We examine the market reactions to firms’ voluntary announcements of emissions reductions plans, unconditional and conditional on whether the firm has joined one or more of four voluntary commitment mechanisms whose goal is the reduction of greenhouse gas emissions in the United States. Our aim is to shed light on whether, and to what extent, these commitment mechanisms enhance the credibility of voluntary disclosures that are usually neither standardized (and therefore noncomparable) nor subject to verification or sanction (and therefore potentially unreliable). We find that the unconditional market reaction to announcements of emissions reduction plans is reliably negative on average, suggesting that investors view such plans as value-destroying. Consistent with the prediction that commitment enhances credibility, we find that membership in the most stringent commitment mechanism, the Chicago Climate Exchange (CCX), is associated with an incrementally positive reaction; the average net reaction to CCX-committed announcements is also reliably positive, implying that investors view these plans as value-enhancing. In contrast, we find no incremental effects for other less-stringent commitment mechanisms. We conclude that while external commitment mechanisms can enhance the credibility of firms’ voluntary environmental disclosures, the efficacy of these mechanisms depends on how well they overcome the comparability and reliability problems typically associated with these disclosures.
Credibility, Commitment and Voluntary Environmental Disclosures

1. Introduction

We examine the efficacy of several voluntary commitment mechanisms in enhancing the credibility of corporate voluntary environmental disclosures.1 The commitment mechanisms we consider are membership in one or more of four organizations whose goal is the reduction of greenhouse gas (GHG) emissions in the United States: the Chicago Climate Exchange (CCX), the Environmental Protection Agency’s Climate Leaders Program (CLP), the United States Climate Action Partnership (CAP), and the Dow Jones Sustainability World and North American Indexes (DJSI). The voluntary environmental disclosures we focus on are firms’ announcements of emissions reduction plans.

Because voluntary environmental disclosures, particularly emissions reductions plans, are not standardized, they are not comparable. To the extent they are not verified, they may not be reliable (or perceived by market participants as reliable). A lack of either comparability or reliability (or both) would, based on previous research, be expected to affect the valuation weight accorded to a given disclosure. We subsume comparability and reliability in the term credibility. Our aim is to assess whether commitment mechanisms improve the credibility of otherwise non-comparable and potentially unreliable voluntary environmental disclosures.

Our analyses are related to and extend previous accounting research that has examined certain capital market outcomes of voluntary disclosures of performance measures, for example, their explanatory power with respect to returns. Examples include Vincent (1999) who analyzes

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1Through 2009, environmental disclosures were largely unregulated in the United States, except for certain regulated entities that disclose environmental information as part of their regulatory requirements. The Securities and Exchange Commission has issued interpretative releases about disclosure of material environmental issues, starting in 1971 and most recently in February 2010 (Securities and Exchange Commission, 2010). Beginning January 1, 2010, the largest U.S. emitters of GHGs (covering 85% of U.S. GHG emissions) are required to report those emissions to the EPA—for manufacturers of engines and vehicles, the effective reporting date is 2011. A large emitter is defined as a facility that emits more than 25,000 metric tons of carbon dioxide equivalent (CO₂eq) per year.
FFO (funds from operations) as a voluntarily-reported, alternative-to-earnings performance metric for real estate investment trusts, and Francis et al. (2003) who analyze several industry-specific performance metrics, some of which are voluntarily reported (e.g., value of new orders for homebuilders and same-store-sales for retail restaurants). These researchers comment on the potential non-comparability of the performance disclosed metrics (because there is no authoritative guidance for calculating them) and their potential unreliability (because they are not subject to a formal assurance or verification mechanism). They speculate that investors might rely more on these measures if they had more confidence in them—that is, if the performance measures were perceived as being more credible. A summary of academic research on nonfinancial performance measures (American Accounting Association Financial Accounting Standards Committee, 2002) notes that investor use of nonfinancial performance measures likely depends on perceptions about the reliability of the source of the information (p. 358), that audits should increase perceived reliability (p. 360), and that non-comparability likely hinders investor use of the measures (p. 360).

We extend this research on performance metrics by considering voluntary disclosures that are forward-looking (e.g., announcing a plan to reduce GHG emissions), non-comparable (because there is no authoritative guidance for benchmarking and measuring GHG emissions changes), and possibly unreliable (because in many cases the original disclosure is not subject to formal assurance and the outcome of the plan is not subject to verification or sanction). While some have described voluntary environmental disclosures as largely without substance (Cooper and Owen, 2007), PricewaterhouseCoopers survey evidence suggests that 89% of corporate executives view environmental policies as an important measure of corporate performance (Bray,

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2 In contrast, management earnings forecasts, a much-studied voluntary disclosure, are subject to after-the-fact assessments of bias and accuracy once actual earnings are announced.
suggesting that environmental disclosures might be similar in credibility to non-regulated performance measures.

We consider whether and to what extent several distinct types of voluntary commitment mechanisms affect market participant perceptions of the credibility of announcements of emissions reduction plans. That is, we consider whether commitment mechanisms substitute for standardization of data preparation (i.e., comparability) and verification/enforcement (i.e., reliability-increasing processes) in terms of making a disclosure credible. Our setting contrasts with (for example) research on the credibility effects of auditor choice, where the decision is not whether to hire an auditor (because the settings all require audited information), but what type of auditor to hire (i.e., a high quality auditor as proxied by Big-8, Big-6 or Big-4 status, or a low quality auditor as proxied by non-Big 8, non-Big-6 or non-Big-4). In contrast, environmental disclosures need not be subject to an external commitment mechanism and there is greater variation among the commitment mechanisms that exist in terms of the extent to which reports are comparable and verified, and failure to perform is penalized. This variation allows for stronger tests of our hypotheses than if we chose a setting where there is a requirement for a commitment device, and where the single commitment mechanism available has limited variation in its effects.

The commitment mechanisms we examine differ both by the type and extent of the environmental commitment imposed or expected, and by the degree to which the organization monitors and enforces the commitment. These differences (detailed in section 2.2) lead to the prediction that credibility-enhancement effects should differ systematically across these commitment mechanisms, with the greatest credibility-enhancement effects associated with CCX. This prediction is driven by several features of the CCX commitment: CCX imposes a

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required emissions reduction plan (6% by 2010); the emissions reduction target is set using a common measurement (gross annual emissions of 100 metric tons of CO2 equivalent), and sanctions are imposed if the emitting firm fails to reach its targeted reductions (firms must purchase allowances equal to their excess emissions). None of the other commitment mechanisms we examine have these features: DJSI and CAP do not require emissions reduction plans (and therefore neither monitor nor enforce emissions reduction behavior), and while CLP requires such plans, the EPA does not impose a minimum reduction amount, specify a common measurement, or impose sanctions for failure to reach targets.

Our analyses focus on investor perceptions of disclosure credibility as revealed by short-window market reactions to emissions reduction plan announcements. We test for differences in signed market responses to these disclosures made by firms that have joined and firms that have not joined a commitment mechanism at the date of the disclosure; we also examine the type of commitment mechanism joined. We focus on signed responses for two reasons. First, as discussed in more detail later, basic theories of voluntary disclosure, including variants of those theories applicable specifically to environmental disclosures, suggest that voluntarily disclosing firms are those with the most favorable information—this analysis suggests a positive average market response to voluntary environmental disclosures if they are credible. Second, some have suggested that corporate social responsibility activities, of which a voluntary emissions reduction plan would be one example, are sometimes resource-dissipating cynical forms of mere lip service or even wasteful (of shareholder wealth) capital expenditures (e.g., The Economist, 2005)—this analysis suggests a negative average response to voluntary environmental disclosures that are not viewed as credible statements about planned activities that are in the shareholders’ interests. By examining signed returns, we are able to assess which of these effects dominates for our sample
unconditionally, and conditional on whether the firm is committed or not, and if so, to which commitment mechanism.

Our analyses are predicated on two assumptions. The first is that environmental disclosures, particularly plans for emissions reduction, have approximately the same news value across firms and over our sample period, so differences in market responses are due to differences in credibility. The second is that shareholders perceive these disclosures to be relevant to resource allocation decisions. However, the disclosures may be intended to affect the perceptions of customers, employees, regulators and other stakeholders, each of which makes its own credibility assessment. Our tests are not able to assess these perceptions, except indirectly, to the extent the disclosures affect stakeholder behavior in a way that alters payoffs to shareholders (for example, better employee retention, increased sales, reduced regulatory interventions).

Our main tests focus on a sample of 57 firm-issued disclosures of emissions reduction plans, made during the period January 1, 2002 and December 31, 2008. For each disclosing firm, we identify if and when it joined the four external commitment mechanisms we consider. We use information on join dates for two purposes: (i) we examine the share price reaction to join announcements; and (ii) we use join dates to classify each of the 57 announcements by whether the issuing firm was committed, or not committed, to an external commitment mechanism at the time of the emissions reduction plan disclosure, and which one(s). We find that the average abnormal price reaction to announcements to join the CCX is significantly positive (1.21%, significant at the 0.02 level); no other commitment mechanism shows a reliably positive reaction at the join date (in fact, firms who stay on the DJSI display a reliably negative reaction to this news). For our sample, about half of the emissions reduction plan announcements (30 of 57)
were made by firms committed to at least one external mechanism, and the rest (27 of 57) are made by non-committed firms. We find that investors, on average, react negatively to emissions reduction plans announced by non-committed firms (-1.23%, significant at the 0.01 level), suggesting that investors view non-committed firms’ emissions reduction plans as value-destroying. In contrast, committed firms generally experience incrementally more positive reactions; the exception is commitment to CAP which shows no incremental effects. Commitment to CCX has the largest, most significant, and most consistent effect: CCX-committed firms that announce emissions reduction plans experience an incremental price reaction of 5.20% (significant at the 0.01 level). The average net reaction, therefore, to emissions plan announcements made by CCX members is 3.97% (significant at the 0.01 level), and indicates that investors view CCX-committed firms’ emissions reduction plans as value-enhancing. The commitment effects for CLP, CAP and DJSI are smaller in magnitude, weaker in significance, and less consistent across our tests.

Our finding that the commitment to CCX has the strongest credibility-enhancement effects relative to the other mechanisms is consistent with CCX membership providing for a stronger commitment, because the CCX mechanism requires firms to use a standardized emissions measure, imposes a specified reductions target, and penalizes firms that fail to meet their commitments. We attribute the credibility effects of CCX membership to these features combined, and do not attempt to separate the credibility effects of the standardized measure, the specified target, or the imposition of sanctions. Such a separation is infeasible given our data, because all CCX commitments entail all three features and because we have been unable to identify other commitment mechanisms that have some subset of these features.
We conclude that while external commitment mechanisms can enhance the credibility of firms’ voluntary environmental disclosures, the efficacy of these mechanisms depends on how well they overcome the comparability and reliability problems typically associated with these disclosures. We further note that our findings are broadly consistent with criticisms that have been levied against some voluntary environmental programs (we describe these criticisms in section 2) which argue that the lack of comparability across reduction plans and the absence of sanctions undermine the effectiveness of these efforts.

The rest of the paper proceeds as follows. In the next section we describe research on voluntary disclosures, emphasizing environmental disclosures, and the commitment mechanisms we consider. Section 3 lays out the hypotheses and research design, section 4 describes the data and sample, and section 5 reports the results. Section 6 summarizes the findings and concludes.

2. Voluntary Disclosures and Credibility

2.1 Research on voluntary environmental disclosures

The theoretical and empirical literature on voluntary disclosures in general is voluminous; rather than attempt to discuss this literature, we refer to Beyer et al. (2009), particularly section 3 of that paper, for a detailed review of recent research on voluntary disclosures. In this section, we focus specifically on research on voluntary environmental disclosures, including the specialized theories and explanations posited by researchers to explain these disclosures.

Within the accounting and management literatures, researchers have posited legitimacy theory and institutional theory as explanations for voluntary environmental disclosures. Legitimacy theory argues that external (to the firm) factors influence managers to take actions,
such as making voluntary environmental disclosures, that will favorably affect the perception that the firm’s actions are proper or appropriate, thereby justifying the firm’s continued existence and its claim on social and economic resources. The theory also predicts disclosure will increase with expected costs arising from exposure to the risk about which management is making disclosures. In our setting, this implies that firms with high exposure to costs associated with emissions in particular and environmental considerations more generally are more likely to make voluntary disclosures. Also, because legitimacy theory predicts that disclosures are intended to create favorable perceptions of the firm and its actions, legitimacy theory predicts that environmental disclosures will convey positive news.4

Tests of legitimacy theory in an environmental context typically examine the content of environmental disclosures and whether firms with poorer environmental performance are more likely to make environmental disclosures than firms with better environmental performance. Research on disclosure content shows that voluntary environmental disclosures tend to be favorable to the company (Cho and Patten, 2007; Clarkson et al. 2008; Cohen et al. 2009), and general in nature (Cooper and Owen, 2007; Clarkson et al. 2008). Research examining the relation between environmental disclosure and performance has produced mixed evidence: some studies find the predicted negative relation, others do not.5 In our setting, legitimacy theory considerations suggest that firms with greater environmental exposure are both more likely to make voluntary disclosures and more likely to join credibility-increasing commitment mechanisms (greater exposure induces management to seek greater credibility for the

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4 As discussed in the introduction, our tests assume that all announcements contain approximately the same amount of news. For the information to affect share returns, it must pertain to risk (discount rates) or payoffs. We do not attempt to specify the exact valuation content of the announcements we consider.

5 Firms with a greater need for legitimacy might be characterized in other ways besides their (poor) environmental performance. For example – and although they do not use legitimacy theory to motivate their tests – Reid and Toffel (2009) find that firms subject to shareholder pressure (in the form of shareholder resolutions filed against the firm) and political pressure (in the form of state regulation) are more likely to make voluntary environmental disclosures in the form of responses to Carbon Disclosure Project surveys.
information it provides—a disclosure that is not viewed as credible would have limited legitimizing authority). Our tests provide evidence on the latter issue—does membership in a commitment mechanism increase environmental disclosure credibility?6

Legitimacy theory speaks to why, in a given period, some firms make environmental disclosures and others do not, but not to the time series pattern of these disclosures (Stanny, 2009). Institutional theory posits that voluntary corporate disclosures are influenced by past behavior and contemporaneous behavior of peers; it does not rule out legitimacy theory as explaining the initial decisions to make environmental disclosures. Using firms’ responses to the Carbon Disclosure Project surveys over 2006-2008, Stanny (2009) finds that a firm’s previous disclosure decision is the most significant factor explaining its current disclosure decision; she argues that this finding supports the institutional theory of disclosure.

Researchers have also examined the capital market consequences of environmental disclosures, including disclosures made (by others) about a given firm, often conditional on corporate exposure to environmental risks. For example, Plumlee et al. (2008) find that their self-constructed firm-specific environmental disclosure quality is not associated with share price, negatively associated with cost of capital for firms in environmentally sensitive industries, and positively associated with cash flows for firms in environmentally non-sensitive industries. Hughes (2000) reports that a proxy for unrecognized environmental obligations is negatively associated with share values for firms with high exposure to environmental regulatory costs from the 1990 Clean Air Act Amendments. Blacconiere and Northcut (1997) find that firms with greater Superfund exposure exhibit more negative returns reactions to regulatory announcements concerning Superfund legislation; and Blacconiere and Patten (2004) examine chemical firms’

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6 In extensions to the analyses in this paper, we will test whether firms with greater environmental exposure are more likely to join commitment mechanisms.
(other than Union Carbide’s) reactions to the 1984 Bhopal chemical disaster. Both studies condition on the exposure to environmental issues and find that more extensive prior environmental disclosures (their proxy for environmental exposure) mitigate the negative price reactions to the studied announcements.

The latter two papers show that the extent to which a firm was forthcoming in the past about its exposure to environmental issues affects investors’ perceptions of the consequences to the firm of subsequent negative environmentally-related shocks. In our setting the conditioning variable for investor responses to disclosures is the presence of a commitment mechanism, and the disclosures are made by the firm about its own actions (e.g., emissions reductions plans). We believe that our analysis of the efficacy of credibility enhancing mechanisms in an environmental setting extends research which applies legitimacy theory to environmental disclosures. Specifically, our analyses speak to whether a commitment mechanism is a necessary condition for investors to perceive environmental disclosures as credible and therefore as legitimating devices, and if so, what type of commitment mechanism works best.

2.2 Mechanisms to increase the credibility of voluntary environmental disclosures

This section describes the two mechanisms that we consider for increasing the credibility of voluntary environmental disclosures: external organization membership and membership in a market index.7 (In sensitivity tests, we consider the relation between general reputation, as proxied by a firm’s ranking in Fortune’s most-admired companies, and the credibility of environmental disclosures). In our context, credibility means market participants perceive the

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7 Other credibility-enhancing mechanisms that we do not consider include assurance (e.g., third party verification by an entity other than one of the organizations we consider) and internal organizational commitment (e.g., creation of an environmental committee of the governing board, composed of qualified environmental experts). Assurance exists for corporate social responsibility (CSR) reports, which sometimes contain emissions reductions plans, but the reports themselves are infrequent and obtaining assurance is even rarer. For example, Dhaliwal et al. (2009) identify 679 CRS reports issued by 196 distinct firms during the 15 years between 1993-2007; of these, only 117 reports (17%) were associated with assurance.
information to be usable in revising share prices. For a disclosure to be perceived as credible, the information must be competently prepared (a form of expertise), amenable to analysis (prepared using standardized procedures) and trustworthy. Using the terminology of financial reporting, the disclosure must be comparable and reliable. Our empirical analysis does not attempt to distinguish among aspects of credibility.

*External organizational membership.* Our analyses consider three of the numerous organizations whose goals include emissions reduction: Chicago Climate Exchange (CCX), EPA Climate Leaders Program (CLP) and U.S. Climate Action Partnership (U.S.CAP). Each organization is well known, has existed during some or all of our sample period, does not restrict membership to a specific industry, and represents a distinct degree of commitment. We consider the Chicago Climate Exchange to have the highest degree of firm-commitment because it requires members to agree to emissions-reduction goals, monitoring, verification, and legally binding sanctions if goals are not met. We view the EPA Climate Leaders Program as having a medium degree of commitment because it monitors and verifies data and assesses whether member firms have met emissions targets, but does not impose sanctions. The U.S. Climate Action Partnership has the least commitment because is more a lobbying arrangement than a monitoring and verification arrangement. We describe each of these organizations below.

**Chicago Climate Exchange (CCX).** Launched in 2003, CCX is a national, cap and trade system for six GHGs in North America. The commodity traded on the CCX is the carbon financial instrument (CFI); each contract (allowance or offset) represents 100 metric tons of CO₂ equivalent. CCX currently has 62 associate members and 111 emitting members. Other entities that are part of CCX include offset providers (owners of qualifying offset projects), offset

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8 The six GHGs are carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF₆).
aggregators (entities that aggregate offsets and act as the agent for aggregated offsets from multiple providers of small offsets), and liquidity providers (entities who trade for reasons other than complying with the CCX emissions reduction objective).

Both associate members and emitting members agree to meet annual GHG emission reduction targets. Associate members have negligible direct GHG emissions, but generate indirect emissions (for example, through electricity or travel). These members agree to offset 100% of their annual indirect emissions from the year they enroll in CCX through 2010. Emitting members have direct GHG emissions, and by joining the CCX, agree to annual emissions reductions targets, determined based on the firm’s baseline emissions and by the CCX’s emissions reduction schedules. Both the baseline and the reduction schedule depend on whether the firm is a Phase I member (2003-2006) and a Phase II member (2007-2010), or just a Phase II member. Phase I members’ baselines equal the average annual emissions over 1998-2001; Phase II members’ baselines equal this same average or their emissions in 2000. Phase I members commit to reduce their emissions by at least 1% per year over 2003-2006; if they continue to Phase II they agree to additional reductions of at least 0.25% in 2007 and 2008, 0.5% in 2009, and 1% in 2010. Phase II members who were not members of Phase I commit to reduce emissions by at least 1.5% per year (2007-2010).9

Both associate members and emitting members are required to submit annual emissions reduction reports which are verified by the Financial Industry Regulatory Authority (FINRA) for accuracy, completeness, and compliance with the targeted emission reduction schedule. FINRA also reviews all reports concerning offset projects. Members whose reductions exceed their annual targets generate surplus allowances, which they may sell on the CCX or bank for later

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9 Thus, both Phase I and II members and Phase II only members would achieve a reduction of 6% by 2010.
use. Members who emit above their annual targets are required (under the legally binding agreement) to purchase CFI contracts equal to the amount of emissions above target.

In the context of our analyses, CCX membership indicates expertise (member firms must have prepared an inventory of GHG emissions prior to joining, to provide a benchmark for the percentage emissions reductions), comparability (because members commit to the same target and emissions are measured using a common basis across firms) and trustworthiness (member firms submit to verification of reports and sanctions for noncompliance). We therefore associate CCX membership with the highest degree of credibility for environmental disclosures.

**EPA Climate Leaders Program (CLP).** CLP is an EPA partnership, begun in February 2002, that works with participating entities to develop climate change strategies. Participants’ commit to inventorying their emissions of GHG (applying guidance developed by the CLP), setting 5-10 year reduction goals, and reporting their annual progress towards those goals to the EPA. Members are expected to complete their base year inventory of GHG emissions within one year of joining the program, and to work with EPA to establish a GHG emission reduction goal – so that within two years of joining the program, a GHG reduction plan is in hand. Participants in the CLP are primarily public and private corporations, a few government agencies (e.g., the U.S. Forest Service) and NGOs (e.g., the National Geographic Society). The CLP currently has 194 members, of which 135 are public companies.

The CLP has been criticized on three dimensions (United States Government Accounting Office, 2006; Stempeck, 2005) that we interpret as making it a relatively weak commitment mechanism. First, the effect of the CLP on actual GHG emissions is uncertain, because CLP members may participate in other voluntary EPA emissions reduction programs (e.g., industry-
focused programs such as Natural Gas STAR)\textsuperscript{11} and/or belong to trade groups that participate in Climate VISION. These overlapping memberships raise the possibility that the same emissions reductions are counted more than once, creating uncertainty about the actual reduction in emissions. Related, if CLP members undertook emissions reductions programs before joining CLP, joining CLP may not have changed their behavior.\textsuperscript{12} Second, CLP provides for significant latitude in defining and measuring emissions goals, including the metric used (e.g., percent of revenues, costs, or production quantity), geographic scope (domestic or worldwide), and time horizon (e.g., five years or ten years). The lack of standardization in measurement makes it difficult to establish accurate and comparable benchmarks and to monitor progress towards targets. Third, CLP does not explicitly define the consequences to members who do not progress as expected, for example, failing to develop an emissions reduction plan within two years of joining the CLP, or failing to meet an emissions reduction target. In conversations with an EPA administrator, we learned that the EPA is currently interviewing members who have not progressed as expected, to find out the reasons for the lack of progress.\textsuperscript{13} The EPA is considering asking members without reasonable explanations to leave the program.

The CLP program differs from the CCX program in several ways. First, at the time they join, CLP members may or may not have prepared their GHG inventories, which provide the baselines that are essential to determining (and therefore announcing) emissions reduction plans; the EPA allows up to two years to determine a plan. For most firms, GHG inventories are not known at the CLP join date. In contrast, joining the CCX immediately binds a member firm to

\textsuperscript{11} Industry-focused voluntary programs have also been the subject of criticism (U.S. EPA Report, Office of Inspector General, Report No. 08-P-0206, 2008).

\textsuperscript{12} However, Cynthia Cummins, the head of the CLP, stated that “Some of these [CLP] companies may have internal targets, but did not publicize them … We add the added credibility of reviewing their inventory. We have lots of companies you’ve never seen before participate publicly.” (Stempeck, 2005)

\textsuperscript{13} For example, it takes some CLP members longer than one year to complete their GHG inventories.
the CCX required emissions reductions described earlier; in order to be bound by such a plan, a firm must know its GHG inventory. Second, CLP plans are not standardized or comparable across firms, whereas the CCX reduction plan uses a common measurement unit and applies reduction targets and time horizon equally across member firms. Third, CLP imposes no sanctions on failure to meet targets and is non-binding; CCX imposes sanctions and is legally binding. For each of these reasons, we associate CLP membership with less credibility than CCX membership.

**United States Climate Action Partnership (CAP).** CAP was formed on January 22, 2007 when 14 founding members sent a letter to President Obama urging the enactment of legislation to significantly reduce greenhouse gas emissions.14 Since then, CAP membership has increased to 24 corporations and five NGOs. Unlike CCX and CLP, CAP members do not commit to a plan of emissions reduction, or to measuring, monitoring or verifying their emissions. Rather, the CAP commitment is to work toward legislation that would slow, stop or reverse the growth of GHG emissions.15 We view CAP as the weakest of the three external organization membership commitment devices we consider, viewing it as more of a lobbying organization.

**Membership in a market index:** We conjecture that inclusion in a sustainability or green index may have a legitimizing effect, to the extent that investors believe index members are committed to improving the environment through, for example, a reduction of GHGs. We focus on the Dow Jones Sustainability Index (DJSI); to be included in this index, a firm must first be invited to participate, and agree to participate, in a DJSI survey, performed by an independent

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14 Ten of the 14 founding members are corporations (Alcoa, BP America, Caterpillar, Duke Energy, DuPont, FPL Group, General Electric, Lehman Brothers, PG&E Corporation and PNM Resources) and four are NGOs (World Resources Institute, Natural Resources Defense Council, Pew Center on Global Climate Change and Environmental Defense).

15 Specifically, their stated commitment is that “the members of the U.S. Climate Action Partnership pledge to work with the President, the Congress and all other stakeholders to enact an environmentally effective, economically sustainable, and fair climate change program consistent with our principles at the earliest practicable date.”
consulting firm, SAM Indexes Gmbh.\textsuperscript{16} Based on firms’ survey responses, as well as publicly available information, SAM prepares an assessment report selecting and identifying the sustainability leaders who are included in the index; the assessment report is subject to an external review by Deloitte. Firms in the index must agree to ongoing monitoring of media, stakeholder information and other publicly available information.

The DJSI captures three dimensions of corporate sustainability: economic (18\%+ weight, including codes of conduct, compliance with corruption and bribery, and quality of corporate governance), environment (3\%+ weight, including environmental reporting) and social (22\%+ weight, including corporate philanthropy, labor practices, social reporting and employee development). The difference between the sum of these weights and 100\% is accounted for by weights attached to industry specific criteria within each dimension. Membership is reviewed annually and firms are added and removed (for example, because of allegations of corruption or human rights abuses). We examine firms’ entries and exits from both the DJSI-World index (which began August 31, 1999) and the DJSI-North America (NA) index (first published September 23, 2005).\textsuperscript{17} Over our sample period, the DJSI-World averaged 317 components per year and the DJSI-NA averaged 116 components per year.\textsuperscript{18} We view membership in the DJSI as a weak indicator of commitment in the environmental disclosure context, in part because the

\textsuperscript{16} For the upcoming 2010 DJSI, whose components will be announced on September 2, 2010, Dow Jones sent invitations to 2,502 firms to participate in the World Index, and 599 firms for the North America Index. Because Dow Jones does not provide data on firms’ participation decisions, it is not possible to know the subset of the invitation list from which Dow Jones selects the final index membership.

\textsuperscript{17} Each year, Dow Jones announces the membership (members added and members deleted) of its sustainability indexes early in September. The new membership is effective with trading beginning on the third Friday of September. We have the exact announcement dates, and trading dates for each of the sample years. Over the sample period, the first announcement occurs in a tight window (September 2-September 7 of any given year). The third Friday, signaling the start of trading, is also in a tight window (September 18-September 24 of any given year).

\textsuperscript{18} We use the composite index for both DJSI-World and DJSI-NA. There are also specialized indexes that exclude companies that generate revenue from activities such as alcohol, tobacco, gambling or firearms.
environment has a relatively small weight in the dimensions considered and in part because we are unsure that removal from the DJSI constitutes a sanction.

3. Hypotheses

We examine whether investor perceptions of the credibility of voluntary environmental disclosures, particularly announcements of emissions reductions plans, vary depending on the disclosing firm’s membership in a commitment mechanism. We measure investor perceptions of credibility using short-window market reactions to these disclosures. We analyze signed responses because we believe that market participants might view environmental disclosures, particularly announcements to plans to reduce GHG emissions, positively, negatively or with indifference. On the positive side, shareholders might view environmental disclosures as credible statements of an intent to act in shareholder interests by changing operations and/or making capital expenditures that will reduce GHG emissions in a cost-effective and perhaps even profit-enhancing matter. Alternatively, shareholders might view these disclosures as empty promises, suggesting indifference, or, worse, as intentions to dissipate shareholder wealth by, for example, making negative net present value capital expenditures, suggesting a negative response.

Our tests separate non-committed firms from committed firms. “Committed firms” have joined (at least) one of the four commitment mechanisms (CCX, CLP, CAP, or DSJI) at the time of the emissions plan announcement. Firms making announcements but who are not members of any of these commitment mechanisms at the time of the disclosure are “non-committed firms.” We predict that the credibility of environmental disclosures made by committed firms exceeds that of otherwise similar disclosures made by non-committed firms, resulting in systematic differences in investor reactions to those disclosures, as stated in H1:
H1: Membership in a commitment mechanism enhances investors’ perceptions of the credibility of the member firm’s environmental disclosures.

Following prior research (e.g., Teoh and Wong, 1993) we expect that the enhanced credibility arising from commitment increases investors’ response to the news in environmental disclosures made by committed firms relative to those made by non-committed firms. Our tests require the assumption that the amount of news in each disclosure analyzed is approximately the same, so that differences in magnitudes of responses are due to credibility.\(^{19}\) As previously discussed, we also assume that investors are able to distinguish between emissions reduction plans that are desirable (i.e., they involve investments and other changes that enhance outcomes for shareholders) and are therefore associated with positive returns versus undesirable (i.e., they involve investments and other changes that are not in shareholder interests) and are therefore associated with negative returns.

Evidence on H1 is also provided by investigating the abnormal returns surrounding the dates that firms join commitment mechanisms. As long as information uncertainty is priced, and to the extent a commitment mechanism is associated with reduced information uncertainty (that is, greater expected precision of future environmental disclosures), we expect the abnormal returns around these “join dates” to be positive, on average. Further, because joining the CCX requires a greater level of expertise concerning GHG emissions than does joining the other organizations (because the CCX binds the firm to a standardized emissions reduction plan that presumes the existence of a baseline), we expect that the reaction to announcements to join the CCX will be larger than those for joining other organizations (where the expertise may not yet be determined).

\(^{19}\) In an analysis of earnings credibility, such as Teoh and Wong, it is possible to control for news by focusing on unexpected earnings. We are not able to implement such a control because we have no benchmark for investor expectations concerning emissions reduction plans.
We consider three additional hypotheses related to H1. The first is that a stronger commitment should be associated with greater disclosure credibility. Hypothesis 2 states this prediction for external organizational membership commitments, which we order in terms of strength of commitment:

H2: The credibility of environmental disclosures is greatest for members of the CCX and weakest for members of the U.S. CAP, with members of the CLP falling in between.

Our second additional hypothesis (H3) explores whether the effects of commitment mechanisms are cumulative over number of memberships. That is, does belonging to multiple commitment mechanism increase the credibility of disclosures as a function of the number of commitment mechanisms?

H3: The credibility of environmental disclosures is increasing in the number of commitment mechanisms a firm has joined.

Our third additional hypothesis (H4) examines the effect of membership in organizations that focus on the continued use of coal, the application of technology to reduce GHG emissions, and effective cost-containment measures (“clean coal” organizations). The clean coal organizations we consider are the Global Climate Coalition (GCC, formed in 1999 and disbanded in 2002), Americans for Balanced Energy Choices (ABEC, begun in 2008, merged with CEED in 2008), the Center for Economic Development (CEED, formed in 2002, merged with ABEC in 2008), the American Coalition for Clean Coal Electricity (ACCCE, formed by the 2008 merger of ABEC and CEED and renamed America’s Power in 2009). Anecdotal evidence suggests that some believe membership in clean coal organizations impairs the credibility effects of joining environmental commitment mechanisms. Elgin (2008), for example, quotes Frank O’Donnell, president of Clean Air Watch, as saying that “Many of these companies want the

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20 See, for example, the Climate Principles section at http://www.americaspower.org
image of being green but are putting their money on the other side of the issue.” The same article describes firms that are members of both clean coal and environmentally-committed organizations as ‘playing both sides’. Our fourth hypothesis examines whether belonging to a clean coal organization reduces the credibility-enhancing effects of external commitment mechanisms:

H4: Firms that are members of both external commitment mechanisms and clean coal organizations have lower credibility of environmental disclosures than firms that have external commitment mechanisms but do not belong to clean coal organizations.

Our final hypothesis considers the possibility that a favorable general corporate reputation might increase the credibility of environmental disclosures. Under this view, a firm could substitute general reputation-enhancing actions for environmental-specific credibility-enhancing actions. We proxy for general reputation using membership in Fortune magazine’s Most Admired Companies; we assume that firms included on these yearly lists and firms with higher ranks on the list (“reputed firms”) have better reputations than firms not included on the list or ranked lower (“less reputed firms”). Our final hypothesis investigates whether investors attach greater credibility to environmental disclosures made by more reputed firms, and whether this effect substitutes for or complements the effect(s) of the other mechanisms we consider.

H5: The credibility of environmental disclosures is increasing in the firm’s general reputation.

4. Sample and Data Description

Our sample consists of two types of disclosures. The first type is a press release announcing that the firm has joined one of the commitment mechanisms that we study; for the
DJSI, we also identify dates firms were dropped (“de-committed”) from the index. Table 1, Panel A shows the distribution of sample commitment and de-commitment announcements. The largest fraction of the commitment announcements relate to the DJSI, which accounts for 80-90% of the announcements; of this group, more than half pertain to announcements that firms would stay in the DJSI (that is, the firm was in the index last year and will continue to be in the index this year). About 20% of the total DJSI announcements pertain to additions to the DJSI index, and the remaining 10% pertain to removals. Turning to the other commitment mechanisms, we are able to identify join dates for 71 firms’ commitments to CCX, 106 firms’ commitments to CLP, and 25 firms’ commitments to CAP.

The second type of disclosure includes firm-issued press releases pertaining to the environment that are included in the Factiva database during January 1, 2002 through December 31, 2008. We identify disclosures using the following word or phrase searches: environment(al), emission(s), and green house gas(es). We read each disclosure to identify those that relate to the environment, resulting in a sub-sample of 380 articles. We code each of the 380 disclosures based on whether the primary emphasis of the disclosure relates to emissions, products, operations, investment, or other. Within the emissions category we distinguish between announcements of emissions reduction plans (which are the focus of our main tests) and announcements that pertain to emissions more generally; the latter include, for example, announcements that mention emissions savings but do not specify a plan. We consider the broader sample of emissions announcements in sensitivity tests. Table 1, Panel B reports the distribution of the press-release disclosures. Of the 380 disclosures, 154 pertain to emissions, of which 57 announce emissions reduction plans.
We obtain CRSP daily returns data for our sample period or for the portion of this period that the firm existed. We calculate an abnormal return for each firm-day by subtracting the daily market return premium \((R_M - R_f)\) from the firm’s raw return.\(^{21}\) We merge the daily abnormal returns with the disclosure dates, and calculate 3-day abnormal returns centered on each disclosure announcement date. Because not all disclosure dates have returns data, our subsequent tests are based on a smaller number of observations than described in Table 1.

5. Tests and Results

5.1. Main analyses

We begin by examining the market response to external commitment announcements. Table 2 documents the 3-day cumulative abnormal return (\(CAR\)) surrounding commitment mechanism announcements for which we also have returns data. These data show a reliably positive price reaction of 1.21\% (significant at the 0.02 level) in the 3-days surrounding announcements that firms joined the CCX. This result suggests that investors perceive commitments to the CCX as value-enhancing. For DJSI announcements, we find negative reactions for firms added, retained and dropped; only the reaction for retained firms is reliably different from zero (-0.26\%, significant at the .01 level), but it is small in economic terms. Finally, we note that the mean and median CARs surrounding CCX join dates are the largest of the four mechanisms, and are generally reliably larger than the other reactions (as indicated by the F-statistics at the bottom of Table 2, which range between 1.96 and 5.79).

\(^{21}\) We use market-adjusted returns (as opposed to beta-adjusted or 3-factor adjusted returns) to preserve sample size. Using beta-adjusted or 3-factor adjusted returns requires each sample firm to have sufficient returns data in a prior (to the sample disclosure) period to estimate a CAPM or a 3-factor model. Not all of our firms have returns data available to estimate these models. Sensitivity tests (described in section 5) suggest that our findings are not sensitive to the market-adjusted specification of returns.
Our main test of H1 examines differences in market responses to emissions reduction plans conditional on whether the firm has previously joined a commitment mechanism. The specific test focuses on the coefficients relating 3-day CAR around emissions reduction plan announcements to indicator variables capturing whether the disclosure occurs after the firm joined the indicated commitment mechanism:

\[ CAR_{j,t} = \beta_0 + \beta_1 CCX\_Commit_{j,t} + \beta_2 CLP\_Commit_{j,t} + \beta_3 CAP\_Commit_{j,t} + \beta_4 DJSI\_Commit_{j,t} + \epsilon_{j,t} \]  

(1)

In equation (1), the independent variables capture whether, at the time of the disclosure (t) whose abnormal return is the dependent variable, the firm belongs to one (or more) commitment mechanisms. Specifically, \( CCX\_Commit = 1 \) if firm j belonged to CCX at time t, 0 otherwise; \( CLP\_Commit = 1 \) if firm j belonged to CLP at time t, 0 otherwise; \( CAP\_Commit = 1 \) if firm j belonged to the CAP at time t, 0 otherwise; \( DJSI\_Commit = 1 \) if firm j belonged to the DJSI at time t, 0 otherwise. The intercept in equation (1) captures the average CAR at disclosures made by firms that, at the time of the disclosure, were not committed to any of the four commitment mechanisms.

Results of estimating equation (1) are reported in Table 3, Panel A for two samples. The first and main sample includes only emission reduction plan announcements; results for this sample are reported in the columns labeled “Emissions Reduction Plans” and examine the market reactions to the 56 (of 57) emissions reduction plan announcements for which we have returns data. The second sample consists of all emissions related announcements for which we have returns data (n=150, of 154); results for this sample are reported in the rightmost columns in Table 3 and are labeled “Emissions Related”. Because the commitment mechanisms we examine are geared to emissions reduction plans and targets, we believe that the first sample
provides the most powerful test of our hypotheses. We report results for the second disclosure sample to discern whether commitment mechanisms related to emissions reductions have credibility effects that extend to other types of emissions-related disclosures.

For the main sample, the estimate of the intercept indicates that, on average, the market reacts negatively to non-committed firms’ emissions reduction plans, by about -1.23% (t-statistic=-2.28). The incremental market reactions to committed firms’ emissions plans are generally positive; the exception is CAP commitments where we find no discernible reaction. The largest incremental reaction is observed for CCX committed firms, where the coefficient estimate on $CCX\_Commit$ indicates an average incremental reaction of 5.20% (t-statistic = 3.42) in the 3-days surrounding the disclosure of an emissions reduction plan. The average net reaction to CCX-committed announcements is 3.97% (the sum of the intercept, -1.23%, and the slope coefficient, 5.20%) and is reliably different from zero (F-statistic =7.81, significant at the 0.01 level). The incremental reactions to DJSI, CLP and CAP commitments are smaller and weaker in significance: 1.74% (t-statistic=2.01) for CLP, 1.52% (t-statistic=1.54) for DJSI and -0.69% (t-statistic=-0.32) for CAP. For each of these commitments, the F-tests reported in Panel A show that the net effect is indistinguishable from zero.

The ordering of the coefficients on the CCX, CLP and CAP commitment variables is as predicted by H2 ($β_1 > β_2 > β_3$). Specifically, the incremental intensity of reaction for CCX announcements of 5.20% is about three times the incremental reaction to CLP announcements of 1.74%, which is itself larger than the incremental reaction to CAP announcements of -0.69%. Tests at the bottom of Panel A confirm that coefficient on CCX is significantly (at the 0.03 level) greater than both the coefficient on CLP (F-statistic=4.71) and CAP (F-statistic=4.84); however,
we are not able to document that the coefficient on CLP is reliably different from the coefficient on CAP (F-statistic=0.91).

H3 focuses on the relation between disclosure credibility and the number of commitment mechanisms. We define $N_{Commit}$ as the number of commitment mechanisms the firm has joined as of disclosure date $t$. For our sample firms, $N_{Commit}$ ranges between zero and three; that is, no firm in our sample belongs to all four commitment mechanisms. Our test examines the following regression:

$$CAR_{jt} = \gamma_0 + \gamma_1 N_{Commit_{jt}} + \epsilon_{jt}$$

(2)

In equation (2), we expect that $\gamma_1$ will be positive if credibility is increasing in the number of commitments. Results, reported in Panel B, Table 3, show a reliably positive $\gamma_1$, suggesting that belonging to multiple commitment mechanisms influences the credibility of a firm’s emissions plan announcements. The point estimate for $\gamma_1$ of 0.0152 suggests that each commitment mechanism joined increases the market reaction by about 1.52% (t-statistic=2.57). In unreported tests, we examine whether this effect is driven by the commitment to CCX, which Panel A shows has the largest effect on market reactions. We include $CCX_{Commit}$ as an additional independent variable in equation (2) and re-estimate the regression. Results show that $N_{Commit}$ continues to be significantly positively related to abnormal returns (coefficient estimate is 0.0129, t-statistic=2.27), even in the presence of the significantly positive association found for $CCX_{Commit}$ (coefficient estimate is 0.0378, t-statistic=2.56).

To investigate H4 we require information on membership of clean coal organizations over our sample period. Precise data on join dates are not readily accessible for clean coal organizations since we rarely observe announcements of firms joining these organizations. By accessing several public sources, we are able to identify 94 members of clean coal organizations,
of which 43 are corporations with returns data on CRSP. We include an indicator variable, *CleanCoal*, that equals one if the firm was ever a member of one or more of these clean coal organizations during our sample period, and zero otherwise. We set *CleanCoal* equal to one when the parent company is listed as a member or when a subsidiary (but not the parent) is listed as a member. We also define the indicator variable, *Conflicted*, and set it equal to one if, at the time of the disclosure, the firm is a member of both a committed organization and a clean coal organization; it is set to zero otherwise. Finally, we set *Commit*=1 if the firm belonged to any of the four commitment mechanisms at time t, and zero otherwise. Our tests of these variables focus on equation (3):

\[ CAR_{j,t} = \delta_0 + \delta_1 Commit_{j,t} + \delta_2 CleanCoal_{j,t} + \delta_3 Conflicted_{j,t} + \epsilon_{j,t} \]  

(3)

The results of estimating equation (3) are reported in Panel C, Table 3. We note first that the intercept in this regression captures the average reaction to disclosures made by firms that are not committed and not a member of a clean coal organization. The intercept is reliably negative, indicating a -1.27% (t-statistic=-2.15) reaction to this subset of emissions reduction plan announcements. Panel C continues to show a positive incremental association between market reactions and committed firms announcements, as evidenced by the positive coefficient relating *Commit* to *CAR* (coefficient estimate = 0.0188, or a 1.88% price reaction, t-statistic = 2.15). There is no evidence, however, that being a member of a clean coal organization affects market reactions to emissions plans, or that being conflicted affects these market reactions. Because equation (3) considers all commitment devices as equivalent, which our prior tests suggest is not the case, we also estimate a variant of equation (3) that examines each commitment mechanism and its conflict counterpart separately. Results, not reported in the tables, show no evidence that being conflicted affects market reactions.
Our final test examines the association between general corporate reputation and disclosure credibility. Specifically, we investigate whether highly reputed firms have more credible environmental disclosures than less reputed firms, and whether this reputation effect substitutes for the credibility enhancement effects of commitment mechanisms. We proxy for general corporate reputation using the scoring data that underlie *Fortune* magazine’s annual lists of most admired companies. Because the scores are not comparable across industries, we rank the N firms within industry I for each year of the sample period and then assign each of the N firms a ranked score (Reputation). The firm with the highest score in industry I is given a ranked score of N, the next highest is given a score of N-1, and so on. Firms in industry I not scored by *Fortune* are assigned a ranked score of zero. We expect that if general corporate reputation substitutes for commitment, the coefficient on Reputation in equation (4) will be positive:

\[
CAR_{j,t} = \tau_0 + \tau_1Reputation_{j,t} + \tau_2CCX\_Commit_{j,t} + \tau_3CLP\_Commit_{j,t} + \tau_4CAP\_Commit_{j,t} + \tau_5DJSI\_Commit_{j,t} + \varepsilon_{j,t}
\]  

(4)

Panel D, Table 3 reports the results of estimating equation (4). We find no evidence, controlling for commitment, that general corporate reputation enhances the credibility of emissions reduction plan disclosures. In unreported tests, we also estimate a variant of equation (4) that excludes the commitment variables; again, we find no evidence that reputation matters. We also investigate other variations of the Reputation variable including setting it equal to one for ranked firms and zero otherwise; results are similar and are not reported.

5.2. Extensions and sensitivity tests

Results of testing H1-H5 using the larger and broader sample of emissions-related disclosures are also shown in Table 3 (two rightmost columns). Although the results for this sample are consistent with those for the main sample, the findings are, without exception,
weaker. In fact, the only results that are reliably distinguishable from zero for both samples are those concerning CCX commitment. Specifically, for both samples we find that market reactions to environmental disclosures made by firms who are members of CCX are significantly larger than are reactions to environmental disclosures made by either non-committed firms or by firms committed to CLP, CAP or DJSI.

In unreported tests, we perform several sensitivity analyses of the results. We find similar inferences using other event windows (2-days versus 3-days), and other specifications of abnormal returns (beta-adjusted returns and 3-factor adjusted returns). We also find that our results are not sensitive to the inclusion or exclusion of non-U.S. firms’ announcements of emission reduction plans.

6. Summary and Conclusion

We analyze the market responses to voluntary corporate environmental disclosures, particularly announcements of emissions reductions plans, conditioning on whether the firm has joined one or more of four voluntary commitment mechanisms whose goal is the reduction of GHG emissions in the United States: the Chicago Climate Exchange, the Environmental Protection Agency’s Climate Leaders Program, the United States Climate Action Partnership, and the Dow Jones Sustainability World and North American Indexes. Our aim is to shed light on whether, and to what extent, these commitment mechanisms enhance the credibility of voluntary disclosures that are not standardized (hence not comparable), and sometimes not subject to verification and sanction (hence possibly unreliable).

We find that environmental disclosures about emissions reduction plans made by firms that have not joined any voluntary commitment mechanisms are associated with negative price
responses. Consistent with the prediction that commitment enhances credibility, we also find that membership in the most stringent commitment mechanism, the Chicago Climate Exchange, is associated with positive price responses to emissions reduction plans, as is membership in multiple commitment mechanisms. Our tests also show that these differences in responses are not eliminated if firms also belong to organizations with pro-clean coal positions and they are not merely manifestations of an overall favorable corporate reputation.

Our results do not speak to whether any of the commitment mechanisms we consider is associated with the economically or socially optimal emissions reduction target; setting these targets involves public policy and scientific considerations that lie outside the scope of our analysis. However, we believe our results suggest that cap-and-trade mechanisms such as the Chicago Climate Exchange are efficacious in making corporate voluntary announcements to reduce GHG emissions credible to capital market participants. The key features that distinguish the cap-and-trade exchange mechanism is knowledge (member firms must have inventoried their GHG emissions to provide a benchmark for the specified percentage reductions); targets (member firms accept specific standardized reductions targets); costly real options alternatives to reducing emissions (the exchanges support trading of emissions credits that can be used in to meet targets); verification (by an external group) and sanctions (legally binding commitments to meet targets or purchase allowances). These features are also found in larger, non-U.S. arrangements such as the European Union’s Emissions Trading Scheme (ETS). Thus, one implication of our results is that if the ETS sets binding emissions reduction targets, announcements of emissions-related actions by members of the ETS will be viewed by investors as credible.
Table 1  
Description of Disclosure Sample Data

Panel A: Sample of firms for which we have commitment information

<table>
<thead>
<tr>
<th>Information</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCX Commitment</td>
<td>71</td>
<td>3.6%</td>
</tr>
<tr>
<td>CLP Commitment</td>
<td>106</td>
<td>5.4%</td>
</tr>
<tr>
<td>CAP Commitment</td>
<td>25</td>
<td>1.3%</td>
</tr>
<tr>
<td>DJSI Action</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Added to DJSI list</td>
<td>405</td>
<td>20.6%</td>
</tr>
<tr>
<td>Retained on DJSI list</td>
<td>1,155</td>
<td>58.7%</td>
</tr>
<tr>
<td>Dropped from DJSI list</td>
<td>204</td>
<td>10.4%</td>
</tr>
<tr>
<td>Total</td>
<td>1,966</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Panel B: Firm-Issued Press Releases

<table>
<thead>
<tr>
<th>Type</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emissions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emissions reduction plan</td>
<td>57</td>
<td>15.0%</td>
</tr>
<tr>
<td>Emissions related</td>
<td>97</td>
<td>25.5%</td>
</tr>
<tr>
<td>Product</td>
<td>144</td>
<td>37.9%</td>
</tr>
<tr>
<td>Operations</td>
<td>50</td>
<td>13.2%</td>
</tr>
<tr>
<td>Investment</td>
<td>1</td>
<td>0.3%</td>
</tr>
<tr>
<td>Other</td>
<td>31</td>
<td>8.2%</td>
</tr>
<tr>
<td>Total</td>
<td>380</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

---
a The sample in Panel A includes announcements made during 2002-2008 disclosing that a firm has joined one of the four external commitment mechanisms: the Chicago Climate Exchange (CCX), the EPA’s Climate Leadership Program (CLO), the US Climate Action Partnership (CAP), and the Dow Jones Sustainability Index (DJSI). For the DJSI, we also include announcements of firms dropped and retained in the index from the prior year.

b The sample in Panel B includes firms’ environmental disclosures made during 2002-2008, as identified by Factiva searches and subsequent reading and coding of the disclosures.
Table 2
Cumulative Abnormal Returns Surrounding Announcements of Commitment Mechanisms\textsuperscript{a}

<table>
<thead>
<tr>
<th>Announcement type</th>
<th>N (with returns)</th>
<th>mean</th>
<th>median</th>
<th>t-stat\textsuperscript{b}</th>
<th>Prob t</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCX Commitment</td>
<td>34</td>
<td>0.0121</td>
<td>0.0094</td>
<td>2.27</td>
<td>0.0231</td>
</tr>
<tr>
<td>CLP Commitment</td>
<td>96</td>
<td>0.0014</td>
<td>0.0005</td>
<td>0.45</td>
<td>0.6510</td>
</tr>
<tr>
<td>CAP Commitment</td>
<td>23</td>
<td>0.0004</td>
<td>-0.0027</td>
<td>0.06</td>
<td>0.9537</td>
</tr>
<tr>
<td>DJSI Action</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Added to DJSI list</td>
<td>226</td>
<td>-0.0016</td>
<td>-0.0007</td>
<td>-0.79</td>
<td>0.4299</td>
</tr>
<tr>
<td>Retained on DJSI list</td>
<td>1098</td>
<td>-0.0026</td>
<td>-0.0003</td>
<td>-2.79</td>
<td>0.0053</td>
</tr>
<tr>
<td>Dropped from DJSI list</td>
<td>190</td>
<td>-0.0008</td>
<td>0.0000</td>
<td>-0.35</td>
<td>0.7235</td>
</tr>
</tbody>
</table>

Difference between mechanisms\textsuperscript{c}

| Test: CCX vs CLP               | 2.97 (.08)       |
| Test: CCX vs CAP               | 1.96 (.16)       |
| Test: CCX vs DJSI (add)        | 5.79 (.02)       |

\textsuperscript{a} The sample includes all join dates (associated with the sample of firms that joined one or more external commitment mechanisms during 2002-2008) for which we have returns data. We report statistics on the 3-day cumulative abnormal return surrounding these join dates.

\textsuperscript{b} The reported t-statistic tests whether the noted mean is reliably different from zero. The t-statistic is derived from a regression which holds constant firms’ commitments to other organizations.

\textsuperscript{c} We test for differences in mean price reactions across the commitment mechanisms. Because only differences related to CCX are significant, we report only these in the table. The test statistic is an F-test of whether the mean reaction to the CCX commitment mechanism equals the mean reaction to the CLP, CAP or DJSI commitment mechanism.
Table 3  
Cumulative Abnormal Returns to Disclosures of Emissions Announcements
Sample Consists of Firm-Issued Press Releases, 2002-2008a

Panel A: Differential market reactions by committed and uncommitted firms b

<table>
<thead>
<tr>
<th>Variable</th>
<th>Emissions Reduction Plans (n=56)</th>
<th>Emissions Related (n=150)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coef. Est.</td>
<td>t-statistic</td>
</tr>
<tr>
<td>Intercept</td>
<td>-0.0123</td>
<td>-2.28</td>
</tr>
<tr>
<td>CCX_Commit</td>
<td>0.0520</td>
<td>3.42</td>
</tr>
<tr>
<td>CLP_Commit</td>
<td>0.0174</td>
<td>2.01</td>
</tr>
<tr>
<td>CAP_Commit</td>
<td>-0.0069</td>
<td>-0.32</td>
</tr>
<tr>
<td>DJSI_Commit</td>
<td>0.0152</td>
<td>1.54</td>
</tr>
</tbody>
</table>

Test: Intercept + CCX_Commit = 0 (F, p-value) 7.81 (.01) 1.64 (.20)
Test: Intercept + CLP_Commit = 0 (F, p-value) 0.51 (.48) 0.49 (.48)
Test: Intercept + CAP_Commit = 0 (F, p-value) 0.71 (.40) 1.84 (.18)
Test: Intercept + DJSI_Commit = 0 (F, p-value) 0.10 (.75) 0.01 (.92)
Test: CCX_Commit = CLP_Commit (F, p-value) 4.71 (.03) 0.51 (.48)
Test: CCX_Commit = CAP_Commit (F, p-value) 4.84 (.03) 2.80 (.10)
Test: CLP_Commit = CAP_Commit (F, p-value) 0.91 (.34) 1.92 (.17)

Panel B: Differential market reactions by number of commitments c

<table>
<thead>
<tr>
<th>Variable</th>
<th>Emissions Reduction Plans (n=56)</th>
<th>Emissions Related (n=150)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coef. Est.</td>
<td>t-statistic</td>
</tr>
<tr>
<td>Intercept</td>
<td>-0.0097</td>
<td>-1.80</td>
</tr>
<tr>
<td>N_Commit</td>
<td>0.0152</td>
<td>2.57</td>
</tr>
</tbody>
</table>
Panel C: Differential market reactions by conflicted and non-conflicted firms

<table>
<thead>
<tr>
<th></th>
<th>Emissions Reduction Plans (n=56)</th>
<th>Emissions Related (n=150)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coef. Est.</td>
<td>t-statistic</td>
</tr>
<tr>
<td>Intercept</td>
<td>-0.0127</td>
<td>-2.15</td>
</tr>
<tr>
<td>Committed</td>
<td>0.0188</td>
<td>2.15</td>
</tr>
<tr>
<td>CleanCoal</td>
<td>-0.0057</td>
<td>-0.27</td>
</tr>
<tr>
<td>Conflicted</td>
<td>0.0203</td>
<td>0.84</td>
</tr>
</tbody>
</table>

Panel D: Differential market reactions by more and less reputed firms

<table>
<thead>
<tr>
<th></th>
<th>Emissions Reduction Plans (n=56)</th>
<th>Emissions Related (n=150)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coef. Est.</td>
<td>t-statistic</td>
</tr>
<tr>
<td>Intercept</td>
<td>-0.0099</td>
<td>-1.40</td>
</tr>
<tr>
<td>Reputation</td>
<td>-0.0047</td>
<td>-0.54</td>
</tr>
<tr>
<td>CCX_Commit</td>
<td>0.0520</td>
<td>3.39</td>
</tr>
<tr>
<td>CLP_Commit</td>
<td>0.0187</td>
<td>2.07</td>
</tr>
<tr>
<td>CAP_Commit</td>
<td>-0.0066</td>
<td>-0.30</td>
</tr>
<tr>
<td>DJSI_Commit</td>
<td>0.0170</td>
<td>1.62</td>
</tr>
</tbody>
</table>

a We report the results of tests for two samples of firm-issued press releases. The sample labeled “Emissions Reduction Plans”, includes the announcement dates for 56 disclosures of firms’ emissions reduction plans, made over 2002-2008. The second sample, labeled “Emissions related”, includes the announcement dates for 150 disclosures of more general emissions disclosures made by firms over the same period.

b Panel A reports the results of estimating equation (1). We also report tests of whether the sum of the intercept and each slope coefficient equal zero, as well as tests of whether the slope coefficients differ from each other.

c Panel B reports the results of estimating equation (2).

d Panel C reports the results of estimating equation (3).

e Panel D reports the results of estimating equation (4).
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