly explain shareholders' response (based on the incremental R^2 from the two variables combined), but none is significant individually in that regression. In addition, regressions 4-6 show that none of the additional factors is significant for the matched sample of pseudo release dates.

As a final analysis, we compute the zero investment hedge portfolio return by the calculating the three-month compounded stock return before CSR release day 0 and after CSR release day 0 for portfolios based on size quintiles and three information availability terciles (number of analysts, standard deviation of analysts' forecasts, standard deviation of analysts' forecast error). We then test for a non-zero return on a portfolio that is long in size quintile 1 (smallest) and short in size quintile 5 (largest) and long in information availability tercile 3 (least) and short in information

uncertainly tercile 3 (most) in the three months before and after CSR release date. In unreported results, we find that seven of the eight hedge portfolios (four metrics times two time periods) generate returns that are virtually indistinguishable from zero. This supports the view that stock prices adjust appropriately around the CSR release dates for differences in public information availability related to size or analyst forecast attributes, since otherwise the hedge portfolio returns would be significantly different from zero, and potentially a source of arbitrage trading profits.

5 Conclusions

This study adds to the literature on the relevance to capital market participants of green information by documenting shareholders' response to companies' voluntary disclosures about GHG emissions made through the CSR newswire service (an organization that claims to be the global leader in climate change disclosure). Our evidence is important because managers should understand the risks and consequences of their green disclosure decisions to outside parties, whose demands have risen substantially in recent years due to heightened concerns about climate change. A more fundamental contribution of our study relates to tests of voluntary disclosure theory in the context of climate change, where the theory predicts that an optimal disclosure decision should (a) produce an overall net benefit for shareholders and (b) that such net benefit should decrease in public information availability. To date, the empirical literature yields little to support the predictions of voluntary disclosure theory in the context of climate change, possibly because managers face a myriad of additional challenges and uncertainties in making optimal climate change disclosures. For instance, too much climate change disclosure could increase proprietary disadvantage and litigation and insurance costs; whereas too little could trigger adverse selection problems, increase information asymmetry, and raise the cost of capital. Changing and uncertain views about the appropriate balance of companies' profit and environmental and social goals further complicate a voluntary green disclosure decision. So it is unclear that we would observe

empirical results for voluntary climate change disclosures consistent with the theory (and with findings in other settings).

Our study generates two new results regarding companies' voluntary disclosures about GHG emissions. First, our evidence shows that managers' voluntary green disclosure decisions produce positive returns to shareholders. This means that we can reasonably infer that managers' green disclosure decisions reflect an appropriate balance of the costs and benefits of disclosure, since the theory also posits that too much or too little disclosure can be harmful to the company. Second, we find that shareholders of smaller companies with limited public information availability benefit the most from voluntary green disclosure, since in this setting investors have fewer other channels and less access to competing information. For instance, for small companies in a limited public information environment, mean adjusted share price increases significantly, by 2.32 percent over days -2 to 2 around the CSR release date. Shareholders of large companies also benefit from voluntary green disclosure but less significantly, as their larger size attracts more attention from financial analysts and others whose analysis preempts some of the value of the additional disclosure.

As part of our research design, we also check whether an investor could exploit differences in shareholder response from differences in public information availability to earn an abnormal hedge portfolio return. We construct a portfolio that is long (short) in companies with low (high) information availability and test for a significant hedge portfolio abnormal return over three months before and/or three months after the CSR disclosure. We find no evidence of an abnormal hedge portfolio return over these intervals, which is another way to conclude that investors recognize the benefits of climate change disclosures efficiently and without bias, although measurement error could explain this result.

Also, as part of our research design, we compare the adjusted share price response of CSR releases with the response of a matched sample of non-CSR companies on the same day. We find

no similar response for the matched sample as a whole, although the mean adjusted price of the matched sample of small companies with low public information availability decreases around CSR release date, which could be an information transfer effect, although we leave a thorough investigation of such effects in the context of climate change disclosures to future research.

As a closing thought, we find our affirmative “it pays to be green” result interesting and encouraging, as shareholders’ overall positive response to companies’ voluntary green disclosures bodes well for the future, since shareholders, regulators, and others will surely place even greater demands on companies for additional disclosure and transparency regarding climate change impacts and strategies. So far, management appears to be making optimal voluntary disclosure decisions in this regard.

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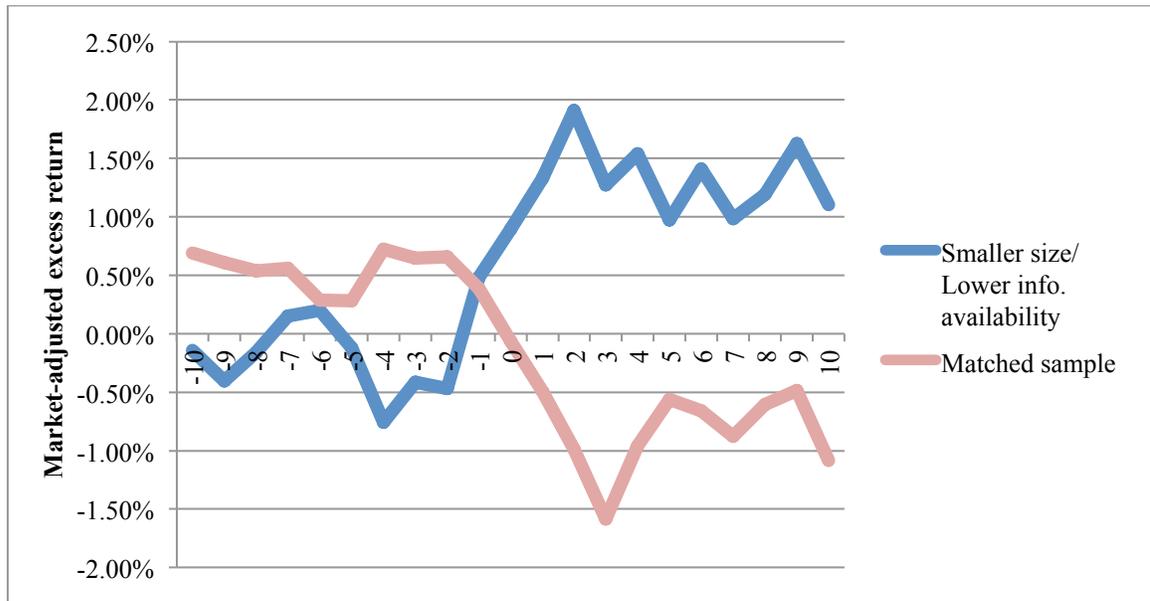
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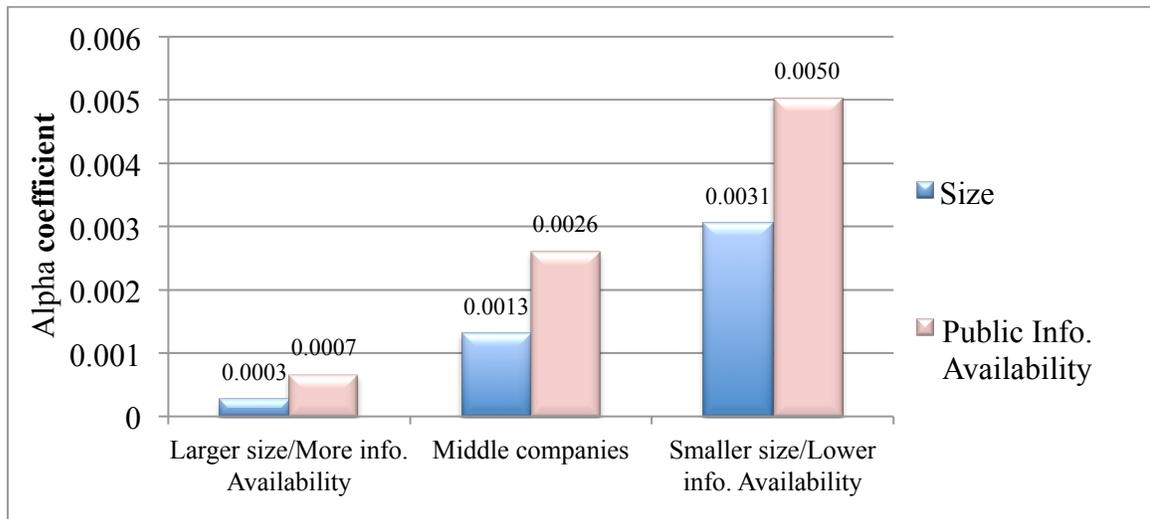
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Figure 1: Shareholder response to CSR release

Panel A: Cumulative mean excess return for days -10 to 10: CSR versus matched sample¹



Panel B: Fama and French (1993) alphas for days -1 to 1: CSR sample by size and public information availability²



¹Panel A plots the cumulative mean market-adjusted excess return for the CSR smallest size/least public information availability portfolio and the equivalent matched sample portfolio, cumulated over days -10 to 10 (table 4 tests for a significant response over days -1 to 1).

²Panel B graphs the Fama and French (1993) four-factor model alpha coefficients from table 5, panel A (CSR sample by size) and panel C (CSR sample by public information availability). The intercept coefficients estimate the announcement effect over days -1 to 1 for each partition after controlling for market return in excess of the risk free rate (*RMRF*) and the portfolio returns on zero-investment, factor-mimicking portfolios for company size (*SMB*), growth (*HML*), and stock momentum (*MOM*).

Table 1: Sample characteristics

Panel A: Sample selection				
CSR release				18,588
CSR "greenhouse gas emissions" releases				575
Non-company disclosure				48
Non-Compustat (GVKEY) or CRSP (PERM) identifier				312
Non-Compustat <i>at</i> or CRSP <i>daily return</i>				43
All				172
Panel B: Calendar month/year distribution				
Month	% of obs.	Year	% of obs.	
Jan	6.25	2000	2.33	
Feb	3.98	2001	0.58	
Mar	9.09	2002	0.58	
Apr	12.50	2003	1.74	
May	8.52	2004	1.74	
Jun	11.36	2005	2.91	
Jul	7.39	2006	8.14	
Aug	5.11	2007	17.44	
Sep	6.82	2008	19.77	
Oct	14.20	2009	23.84	
Nov	6.25	2010	20.93	
Dec	8.52			
All	100.00		100.00	
Panel C: Mean Log <i>at</i> by industry				
<i>gsector</i>	% of obs.	CSR sample	% of obs.	Matched sample
1 Utilities	4.60	23.870	4.60	23.342
2 Consumer discretionary	13.22	24.350	13.22	23.497
3 Consumer staples	16.67	22.180	16.67	21.796
4 Energy	17.24	23.615	17.24	23.646
5 Financials	18.97	24.260	18.97	23.753
6 Health care	9.20	24.400	9.20	24.414
7 Industrials	2.30	23.580	2.30	23.679
8 Information technology	9.20	24.260	9.20	23.828
9 Materials	3.45	26.310	3.45	26.133
10 Telecommunication	5.17	24.260	5.17	24.057

This table summarizes the sample selection process and the distribution of the sample across months in a calendar year, year of CSR release, and *Compustat gsector*.

Table 2: Sample descriptive statistics

Panel A: CSR sample					
	No. of obs.	Mean	25%	50%	75%
Log <i>at</i>	172	23.648	22.780	23.930	24.640
Log <i>revt</i>	172	23.464	22.715	23.652	24.490
Gross margin (<i>1-cosg/revt</i>)	172	0.390	0.241	0.360	0.565
Leverage (<i>dltt/at</i>)	172	0.217	0.123	0.211	0.296
ROA (<i>ib/at</i>)	172	0.060	0.030	0.063	0.092
Capital expenditures (<i>capx/at</i>)	172	0.053	0.030	0.046	0.063
Earnings to price (<i>epspx/prcc</i>)	172	0.046	0.042	0.057	0.072
Book to market (<i>ceq/prcc.csho</i>)	172	0.425	0.218	0.365	0.542
<i>IBES</i> number of analysts (<i>numest</i>)	144	15.264	10	15	19
Panel B: Matched sample					
	No. of obs.	Mean	25%	50%	75%
Log <i>at</i>	172	23.365	22.649	23.646	24.185
Log <i>revt</i>	172	23.094	22.468	23.316	24.014
Gross margin (<i>1-cosg/revt</i>)	172	0.371	0.234	0.343	0.469
Leverage (<i>dltt/at</i>)	172	0.257	0.136	0.260	0.339
ROA (<i>ib/at</i>)	172	0.040	0.016	0.043	0.072
Capital expenditures (<i>capx/at</i>)	172	0.055	0.021	0.043	0.080
Earnings to price (<i>epspx/prcc</i>)	172	0.039	0.035	0.056	0.074
Book to market (<i>ceq/prcc.csho</i>)	172	0.526	0.296	0.434	0.671
<i>IBES</i> number of analysts (<i>numest</i>)	144	14.972	10	15	19
Panel C: <i>Compustat</i> / <i>IBES</i> population					
	no. of obs.	mean	25%	50%	75%
Log <i>at</i>	81,587	19.225	17.471	19.313	21.024
Log <i>revt</i>	81,587	18.575	16.948	18.704	20.505
Gross margin (<i>1-cosg/revt</i>)	81,587	0.397	0.223	0.381	0.577
Leverage (<i>dltt/at</i>)	81,587	0.170	-	0.078	0.267
ROA (<i>ib/at</i>)	81,587	(0.074)	(0.076)	0.010	0.053
Capital expenditures (<i>capx/at</i>)	81,587	0.050	0.007	0.026	0.062
Earnings to price (<i>epspx/prcc</i>)	81,587	(0.083)	(0.094)	0.026	0.065
Book to market (<i>ceq/prcc.csho</i>)	81,587	0.684	0.264	0.519	0.879
<i>IBES</i> number of analysts (<i>numest</i>)	81,587	6.066	2	4	8

This table summarizes the CSR, the matched sample, and the *Compustat* population of companies by key financial statement and stock market characteristics. The italicized variable descriptors refer to the terms in *Compustat* or *IBES*.

Table 3: Shareholder response to CSR newswire release

Model	CSR sample	Signif.	Matched sample	Signif.	Diff.	Signif.		No. of obs.
Panel A: Market-adjusted excess return ¹								
Day -1	0.00202		-0.00075		0.00277			172
Day 0	0.00103		-0.00010		0.00113			172
Day 1	0.00163		0.00015		0.00148			172
Days -1 to 1	0.00468		-0.00070		0.00538	0.098	*	172
Signif. versus 0	0.042	**	0.581	ns				
Signif. versus days -20 to 20, excl. -1 to 1	0.027	**	0.528	ns				
Model	CSR sample	Signif.	Matched sample	Signif.	Diff.	Signif. robust	Signif. cluster	No. of obs.
Panel B: Fama-French 4-factor model ²								
Days -1 to 1 alpha	0.00153		-0.00057	ns	0.00210	0.125 ns	0.016**	516
Signif. versus 0, robust std. err.	0.075	*	0.593	ns				516
Signif. versus 0, sector-clustered std. err.	0.034	**	0.450	ns				516
Days -20 to 20, excl. -1 to 1, alpha	-0.000155		-0.00018		0.00003	0.940 ns	0.906 ns	6,260
Signif. versus 0, robust std. err.	0.521	ns	0.558	ns				6,260
Signif. versus 0, sector-clustered std. err.	0.533	ns	0.471	ns				6,260

¹Panel A summarizes the mean market-adjusted excess return for the CSR and the matched sample over days -1 to 1 relative to day 0, the day of CSR release. The significance tests show the one-sided t statistic probability of a type 1 error under the null hypothesis that the mean excess return over days -1 to 1 is greater than zero, or greater than the mean excess return over days -20 to 20 excluding days -1 to 1. The significance test for the difference between the CSR sample and the matched sample tests the null hypothesis that the mean excess return over days -1 to 1 for the CSR sample is different from the mean excess return for the matched sample over the same period. * indicates significant at less than 10%, ** indicates significant at less than 5%, and “ns” indicates not significant at less than 10%.

²Panel B summarizes the alpha coefficient from a Fama and French (1993) four-factor model estimated over each sample as a cross-sectional regression over CSR release days -1 to 1. The intercept coefficient or alpha in the regression tests for an announcement effect after controlling for market return in excess of the risk free rate (*RMRF*) and portfolio returns on zero-investment, factor-mimicking portfolios for company size (*SMB*), growth (*HML*) and stock momentum (*MOM*). The significance tests show the two-sided t statistic probability of a type 1 error under the null hypothesis that the alpha coefficient equals zero. The significance test for the difference between the CSR sample and the matched sample tests the null hypothesis that the alpha for the CSR sample is different from the alpha for the matched sample. * indicates significant at less than 10%, ** indicates significant at less than 5%, and “ns” indicates not significant at less than 10%.

Table 4: Shareholder response to CSR newswire release: By company size and public information availability

Sample	CSR		CSR		CSR		CSR		CSR		CSR	
	Large	Sig. ³	Small	Sig.	High Public Info.	Sig.	Low Public Info.	Sig.	Large/High Public Info.	Sig.	Small/Low Public Info.	Sig.
Panel A: Market-adjusted returns ¹												
Day -1	0.00092		0.00332		0.00075		0.00530		0.00222		0.00950	
Day 0	-0.00022		0.00254		0.00077		0.00185		0.00101		0.00414	
Day 1	-0.00062		0.00427		0.00289		0.00262		-0.00037		0.00435	
Days -1 to 1	0.00008		0.01013		0.00441		0.00976		0.00285		0.01799	
Signif. versus 0	0.487	ns	0.025	**	0.091	*	0.022	**	0.216	ns	0.007	***
Signif. versus days -20 to 20, excl. -1 to 1	0.376	ns	0.018	**	0.062	*	0.010	***	0.143	ns	0.002	***
Signif. versus matched sample, days -1 to 1	0.478	ns	0.050	**	0.175	ns	0.085	*	0.068	*	0.003	***
Signif. versus large or/and high public info.			0.031	**			0.172	ns			0.022	**
Panel B: Fama and French (1993) model ²												
Fama-French 4 factor alpha (α) over days -1 to 1	-0.00005		0.00329		0.00137		0.00330		0.00078		0.00595	
Signif. α versus 0, robust standard error	0.950	ns	0.050	**	0.186	ns	0.037	**	0.484	ns	0.013	**
Signif. α versus 0, sector clustered std. err.	0.945	ns	0.019	**	0.114	ns	0.060	*	0.429	ns	0.038	**
Signif. small v. large; high v. low, robust std. err.			0.069	*			0.302	ns			0.048	**
Signif. small v. large; high v. low, sector-clustered std. err.			0.042	**			0.339	ns			0.093	*
Fama-French 4 factor alpha (α) over days -20 to 20, excl. -1 to 1	-0.00026		-0.00005		-0.00015		0.00003		-0.00028		-0.00010	
Signif. α versus 0, robust std. err.	0.279	ns	0.908	ns	0.609	ns	0.927	ns	0.361	ns	0.855	ns
Signif. α versus 0, sector-clustered std. err.	0.083	*	0.946	ns	0.376	ns	0.823	ns	0.089	*	0.735	ns

¹Panel A summarizes the mean market-adjusted excess return over days -1 to 1 relative to day 0, the day of CSR release, partitioned on company size and public information availability (number of *IBES* analysts following the stock). The significance tests show the one-sided t statistic probability of a type 1 error under the null hypotheses that the mean excess return for the CSR sample over days -1 to 1 is greater than zero, greater than the mean excess return over days -20 to 20 excluding days -1 to 1, or greater than the mean return for the matched sample. The significance test also tests the null hypothesis that the mean excess return for small or/and low public information companies is higher than large or high public information companies. * indicates significant at less than 10%, ** indicates significant at less than 5%, *** indicates significant at less than 1%, and “ns” indicates not significant at less than 10%.

²Panel B summarizes the alpha coefficients and tests of significance from a Fama and French (1993) four-factor model estimated over each sample as a cross-sectional regression over CSR release days -1 to 1, partitioned on company size and public information availability (number of *IBES* analysts following the stock). The intercept coefficient or alpha in the regression tests for an announcement effect for each partition after controlling for market return in excess of the risk free rate (*RMRF*) and portfolio returns on zero-investment, factor-mimicking portfolios for company size (*SMB*), growth (*HML*) and stock momentum (*MOM*). The significance tests show the two-sided t statistic probability of a type 1 error under the null hypothesis that the alpha (α) coefficient equals zero. The significance test also tests the null hypothesis that the mean excess return for small or/and low public information companies is higher than large or high public information companies. * indicates significant at less than 10%, ** indicates significant at less than 5%, *** indicates significant at less than 1%, and “ns” indicates not significant at less than 10%.

Table 5: Fama and French (1993) four-factor regressions

Panel A: CSR sample by size						
	Larger size		Middle size		Smaller size	
	Coefficient	Sig.	Coefficient	Sig.	Coefficient	Sig.
Intercept (α)	0.0003	0.3759	0.0013	0.2173	0.0031	0.1799
<i>RMRF</i>	-0.0016	0.0850	0.0003	0.3676	-0.0022	0.1453
<i>SMB</i>	0.0010	0.3548	-0.0026	0.1868	0.0062	0.1822
<i>HML</i>	-0.0025	0.2125	-0.0028	0.2912	0.0085	0.1024
<i>MOM</i>	0.0002	0.3939	-0.0007	0.3180	0.0037	0.0779
Adjusted R ²	14.60%		0.00%		1.24%	
No. of obs.	171		204		145	
Panel B: Matched sample by size						
	Larger size		Middle size		Smaller size	
	Coefficient	Sig.	Coefficient	Sig.	Coefficient	Sig.
Intercept (α)	-0.0023	0.1454	-0.0002	0.3964	0.0007	0.3548
<i>RMRF</i>	0.0023	0.1373	-0.0006	0.3851	0.0050	0.0362
<i>SMB</i>	0.0037	0.2221	0.0084	0.1314	0.0001	0.3982
<i>HML</i>	-0.0052	0.3071	-0.0015	0.3861	-0.0047	0.2196
<i>MOM</i>	-0.0031	0.2749	-0.0018	0.3496	-0.0015	0.3304
Adjusted R ²	5.15%		0.88%		6.66%	
No. of obs.	183		177		162	
Panel C: CSR sample by public information availability						
	More public information		Middle public information		Less public information	
	Coefficient	Sig.	Coefficient	Sig.	Coefficient	Sig.
Intercept (α)	0.0007	0.3264	0.0026	0.1373	0.0050	0.0253**
<i>RMRF</i>	-0.0011	0.1237	0.0011	0.3264	-0.0015	0.2340
<i>SMB</i>	-0.0020	0.2630	0.0025	0.3026	-0.0028	0.2677
<i>HML</i>	-0.0035	0.2125	0.0004	0.3955	-0.0023	0.3221
<i>MOM</i>	-0.0010	0.2866	0.0027	0.0896	0.0016	0.2653
Adjusted R ²	3.72%		0.62%		1.81%	
No. of obs.	192		132		108	
Panel D: Matched sample by public information availability						
	More public information		Middle public information		Less public information	
	Coefficient	Sig.	Coefficient	Sig.	Coefficient	Sig.
Intercept (α)	0.0021	0.1294	-0.0030	0.2054	0.0001	0.3970
<i>RMRF</i>	-0.0005	0.3422	0.0074	0.0062	-0.0054	0.0284
<i>SMB</i>	-0.0011	0.3460	0.0112	0.1128	0.0165	0.0005
<i>HML</i>	-0.0006	0.3905	-0.0092	0.2268	0.0017	0.3758
<i>MOM</i>	-0.0013	0.2678	-0.0034	0.3049	-0.0006	0.3904
Adjusted R ²	0.00%		16.72%		18.74%	
No. of obs.	201		132		102	

This table summarizes the coefficients and tests of significance from a Fama and French (1993) four-factor model estimated over each sample as a cross-sectional regression over CSR release days or a matched sample pseudo release days -1 to 1, partitioned on three groups of company size (larger, middle, smaller) and three groups of public information availability based on number of *IBES* analysts following the stock (less, middle, more). The intercept coefficients or alphas in the regressions test for an announcement effect for each partition after controlling for market return in excess of the risk free rate (*RMRF*) and the portfolio returns on zero-investment, factor-mimicking portfolios for company size (*SMB*), growth (*HML*), and stock momentum (*MOM*). ** indicates significant at less than 5%.

Table 6: Fama and French multi-factor regressions with size and public information availability

Sample Regression	CSR			Matched		
	1	2	3	4	5	6
Intercept (α)	0.03566	0.00660	0.04399	0.01951	0.00067	0.03024
p-value	0.06211	0.01065	0.08489	0.15175	0.38828	0.14139
Signif.	*	**	ns	ns	ns	ns
<i>RMRF</i>	-0.00061	-0.00066	-0.00065	0.00176	0.00160	0.00157
p-value	0.24416	0.21761	0.22240	0.12187	0.16900	0.17569
Signif.	ns	ns	ns	ns	ns	ns
<i>SMB</i>	-0.00019	-0.00071	-0.00065	0.00420	0.00563	0.00555
p-value	0.39539	0.36024	0.36799	0.08942	0.04515	0.05105
Signif.	ns	ns	ns	ns	**	ns
<i>HML</i>	0.00005	-0.00199	-0.00209	-0.00347	-0.00605	-0.00602
p-value	0.39857	0.21761	0.20571	0.25864	0.14548	0.14963
Signif.	ns	ns	ns	ns	ns	ns
<i>MOM</i>	0.00072	0.00048	0.00039	-0.00237	-0.00287	-0.00296
p-value	0.24174	0.32266	0.34637	0.20575	0.18476	0.17345
Signif.	ns	ns	ns	ns	ns	ns
<i>Log at</i>	-0.00144		-0.00173	-0.00086		-0.00135
p-value	0.06577		0.11273	0.14550		0.16461
Signif.	*		ns			ns
<i>numest</i>		-0.00029	-0.00006		-0.00005	0.00008
p-value		0.02795	0.36650		0.37877	0.37364
Signif.		**	ns		ns	ns
Adjusted R ²	1.37%	3.03%	4.05%	2.99%	3.49%	3.66%
No. of obs	520	432	432	522	435	435

This table summarizes the coefficients and tests of significance from a Fama and French (1993) five- or six-factor model estimated for each sample as a cross-sectional regression over CSR release days or matched sample pseudo release days -1 to 1. The coefficients for *Log at* and *numest* test for a relation between stock return and size and public information availability, respectively, on release days -1 to 1 after controlling for market return in excess of the risk free rate (*RMRF*) and portfolio returns on zero-investment, factor-mimicking portfolios for company size (*SMB*), growth (*HML*), and stock momentum (*MOM*). The intercept coefficients or alphas in the regressions test for an announcement effect after controlling for *RMRF*, *SMB*, *HML*, *MOM*, *Log at*, and *numest*. * indicates significant at less than 10%. ** indicates significant at less than 5%.