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Organizational Commitment to Climate Change and GHG Reductions

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Abstract: Under the CDP (formerly the Carbon Disclosure Project), companies provide assurance of their commitment to reduce future carbon emissions by responding to a CDP survey on their use of corporate governance measures to ensure their organizational commitment for carbon reductions. In this study we construct an overall measure for the level of a corporation's organizational commitment for a sample of 224 companies in the S&P to the CDP in 2009. We test a commitment-performance hypothesis by examining the relationship between a firm's level of commitment and its future performance in reducing carbon emission. Although we find an insignificant relationship between a firm's level of commitment and future emission reductions, the likelihood of emission reductions rises when a company gives its board or executives oversight for sustainability operations. Also, more profitable firms and those with previous success/targets set for reducing C02 emissions are more likely to show future reductions.

Keywords: Corporate Governance, Climate Change, Carbon Disclosure Project
JEL: G30, M14, Q54

I. Introduction

As the risk of world temperatures rising greater than 2^{o}C increases, which is associated with catastrophic climate change (Meinshausen, et al. 2009), stakeholders (institutional investors, customers, employees, governments, NGOs, and regulators), have urged corporations to take on more pro-active approaches to climate change and have initiated guidelines for responsible corporate engagement in climate policy (Kolk, Levy, and

Pinkse 2008; CDP 2011; UNEP 2013).

Corporations across diverse countries have developed a number of different corporate governance mechanisms to embed sustainability in their organizations to reduce their carbon footprints. Thirteen of the largest U.S. corporations recently pledged $150 billion to the American Business Act on Climate Pledge, with a commitment to invest in technology and other efforts reduce their carbon emissions (Kasperkevic and Thielman 2015).). Yet the emissions path of many corporations continues on average to satisfy a business-as usual allocation for their share of global emissions in recent years (Byrd, Bettenhausen, and Cooperman 2013).

Companies report their greenhouse gas emissions annually to the CDP (formerly the Carbon Disclosure Project), which began collecting data in 2008 on a voluntary basis, from companies worldwide. Of primary interest are reports on actual carbon emission reductions, but the CDP also surveys on the corporate governance mechanisms participating companies use to help to ensure future carbon emission reductions. This includes questions on: (1) how carbon emissions are disclosed; (2) if the firm sets CO2 emission reduction goals and targets; (3) if a firm has emissions verified by a third-party; (4) whether responsibility for sustainability is at a board or executive level; (5) if a firm offers monetary and/or non-monetary incentives for achieving climate goals; and (6) if a firm shows transparency by having sustainability information in annual and special corporate social responsibility reports. As a relatively new database, few studies have utilized the detailed CDP survey data to exam whether the of corporate governance mechanisms for organizational commitment strategies has a significant effect on a firm's future carbon emission reductions.

In this study we use the CDP database to examine whether higher levels of organizational commitment, and specific types of corporate governance mechanisms, leads to greater carbon emissions reductions. Specifically, we examine this relationship utilizing a sample of 224 companies in the S&P 500 with available data from the 2010 CDP survey (which reports data for 2009). We review the level of a firm's commitment based on CDP responses and categorize firms by their level of commitment. We then examine the relationship between the level of commitment and future carbon emission reductions for future years, 2011 and 2012, where CDP data is available. We also examine differences by industry type, and by type of corporate governance mechanisms reported in CDP surveys. The paper is organized as follows. Section 2 provides a brief overview of some previous literature. Section 3 discusses the procedures we use for creating our commitment measures,

the hypotheses we test, sample statistics and the empirical methods we use. Section 4 presents our regression results, followed by a summary and conclusion in Section 5.

2. Brief Literature Overview

Weaver and Bonfiglioli (2013) provide an overview of issues on strategy and sustainability from an organizational behavior perspective, noting that corporations need to embed sustainability into their operations, with the operations area of a business having the greatest ability to their minimize environmental impact. Laslo and Zhexembayeva (2011) also note that corporate responses to environmental issues provide competitive advantages and business opportunities. Firms have made progress embedding sustainability within their companies, but it has been questioned whether the corporate governance mechanisms put in place have had a significant effect on future carbon emission reductions. There has also been a debate over whether corporations voluntarily will make efforts to reduce their carbon footprints or if regulations need to be imposed, such as a carbon tax or cap on emissions.

Whether firm commitment affects corporate environmental performance is an unanswered question. As Kagan, Gunningham, and Thornton (2002) point out, although it is widely recognized that regulatory enforcement affects differences in environmental performance, there may be significant firm-level differences as well. Examining data on the environmental performance for 14 pulp and paper manufacturing mills in different countries under different regulatory rules for 1998 and 1999, Kagan, et al. find regulatory requirements and political pressures by environmental activists and local communities have a significant effect on environmental performance differences. However, several firm-specific factors were also found to be important including the corporate environmental management style of a company.

Among corporate governance factors that may affect a firm's environmental performance, it may be that the type of oversight for sustainability activities is important, particularly whether this oversight is at the board or executive level. Tonello (2013) points out results for a Conference Board Survey for the organizational format for sustainability operations for 359 SEC-registered firms in 2010. Over 40 percent of the non-financial companies and 25 percent of the financial companies responded that oversight for sustainability operations was at the board level. For 34 percent of these that put the CEO in charge of oversight, a chief sustainability officer was designated to report directly to the CEO. However, when responsibility was at the board level, few respondents indicated any

liaison with corporate executives on issues. Many companies showed little structural framework for oversight of sustainability within firms.

Another corporate control mechanism to help ensure carbon emission reductions is whether a firm has a target the type of target that is used. Absolute emissions carbon reduction targets are more transparent and allow investors to see the actual changes in total carbon emissions. In contrast, intensity-only CO2 emission targets (carbon emissions relative to sales, assets, or other measures) are less transparent, since an intensity ratio reduction if a firm increases its sales or assets does not imply an absolute carbon emission reduction. Growing companies prefer intensity measures, since they allow actual carbon emissions to grow along with a firm's growth. Byrd, Cooperman, and Bettenhausen (2014) examine differences in firm characteristics for a sample of 228 corporations reporting to the CDP in 2012. They find a higher likelihood for firms that are more in the public eye (i.e., consumer/retail firms) and firms in higher growth, higher emission industries to take on a less transparent intensity-only CO2 emission target. In contrast, corporations that have stronger brand reputations are more likely to take on absolute emission targets that provide greater transparency.

Monetary incentives for managers--to encourage managers to meet carbon emission targets--is another corporate governance mechanism that is firms use. Eccles, Ioannou, Li, and Serafeim (2014) look specifically at the effect of monetary and non-monetary incentives on carbon intensity ratios (carbon emissions scaled by sales) for a sample of large multinational firms. They find a firm's use of monetary incentives to be associated with higher carbon intensity ratios, while non-monetary incentives are associated with lower ratios, suggesting that monetary incentives may crowd out non-monetary pro-social motivations that are more effective.

Merriman and Sen (2014) examining direct and indirect pay incentives to managers for environmental sustainability projects similarly find managers with stronger social norms have a larger effect on environmental performance than managers given incentive pay. Berrone and Gomez-Mejia (2009) studying firms reporting to the EPA's Toxic Release Inventory find that firms with explicit environmental performance pay policies did not actually reward environmental performance any more than other firms, consistent with manipulation. Their results suggest that external environmental audits may be more effective as a corporate control mechanism.

Another corporate governance mechanism is transparency in terms of whether

corporations provide carbon emission information in their annual reports and in a special corporate social responsibility report. Holder-Webb, Cohen, Nash, and Wood (2013) performing a content analysis for corporate social responsibility disclosures in annual reports for 50 U.S. publicly-traded firms during 2004 find about 50 percent of the companies have CSR disclosures that include environmental progress. Consistent with previous studies, firms took on a self-laudatory tone in their disclosures, more consistent with *green washing* than actual accomplishments.

Whether carbon emission reductions for firms are associated with a firm's organizational commitment to climate change as expressed by having corporate control mechanisms tied to carbon emissions reductions in place is an unanswered question. In this study we extend upon the literature by examining the relationship between the level of a firm's commitment in terms of having different corporate control mechanism in place and the likelihood of future carbon emission reductions.

3. Sample and Methodology

3.1 Construction of the Sample and Organizational Commitment variables.

We began with the 2010 CDP data set, which reports carbon emissions and other information for 2009. This includes 289 S&P500 companies in 10 broad industry groups. We deleted any companies that either did not report their carbon emissions or chose not to make their information public, resulting in 251 firms. We then collected carbon emissions data for 2011 and 2012 from the 2012 and 2013 CDP data sets. Any company with no future carbon emissions data was deleted. This produced a final sample of 224 companies. Future emissions data was available for 207 of these firms for both 2011 and 2012, with 219 firms having data for at least 2011, and 212 firms having data for at least 2012. Table 1 shows the sample as it moved through these stages in total and by industry group. The CDP data was combined with data for company characteristics on Compustat, with data for all but 3 or 4 companies depending on the specific variables being collected.

We constructed the organizational commitment variable by considering how many ways a company addressed climate change issues and at what level including if: (1) a corporation has a board committee or other executive responsible for climate issues, (2) a carbon reduction target in place or recently achieved, (3) 80 percent or more of emissions verified, (4) monetary incentives for reduced emissions at the board/executive level; (5) monetary incentives for the management group; (6) climate information in the annual report; and (7)

climate change information in a more detailed corporate social responsibility or sustainability report,

As shown in Table 2 these seven checked variables in the CDP survey are those we used to construct our commitment variables. Our *VeryHighCommitment* variable is designated 1 if a company reports doing all seven of the checked items. Our *HighCommitment* variable is designated 1 if a company reports doing five of the seven checked items. We also created a *LowCommitment* variable assigned the value 1 if a company reports doing none of these actions. These constructed variables are correlated with CDP designations of companies as having excellent carbon disclosure and carbon performance. In 2010 the CDP rated firms respectively on their performance and the transparency of their carbon disclosures based on this survey. To examine the relationship between CDP scores and CDP performance variables in later regressions, we transformed these ratings from A, B, etc. ratings to 5 to 1 values (i.e. 5 for an A grade, 4 for B, etc.).

3.2 Hypotheses and Empirical Procedures

Using our constructed commitment variables, we test the overall hypothesis of a firm's level of commitment (i.e. a very high or high commitment variable) being associated with a future reduction in carbon emissions. We test this hypothesis by first examining the percentage of firms in each very high, high commitment, and low commitment category having a future reduction in emissions in respectively 2009 to 2011 and 2009 to 2012. We also examine reductions in carbon intensity ratios (based on respectively assets and sales) for these years.

We test two primary hypotheses as follows:

Ho 1: Firms with high organizational commitment levels will have higher carbon emission reductions in future years.

Under a performance-commitment hypothesis, companies with higher organizational commitment levels using a variety of corporate governance mechanisms to ensure a reduction in carbon emissions are expected to have lower carbon emissions that firms with no or lower level commitments. Alternatively, it may be that having a larger quantity of corporate governance may not matter, so much as utilizing a particular type of corporate governance mechanism. Particular corporate governance mechanisms instead may have a significant effect on the likelihood of a firm having future lower emissions. From this perspective, we test a second hypothesis:

Ho 2: Specific corporate control mechanisms are associated with a higher likelihood

for a company to have a future carbon emissions reduction.

For this corporate governance mechanism hypothesis only specific types of corporate governance mechanisms would be expected to be effective as a determinant for reducing future carbon emissions (such as respectively having board/executive oversight for carbon emission reductions, having monetary incentives, having previous success and a previous target in place, among other individual mechanisms).

To test the overall performance-commitment hypothesis, we first perform regressions where the dependent variable in respective models is: (1) the performance score that the CDP gives to company's based on their survey data in 2010; (2) the CDP disclosure score that the CDP gives to company's based on the transparency revealed for their corporate emissions. The independent variables in the model are indicator variables for alternative regressions for respectively very high commitment firms and high commitment firms. Robust regressions are performed which eliminate gross outliers using Cook's distance, as well as robust regressions with corrections for industry affiliation, based on STATA's cluster command.

To examine the relationship between actual future emissions and a firm's commitment variable, we also perform regression models using the change in carbon emissions for respectively 2009 to 2011 and 2009 to 2012 as the dependent variable. For these regressions for alternative models, we use alternative independent variables for respectively the very high and high commitment indicator variables. We also perform the same regressions using the percentage change in the respective asset intensity and revenue intensity as the respective dependent variables.

We then perform logit regressions, where the dependent variable is equal to 1, for firms that had lower carbon emissions in the future; 0, otherwise. The independent variables include respectively the very high commitment and high commitment variables for alternative regressions, along with other independent variables in for previous levels and profitability.

To test hypothesis 2, whether particular corporate control mechanisms are associated with a higher likelihood of carbon emission reductions for a corporation, we also perform logit regressions with the dependent variable equal to 1, if a firm has lower carbon emissions in the future; 0, otherwise. For these regression models, we include the individual corporate governance mechanisms as independent variables including board or executive responsibility for sustainability, a carbon reduction target in place or recently achieved, 80% of emissions

verified, monetary incentives for the board or executives, climate information in annual report, and climate change in CSR report.

3.2 Descriptive Statistics for the Sample

Table 3A presents summary statistics for the assets and revenues for our final sample (excluding three firms that did not have data on Compustat for assets and revenues). Means, medians, minimums and maximums are presented by industry type including a variety of firms from nine different industries (banking, consumer discretionary products, consumer staples, energy, health care, industrials, information technology, materials telecommunication services, and utilities). The mean asset size and mean revenues respectively for all sample firms for 2009 is $80.898 billion and $406.103 billion, with a wide range from $1.569 billion to $2,223.299 billion.

Table 3B shows summary statistics for carbon emissions (metric tons CO2 equivalents) for each year including both Scope 1 (all direct emissions) and Scope 2 (indirect emissions from consumption of purchased electricity, heat or steam). The base mean for total CO2 emissions is 5,784,451MTCO2 (metric tons of carbon dioxide) in 2009, with 5,841,636MTCO2 in 2011, and 5,503,413MTCO2 in 2012. The range is quite large across firms from a minimum of 7,290 MTCO2 to a maximum of 143,000,000MTCO2 in 2009. The banking, health care, and information technology industries have relatively low means, while the utilities, industrials, energy, and materials have the largest means for carbon emissions as would be expected. For example, the mean for the utilities industry is 28,900,000MTCO2 compared to 402,995MTCO2 for the banks in the sample in 2009. For each of the industries, there is a wide range for total carbon emissions.

Table 4 shows the number and percentage of firms with absolute emission reductions and carbon intensity ratios for assets and sales in respectively 2009 to 2011 and 2009 to 2012 for the total sample and for each of the commitment categories. For the entire sample, about 51 percent of firms had lower absolute CO2 emissions from 2009 to 2011, and 56 percent had emission reductions for the entire period 2009 to 2012.For the carbon intensity ratios for both sales and assets absolute emissions, it is worth noting that a much larger percentage of firms (73 to 80 percent) had lower carbon intensity ratios in future years, suggesting that carbon intensity ratios are not good indicators of actual emission reductions.

For the subsamples, comparing future reductions for absolute carbon emissions and carbon intensity, the very high commitment firms have a higher percentage of firms with absolute and intensity ratio emission reductions than the high or low commitment

subsamples, but the differences are not statistically significant. Similarly, the differences in the number and percentage of firms for the high versus the low commitment firms with lower futures emissions (although higher in the 2009 to 2012 period for the high commitment firms) are not significantly different for either time period using both absolute and intensity ratio emission reduction measures.

4. Empirical Results

To test the overall performance-commitment hypothesis, we first regress respectively CDP performance and CDP transparency scores against respectively very high and high commitment indicator variables. The regressions are performed using the robust regressions and robust regressions with corrections for industry affiliation.

Table 5 shows these results. For each of the robust regressions with the CDP Performance score as the dependent variable, the coefficient on respectively the very high commitment and high commitment indicator variables are positive and significant at a .01 level. For the robust regressions with corrections for industry affiliation, the coefficient on the very high commitment indicator variable is positive and significant at a .02 level, and the high commitment indicator variable is positive and significant again at a .01 level. For the regressions with the CDP Carbon Disclosure score as the dependent variable, for all regressions, the respective very high commitment and the high commitment variable are again positive and very significant. These results suggest that firms with many different corporate control mechanisms to help firms ensure their commitments to reduce carbon emissions are strongly associated with higher CDP performance scores.

To test the performance-commitment hypothesis based on actual emission reductions, we next perform regressions with the dependent variable actual changes in total emissions during respectively 2009 to 2011 and 2009 to 2012. For each of these regressions alternatively using the very high commitment and the high commitment indicator variables, all coefficients are insignificant suggesting no relationship between future carbon emission reductions and having a number of different corporate control mechanisms to help ensure a commitment to lower emissions.

Table 7 shows the results for regressions alternatively using changes in carbon intensity ratios (relative to assets and sales) as dependent variables. The results for regressions for changes in intensity ratios during 2009 to 2011 are shown in Panel A, and during 2009 to 2012 in Panel B. Again for each regression, the coefficient on alternatively the very high and

high commitment variables are insignificant.

For our final test for the performance-commitment hypothesis, we use a logit regression model where the dependent variable is equal to 1, for firms with future emission reductions; 0, otherwise. We include as dependent variables, alternately, the very high commitment and high commitment indicator variables. Since more profitable firms may have greater ability to make significant investments to implement carbon reduction strategies, and firms with higher emissions may have a more difficult time reducing emissions, we also include profitability and emission level control variables in the regressions.

The results for the regression are shown in Table 8. Once again, the respective very high and high commitment variables are insignificant. However, for the 2009-2012 models, the coefficient on the previous change in carbon emissions (from 2008 to 2009) is positive and significant at a .01 level. This suggests that if a firm has had previous success in reducing emissions, it is more likely to have future emission reductions. The coefficient on the 2009 total carbon emissions level of a firm is also positive and significant at a .10 level. Firms with larger emissions were also more likely to have future emission reductions.

For each of the regressions, the coefficient on the % change in net income for previous years (2007 to 2008), as a proxy for previous profitability growth is significant and positive, consistent with more profitable firms being having a higher likelihood of having future carbon emission reductions. This result is consistent with the findings of Kagan, Gunningham, and Thorton (2002) of a positive relationship between profitability and environmental performance. The result suggests that more profitable firms may have greater funds available to implement efficiency changes that allow for fewer carbon emissions in the future. Surprisingly, for the 2009-2012 regressions, changes in the 3 year stock market returns in previous years (2007 to 2009) has a significant, negative coefficient, which perhaps may reflect firms with lower stock returns following the subprime loan crisis attempting to be more efficient in later years, that is also associated with lower emissions.

Our final logit regression is to test hypothesis 2 for specific corporate governance variables that may have a significant effect on the likelihood of carbon emission reductions. For this regression, the dependent variable is equal to 1 if emissions for the company fell, 0, otherwise as in the previous regression, but the independent variables are each of the seven respective types of corporate control mechanisms.

Table 9 presents these results. Unlike our previous results, several individual commitment variables are significant. The Board or Executive Responsibility variable has a

positive coefficient that is significant at a .10 level for each regression. Firms that have board/executive responsibility for sustainability appear to have more success in having carbon emission reductions in the future. Corporations having board buy-in may gain greater legitimacy for greenhouse gas carbon reduction activities, better embedding sustainability across the culture of a corporation. This suggests that a growing trend to having board responsible for sustainability efforts may be a positive step for ensuring future corporate carbon reductions.

Having a carbon reduction target in place or recently achieved is also associated with carbon emissions reductions and significant at the 5% level. This suggests that firms that started sustainability activities earlier and achieved targets continue to reap benefits, and that previous success may create greater engagement for managers across the organization.

Two variables have an unexpected negative coefficient indicating they increase the likelihood of not having a future emission reduction. This includes the indicator variable for having 80% of emissions verified and reporting emissions data in the annual report. Both are significant at a .05 level. Verification of emissions and reporting of emissions may represent early attempts by companies for transparency in emissions, while it may take many years before actual emissions changes occur. This may be particularly the case for companies that report intensity carbon emission targets (i.e. carbon emissions relative to sales, production, or others) that often do not result in and decline in absolute CO2 emissions.

Having climate-related information in annual reports is negatively and significantly related to the likelihood of having future carbon emission reductions, consistent with green washing, consistent with Holder-Webb, et al. (2013). Consistent with Berrone and Gomez-Mejia (2009) and Eccles, et al. (2014) monetary incentives do not have a significant relationship to whether or not a firm has emission reductions for board members or management groups.

5. Summary and Conclusion

Embedding sustainability in corporate strategy and determining how successful it is remains a difficult area to assess. In this study we examine organizational commitment levels and how successful they are in terms of reducing a firm's carbon emissions or carbon emission intensity ratios relative to total assets, total revenues, or total number of employees. Utilizing data from the Carbon Disclosure Project (CDP) database for a sample of 224

companies in the S&P 500 operating in 2009, we construct an overall measure for the level of organizational commitment to climate change using information firms self-reported to the CDP project survey. We perform regressions on two versions of this variable (*VeryHighCommitment* and *HighCommitment*) and changes in carbon emissions and carbon intensity ratios for future years 2009 to 2011, and 2009 to 2012, as well as individual commitment measures.

The empirical results suggest that the use of a larger number of corporate control mechanisms, which is highly correlated with CDP carbon performance ratings, is not significantly related to having a decline in future carbon emission or carbon intensity reductions. This may suggest "green-washing" in terms of commitments or that other key factors not captured may be more important determinants and/or that a longer-time period is needed for committed companies to make significant GHG reductions.

We do find some evidence that individual components or the commitment variables are associated with reductions in subsequent reductions (and increases) of carbon emissions. The results suggest that firms with board/executive level responsibility for sustainability actions by a company and companies that have targets in place and previous success in meeting targets are more likely to have carbon emission reductions in the future. This suggests that board buy-in and having targets in place, with previous success, can help to engage managers and create a sustainability culture within a corporation. Greater profitability for corporations is also associated with future carbon emission reductions, perhaps allowing investments necessary for carbon reduction. Overall, the evidence suggests that growing trends for board level responsibility for sustainability actions and board buy in, and a clear carbon reduction target in place, along with greater profitability for companies may be key factors for corporate carbon emission reductions.

As a caveat and limitation for the study, since data from the CDP is only available for a short period of time, future research is needed on the effectiveness of individual commitment factors when greater data becomes available to examine larger samples across industries over a longer time period. We see carbon emission reductions, but the overall driver of these reductions is less clear, and embedding sustainability, as related to climate change does not appear to follow a simple prescription.

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Table 1: Sample Firm Categorized by Industry Type

Industry Type	Initial Sample	After Deleting Observations missing 2009 Emissions Data	Final Sample: After Deleting Observations Missing both 2011 and 2012 Emissions Data
Banks	44	35	32
Consumer Discretionary	32	25	23
Consumer Staples	33	33	31
Energy	20	19	14
Health Care	30	26	23
Industrials	30	28	26
Information Technology	46	42	37
Materials	19	18	18
Telecommunication Services	6	5	4
Utilities	29	20	16
Total Sample	**289**	**251**	**224**

Table 2: Construction of Organizational Commitment Variable

Variables available in the CDP Database	Required for Very High Commitment variable
Responsibility for climate issues: Board committee or other executive body	√
Responsibility for climate issues: Other, lower level departments Reporting to Board	
Responsibility for climate issues: Other, lower level departments not reporting to Board	
Responsibility for climate issues: There is no individual or committee with overall responsibility for climate change	
Carbon reduction target in place or recently achieved	√
Developing a target	
Emissions Verified (80%+)	√
Emissions Verified (60% - 80%)	
Emissions Verified (40% - 60%)	
Emissions Verified (20% - 40%)	
Emissions Verified (0% - 20%)	
Monetary Incentives -Board/Executive board	√
Monetary Incentives -Management group	√
Monetary Incentives -Mid-Managers	
Monetary Incentives -All employees	
Non-Monetary Incentives -Board/Executive board	
Non-Monetary Incentives -Management group	
Non-Monetary Incentives -Mid-Managers	
Non-Monetary Incentives -All employees	
Absolute Carbon Reduction Target	
Intensity Carbon Reduction Target	
Other Target	
Climate Information in Annual Report	√
Climate Information in CSR Report	√
Climate Info only CDP	

Other variants of the commitment variable were constructed and used in regression models. These variables considered Monetary Incentives -Mid-Managers, Monetary Incentives -All employees and whether the company reported any Scope 3 emissions. None of these variations produced different statistical results than the initial definition of the Very High Commitment and High Commitment variables.

Table 3A: Summary Statistics for the sample Panel A: Size Variables (In $mils.)

Industry Sector	Asset Size 2009	2011	2012	Sales 2009	2011	2012
Banks (N=32) Mean	357,510	388,136	408,120	26,290	27,699	27,951
Median	108,874	115,702	120,130	10,292	13,381	13,507
Min	4,448	4,259	4,384	1,212	1,167	1,339
Max	2,223,299	2,265,792	2,359,141	150,450	129,913	107,084
Consumer Discretionary (N=22) Mean	25,952	26,629	27,997	22,743	25,533	25,761
Median	12,871	12,427	11,031	15,648	15,905	14,935
Min	3,488	4,159	4,631	2,710	3,643	3,794
Max	194,850	178,348	190,554	118,308	136,264	134,252
Consumer Staples (N=30) Mean	24,709	27,812	29,017	33,129	36,756	37,925
Median	11,167	11,671	11,987	10,827	11,470	11,496
Min	2,070	2,767	3,258	2,469	2,654	2,796
Max	170,706	193,406	203,105	406,103	444,948	467,231
Energy (N=14) Mean	62,614	79,826	81,951	53,069	79,500	65,692
Median	31,576	46,448	48,015	15,039	21,885	22,767
Min	11,439	16,444	17,554	2,143	3,568	4,037
Max	233,323	331,052	333,795	275,564	433,526	420,714
Health Care (N=23) Mean	37,259	38,678	40,884	26,218	29,878	30,385
Median	25,119	21,290	21,240	15,835	16,184	16,590
Min	3,064	3,834	3,902	1,812	1,921	2,141
Max	212,949	188,002	185,798	99,512	102,644	110,618
Industrials (N=26) Mean	50,121	50,139	52,031	24,442	26,387	27,349
Median	20,047	20,319	24,820	11,138	14,518	14,980
Min	2,841	3,232	3,348	2,329	2,741	2,672
Max	781,818	717,242	685,328	155,777	141,547	144,796
Information Technology (N=36) Mean	20,665	25,183	26,162	15,696	18,892	18,933
Median	8,345	9,520	11,510	4,908	7,060	7,676
Min	1,569	1,951	1,870	860	1,010	945
Max	114,799	129,517	121,271	114,552	127,245	120,357
Materials (N=18) Mean	18,253	21,847	22,673	12,250	16,134	15,971
Median	14,279	16,215	17,257	8,606	10,805	11,531
Min	2,714	3,281	3,820	2,148	2,505	2,623
Max	65,937	69,224	69,605	44,875	59,985	56,786
Telecommunications (N=4) Mean	142,952	183,396	183,036	68,849	90,426	92,875
Median	141,338	230,461	225,222	70,034	110,875	115,846
Min	20,380	49,383	51,570	12,311	33,679	35,345
Max	268,752	270,344	272,315	123,018	126,723	127,434

Table 3A continued

Industry Sector	Assets 2009	2011	2012	Sales 2009	2011	2012
Utilities (N=16) Mean	27,805	30,348	34,754	9,966	10,095	9,860
Median	24,842	27,753	31,141	9,452	10,345	9,647
Min	11,808	13,111	13,380	3,297	3,241	3,302
Max	49,180	55,092	78,554	17,318	18,924	23,489
Total (N=221) Mean	80,898	88,577	93,183	25,056	29,275	28,877
Median	17,679	19,628	20,405	10,493	12,070	12,237
Min	1,569	1,951	1,870	860	1,010	945
Max	2,223,299	2,265,792	2,359,141	406,103	444,948	467,231

Panel 3B: Summary Statistics for carbon emissions, in metric tons of CO2 equivalents, for 2009, 2011, and 2012, across industry groups.

GIC-sector		2009 Total Scope 1 and Scope 2 emissions	2011 Total Scope 1 and Scope 2 emissions	2012 Total Scope 1 and Scope 2 emissions
Banks	Mean	402,995	379,298	371,568
	Median	116,571	101,109	100,852
	Min	8,485	8,667	6,535
	Max	2,699,443	2,597,467	2,669,280
	Count	32	32	31
Consumer Discretionary	Mean	1,187,676	1,254,199	1,219,760
	Median	813,026	755,759	750,039
	Min	32,274	44,332	44,511
	Max	4,849,719	5,095,199	5,139,137
	Count	23	21	21
Consumer Staples	Mean	2,030,930	2,140,801	2,039,136
	Median	879,084	831,706	748,406
	Min	62,606	72,351	74,891
	Max	21,000,000	21,500,000	21,200,000
	Count	31	31	29
Energy	Mean	26,000,000	25,800,000	23,700,000
	Median	9,746,588	8,649,499	8,684,562
	Min	570,000	915,000	941,000
	Max	143,000,000	150,000,000	146,000,000
	Count	14	14	13
Health Care	Mean	606,722	595,192	542,506
	Median	227,715	193,772	235,386
	Min	16,046	25,993	32,878
	Max	2,873,235	2,659,192	2,373,498
	Count	23	22	22
Industrials	Mean	3,839,281	3,803,621	3,868,310
	Median	1,078,081	740,970	724,715
	Min	7,290	12,789	13,645
	Max	23,700,000	18,700,000	19,600,000

Count	26	26	26
Information Technology Mean	513,022	549,573	600,710
Median	180,740	164,500	180,499
Min	8,110	8,475	5,569
Max	3,189,883	3,099,546	3,125,807
Count	37	37	34
Materials Mean	11,900,000	12,700,000	13,300,000
Median	6,711,720	5,616,880	7,302,687
Min	171,391	36,693	218,807
Max	47,300,000	49,500,000	47,800,000
Count	18	18	18
Telecommunications			
Mean	4,698,842	5,618,610	4,703,014
Median	4,265,438	5,750,014	4,103,604
Min	1,348,713	2,027,545	1,761,779
Max	8,915,778	9,078,271	8,843,067
Count	4	3	4
Utilities Mean	28,900,000	29,000,000	26,500,000
Median	17,000,000	16,600,000	16,900,000
Min	2,065,591	1,871,341	1,327,622
Max	137,000,000	136,000,000	122,000,000
Count	16	15	14
Total Mean	5,784,451	5,841,636	5,503,413
Median	644,040	670,218	701,521
Min	7,290	8,475	5,569
Max	143,000,000	150,000,000	146,000,000
Count	224	219	212

Table 4: Organizational Commitment and Carbon Emissions Reductions

Results of tests comparing the proportions of companies reducing carbon emissions or reducing carbon intensity measures from 2009 to 2011 and 2009 to 2012 by level of commitment. Very high commitment firms had sustainability assigned to a board or executive level, monetary incentives for achieving carbon reduction goals, had or achieved carbon emission reduction targets, had third-party verification of 80% or more of the their Scope 1 emissions, and published emissions data in either their annual report or a CSR report or both. High commitment firms did all but two of the activities listed for Very High Commitment firms. Low Commitment firms did at most two of the listed activities. There are no statistically significant (10% level or higher) differences between any proportions shown in the table.

Org Commitment Level	Reduced Absolute Emissions 2009 to 2011	Reduced Absolute Emissions 2009 to 2012	Reduced Carbon Intensity (Assets) 2009 to 2011	Reduced Carbon Intensity (Sales) 2009 to 2011	Reduced Carbon Intensity (Assets) 2009 to 2012	Reduced Carbon Intensity (Sales) 2009 to 2012
Total Sample						
# Reducing	112	119	158	173	166	166
#Total	219	212	216	216	208	208
% Reducing	51.1%	56.1%	73.1%	80.1%	79.8%	79.8%
Very high commitment						
# Reducing	7	7	10	11	10	11
#Total	12	12	12	12	12	12
% Reducing	58.3%	58.3%	83.3%	91.7%	83.3%	91.7%
High Commitment						
# Reducing	25	27	34	41	39	38
#Total	51	50	51	51	50	50
% Reducing	49.0%	54.0%	66.7%	80.4%	78.0%	76.0%
Low Commitment						
# Reducing	13	11	16	21	16	18
#Total	26	25	25	25	23	23
% Reducing	50.0%	44.0%	64.0%	84.0%	69.6%	78.3%

Table 5: Regression Results CDP Scores and Climate Commitment Variable

Coefficient estimates from regression models of CDP (Carbon Disclosure Project) Carbon Performance grades and Carbon Disclosure Scores for 2010 (based on 2009 data) on our constructed climate commitment variable. Very high commitment firms had sustainability assigned to a board or executive level, monetary incentives for achieving carbon reduction goals, had or achieved carbon emission reduction targets, had third-party verification of 80% or more of the their Scope 1 emissions, and published emissions data in either their annual report or a CSR report or both. High commitment firms did all but two of the activities listed for Very High Commitment firms. Low Commitment firms did at most two of the listed activities. Robust regression eliminates gross outliers using Cook's distance. The correction for industry affiliation is based on STATA's *cluster* command.

Dependent variable: CDP Carbon Performance Score	**Robust regressions**		**Robust regressions with correction for industry affiliation**		**Dependent variable: CDP Carbon Disclosure Score**	**Robust regressions**		**Robust regressions with correction for industry affiliation**	
Very High Commitment	0.78		0.78		Very High Commitment	11.16		11.16	
t-score	3.78		2.78		t-score	2.91		2.79	
p-value	0.00		0.02		p-value	0.00		0.02	
High Commitment		0.85		0.85	High Commitment		14.14		14.14
t-score		8.16		6.92	t-score		7.56		7.83
p-value		0.00		0.00	p-value		0.00		0.00
Intercept	3.39	3.21	3.39	3.21	Intercept	66.01	63.35	66.01	63.35
t-score	64.67	61.93	66.39	73.32	t-score	64.64	57.48	90.71	76.52
p-value	0.00	0.00	0.00	0.00	p-value	0.00	0.00	0.00	0.00
Number of obs	193	193	193	193	Number of obs	221	221	221	221
F-statistic	14.31	66.64	7.70	47.88	F-statistic	8.48	57.21	7.81	61.34
Prob > F	0.00	0.00	0.02	0.00	Prob > F	0.004	0	0.0209	0
R-squared	0.07	0.27	0.07	0.27	R-squared	0.0291	0.1617	0.0291	0.1617

Table 6: Regression Results for Changes in Carbon Emissions and Commitment Variables

Coefficient estimates from regression models of our constructed organizational climate commitment variable on carbon emissions reductions from 2009 to 2011 and 2009 to 2012 for a sample of S&P 500 companies. Very high commitment firms had sustainability assigned to a board or executive level, monetary incentives for achieving carbon reduction goals, had or achieved carbon emission reduction targets, had third-party verification of 80% or more of the their Scope 1 emissions, and published emissions data in either their annual report or a CSR report or both. High commitment firms did all but two of the activities listed for Very High Commitment firms. Low Commitment firms did at most two of the listed activities. Robust regression eliminates gross outliers using Cook's distance. The correction for industry affiliation is based on STATA's *cluster* command.

Dependent variable: Change in Scope 1 and Scope 2 Carbon emissions from 2009 to 2011			**Dependent variable: Change in Scope 1 and Scope 2 Carbon emissions from 2009 to 2012**		
Very High Commitment	-254670		Very High Commitment	1576848	
t-score	-0.63		t-score	1.31	
p-value	0.546		p-value	0.223	
High Commitment		-40717	High Commitment		315497
t-score		-0.14	t-score		2.02
p-value		0.893	p-value		0.074
Intercept	52630.98	48158.66	Intercept	-216291	-201446
t-score	0.74	0.34	t-score	-0.76	-0.76
p-value	0.479	0.738	p-value	0.469	0.469
Number of obs	219	219	Number of obs	212	212
F-statistic	0.39	0.02	F-statistic	1.71	4.09
Prob > F	0.5461	0.8934	Prob > F	0.2228	0.0738
R-squared	0.0007	0.0001	R-squared	0.0095	0.0013

Table 7: Regression Results on Carbon Intensity Ratios and High Commitment Variables

Coefficient estimates from regression models of our constructed organizational commitment variable on changes in carbon intensity. The carbon intensity dependent variables are computed as the change in carbon emissions as divided by assets (or revenues or employees) from 2009 to 2011 and from 2009 to 2012 for a sample of S&P 500 companies. All regression models are eliminated gross outliers using Cook's distance, and corrected for industry affiliation is based on STATA's *cluster* command.

Panel A: Changes from 2009 to 2011

	Dependent Variable: % Change in Asset Intensity 2009 to 2011		**Dependent Variable: % Change in Revenue Intensity 2009 to 2011**	
Very High Commitment	0.00		0.03	
t-score	0.01		1.00	
p-value	1.00		0.35	
High Commitment		0.02		0.03
t-score		0.64		0.91
p-value		0.54		0.39
Intercept	-0.10	-0.10	-0.12	-0.13
t-score	-6.12	-6.92	-6.64	-8.58
p-value	0.00	0.00	0.00	0.00
N	216	216	216	216
F-statistic	0.00	0.40	0.99	0.83
Prob. > F	0.99	0.54	0.35	0.39
R-squared	0.0001	0.0016	0.007	0.0034

Panel B: Changes from 2009 to 2012

	Dependent Variable: % Change in Asset Intensity 2009 to 2012		**Dependent Variable: % Change in Revenue Intensity 2009 to 2012**	
Very High Commitment	0.08		0.13	
t-score	0.69		0.93	
p-value	0.51		0.38	
High Commitment		0.04		0.07
t-score		1.09		1.38
p-value		0.30		0.20
Intercept	-0.16	-0.16	-0.15	-0.16
t-score	-9.91	-9.32	-16.60	-12.95
p-value	0.00	0.00	0.00	0.00
N	208	208	208	208
F-statistic	0.47	1.20	0.86	1.91
Prob.> F	0.51	0.30	0.38	0.20
R-squared	0.004	0.0045	0.01	0.01

Table 8: Logit Regression Results on Commitment Variables

Coefficient estimates from logit regressions of the dummy variables of a reduction in emissions (assigned the value 1) from either 2009 to 2011 or 2009 to 2012 on our commitment variables and a set of control variables. All regressions are corrected for outliers and have robust standard errors and are corrected for industry effects using the STATA cluster function. Change in CO2 Emissions in millions of tons.

	2009-2011		**2009-2012**	
Very High Commitment	-0.17		-0.03	
z-statistic	-0.31		-0.04	
p-value	(0.75)		(0.97)	
High Commitment		-0.46		-0.24
z-statistic		-0.85		-0.56
p-value		(0.40)		(0.58)
Change emissions 2008_2009	0.02	0.02	0.15	0.15
z-statistic	0.33	0.26	3.30	3.78
p-value	(0.74)	(0.79)	(0.001)	(0.0001)
2009 Total Scope 1 and Scope 2 emissions	0.01	0.01	0.03	0.03
z-statistic	0.44	0.52	1.78	1.84
p-value	(0.66)	(0.61)	(0.08)	(0.07)
3-year Stock Market Return (2007-2009)	-0.97	-1.01	-1.48	-1.49
z-statistic	-1.50	-1.59	-2.15	-2.22
p-value	(0.13)	(0.11)	(0.03)	(0.03)
% change in Net Income (2007_2008)	0.03	0.02	0.04	0.04
z-statistic	1.89	1.95	2.03	2.36
p-value	(0.06)	(0.05)	(0.04)	(0.02)
% change in Net Income (2008_2009)	-0.02	-0.02	-0.01	-0.01
z-statistic	-0.66	-0.80	-0.42	-0.52
p-value	(0.51)	(0.42)	(0.68)	(0.61)
Intercept	0.03	0.15	0.10	0.17
z-statistic	0.10	0.46	0.32	0.63
p-value	(0.92)	(0.64)	(0.75)	(0.53)
Wald Chi Square	17.75	12.76	22.95	32.88
Prob > Chi2	0.0069	0.0469	0.0008	0.001
Pseudo R2	0.0193	0.0264	0.0527	0.0546
N	123	123	123	123

Table 9: Logit Regression Results on Individual Commitment Variables

Coefficient estimates from logit regressions of the dummy variable of a reduction in emissions (assigned the value 1) from 2009 to 2011 on individual components of our commitment variable and a set of control variables. The control variables include change in emissions from 2008 to 2009, Total 2009 emissions, 3-year stock return from 2007 to 2009, the change in net income from 2007 to 2008 and the change in net income from 2008 to 2009. All regressions are corrected for outliers and have robust standard errors.

Board committee or other executive body responsible	1.003	1.005	0.998	0.966
z-statistic	1.88	1.89	1.87	1.80
p-value	(0.06)	(0.06)	(0.06)	(0.07)
Carbon reduction target in place or recently achieved	1.113	1.124	1.108	1.163
z-statistic	2.01	2.04	2.01	2.12
p-value	(0.04)	(0.04)	(0.05)	(0.03)
Emissions Verified (80%+)	-0.990	-0.983	-0.987	-0.941
z-statistic	-2.08	-2.07	-2.08	-1.99
p-value	(0.04)	(0.04)	(0.04)	(0.05)
Monetary Incentives -Board/Executive board	0.086			
z-statistic	0.18			
p-value	(0.86)			
Monetary Incentives -Management group	-0.234	-0.194		
z-statistic	-0.33	-0.30		
p-value	(0.74)	(0.76)		
Climate Information in Annual Report	-1.034	-1.006	-1.009	-0.968
z-statistic	-1.97	-2.02	-2.02	-2.00
p-value	(0.05)	(0.04)	(0.04)	(0.05)
Climate Information in CSR Report	0.707	0.706	0.684	
z-statistic	1.01	1.01	0.98	
p-value	(0.31)	(0.31)	(0.33)	
Intercept	-1.281	-1.280	-1.263	-0.702
z-statistic	-1.60	-1.59	-1.57	-1.13
p-value	(0.11)	(0.11)	(0.12)	(0.26)
N	123	123	123	123
Wald chi2(12)	16.51	16.51	16.31	15.41
Prob > chi2	0.17	0.12	0.09	0.08
Pseudo R2	0.11	0.11	0.11	0.10