# Does the 2010 SEC Climate Change Disclosure Guidance Change Firms' Corporate Social Responsibility Reporting?

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## ABSTRACT

There is an increasing public concern about climate change. As a response to such concern in the accounting field, in 2010, the Securities and Exchange Commission (SEC) announced the SEC 2010 Commission Guidance Regarding Disclosure Related to Climate Change (SEC 2010 Guidance), the first disclosure guidance issued by either the FASB or the SEC for U.S. listed companies. However, the publication provoked criticism and debate. Opponents point out that the SEC 2010 Guidance might have an adverse impact on corporate social responsibility (CSR) reporting "by registrants fearful of liability under securities laws for the contents of such disclosures" (Shorter, 2013). This study investigates (1) the relation between firms' climate change disclosure and corporate social responsibility (CSR) disclosures and (2) the impact of the passage of SEC 2010 Guidance on corporate social responsibility (CSR) reporting. The analysis results suggest that climate change disclosures are positively associated with corporate social responsibility concerns, strengths, and overall disclosure. In addition, we do not find empirical evidence that the SEC 2010 Guidance discourages firms' overall environmental and corporate social responsibility disclosures.

*JEL Classification: M40*

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# I.    INTRODUCTION

Climate change has emerged as a critical issue that is studied in relation to agriculture, terrestrial ecosystems, marine and fisheries, water, forestry, energy, tourism, economics, human health, and other areas. However, there is scarce research on the impact of climate change as it relates to accounting (e.g., climate change and firms' financial and environmental performance or climate change and corporate reporting), even though the generally accepted reality of climate change (i.e., ecological issues, economic concerns, and political agendas) has uncovered accounting issues that raises research questions for the academic accounting community.

Climate change threatens companies' operations, development, and profitability. A study by the consulting firm Mercer suggests that climate change could increase investment portfolio risk by 10% over the next two decades (Coburn, Donahue, and Jayanti, 2011). In addition, a global executive survey revealed that 50% of executives list environmental issues among the foremost risks that might hurt stockholder value (Bonini, Mendonca, and Rosenthal, 2008). Under these circumstances, stakeholders and investors encourage environmentally and socially responsible business practices, and are demanding sound environmental and social responsibility disclosure from corporations. For example, a group of investors including Ceres-led Investor Network on Climate Risk (INCR), BlackRock, British Columbia Investment Management Corporation, and the AFL-CIO Office of Investment has proposed a sustainability disclosure listing standards for U.S. and international stock exchanges in order to develop uniform sustainability reporting standards for all stock exchanges (EcoWatch, 2013).

Notably, on February 8, 2010, in response to the urgency of climate change and the increasing demand for climate change disclosure in the public interest, the SEC issued an interpretive release (Nos. 33–9106; 34–61469; FR–82) titled *Commission Guidance Regarding Disclosure Related to Climate Change* (hereafter, SEC 2010 Guidance). The SEC 2010 Guidance highlights public companies' obligations under securities laws and SEC regulations to disclose to investors material information concerning risks and opportunities related to climate change. Currently, this is the only U.S. accounting report standard that emphasizes climate change disclosure.

The SEC 2010 Guidance specifies that companies (registrants) should consider four main possible climate change impact criteria in determining whether the disclosure requirement has been triggered: (a)  the impact of newly developed or updated climate change legislation and regulation; (b) the impacts of international accords on climate change; (c) the indirect consequences of regulations or business trends resulting from climate change; and (d) the physical impact of climate change. Unless management determines that a material effect from the above climate change concerns is not reasonably likely, disclosure of climate change issues is required.

Unlike other mandatory disclosure rules, the SEC 2010 Guidance does not create any new laws or regulations. It simply serves as a reminder that climate risk disclosure is a matter of compliance with existing legal obligations, a corporate strategy, and a response to investors' increasing concerns (Coburn et al., 2011). How this guidance influences corporate disclosure is unclear. In addition, the SEC 2010 Guidance itself is controversial. The five-member SEC commission passed it with a split vote, three to two. Moreover, in 2012, congress attempted to repeal it (S. 1393 and H.R. 2603). The

opponents of this guidance are concerned about the discouraging effect of the Guidance on corporate social responsibility disclosure (Shorter, 2013).

Therefore, studies on corporate reporting behavior have become invaluable tools for policy makers and others in helping public interest groups evaluate its effectiveness and impact, and in further analyzing the costs and benefits of additional disclosure. Since the SEC 2010 Guidance effective date of February 8, 2010, only a few descriptive studies have investigated its effectiveness and impact (Coburn et al., 2011; Davis Polk and Wardwell, 2011; Karol, 2011; Shorter, 2013). The results of these studies are decidedly conflicting. An examination of the Coburn et al. (2011) study reveals that it relied only on 2010 SEC filings data submitted immediately after the guidance was issued. In order to draw a valid conclusion, data covering a longer period should be investigated. Furthermore, in these studies, no univariate or multivariate analyses was applied, and both financial and non-financial factors were not carefully investigated. In short, these studies suffer from limitations of the sample and the research methodologies.

This study incorporates data over a longer period (from 2007 to 2012) and applies multivariate analysis to answer the research questions on the effectiveness and impact of the SEC 2010 Guidance. Further, it compares not only climate change disclosure groups and nondisclosure groups but also sub-samples before and after February 8, 2010, the effective date of the SEC 2010 Guidance. Through a comparison of climate change disclosure and nondisclosure firms, this study extends the understanding of the impact of climate change disclosure.

This study contributes to the body of accounting research in several ways. First, it helps evaluate the impact of the 2010 SEC Guidance on corporate annual reporting. Three descriptive studies (Coburn et al., 2011; Davis Polk and Wardwell, 2011; Karol, 2011) have investigated the impact of the Guidance, but they report conflicting results. By incorporating financial data from COMPUSTAT and comparing data before and after the February 8, 2010 effective date, this study adopts a longer time span for the sample. The results provide policy makers important insights into standard setters' evaluations of the newly-passed policy. Second, this study focuses on climate change disclosure, a newly emerging area in firm reporting. We examine the relation between climate change disclosure and corporate social responsibility disclosure. The results provide empirical evidence as to firms' behaviors in disclosing climate-change-related information. The findings add to the research on corporate disclosure. In addition, although multiple theoretical frameworks have been developed in the corporate disclosure literature, this study employs stakeholder theory and tests the validity of this framework in the scenario of climate change reporting.

The rest of this paper is organized in the following manner: Section II provides the literature review and hypothesis development; Section III introduces the research methodology; Section IV provides the data sources, sample, and data analysis; Section V shows robust test results of the hypotheses; and Section VI concludes the paper.

## II.     LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

### A.     Motives for Environmental Disclosure

Rather than create new laws or amend prior rules for firms' SEC filings, the SEC 2010 Guidance highlights legislative liabilities from existing laws when firms fail to disclose climate-change-related information. Management makes the final call on whether a firm discloses climate change information based on a judgment of its likelihood and materiality and on a cost-benefit analysis. Thus, the theoretical frameworks developed in voluntary disclosure of CSR (including economic, social, and environmental aspects) apply to the study of climate change disclosure. Climate changes are widely recognized as environmental, and therefore a corporate social responsibility issue. Thus, we think it is appropriate to apply theoretical frameworks developed in voluntary CSR or environmental disclosure to study climate change disclosure and its relation to CSR disclosure.

In particular, for studies on environmental disclosure, the generally accepted categorization method is to divide the theoretical frameworks into two main streams (Araya, 2006; Cormier and Magnan, 1999; Reverte, 2009). The first stream (also referred to as the positive accounting perspective) was developed from the classical economic domain, including agency theory (Freidman, 1962, 1970), signaling theory (Bini, Giunta, and Dainelli, 2011; Spence, 1973; Yekini and Jallow, 2012), and the cost-benefit framework (Cormier and Magnan, 1999 and 2003). Rather than starting from fundamental economics, the second stream of theory views CSR/environmental disclosure as the outcome of social contracts between organizations and societal groups. It is considered a systems-oriented theory, including legitimacy theory (Deegan, 2002; Gray, Kouhy, and Lavers, 1995; Patten, 1991), political economy theory (Cooper and Sherer, 1984; Tinker, Neimark, and Lehman, 1991), and stakeholder theory (Freeman, 1984; Mitchell, Agle, and Wood, 1997; Roberts, 1992). According to Gray et al. (1995), legitimacy theory and stakeholder theory were both developed from and based on the political economy theory framework.

Other classifications of CSR and environmental disclosure theory exist. For example, Finch (2005) classifies the motives for CSR as the agency view (Freidman, 1962, 1970), the corporate social performance view (Carroll 1979; Preston, 1978), the resource-based view (Russo and Fouts, 1997), the supply and demand view (McWilliams and Siegel, 2001), and the stakeholder view (Freeman, 1984).

The corporate social performance view developed out of research by Preston (1978) and Carroll (1979). Carroll (1979) divides CSR into four types: economic, legal, ethical, and discretionary. Among these four responsibilities, economic and legal are socially required, ethical is socially expected, and discretionary is socially desired (Jamali, 2008). Similar to the legitimacy view, the corporate social performance view emphasizes the integrated corporate philosophy of social responsibility and predicts financial success for socially responsible firms. By doing "good", these firms do "well." Pava and Krausz (1996) confirm the positive association between CSR and firms' financial performance. They conclude that "a conscious pursuit of corporate social responsibility" (p. 321) results in financial success.

The resource-based view was first introduced in industrial organization research (Bain, 1959). From a resource-based perspective, the corporation is treated as a portfolio of resources. It is critical for a corporation to become a valuable "resource" to the stakeholders in order for business survival and success. Russo and Fouts (1997) adopt a resource-based framework to explain the positive association between corporate environmental and economic performance through enhanced competitive advantage.

McWilliams and Siegel (2001) developed the supply and demand view to explain CSR. Beginning with an analysis of the supply-side of resource-based theory, McWilliams and Siegel use the supply and demand theory framework to suggest that there is an optimizing level of CSR investment that maximizes operation profit and satisfies stakeholders' expectations of CSR. Importantly, as Reverte (2009) suggests, these distinct views "should not be seen as competing perspectives, but rather as alternative ways of comprehending and studying organizational decisions to disclose different kinds of information to the public" (p. 354).

### B.    Hypothesis Development: Impact of the SEC 2010 Guidance on Corporate Social Responsibility Disclosure

Many researchers favor the stakeholder theory of the motivation for corporate social responsibility disclosure because its theoretical framework takes into account the different needs of various stakeholder groups. Considering stakeholders such as the SEC, present or potential shareholders who are sensitive to environmental issues or corporate social responsibility, we adopt the stakeholder theory to explain firms' corporate social responsibility disclosure. Under stakeholder theory, the continuous operation of the firm depends on an optimal relationship with its various stakeholder groups (Reverte, 2009). The firm responds to the demands of key stakeholder groups and modifies the expectations of stakeholders through strategic actions.

Wartick and Cochrane (1985) outlined four main strategies for responding to stakeholders' expectations: reactive, defensive, accommodative, and proactive. Defensive and accommodative strategies are the most prevalent in studies of voluntary disclosure. In the defensive and compliance strategies, companies with poor corporate social responsibility performance attempt to justify their problems through voluntary disclosure. Firms who mention an adverse impact from climate change in their annual reports (often included in the Risk Factor section in the 10-K) frequently discuss the same issue as a concern in their CSR reports. Thus, a positive association exists between a firm's climate change disclosure and corporate social responsibility concerns. The corresponding hypothesis follows:

H1a:  Climate change disclosure is positively associated with a firm's corporate social responsibility concerns.

In the accommodative reporting strategy, companies with good corporate social responsibility performance records differentiate themselves from those with poor corporate social responsibility performance through voluntary corporate social responsibility disclosure. Firms taking measures to react to climate change (such as adopting clean energy or decreasing green gas emissions) are most likely to mention their climate change response in their CSR reports as well. Thus, it is expected that a positive correlation exists between firms' climate change disclosures and corporate social responsibility strengths. The hypothesis for the relationship between corporate social responsibility strengths and climate change disclosure states as follows:

H1b:  Climate change disclosure is positively associated with a firm's corporate social responsibility strengths.

Based on stakeholder theory, firms engaged with climate change disclosure (either due to climate change concerns or preventive measures) tend to increase CSR disclosure. Therefore, we propose the following hypothesis on the relation between corporate social responsibility disclosure and climate change disclosure:

H1c:  Climate change disclosure is positively associated with a firm's corporate social responsibility disclosure.

There is no clear indication that stakeholders' expectations for CSR change significantly because of the passage of the SEC 2010 Guidance; therefore, according to stakeholder theory, CSR reporting behavior should not change significantly after its effective date, an expectation that is controversial. The concern is that the SEC 2010 Guidance deters CSR reporting. We propose that there is no significant change in CSR before and after the SEC 2010 Guidance. This study tests the following null hypothesis:

H2:   Climate change disclosure firms are not less likely to report CSR after the SEC 2010 Guidance effective date.

### III.        RESEARCH METHODOLOGY

We conduct three tests to investigate the association between firms' climate change disclosure and CSR disclosure. The models are shown below. Our complete samples include all observations for companies listed in the SEC EDGAR database, merging with the COMPUSTAT and KLD STATS databases for other necessary variables for years 2007-2012.

$$CSR\_CON_{i,t} = \alpha_0 + \beta_0 CCD_{i,t} + \beta_1 SIZE_{i,t} + \beta_2 ENV_{SEN_{i,t}} + \beta_3 ROE_{i,t} + \beta_4 LEV_{i,t}$$
$$+ \beta_5 MTB_{i,t} + \sum j\,\beta_{6j} YEAR_{i,t,j} + \sum l\beta_{7l}\, IND_{i,t,l+\varepsilon_{i,t}} \qquad (1)$$

$$CSR\_STR_{i,t} = \alpha_0 + \beta_0 CCD_{i,t} + \beta_1 SIZE_{i,t} + \beta_2 ENV_{SEN_{i,t}} + \beta_3 ROE_{i,t} + \beta_4 LEV_{i,t}$$
$$+ \beta_5 MTB_{i,t} + \sum j\,\beta_{6j} YEAR_{i,t,j} + \sum l\beta_{7l}\, IND_{i,t,l+\varepsilon_{i,t}} \qquad (2)$$

$$CSR\_TOTAL_{i,t} = \alpha_0 + \beta_0 CCD_{i,t} + \beta_1 SIZE_{i,t} + \beta_2 ENV_{SEN_{i,t}} + \beta_3 ROE_{i,t} + \beta_4 LEV_{i,t}$$
$$+ \beta_5 MTB_{i,t} + \sum j\,\beta_{6j} YEAR_{i,t,j} + \sum l\beta_{7l}\, IND_{i,t,l+\varepsilon_{i,t}} \qquad (3)$$

where CSR_STR$_{i,t}$  equals the gross index number of CSR strength for firm i in the year of t, CSR_CON$_{i,t}$ the gross index number of CSR concern for firm i in the year of t, and CSR_TOTAL $_{i,t}$ the total of CSR_STR $_{i,t}$ and CSR_CON$_{i,t}$. The KLD STATS database is needed to generate the dependent variables CSR strength (CSR_STR), CSR concern (CSR_CON) and total CSR disclosure score (CSR_TOTAL). Based on a firm's CSR disclosure, the KLD STATS database provides its performance score on the environment, on corporate governance, on the community, on employee relations, on diversity, on human rights, and on aspects of its products. In prior literature, KLD CSR scores are often used to proxy firms' CSR performance. They can also serve as proxies of the firms' disclosure on CSR performance (Cho et al., 2013). The total strength and concern indexes are utilized to compute the CSR strength (CSR_STR) and CSR

concern (CSR_CON) variables. We scaled these two variables with the total number of items included in the same category (environment, corporate governance, community, employee relations, diversity, human rights, and product aspects) following earlier literature. This measure helps mitigate the impact from the index construction change in the KLD STATS database. The overall CSR score (CSR_TOTAL) is calculated as the sum of CSR_STR and CSR_CON as in Cho et al. (2013). The independent variables here are CCD, which is a (0, 1) dichotomous variable, created to denote the firms' climate change disclosure choice. For those firms that disclose climate change issues in their 10-K filed with the SEC, CCD is equal to 1. Otherwise, CCD is equal to 0. If climate change disclosure is positively associated with a firm's corporate social responsibility concerns, strengths, and total disclosure, we expect the coefficients of CCD in models (1), (2) and (3) to be positive and statistically significant.

Various firm and industry characteristics are believed to influence the costs and benefits of nonfinancial disclosure (e.g., environmental and CSR disclosure) and therefore affect corporate reporting strategy: firm size, environmental sensitivity, financial performance, and leverage ratio (Cormier and Magnan, 1999, 2003; Gray et al., 1995; Hackston and Milne, 1996; Reverte, 2009). Firm size (SIZE) is measured by the log of revenues (LOGREV), following Dawkins and Fraas (2011). Return on equity (ROE) is employed as a proxy for firms' financial performance, measured by income before extraordinary items divided by total equity (Bansal and Clelland, 2004; Dawkins and Fraas, 2011). LEV, a leverage proxy, is defined as total liabilities divided by total stockholders' equity. ENV_SEN is constructed to capture the industry effect. The industries are divided into two categories: environmentally sensitive and non-environmentally sensitive industries (Ahmad, Hassan, and Mohammad, 2003; Reverte, 2009). According to Reverte's classification, environmentally sensitive industries, which include mining, oil and gas; chemicals; forestry and paper; steel and other metals; electricity; gas distribution; and water, can be categorized as chemical (2-digit SIC 28), oil and gas (2-digit SIC 13), water (3-digit SIC 208), and steel and metals (2-digit SIC 33/34). The industries that do not fall in the above list are identified as non-environmentally sensitive. Financial institutions and firms in highly regulated industries (SIC codes 6000-6999, 4800-4999, and 4000-4490) were deleted according to previous literature.   ENV_SEN is set to one for environmentally sensitive industries and to zero otherwise. This study also controls for the market to book ratio (MTB) because previous accounting literature has suggested that MTB affects accounting choice.

In order to test whether the SEC 2010 guidance deters corporate voluntary reporting, the following models are used for all observations that disclose climate change information in the 10-K SEC filings (CCD = 1), merging with COMPUSTAT and KLD for years 2007-2012:

$$CSR\_TOTAL_{i,t} = \alpha_0 + \beta_0 CCDAGA_{i,t} + \beta_1 SIZE_{i,t} + \beta_2 ENV_{SEN_{i,t}} + \beta_3 ROE_{i,t} + \beta_4 LEV_{i,t}$$
$$+\beta_5 MTB_{i,t} + \sum j\, \beta_{6j} YEAR_{i,t,j} + \sum l\beta_{7l}\, IND_{i,t,l+\varepsilon_{i,t}} \qquad (4)$$

The dependent variable in model (4) is CSR_TOTAL. The independent variable is climate change disclosure after the SEC Guidance is announced (CCDAGA), CCDAGA = 1 if the firm provides climate change information in its annual financial report after February 8, 2010, and 0 otherwise. If the SEC 2010 Guidance has a

negative impact on environmental disclosure and CSR reporting, the coefficients of CSR_TOTAL will be negative and significant.

## IV.        SAMPLE AND DATA ANALYSIS

### A.     Sample and Data Description

In this study, the LexisNexis search engine is first used to find the firms that disclose climate change information in their 10-K SEC filings from 2007 to 2012, using the key word "Climate Change" within "10-K" filing under the advance search function. The LexisNexis search provides 5,010 firm-year observations with a valid Central Index Key (CIK) given by SEC for further data processing. The data cover 2,122 reporting entities.

In order to obtain sufficient financial data to construct the necessary variables for the analysis, this study merges the climate change disclosure company list with the COMPUSTAT data set by CIK and fiscal year. After merging with COMPUSAT for years 2007-2012, the reporting sample contains 3,875 firm-year observations from 1,453 firms that disclose climate change information in their 10-K forms. Among these 3,875 observations, 78% are filed on dates after February 8, 2010 (the SEC Climate Change Disclosure Guidance effective date). This statistic implies that the SEC 2010 Guidance does encourage corporate climate change disclosure.

The data set for further analysis includes only the firms with all available variables for calculating the independent and control variables (e.g., SIZE, ROE, LEV, ENV_SEN, and MTB). Then the data set is merged with the KLD STATS Environmental, Social, and Governance Index, which can be used to compute CSR_CON, CSR_STR, and CSR_TOTAL. While merging the COMPUSTAT and KLD databases, we retained the non-reporting firms to serve as a control sample. The final dataset contains 10,073 observations, including 1,496 climate change reporting samples from 609 firms. Among these 10,073 firm-year observations, 6,991 are from non-reporting firms in the sample period (the never-reporting firm sample). The whole data set (the full sample) is used to test the hypotheses.

The descriptive statistics for the main variables in the regression are shown in Table 1, Panel A. The descriptive statistics for the reporting sample are in the left panel and the never-reporting sample in the right panel. The results suggest that the size of climate change disclosure firms (with a mean of 7.4424) is larger than that of the never-reporting firms (with a mean of 6.3441). The climate change disclosure firms are more likely to be in an environmentally sensitive industry (with a mean ENV_SEN of 0.3656) than control sample firms (with a mean ENV_SEN of 0.1688). Further, the climate change disclosure reporting firms are more profitable and have higher leverage ratios, as shown in Table 1, Panel B. In addition, the mean and median of CCDAGA reveals an increasing trend for climate change reporting after the SEC 2010 Guidance. Climate change disclosure firms also display characteristics of high CSR concerns (0.3823 and 0.2538, concerns score for the reporting sample and control sample, respectively), high CSR strength (0.3206 and 0.1635, for the reporting sample and control sample, respectively) and high CSR total score (0.7028 and 0.4163, for the reporting sample and control sample, respectively).

**Table 1**
Descriptive and correlation analysis of sample

Panel A: Descriptive statistics of reporting sample and control sample

| | | Reporting sample | | | Control sample(Never-reporting sample) | | | | Non-reporting sample | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Variables | N | Mean | Std. Dev | Median | N | Mean | Std. Dev | Median | N | Mean | Std. Dev | Median |
| CSR_CON | 1496 | 0.3823 | 0.3674 | 0.2857 | 6991 | 0.2528 | 0.2219 | 0.2857 | 8577 | 0.2723 | 0.2394 | 0.2857 |
| CSR_STR | 1496 | 0.3206 | 0.5178 | 0.1429 | 6991 | 0.1635 | 0.3148 | 0 | 8577 | 0.1812 | 0.3380 | 0 |
| CSR_TOTAL | 1496 | 0.7028 | 0.7669 | 0.4286 | 6991 | 0.4163 | 0.4305 | 0.2857 | 8577 | 0.4534 | 0.4678 | 0.2857 |
| CCDAGA | 1496 | 0.8362 | 0.3702 | 1 | 6991 | 0.4975 | 0.5000 | 0 | 8577 | 0.4722 | 0.4993 | 0 |
| SIZE | 1496 | 7.4424 | 1.8543 | 7.3864 | 6991 | 6.3441 | 1.8011 | 6.4021 | 8577 | 6.5331 | 1.8336 | 6.5705 |
| ENV_SEN | 1496 | 0.3656 | 0.4818 | 0 | 6991 | 0.1688 | 0.3746 | 0 | 8577 | 0.1954 | 0.3965 | 0 |
| ROE | 1496 | 0.0046 | 0.2118 | 0.0504 | 6991 | -0.0284 | 0.2471 | 0.0379 | 8577 | -0.0274 | 0.2562 | 0.0411 |
| LEV | 1496 | 0.2265 | 0.1782 | 0.2104 | 6991 | 0.1594 | 0.1970 | 0.0880 | 8577 | 0.1695 | 0.1949 | 0.1134 |
| MTB | 1496 | 1.6129 | 0.8472 | 1.3885 | 6991 | 2.0940 | 1.4233 | 1.6050 | 8577 | 2.0099 | 1.3567 | 1.5482 |

Panel B: Pearson correlation coefficient between variables from full sample in analysis

|              | (2)   | (3)   | (4)    | (5)   | (6)    | (7)    | (8)    | (9)    |
|--------------|-------|-------|--------|-------|--------|--------|--------|--------|
| (1) CSR_CON  | 0.361 | 0.754 | -0.021 | 0.406 | 0.061  | 0.022  | 0.089  | -0.099 |
| (2) CSR_STR  | 1     | 0.885 | 0.000  | 0.511 | 0.013  | 0.066  | 0.039  | -0.005 |
| (3) CSR_TOTAL|       | 1     | -0.010 | 0.563 | 0.039  | 0.057  | 0.072  | -0.053 |
| (4) CCDAGA   |       |       | 1      | 0.020 | 0.032  | 0.112  | 0.010  | 0.011  |
| (5) SIZE     |       |       |        | 1     | -0.188 | 0.177  | 0.224  | -0.300 |
| (6) ENV_SEN  |       |       |        |       | 1      | -0.054 | 0.081  | 0.127  |
| (7) ROE      |       |       |        |       |        | 1      | -0.140 | 0.080  |
| (8) LEV      |       |       |        |       |        |        | 1      | -0.182 |
| (9) MTB      |       |       |        |       |        |        |        | 1      |

The Pearson correlation table is presented in Table 1, Panel B. The correlation coefficients do not show severe multicollinearity among the independent variables: the largest correlation exists between SIZE and MTB, with a coefficient of -0.2998. This result suggests that multicollinearity is not a big concern for the analysis.

### B.    The Relation between CSR and Climate Change Disclosure (H1a-H1c)

### 1.    Univariate Analysis

To investigate the association between climate change disclosure in firms' SEC 10-K filing and corporate CSR disclosure, this study first contrasts the climate-change reporting sample (1,496) and non-reporting sample (8,577). The results are presented in Table 2.

Both the mean and median of the climate change disclosure sample are larger than those of the non-disclosure sample. The t-test and Wilcoxon rank-sum test are both significant and p-values are less than 0.01. These results suggest that the reporting sample is associated with higher CSR concern, strength, and overall disclosure scores. In an untabulated sensitivity test, we also compare the reporting sample (1,496) with the control sample (6,991 only from never-reporting firms) and perform the t-test and Wilcoxon test. The results are consistent.

### 2.    Regression Analysis

Hypotheses H1a–H1c are tested with models (1) - (3) in Section III. The dependent variables are CSR_CON, CSR_STR and CSR_TOTAL and the independent variable is CCD. We predict that the coefficients of CCD in the models are positive and significant. During the data analysis, the sample is clustered by firm to eliminate uncontrolled firm-specific factors. The regression results are listed in Table 2.

As the results in Table 3 show, the coefficient of CCD in model (1) is 0.0350, which is statistically significant at the 0.01 level, supporting hypothesis H1a: climate change disclosure firms tend to report more CSR concerns. The coefficient of CCD in model (2) is 0.0563, which is significant at the 0.001 level. These findings confirm hypothesis H1b: climate change disclosure firms tend to report more CSR strength as well. From the regression analysis based on model (3), we observe positive and significant coefficients of CCD on CSR_TOTAL (at the 0.001 level), implying that firms with climate change disclosure have a high CSR disclosure score. This result supports H1c.

**Table 2**

Difference test on mean (t-test) and median (Wilcoxon test) / descriptive analysis

| Model | (1) | | (2) | | (3) | |
|---|---|---|---|---|---|---|
| Dependent Variable | CSR_CON | | CSR_STR | | CSR_TOTAL | |
| | Coefficient | Pr | Coefficient | Pr | Coefficient | Pr |
| Intercept | 0.341 | 0.380 | -0.163 | 0.812 | 0.178 | 0.868 |
| CCD | 0.035 | 0.004 | 0.056 | 0.001 | 0.091 | 0.000 |
| SIZE | 0.062 | <.0001 | 0.127 | <.0001 | 0.189 | <.0001 |
| ENV_SEN | 0.159 | 0.110 | 0.152 | 0.343 | 0.311 | 0.1891 |
| ROE | -0.049 | <.0001 | -0.086 | <.0001 | -0.134 | <.0001 |
| LEV | -0.060 | 0.002 | -0.156 | <.0001 | -0.216 | <.0001 |
| MTB | 0.006 | 0.026 | 0.039 | <.0001 | 0.045 | <.0001 |
| Firm Cluster | | Yes | | Yes | | Yes |
| Year Fixed Effect | | Yes | | Yes | | Yes |
| Industry Fixed Effect | | Yes | | Yes | | Yes |
| Adj. R2 | | 0.361 | | 0.351 | | 0.447 |
| N | | 10,073 | | 10,073 | | 10,073 |

**Table 3**

Regression results based on models (1) - (3)

| | Climate Change Reporting firm-year Obs. (1,496) | | Climate Change Non-Reporting Firm-Year Obs. (8,577) | | Difference Test | |
|---|---|---|---|---|---|---|
| Variable | Mean | Median | Mean | Median | t-test p-value | Wilcoxon p-value |
| CSR_CON | 0.382 | 0.286 | 0.272 | 0.286 | <0.0001 | <0.0001 |
| CSR_STR | 0.321 | 0.143 | 0.181 | 0 | <0.0001 | <0.0001 |
| CSR_TOTAL | 0.703 | 0.429 | 0.453 | 0.286 | <0.0001 | <0.0001 |

## C.    The Impact of the SEC 2010 Guidance on Corporate Social Responsibility Disclosure

According to its opponents, the SEC 2010 Guidance will deter overall CSR disclosure due to increasing liability concerns from the SEC and the public. This logic becomes one of the primary reasons opponents reject the SEC 2010 Guidance. If this argument is correct, the empirical results based on model (4) should reject H2: the coefficient of CCDAGA should be negative and statistically significant.

Table 4 summarizes the regression results from model (4). We run a regression analysis on the full sample first. We also test the impact of SEC 2010 Guidance for climate change disclosure firms only. According to the results, the coefficients of CCDAGA in model (4) are not significant, as we predict in H2. Thus, the empirical evidence from this study does not conclude that the passage of climate change disclosure guidance in 2010 has a significant adverse effect on firms' CSR reporting, as the opponents of the SEC 2010 Guidance feared.

**Table 4**
Regression results on the impact of SEC 2010 guidance on firm's CSR disclosure

| Sample | Full Sample | | Climate Change Disclosure Firms | |
|---|---|---|---|---|
| Dependent Variable: | CSR_TOTAL | | CSR_TOTAL | |
| | Coefficient | Pr | Coefficient | Pr |
| Intercept | 0.1301 | 0.9032 | -1.8657 | <.0001 |
| CCDAGA | 0.0297 | 0.3355 | 0.0384 | 0.7394 |
| SIZE | 0.1916 | <.0001 | 0.2948 | <.0001 |
| ENV_SEN | 0.3211 | 0.1773 | 0.4380 | 0.1692 |
| ROE | -0.1318 | <.0001 | -0.2011 | 0.0095 |
| LEV | -0.2126 | <.0001 | -0.4067 | 0.0002 |
| MTB | 0.0440 | <.0001 | 0.1252 | <.0001 |
| Firm Cluster | | Yes | | Yes |
| Year Fixed Effect | | Yes | | Yes |
| Industry Fixed Effect | | Yes | | Yes |
| Adj. R2 | | 0.4437 | | 0.5613 |
| N | | 10,073 | | 1,496 |

## V.          ADDITIONAL ANALYSIS

In addition to the main tests mentioned in Section IV, we performed a paired sample design to address selection bias concerns. In the paired sample sensitivity test, this study identifies a group of matched control firms not disclosing climate change information during the 2007-2012 timeframe. The process involves matching each sample firm with a control firm based on its two-digit SIC code, fiscal year, and total assets each year to control for the effect of firm size. It sets the matching priority based on SIC code and then minimizes the differences in total assets between the climate change disclosure firms and the control firms by selecting different non-climate-change disclosure firms. Only firms having properly matched control firms are left in the final (paired) sample. The final paired sample consists of 1,099 reporting firm-year observations (from 503 distinct firms) and their one-to-one matched control observations (from 570 distinct firms). A propensity score matching method was also conducted as an alternative measure. The sample is smaller but the results are identical.

### A.     Paired Sample Test on H1a-H1c

According to H1a, H1b, and H1c, climate change disclosure is positively associated with firm CSR concerns, strengths, and overall disclosure scores. The empirical test results based on the full sample confirm H1a -H1c (the results shown in Section IV). Here, a matched sample is used to repeat the analysis. The regression outputs based mainly on models (1)-(3) are provided in Table 5. Similar to the full sample analysis, the paired sample regression shows both significant and positive coefficients of CCD when the dependent variable is CSR_CON, CSR_STR, and CSR_TOTAL respectively, as seen in Table 5.

**Table 5**
Paired sample test of the association of climate change disclosure and firm CSR
concerns, strengths and overall disclosure following models (1)-(3)

| Model | (1) | | (2) | | (3) | |
|---|---|---|---|---|---|---|
| Dependent Variable | CSR_CON | | CSR_STR | | CSR_TOTAL | |
| | Coefficient | Pr | Coefficient | Pr | Coefficient | Pr |
| Intercept | -0.453 | <.0001 | -1.306 | <.0001 | -1.759 | <.0001 |
| CCD | 0.033 | 0.036 | 0.046 | 0.049 | 0.079 | 0.012 |
| SIZE | 0.083 | <.0001 | 0.191 | <.0001 | 0.274 | <.0001 |
| ENV_SEN | 0.121 | 0.323 | 0.103 | 0.525 | 0.224 | 0.364 |
| ROE | -0.080 | 0.046 | -0.207 | 0.000 | -0.288 | 0.001 |
| LEV | -0.091 | 0.020 | -0.253 | <.0001 | -0.344 | <.0001 |
| MTB | 0.006 | 0.475 | 0.080 | <.0001 | 0.086 | <.0001 |
| Firm Cluster | | Yes | | Yes | | Yes |
| Year Fixed Effect | | Yes | | Yes | | Yes |
| Industry Fixed Effect | | Yes | | Yes | | Yes |
| Adj. R2 | | 0.414 | | 0.456 | | 0.535 |
| N | | 2,198 | | 2,198 | | 2,198 |

**B.    Paired Sample Test on H2**

To confirm the conclusion from the test on H2, we re-run model (4) on a matched
sample. The regression results are presented in Table 6.
     Since the coefficients of CCDAGA are not significant, the sensitivity test here
points to the same conclusion as that in Section IV C: there is no empirical evidence to
show that the SEC 2010 Guidance discourages firms' environmental and CSR
reporting.

**Table 6**
Paired sample test on the impact of the SEC 2010 guidance on CSR reporting

| Sample | Full Sample | | Climate Change Disclosure firm | |
|---|---|---|---|---|
| Dependent Variable: | CSR_TOTAL | | CSR_TOTAL | |
| | Coefficient | Pr | Coefficient | Pr |
| Intercept | -1.775 | <.0001 | -2.141 | <.0001 |
| CCDAGA | 0.051 | 0.295 | 0.015 | 0.914 |
| SIZE | 0.276 | <.0001 | 0.321 | <.0001 |
| ENV_SEN | 0.240 | 0.335 | 0.402 | 0.209 |
| ROE | -0.283 | 0.001 | -0.371 | 0.011 |
| LEV | -0.342 | <.0001 | -0.419 | 0.001 |
| MTB | 0.082 | <.0001 | 0.149 | <.0001 |
| Firm Cluster | | Yes | | Yes |
| Year Fixed Effect | | Yes | | Yes |
| Industry Fixed Effect | | Yes | | Yes |
| Adj. R2 | | 0.533 | | 0.581 |
| N | | 2,198 | | 1,099 |

## VI.        CONCLUSION

Climate change impacts our society and ecosystems in a broad variety of ways. Because of the significant differences in the causes and effects of other environmental and corporate social responsibility issues, climate change deserves special attention in accounting research. Before 2010, there were no specific guidelines from the FASB or the SEC on climate change issues for U.S. companies. A significant milestone was reached in the U.S. when the SEC announced its Commission Guidance Regarding Disclosure Related to Climate Change (Release Nos. 33-9106; 34-61469; FR-82) to address climate change concerns, on February 8, 2010. This study attempts to answer the following question: What is the impact of the SEC 2010 Guidance on firms' CSR reporting?

This study investigates the research questions by comparing climate change disclosure firms and non-disclosure firms between the period before and after the effective date of the SEC 2010 Guidance. Because its intrinsic complexity and inner correlation raise concerns about an endogenous selection bias, this study also uses a paired samples method to mitigate such a concern.

As stakeholder theory predicts, our results confirm that climate change disclosure is positively associated with a firm's CSR strengths/concerns and therefore overall disclosure. Further, this study suggests that the SEC 2010 Guidance does not have an adverse effect on firms' overall CSR disclosures, as opponents of the SEC 2010 Guidance claim.

By incorporating financial data from COMPUSTAT and CSR indexes from KLD STATS covering the period from 2007 to 2012, this work provides empirical evidence for various capital market participants, such as the SEC, to justify the requirement of climate change disclosure and evaluate the impact of the 2010 SEC Guidance on firms' 10-K reporting. In addition, this study contributes to accounting literature by identifying an underlying association between corporate climate change disclosure and CSR disclosure.

### ENDNOTES

1.   S. 1393 and H.R. 2603: See
     http://www.congress.gov/bill/112th-congress/house-bill/2603/all-info
2.   Coburn et al., 2011; Davis Polk and Wardwell, 2011; Karol, 2011; Shorter, 2013: In addition, only 2010 data are included in their investigations.

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