When Does Institutional Investor Activism Pay?:
The Carbon Disclosure Project

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Abstract

This paper presents the first empirical test of the effect of institutional investor activism towards climate change. Specifically, we study whether and when FT 500 companies’ participation in the Carbon Disclosure Project (CDP), a consortium of institutional investors with $41 trillion in assets, creates shareholder value using event study methodology. By making use of Russia’s ratification of the Kyoto Protocol, which caused the Protocol to go into effect, we find that the companies’ CDP participation paid when expected regulatory cost of climate change rose. We conservatively estimate the total value created at about $2.7 billion, about 27% of the size of the carbon market in 2005. Our findings suggest that institutional investor activism towards climate change can increase shareholder value when the external business environment becomes more climate conscious.

Keywords: institutional investor activism, Kyoto Protocol, Carbon Disclosure Project

JEL No.

D21 – Firm Behavior;
F53 – International Agreements and Observance;
G14 – Information and Market Efficiency; Event Studies
Q54 – Climate; Natural Disasters; Global Warming

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1. Introduction

Since 2002 the Carbon Disclosure Project (CDP), a consortium of over 300 institutional investors with $41 trillion in assets from Barclays Group, California Public Employees’ Retirement System (CalPERS), Goldman Sachs, Merrill Lynch, Morgan Stanley, UBS, among others, has asked the world’s 500 largest companies every year to disclose their greenhouse gas (GHG) emissions, risks, opportunities, and management strategies. Some companies participate in the CDP, while others do not. The CDP publicly discloses company responses on its website, presumably in the hope that publicized information shall affect investment behavior.

Despite the seeming significance of the CDP, we wonder whether CDP disclosure is material. The CDP seems a little different from typical institutional investor activism. Institutional investor activism often interferes with management decisions with the intention of increasing shareholder value. For example, CalPERS annually announces the so-called focus list, a list of poorly performing firms, aiming to increase their stock performance and corporate governance through active engagement with management. Majority of prior studies find the “CalPERS effect,” positive abnormal stock returns of firms included in the focus list around the day of its announcement. Positive shocks suggest that these types of activism create shareholder value. The CDP, however, does not actively interfere with management decisions. Instead, it monitors environmental performance. Regardless of whether it is due to the nature of the problem the CDP is addressing, i.e., environmental performance, which does not seem to be directly related to financial performance, a natural question is what good the CDP does with its monitoring function. Does firms’ CDP participation affect shareholder value?

We empirically examine the circumstances under which the CDP affects shareholder value. For this we pose a series of empirical research questions. We first ask whether firms’ CDP participation matters. Then, we ask a couple of situation-specific

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1 We ask the question of when instead of whether institutional investor activism pays. This is based on our notion that the latter question may be too broad. This is especially so for environmental activism. One of the important questions the empirical literature on corporate environmental strategy seeks to answer is whether going green pays or not. There have been numerous studies trying to link firms’ environmental and financial performance, but the evidence is mixed (Margolis and Walsh, 2003). Perhaps one of the reasons why it is difficult to establish a more definite link is that the question is too broad. Instead of asking whether going green pays or not, perhaps we should ask when going green pays. The same seems to apply to institutional investor activism.
questions by making use of Russia’s ratification of the Kyoto Protocol on October 22, 2004, which caused the Protocol to go into effect in all the nations that had ratified it. We ask whether upon Russia’s ratification, CDP participation affected stock prices specifically in countries that had already ratified the Protocol or in countries that had not yet ratified it. We propose that CDP participants experienced no abnormal returns in countries that had ratified the Protocol because firms in these countries had already taken measures in anticipation of Kyoto. On the other hand, we posit that CDP participation paid in countries that had not yet ratified Kyoto, especially for firms in greenhouse emitting industries likely to be regulated. Russia’s ratification seemed to have increased the pressure on countries that had not yet ratified Kyoto to take some action on climate change, and accordingly expected regulatory cost of climate change rose in these countries. Under this circumstance, CDP participants may be viewed as better prepared for the exogenous shock.

The paper is organized as follows. Section 2 describes the CDP. Section 3 poses research questions and surveys relevant literature. Section 4 describes methods, and section 5 describes our data. Section 6 reports results and section 7 concludes.

2. Carbon Disclosure Project

Investors have expressed concerns over financial risks companies might be exposed to due to their greenhouse gas emissions. Two types of potential financial risks are present. One is the direct effects of climate change such as changes in weather patterns and rising sea levels. The other is the effect of regulation such as clean-up and liability costs. In 2002 institutional investors started to address the concerns collectively via the CDP. Every year the CDP asks the world’s 500 largest companies (the FT Global 500) to disclose their greenhouse gas emissions, risks, opportunities, and management strategies by answering the CDP questionnaire. Some companies respond to the CDP request, while others do not.

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2 The Wall Street Journal, “Moving the Market: Investors Urge Large Companies to Disclose Data on Emissions,” 02/02/05.
3 The information requests have historically been sent to the FT Global 500, but in 2006 the CDP expanded and in 2007 the information request was sent to 2,400 companies globally. www.cdproject.net.
4 The CDP questionnaire itself has evolved since 2002. The CDP4 questionnaire includes the followings: 1) General: How does climate change represent commercial risks and/or opportunities for your company? 2)
Company responses to the CDP questionnaire are made publicly available on the CDP website. The results from the first cycle of the project (CDP1), which was endorsed by 35 institutional investors with $4.5 trillion in assets, were made available on February 17th 2003. 71% of the FT Global 500 companies responded and 45% answered the questionnaire in full. Since then, both the number of institutional investors who endorsed the CDP project and the response rate steadily increased over time.\(^5\) By the fourth cycle of the project (CDP4), the number of endorsers increased to 225 institutional investors with more than $31 trillion in assets. The CDP4 results were made available on September 18th 2006. 91% of the FT Global 500 companies responded and 72% answered the questionnaire in full.

This paper makes use of the company responses to the first four cycles of the CDP, CDP1 through CDP4, to investigate our question, under what circumstances firms’ participation in CDP, a positive response to environmental activism by institutional investors, increases shareholder value. For our analysis, we re-categorize the CDP response categories. The CDP categorizes corporate responses into five categories: Questionnaire Forthcoming (QF), Answered Questionnaire (AQ), Provided Information (IN), Declined to Participate (DP), and No Response (NR).\(^6\) We lump the five categories...

\(^{10}\) Emissions: What is the quantity of annual emissions of the six main GHG’s produced by your owned and controlled facilities? \(^{20}\) Energy costs: What are the total costs of your energy consumption, e.g. fossil fuels and electric power? Please quantify the potential impact on profitability from changes in energy prices and consumption.

http://www.cdproject.net/questionnaire.asp.

\(^5\) The CDP2 request was endorsed by 95 institutional investors with $10 trillion in assets. 86% responded and 60% answered in full. The results were disclosed on May 19th 2004. The CDP3 request was endorsed by 155 institutional investors with more than $21 trillion in assets. 89% responded and 71% answered in full. The results were disclosed on September 14th 2005.

\(^6\) QF = Questionnaire Forthcoming, this means a company has confirmed that it does intend to answer the CDP questions. AQ = Answered Questionnaire, this means a company has answered the questions as they are set out in the CDP documents. IN = Provided Information, this means a company has responded by providing an Environment / CSR / Annual report or a web link to such a report. It could also be a more detailed email or letter that provides some information but does not actually answer the questions as they are set out in the CDP documents. DP = Declined to Participate, this means a company has responded...
into two categories based on the similarity of responses: CDP participants and CDP non-participants. CDP participants include companies in the QF or AQ categories. CDP non-participants include companies in the DP or NR categories. We do not include the IN category in either of our two categories. This is because the IN category seems quite distinct either from the CDP participant group or the CDP non-participant group.

3. Research questions and literature review

As we discussed in section 1, the CDP does not interfere with management decisions. Instead, it monitors environmental performance. We wonder whether this type of institutional investor activism affects shareholder value. Thus, we ask:

**Question 1: Does firms’ CDP participation matter?**

Tirole (2001) shows theoretically how passive monitoring might increase shareholder value. Passive monitoring refers to investor behaviors that aim at measuring interim performance as in the case of the CDP. In his agency cost-based framework, interim performance revealed by passive monitoring informationally dominates the final outcome.\(^7\) Thus, passive monitoring works to lower the incentive constraint of the manager, increasing the income that is pledgeable to investors.\(^8\) This leads to lower cost of capital. Verrecchia (2001) proposes that a firm voluntarily discloses information when

\[ \frac{q_H - q_L}{q_H} > \frac{p_H - p_L}{p_H} , \]

where \( p_H = \) Initial probability of project success with no shirking, \( p_L = \) Initial probability of project success with shirking, \( q_H = \) Good interim signal with no shirking (\( q_H > p_H \)), and \( q_L = \) Bad interim signal with shirking (\( q_L < p_L \)).

\(^7\) This means that when a signal changes from good to bad, percentage decrease in probability of project success is higher in terms of interim signals than in terms of initial signals, i.e., \( \frac{q_H - q_L}{q_H} > \frac{p_H - p_L}{p_H} \).

\(^8\) Under passive monitoring, the manager’s incentive compatibility constraint is \( (q_H - q_L)w \geq B \), where \( w \) is manager compensation in case of success and \( B \) is private benefit in case of shirking. Pledgeable income to investors is then \( p_H R - \frac{q_H}{q_H - q_L}B - C_p \), where \( R \) is project income in case of success (zero otherwise) and \( C_p \) is the cost of passive monitoring. Pledgeable income to investors is higher with passive monitoring as long as \( C_p \) is sufficiently small, i.e., \( C_p < \left( \frac{p_H}{q_H} - \frac{q_H}{q_H - q_L} \right)B \).
the firm performs better than market expectation. These papers together suggest that firms’ CDP participation is good news and may positively affect their stock prices around the date of CDP disclosure. However, numerous studies that test the effect of voluntary environmental information disclosure on financial performance show mixed results (Margolis and Walsh, 2003). Thus, the question seems to be indeed an empirical matter.

Next, we ask a couple of more situation-specific questions. As we mentioned, the empirical evidence on the effect of voluntary environmental information disclosure is mixed. Mixed findings are not limited to environmental information disclosure literature. One of the important questions the empirical literature on corporate environmental strategy seeks to answer is whether going green pays or not. There have been a large number of studies trying to link firms’ environmental and financial performance, but the evidence is also mixed. Perhaps one of the reasons why it is difficult to establish a more definite link is that the question is too broad. Instead of going green pays or not, perhaps we should ask “when” going green pays. The same story seems to apply to institutional investor activism. Thus, we ask a couple of “when” questions by making use of an exogenous event, Russia’s ratification of the Kyoto Protocol on October 22, 2004, which we expect to have had significant effects on the expected regulatory cost of climate change. For the Protocol to go into force in all the nations that had ratified it, the Protocol needed to be ratified by at least 55 countries that account for at least 55% of global GHG emissions. The threshold was met when Russia ratified the Protocol on October 22, 2004. Thus, we ask whether upon Russia’s ratification, CDP participation affected stock prices specifically in countries that had already ratified the Protocol or in countries that had not yet ratified it.

**Question 2: Upon Russia’s ratification of the Kyoto Protocol, did firms’ CDP participation affect stock prices in countries that had already ratified the Protocol?**

Although prior studies failed to find any link between environmental information disclosure and environmental performance (Ingram & Frazier, 1980; Wiseman, 1982; Lyon and Kim, 2006), studies have consistently found that at times of regulatory threat the market rewards greater environmental information disclosure (Bowen, Castanias, and Daley, 1983; Hill and Schneeweis, 1983; Blacconiere & Patten, 1994; Blacconiere & Northcut, 1997; Patten & Nance, 1998).

CDP participation may incur costs such as abatement costs or administrative costs. Yet, there is also the legitimacy benefit in the opposite direction. Under no regulation, it’s hard to tell what the net effect is.
Previous literature on the effects of international institutions discusses how international institutions can affect domestic policy through various channels even without legal obligations (Keohane, et al., 1993; Cortell and Davis, 1996; Bernstein, 2002; Martin and Simmons, 2005; Simmons and Hopkins, 2005). Keohane, et al. (1993) point out that international institutions help overcome national reluctance to act and to reach harmonized national measures. Cortell and David (1996) propose that government officials and interest groups may appeal to international rules and norms to further their own interests. Bernstein (2002) and Simmons and Hopkins (2005) discuss how signing an international treaty might affect national policy even before the treaty goes into effect. They posit that merely signing a treaty exposes national governments to reputational risks.

The various channels described above suggest that the Kyoto Protocol, an international environmental institution, is likely to have exerted pressure on national governments and other actors before Russia’s ratification of the Protocol. However, the previous literature does not suggest that the Kyoto Protocol itself has exerted pressure since its inception in 1997. For example, Bernstein (2002) and Simmons and Hopkins (2005) specifically discuss how signing an international treaty might affect national policy even before the treaty goes into effect. This indicates that signing the Kyoto Protocol, especially ratifying the Kyoto Protocol since many countries sign but do not ratify international treaties, is likely to have exerted pressure on national policy.

This indeed seems to be the case. For instance, the European Union (EU) has implemented the European Union Emission Trading Scheme (EU ETS) to meet the Kyoto Protocol. Although the EU ETS officially started in January 2005, it was designed well before Russia’s ratification on October 22, 2004, which caused the Kyoto Protocol go into force. The EU ETS is based on Directive 2003/87/EC, which entered into force in 2003. This was after the EU ratified the Kyoto Protocol in May 2002. Also, the second phase of the EU ETS, 2008-2012, exactly coincides with the Kyoto target period. It seems clear that the EU ETS was designed in anticipation of Kyoto after the EU ratified Kyoto. The EU’s preparation for Kyoto is likely to have been facilitated by the specific reduction targets stipulated in the Kyoto Protocol for developed countries.

11 www.environment-agency.gov.uk.
EU is expected to reduce emissions 8% below the 1990 level during 2008-2012 and has reached agreement on how its targets would be allocated amongst its members.\textsuperscript{13} This in turn implies that the EU member countries had prepared themselves in anticipation of Kyoto well before Russia’s ratification of Kyoto. Also, Bernstein (2002) shows how the Kyoto Protocol shaped specifically Canada (Kyoto signatory)’s domestic climate change policy before Russia’s ratification.

The literature surveyed above suggests that upon Russia’s ratification of the Kyoto Protocol, firms’ participation in the CDP, good signals, probably did not have any measurable impact if the firms are in the countries that had already ratified Kyoto because in these countries firms had already taken measures in anticipation of Kyoto. In these countries, we might expect that future regulatory costs changed upon their ratification, not upon Russia’s ratification of the Kyoto Protocol.

\textit{Question 3: Upon Russia’s ratification of the Kyoto Protocol, did firms’ CDP participation affect stock prices in countries that had not yet ratified it, especially if firms are in greenhouse gas emitting industries expected to be regulated?}

Keohane, et al. (1993), Bernstein (2002) and Martin and Simmons (2005) discuss the effect of international institutions on recalcitrant nations. They explain how international institutions embody international norms and thus exert pressure on recalcitrant nations. Upon Russia’s ratification, the Kyoto Protocol had enough ratification to go into force. Keohane, et al. (1993), Bernstein (2002), and Martin and Simmons (2005) suggest that the official international adoption of the Kyoto Protocol upon Russia’s ratification probably exerted pressure on countries that had not yet ratified it such as US or Australia. The Wall Street Journal describes how Russia’s ratification increased regulatory threat in the US.\textsuperscript{14} We think that this is especially so for firms in the GHG emitting industries expected to be regulated such as energy and steel.\textsuperscript{15} For these

\textsuperscript{13} http://unfccc.int/kyoto_protocol/background/items/3145.php
\textsuperscript{14} The Wall Street Journal, “As Kyoto Protocol Comes Alive, So Do Pollution-Permit Markets --- Funds Handling Trades For Emissions Credits Gain While Russia Sets Pact,” 11/08/04.
\textsuperscript{15} Refer to footnote 3 in Table 2 for specific industries.
firms, it seems likely that Russia’s ratification increased expected regulatory costs of climate change.

How the increase in expected regulatory costs of climate change upon Russia’s ratification might affect the shareholder value of CDP participants? Prior empirical studies on the effect of environmental information disclosure consistently find that at times of regulatory threat environmental disclosure paid (Blacconiere & Patten, 1994; Blacconiere & Northcut, 1997; Patten & Nance, 1998; Freedman and Patten, 2004). Blacconiere & Patten (1994) find that chemical firms with more extensive environmental disclosures in their financial report prior to Union Carbide’s 1984 chemical leak in Bhopal, India experienced a less negative stock market reaction than firms with less extensive prior disclosures. Blacconiere & Northcut (1997) find that chemical firms with more extensive environmental disclosures had a less negative reaction to the Superfund Amendments and Reauthorization Act of 1986. Patten & Nance (1998) find that petroleum firms with less extensive environmental disclosures had a less positive reaction upon the Exxon Valdez oil spill.16 Freedman and Patten (2004) find that firms that emit toxic releases with less extensive environmental disclosures suffered more negative reactions upon the unexpected proposal by President Bush in 1989 for revisions in the Clean Air Act.

These findings, significant market reaction to regulatory threat, are also consistent with the findings of empirical studies on the impact of catastrophic environmental events. Bowen et al. (1983) and Hill and Schneeweis (1983) found that nuclear-based utility firms experienced a significant negative market reaction upon the Three Mile Island (TMI) nuclear accident in 1979. They explain that the nuclear accident increased expected future regulatory cost for the nuclear industry.

Why does regulatory threat increase the value of environmental information disclosure? Rationality based stock valuation models suggest that a firm’s stock price is the present value of expected cash flows, discounted at the appropriate rate of return. Regulatory threat is likely to negatively affect a firm’s both expected cash flows and the required rate of return. Regulatory threat has a negative influence on a firm’s expected

16 The oil spill triggered substantial increase in gasoline prices. The unexpected price increase was interpreted as good news for petroleum companies leading to positive abnormal returns (Pattern and Nance, 1998).
cash flows because regulatory threat increases expected future regulatory costs; firms may have to incur higher compliance costs, penalties, or liability costs (Bowen et al., 1983; Hill and Schneeweis, 1983; Blacconiere & Patten, 1994; Freedman and Patten, 2004). Regulatory threat also has a negative influence on the required rate of return because it affects not only the level of a firm’s future cash flows but also the volatility of future cash flows (Bowen et al., 1983; Hill and Schneeweis, 1983). An increase in the expected volatility of future cash flows leads to higher required rate of return than otherwise. Both a decrease in a firm’s expected future cash flows and an increase in the required rate of return work to lower the firm’s stock price. Empirical evidence on the moderating role of prior environmental information disclosures upon regulatory threat suggests that investors viewed firms with more extensive prior disclosures as better prepared for possible future environmental regulations.

The two streams of research together suggest that upon Russia’s Kyoto ratification, firms’ CDP participation might have positively affected stock prices in countries that had not yet ratified Kyoto especially if firms are in greenhouse gas emitting industries. However, this story does not seem to be entirely convincing. The U.S. is not doing anything despite seemingly strong enough international pressure. Thus, this question seems to be indeed an empirical matter.

4. Method

We employ the event study methodology that focuses on the mean stock price effects to test our hypotheses. The basic idea is that under the efficient market hypothesis the effect of an event will be immediately reflected in security prices. Thus, we can measure the effect of an event on the value of a firm by observing security prices over a short period. We use the market model, which assumes joint normality of security returns.

17 For review see MacKinlay (1997) and Kothari and Warner (2004).
18 The market model also assumes that Cov($R_{mt}$, $\epsilon_i$) = 0. Other variables may be associated with security returns, especially, firm size and book-to-market equity (Fama and French, 1992; 1996). For short-horizon event studies using daily data, however, the effect of these variables is not significant (Bernard, 1987; Kothari and Warner, 2004). Our use of market model also reflects limited data availability for international firms.
\[ R_{it} = \alpha_i + \beta_i R_{mt} + \epsilon_{it} \]  \hspace{1cm} (1)

where \( R_{it} \) = return on security \( i \) on day \( t \)

\( R_{mt} \) = return on market portfolio on day \( t \)

\( \alpha_i, \beta_i, \) and \( \sigma_{\epsilon_i}^2 \)

From equation (1), the market model parameters, \( \alpha_i, \beta_i, \) and \( \sigma_{\epsilon_i}^2 \) are first estimated using data from the period preceding the event and thus not affected by the event (estimation window). The market model parameters are then used to calculate abnormal returns during an event window. As shown in equation (2) the abnormal return is calculated by subtracting the normal return from the actual ex post return of the security over the event window.

\[ AR_{it} = R_{it} - (\hat{\alpha}_i + \hat{\beta}_i R_{mt}) \]  \hspace{1cm} (2)

where \( AR_{it} \) = abnormal return on security \( i \) on day \( t \)

Our estimation window is 250 trading days starting from the sixth day prior to the event. We choose the large estimation window size to minimize out-of-sample bias. Out-of-sample bias can arise since the event study methodology applies the estimated results from estimation window to event window. The abnormal returns are essentially calculated on an out-of-sample basis. Thus, any difference between in-sample and out-of-sample should be taken into account (Collins and Dent, 1984). With the large estimation window, however, the increase in variance over the event window due to the sampling error in \( \alpha_i \) and \( \beta_i \) becomes negligible.\(^\text{20}\) Under this circumstance, the variance of the abnormal returns over the event window can be approximated by the variance of the error term in equation (4), i.e., \( \text{Var}(AR_{it}) \approx \sigma_{\epsilon_i}^2 \) (MacKinlay, 1997).

To examine the effect of an event, the abnormal return for each period should be aggregated over multi-periods and over multi-securities. We use multiple event windows, which spread over a 10-day period, five days before and after the event date. This is to

\(^{19}\) To allow for the possibility that the market may not be fully efficient globally, we use country-specific as well as global benchmarks as our market portfolios.

\(^{20}\) In our analysis, we still control for possible changes in variance over time.
allow information leakage during pre-event periods and adjustment periods following the event. Given N securities, mean cumulative abnormal returns for period T can be calculated as shown in (3). Assuming no serial correlation and independence across securities, the corresponding variance can be represented by equation (4). Our hypothesis that the event has no impact, i.e., the mean cumulative abnormal returns are not significantly different from zero, can then be tested under the normality assumption.

\[
\overline{CAR}(t_1, \ldots, t_T) = \frac{1}{N} \sum_{i=1}^{N} \sum_{t=1}^{T} AR_{it}
\]

(3)

\[
\text{Var}(\overline{CAR}(t_1, \ldots, t_T)) = \frac{1}{N^2} \sum_{i=1}^{N} \text{Var}(\overline{CAR_i}(t_1, \ldots, t_T))
\]

(4)

where \( \text{Var}(\overline{CAR_i}(t_1, \ldots, t_T)) = (t_T - t_i + 1)\sigma^2_{\epsilon_i} \)

As pointed out, variance estimation as shown in equation (4) is based on three assumptions: 1) changes in variance over time, especially, during the estimation and the event windows, are not significant, 2) the abnormal returns are not serially correlated, and 3) the abnormal returns are not cross-sectionally correlated. Deviations from these assumptions, however, should be taken into account (Patell, 1976; Collins and Dent, 1984; Bernard, 1987). To address this issue, we use several statistics to test our hypothesis that the event has no impact. To control for changes in variance over time and serial correlation, we use the serial correlation adjusted Patell test and the standardized cross-sectional test. Both tests involve standardizing abnormal returns using a measure of standard deviation during the event window period (Cowan, 2006). Both tests also control for the fact that because abnormal returns during the event window are all functions of the same market model parameters, the abnormal returns during the event window are serially correlated (MacKinlay, 1997). In addition, we use the Jackknife test, which also controls for changes in variance over time using standardized abnormal returns (Cowan, 2006). To control for cross-sectional correlations across securities, we complement our event study with a portfolio approach, where the security returns are

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Equation (7) follows from our discussion that with our large estimation window \( \text{Var}(AR_{it}) \approx \sigma^2_{\epsilon_i} \).
aggregated into a portfolio each period and then the abnormal returns of the portfolio are examined (Cowan, 2006).

5. Data

We obtained the CDP response data from Innovest, a company specializing in identifying non-traditional sources of risk and value potential for investors. The data includes the FT Global 500 companies in 2006, the year for their CDP4 response. The data also includes the company responses to the CDP1, CDP2 and CDP3 requests. Table 1 shows the number of companies in each response category in our sample.

As described in section 2, for our analysis we recategorize the CDP responses into two categories based on the similarity of responses: CDP participants and CDP non-participants. CDP participants include companies in the QF or AQ categories. CDP non-participants include companies in the DP or NR categories. We do not include the IN category in either of our two categories because the IN category seems quite distinct either from the CDP participant or the CDP non-participant group.

We use the Morgan Stanley Capital Investments (MSCI) database for global benchmark. We obtain firm-specific daily return index and other firm-specific variables from Thomson Datastream. Table 2 reports summary statistics for our sample, both in aggregate and by the Kyoto ratification status, i.e., whether the country had ratified the Kyoto Protocol or in the energy industry.

22 Collins and Dent (1984) examines the severity of cross-sectional correlations when there is industry concentration in sample firms. Our sample, FT500, covers 27 countries and diversified industries ranging from aerospace & defense to banks and movies & entertainment. Industry concentration in our sample is expected to be less problematic. Also, Bernard (1987) points out that the degree of cross-sectional correlations increases dramatically as the event window increases from daily periods to annual periods. Our event study uses daily periods. We use portfolio approach when there is industry concentration in our sample, i.e., firms in the industries covered by the Kyoto Protocol or in the energy industry.

23 Used with permission of Wharton Research Data Services (WRDS). The MSCI total return index values are used. Global benchmark returns on day t are set equal to \((RI_t/RI_{t-1})-1\), where \(RI_t\) is the return index on day t.

24 Used with permission of Datastream. Using the firm-specific daily return index, we construct the firm-specific daily return values, which are represented as follows.

If \(t \neq \text{ex-date of the dividend payment} D_t\), \(R_t = \frac{P_t}{P_{t-1}} - 1\), where \(P_t\) = adjusted closing price on date t.

If \(t = \text{ex-date of the dividend payment} D_t\), \(R_t = \frac{P_t + D_t}{P_{t-1}} - 1\), where \(P_t\) = adjusted closing price on ex-date, \(P_{t-1}\) = adjusted closing price on previous day, and \(D_t\) = dividend payment associated with ex-date t. Ex-date refers to the first day of the ex-dividend period (the period of time between the announcement of the dividend and the payment).
Kyoto Protocol when Russia ratified on Oct 22, 2004. Table 2 shows that the two groups categorized by the ratification status are comparable, especially in firm size and growth prospects. Firm size is represented by market capitalization. Growth prospects are represented by price to book value and price to earnings ratio. This comparability supports our use of the market model since it implies that abnormal returns we found after controlling for market returns are not attributable to systematic differences between the two groups in terms of firm size or growth prospects.

6. Results

The analysis results are presented in Table 3 through Table 10. Table 3 shows results for all firms in our sample. Table 4 – 6 show results for firms in countries that had already ratified the Kyoto Protocol as of Russia’s ratification. Table 7 – 9 show results for firms in countries that had not yet ratified it. Table 10 shows results of a portfolio approach. As shown in the tables, most of all, the results are sensitive to what window period we choose and whether we apply the standard event study approach or portfolio approach. As a consequence, we focus only on robust results, the common findings across alternative results.

The effects of each CDP disclosure are shown in Table 3, Table 4 and Table 7. Table 3 shows results for all firms. Table 4 shows results for firms in countries that had already ratified Kyoto as of each CDP disclosure. Table 8 shows results for firms in countries that had not yet ratified Kyoto as of each CDP disclosure. Table 3 does not seem to show any systematic effect of CDP disclosure. Table 4 shows mixed results. CDP1 and CDP4 disclosure do not appear to have systematic effects. CDP2 and CDP3 disclosure, however, had some effects on stock prices: CDP2 participants had less positive stock price shock than CDP2 non-participants and CDP3 participants had overall greater positive stock price shock. Table 7 also shows mixed results. CDP1 and CDP4 do

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25 For each CDP disclosure and Russia’s ratification, countries that had ratified the Kyoto Protocol include:
- CDP1 (Feb 17, 2003): all countries except Hong Kong, Switzerland, Israel, Russia, Saudi Arabia, Singapore, Taiwan, Australia, US.
- CDP2 (May 19, 2004): all countries except Russia, Saudi Arabia, Singapore, Taiwan, Australia, US.
- Russia’s Ratification of Kyoto (Oct 22, 2004): all countries except Saudi Arabia, Singapore, Taiwan, Australia, US (Russia officially ratified on Nov 18, 2004, but in this paper we treat Russia as ratified as of Oct 22, 2004).
- CDP3 (Sep 14, 2005): all countries except Singapore, Taiwan, Australia, US.
- CDP4 (Sep 18, 2006): all countries except Taiwan, Australia, US.
not seem to have systematic effects. But, CDP2 and CDP3 participants were treated better than their non-participants counterparts. Perhaps, mixed results of the effect of CDP disclosure somewhat reflect inconclusiveness of prior research on the effect of environmental information disclosure. Overall, we find that it is difficult to say that there are systematic effects of CDP disclosure.

The effects of firms’ CDP participation in countries that had already ratified Kyoto as of Russia’s ratification are presented in Table 5, Table 6, and Table 10. Table 5 shows results for all firms. Table 6 and Table 10 disaggregate by industry. Table 5 shows some significant findings especially for CDP participants, but the signs of the significant coefficients flip over alternative windows. Disaggregation by industry does not seem to resolve the indefiniteness of signs as shown in Table 6. Table 6 appears to show some negative effects for CDP2 participants that are not in GHG emitting or energy industries but Table 10 shows the effects are positive and insignificant for the same CDP2 participants. Overall, we do not find systematic effects of firms’ CDP participation, i.e., significantly positive or negative effects, on stock prices in countries that had already ratified Kyoto. This is consistent with our prior that for firms in these countries, expected regulatory costs of climate change did not particularly change upon Russia’s ratification presumably because they had already prepared themselves in anticipation of Kyoto.

The effects of firms’ CDP participation in countries that had not yet ratified the Kyoto Protocol as of Russia’s ratification are presented in Table 8 – Table 10. Table 8 shows results for all firms. Table 9 and Table 10 disaggregate by industry. Although Table 8 shows some significant negative effects, especially during the first couple of days of Russia’s ratification, Table 9 shows that negative effects are mostly limited to firms

26 We also examine whether dropping out of CDP had any effects on firm stock prices. The results are again mixed. There were 10 firms that participated in CDP2 but did not participate in CDP3 and 6 firms that participated in CDP3 but not in CDP4. We examine whether their stock prices were negatively affected upon CDP3 disclosure and upon CDP4 disclosure, respectively. We find that only dropping out of CDP3 had some negative effects, although significance is mostly limited to dates prior to CDP3 disclosure.

27 GHG industry indicates whether a firm is in the GHG emitting industries, especially those covered by the EU ETS. The Yes category includes companies in energy, production and processing of ferrous metals, mineral, and pulp and paper industries. The No category includes all other industries. Energy Industry includes electric utilities, oil refineries and coke ovens. Application of the emissions trading directive by EU Member States, European Environmental Agency (2006), p.43.

28 Table 10 shows results for (-1, 1), the smallest window size possible for portfolio approach.
that are not in GHG emitting or energy industries. 29 For firms in GHG emitting industries or in energy industries, the effects are consistently positive. The positive stock price effect is also demonstrated in Table 10. The robust findings suggest that upon Russia’s Kyoto ratification, firms’ participation in the CDP relatively increased stock prices if the firms are in GHG emitting industries expected to be regulated and in countries that had not yet ratified the Kyoto Protocol. This suggests that for these firms Russia’s official ratification of the Kyoto Protocol signaled regulatory threat, increasing expected regulatory costs of climate change. Under this circumstance, CDP participants appeared to be viewed as better prepared for the exogenous change.

We estimate the total value created for our consistently significant finding, an increase in shareholder value upon Russia’s Ratification for CDP participants in GHG emitting industries and in countries that had not ratified Kyoto. To obtain the most conservative estimate, we focus on the smallest significant abnormal return on Oct 22, 2004 among alternative approaches and only on day 0 excess return. The total value created is about $2.7 billion (= 0.0037 (the smallest significant abnormal return on Oct 22, 2004) × $43705.49 million (the mean market cap for our sample firms in countries that had not ratified Kyoto) × 17 (the number of firms in GHG emitting industries and in countries that had not ratified Kyoto)). 30 This is about 27% of the size of the carbon market in 2005. 31

7. Conclusion

In this paper we study when institutional investor activism towards climate change pays by making use of the Carbon Disclosure Project. To our knowledge, this is the first paper that examines the effect of institutional investor activism towards issues that do not appear to be directly related to shareholder value.

Using the event study methodology, we examine when it pays for firms to participate in the CDP. We find no systematic evidence of increased value around the dates each year that participation was announced. However, we do find that CDP

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29 Although not a subject in this paper, it will be interesting to study why Russia’s Kyoto ratification had significant negative effects for firms not in GHG emitting or energy industries in Kyoto non-signatories.

30 The numbers are taken from Table 2 and Table 9.

participants were treated better by investors when exogenous events caused the expected regulatory cost of climate change to rise. We identify this effect using Russia’s ratification of the Kyoto Protocol on October 22, 2004, which caused the Protocol to go into effect in all the nations that had ratified it. We argue that Russia’s ratification also increased the pressure on countries that had not yet ratified Kyoto to take some action on climate change, and accordingly firms in countries such as the U.S. saw their expected regulatory cost of climate change rise. We find that in countries that had already ratified Kyoto, CDP participants did not experience systematic abnormal returns upon Russia’s ratification, presumably because firms in these countries had already taken measures in anticipation of Kyoto. In nations that had not ratified the Protocol, however, most notably the U.S., we find that firms experienced positive and significant abnormal returns on the day of Russia’s ratification. We conservatively estimate the total value created at $2.7 billion, about 27% of the size of the carbon market in 2005.

Our findings demonstrate that institutional investor activism toward climate change pays when the external business environment becomes more climate conscious. This in turn suggests that institutional investor activism towards issues seemingly unrelated to shareholder value can indeed be value-increasing under certain circumstances.
REFERENCES


B. M. Barber, “Monitoring the Monitor: Evaluating CalPERS’Activism,” working paper, Graduate School of Management, University of California at Davis, Davis (2006).


Table 1. Number of Companies in the CDP Response Categories in our Sample*

<table>
<thead>
<tr>
<th></th>
<th>CDP1</th>
<th>CDP2</th>
<th>CDP3</th>
<th>CDP4</th>
</tr>
</thead>
<tbody>
<tr>
<td>QF</td>
<td>0</td>
<td>17</td>
<td>0</td>
<td>27</td>
</tr>
<tr>
<td>AQ</td>
<td>185</td>
<td>244</td>
<td>319</td>
<td>345</td>
</tr>
<tr>
<td>DP</td>
<td>62</td>
<td>54</td>
<td>41</td>
<td>43</td>
</tr>
<tr>
<td>NR</td>
<td>83</td>
<td>48</td>
<td>44</td>
<td>40</td>
</tr>
<tr>
<td>IN</td>
<td>32</td>
<td>23</td>
<td>34</td>
<td>44</td>
</tr>
<tr>
<td>NA *</td>
<td>137</td>
<td>114</td>
<td>62</td>
<td>1</td>
</tr>
</tbody>
</table>

* We obtained the CDP response data from Innovest, a company specializing in identifying non-traditional sources of risk and value potential for investors. The data includes the FT Global 500 companies in 2006, the year for their CDP4 response.
** NA: Not in FT Global 500 or Not Available.
QF = Questionnaire Forthcoming, this means a company has confirmed that it does intend to answer the CDP questions. AQ = Answered Questionnaire, this means a company has answered the questions as they are set out in the CDP documents. IN = Provided Information, this means a company has responded by providing an Environment / CSR / Annual report or a web link to such a report. It could also be a more detailed email or letter that provides some information but does not actually answer the questions as they are set out in the CDP documents. DP = Declined to Participate, this means a company has responded saying that they will not be answering the CDP questions. NR = No Response, this means a company has not responded at all. http://www.cdproject.net/faq.asp.
Table 2. Firm Characteristics in Aggregate and by the Kyoto Ratification Status, 2004*

<table>
<thead>
<tr>
<th></th>
<th>CDP2 sample</th>
<th>Firms in countries that had ratified Kyoto as of Oct 22, 2004</th>
<th>Firms in countries that had not ratified Kyoto as of Oct 22, 2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of firms**</td>
<td>358</td>
<td>183</td>
<td>175</td>
</tr>
<tr>
<td>Mean Market capitalization***</td>
<td>3,796.901M USD</td>
<td>32,232.52M USD</td>
<td>43,705.49M USD</td>
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<tr>
<td>Mean Price to book value***</td>
<td>3.23</td>
<td>3.61</td>
<td>2.86</td>
</tr>
<tr>
<td>Mean Price to Earnings***</td>
<td>31.96</td>
<td>30.98</td>
<td>32.99</td>
</tr>
<tr>
<td>GHG Industry****</td>
<td>Yes – 60</td>
<td>Yes – 37</td>
<td>Yes – 23</td>
</tr>
<tr>
<td></td>
<td>No – 298</td>
<td>No – 146</td>
<td>No – 152</td>
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<td>Countries represented</td>
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<td>Belgium – 4</td>
<td>Australia – 5</td>
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<td></td>
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<td>Brazil – 2</td>
<td>Saudi Arabia – 5</td>
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<td></td>
<td>Brazil – 2</td>
<td>Canada – 16</td>
<td>Singapore – 2</td>
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<td></td>
<td>Canada – 16</td>
<td>Denmark – 3</td>
<td>Taiwan – 2</td>
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<td></td>
<td>Denmark – 3</td>
<td>Finland – 1</td>
<td>US – 161</td>
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<tr>
<td></td>
<td>Finland – 1</td>
<td>France – 21</td>
<td></td>
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<tr>
<td></td>
<td>France – 21</td>
<td>Germany – 13</td>
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<td>Germany – 13</td>
<td>Hong Kong – 8</td>
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<td></td>
<td>Hong Kong – 8</td>
<td>India – 2</td>
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<td></td>
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<tr>
<td></td>
<td>Ireland – 3</td>
<td>Italy – 9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Italy – 9</td>
<td>Japan – 35</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Japan – 35</td>
<td>Mexico – 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mexico – 2</td>
<td>Netherlands – 8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Netherlands – 8</td>
<td>Norway – 2</td>
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<tr>
<td></td>
<td>Norway – 2</td>
<td>Russia – 3</td>
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<td>Spain – 8</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Switzerland – 7</td>
<td>UK – 27</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Taiwan – 2</td>
<td>UK – 27</td>
<td></td>
</tr>
<tr>
<td></td>
<td>US – 161</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* The Kyoto ratification status indicates whether the country had already ratified the Kyoto Protocol when Russia ratified Kyoto on Oct 22, 2004.
** Five firms are dropped because their firm-specific returns are not available.
*** The average values are calculated based on the data available from Datastream.
**** GHG industry indicates whether a firm is in the GHG emitting industries, especially those covered by the EU ETS. The Yes category includes companies in energy, production and processing of ferrous metals, mineral, and pulp and paper industries. The No category includes all other industries. Application of the emissions trading directive by EU Member States, European Environmental Agency (2006), p.43.

20
Table 3. The Effects of CDP Disclosure – all firms

<table>
<thead>
<tr>
<th>CDP participation</th>
<th>CDP1</th>
<th>CDP2</th>
<th>CDP3</th>
<th>CDP4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>No of firms</td>
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<td>143</td>
<td>256</td>
<td>96</td>
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<tr>
<td>Event window</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>(-5, +5)</td>
<td>-0.42</td>
<td>-1.03</td>
<td>-0.49</td>
<td>-1.38*</td>
</tr>
<tr>
<td>(-2, +2)</td>
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<td>-0.36</td>
<td>-0.29*</td>
<td>-1.11***</td>
</tr>
<tr>
<td>(-1, +1)</td>
<td>0.90*</td>
<td>1.08***</td>
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<td></td>
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<tr>
<td>-1</td>
<td>0.52**</td>
<td>0.71***</td>
<td>0.20</td>
<td>0.60**</td>
</tr>
<tr>
<td>0</td>
<td>0.60***</td>
<td>0.30</td>
<td>0.50***</td>
<td>-0.26***</td>
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<td>0.38</td>
<td>0.38</td>
<td>0.14</td>
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<tr>
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<td>0.11</td>
<td>-0.25$</td>
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<tr>
<td>(0,5)</td>
<td>-0.86</td>
<td>-1.35*</td>
<td>0.10</td>
<td>-0.43</td>
</tr>
</tbody>
</table>

The symbols $, *, **, and *** denote statistical significance at the 0.10, 0.05, 0.01 and 0.001 levels, respectively, using a 2-tail Patell Z test.
(a) Statistically significant at the 0.01 level using a 2-tail Cross-sectional standard deviation test and a 2-tail Jackknife test.
Table 4. The Effects of CDP Disclosure in countries that had ratified Kyoto as of CDP1 – CDP4

<table>
<thead>
<tr>
<th>CDP participation</th>
<th>CDP1</th>
<th>CDP2</th>
<th>CDP3</th>
<th>CDP4</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of firms</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>(-5, +5)</td>
<td>-0.39</td>
<td>-0.59</td>
<td>-0.34</td>
<td>-2.11</td>
</tr>
<tr>
<td>(-2, +2)</td>
<td>-0.31</td>
<td>-0.61</td>
<td>0.38</td>
<td>0.46</td>
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<tr>
<td>(-1, +1)</td>
<td>0.88*(b)</td>
<td>0.74</td>
<td>0.70*</td>
<td>2.93***</td>
</tr>
<tr>
<td>-1</td>
<td>0.53*</td>
<td>0.05</td>
<td>0.18</td>
<td>1.46***(b)</td>
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<tr>
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<td>0.90***(a)</td>
<td>1.28*(b)</td>
<td>1.29***(a)</td>
<td>2.34***(a)</td>
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<td>0.71</td>
<td>0.52**</td>
<td>1.47*</td>
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The symbols $, *, **, and *** denote statistical significance at the 0.10, 0.05, 0.01 and 0.001 levels, respectively, using a 2-tail Patell Z test.

(a) Statistically significant at the 0.001 level using a 2-tail Cross-sectional standard deviation test and a 2-tail Jackknife test.

(b) Statistically significant at the 0.01 level using a 2-tail Cross-sectional standard deviation test and statistically significant at the 0.001 level using a 2-tail Jackknife test.

Table 5. The Effects of Russia’s Kyoto Ratification in countries that had ratified Kyoto

<table>
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<tr>
<th>CDP participation</th>
<th>CDP2</th>
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</thead>
<tbody>
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<td>No of firms</td>
<td>Yes</td>
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<td>(0, 1)</td>
<td>0.44***(a)</td>
</tr>
<tr>
<td>(0, 2)</td>
<td>-0.68***(a)</td>
</tr>
<tr>
<td>(0, 5)</td>
<td>-0.57*(b)</td>
</tr>
</tbody>
</table>

The symbols $, *, **, and *** denote statistical significance at the 0.10, 0.05, 0.01 and 0.001 levels, respectively, using a 2-tail Patell Z test.

(a) Statistically significant at the 0.001 level using a 2-tail Cross-sectional standard deviation test and a 2-tail Jackknife test.

(b) Statistically significant at the 0.01 level using a 2-tail Cross-sectional standard deviation test and statistically significant at the 0.001 level using a 2-tail Jackknife test.
Table 6. The Effects of Russia’s Kyoto Ratification in countries that had ratified Kyoto

<table>
<thead>
<tr>
<th></th>
<th>CDP2</th>
<th>CDP2</th>
<th>CDP2</th>
<th>CDP2</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of firms</td>
<td>183</td>
<td>183</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GHG Industry¹</td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>Energy Activities Industry²</td>
<td>Yes</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CDP participation</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>No of firms</td>
<td>31</td>
<td>6</td>
<td>127</td>
<td>19</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Event window</td>
<td>(-5, +5)</td>
<td>Mean Cumulative Abnormal Return (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-1.45</td>
<td>-0.88</td>
<td>-1.38</td>
<td>-1.21</td>
</tr>
<tr>
<td></td>
<td>(-2, +2)</td>
<td>-0.10</td>
<td>-0.69</td>
<td>-1.42***(a)</td>
</tr>
<tr>
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<td>(-1, +1)</td>
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<td>0.37</td>
<td>0.49</td>
<td>-0.13</td>
</tr>
<tr>
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<td>0.58*(a)</td>
<td>0.30</td>
<td>0.40***(a)</td>
</tr>
<tr>
<td></td>
<td>(0,1)</td>
<td>0.23</td>
<td>-0.34</td>
<td>-0.38*(b)</td>
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<tr>
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<td>(0,2)</td>
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<tr>
<td></td>
<td>(0,5)</td>
<td>-1.27*</td>
<td>-0.14</td>
<td>-0.40</td>
</tr>
</tbody>
</table>

¹ GHG industry indicates whether a firm is in the GHG emitting industries, especially those covered by the EU ETS. The Yes category includes companies in energy, production and processing of ferrous metals, mineral, and pulp and paper industries. The No category includes all other industries. Application of the emissions trading directive by EU Member States, European Environmental Agency (2006), p.43.

The symbols $,*,**, and *** denote statistical significance at the 0.10, 0.05, 0.01 and 0.001 levels, respectively, using a 2-tail Patell Z test.
(a) Statistically significant at the 0.001 level using a 2-tail Cross-sectional standard deviation test and a 2-tail Jackknife test.
(b) Statistically significant at the 0.01 level using a 2-tail Cross-sectional standard deviation test and statistically significant at the 0.001 level using a 2-tail Jackknife test.
### Table 7. The Effects of CDP Disclosure in countries that had not ratified Kyoto as of CDP1 – CDP4

<table>
<thead>
<tr>
<th>CDP participation</th>
<th>CDP1</th>
<th>CDP2</th>
<th>CDP3</th>
<th>CDP4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>No of firms</td>
<td>67</td>
<td>104</td>
<td>98</td>
<td>74</td>
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<tr>
<td>Event window</td>
<td>Mean Cumulative Abnormal Return (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(-5, +5)</td>
<td>-0.47</td>
<td>-1.20S</td>
<td>-0.74</td>
<td>-1.16S</td>
</tr>
<tr>
<td>(-2, +2)</td>
<td>-0.21</td>
<td>-0.26</td>
<td>-1.36***(a)</td>
<td>-1.58***(a)</td>
</tr>
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<td>(-1, +1)</td>
<td>0.94</td>
<td>1.21***(a)</td>
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</tr>
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<td>0.50</td>
<td>0.96***(a)</td>
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<td>0.35*</td>
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<td>-0.76***(a)</td>
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</tr>
<tr>
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<td>0.25</td>
<td>-0.45**(a)</td>
<td>-0.74***(a)</td>
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<tr>
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<td>-0.04</td>
<td>-0.89*</td>
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</table>

The symbols $, *, **, and *** denote statistical significance at the 0.10, 0.05, 0.01 and 0.001 levels, respectively, using a 2-tail Patell Z test.

(a) Statistically significant at the 0.001 level using a 2-tail cross-sectional standard deviation test and a 2-tail Jackknife test.

(b) Statistically significant at the 0.001 level using a 2-tail cross-sectional standard deviation test and statistically significant at the 0.01 level using a 2-tail Jackknife test.

### Table 8. The Effects of Russia’s Kyoto Ratification in countries that had not ratified Kyoto

<table>
<thead>
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<th>CDP participation</th>
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</thead>
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<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>No of firms</td>
<td>98</td>
</tr>
<tr>
<td>Event window</td>
<td>Mean Cumulative Abnormal Return (%)</td>
</tr>
<tr>
<td>(-5, +5)</td>
<td>0.16</td>
</tr>
<tr>
<td>(-2, +2)</td>
<td>0.23</td>
</tr>
<tr>
<td>(-1, +1)</td>
<td>-0.78***</td>
</tr>
<tr>
<td>0</td>
<td>0.14</td>
</tr>
<tr>
<td>(0, 1)</td>
<td>-0.58***(a)</td>
</tr>
<tr>
<td>(0, 2)</td>
<td>-0.01</td>
</tr>
<tr>
<td>(0, 5)</td>
<td>0.76**</td>
</tr>
</tbody>
</table>

The symbols $, *, **, and *** denote statistical significance at the 0.10, 0.05, 0.01 and 0.001 levels, respectively, using a 2-tail Patell Z test.

(a) Statistically significant at the 0.001 level using a 2-tail cross-sectional standard deviation test and a 2-tail Jackknife test.

(b) Statistically significant at the 0.001 level using a 2-tail cross-sectional standard deviation test and statistically significant at the 0.001 level using a 2-tail Jackknife test.

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Table 9. The Effects of Russia’s Kyoto Ratification in countries that had not ratified Kyoto

<table>
<thead>
<tr>
<th>Event window</th>
<th>Mean Cumulative Abnormal Return (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(-5, +5)</td>
<td>-1.21 -3.32$ 0.45 0.07 -0.32 -4.81* 0.23 0.11</td>
</tr>
<tr>
<td>(-2, +2)</td>
<td>2.68***(a) 2.11 -0.28 -0.09 2.86***(a) 1.51 -0.17 -0.02</td>
</tr>
<tr>
<td>(-1, +1)</td>
<td>1.09***(b) 0.04 -1.17***(a) -1.30***(a) 1.11***(b) -0.60 -1.07***(a) -1.24***(a)</td>
</tr>
<tr>
<td>-1</td>
<td>0.18 -0.58 0.13 -0.28* -0.02 -0.68$ 0.17 -0.28*</td>
</tr>
<tr>
<td>0</td>
<td>0.37$ 0.47 -0.78***(a) -0.66***(c) 0.59(b) 0.61 -0.76***(a) -0.65***(c)</td>
</tr>
<tr>
<td>(0,1)</td>
<td>0.91**(b) 0.63 -1.31***(a) -1.03***(c) 1.13***(b) 0.09 -1.24***(a) -0.97***(c)</td>
</tr>
<tr>
<td>(0.2)</td>
<td>1.76***(a) 0.62 -0.39 0.42** 2.09***(a) 0.28 -0.33 0.45**</td>
</tr>
<tr>
<td>(0.5)</td>
<td>-0.33 -3.46* 0.99**(b) 1.74***(a) 0.03 -4.24**(b) 0.87**(b) 1.71***(a)</td>
</tr>
</tbody>
</table>

1 GHG Industry indicates whether a firm is in the GHG emitting industries, especially those covered by the EU ETS. The Yes category includes companies in energy, production and processing of ferrous metals, mineral, and pulp and paper industries. The No category includes all other industries. Application of the emissions trading directive by EU Member States, European Environmental Agency (2006), p.43.


The symbols $,*,**, and *** denote statistical significance at the 0.10, 0.05, 0.01 and 0.001 levels, respectively, using a 2-tail Patell Z test.

(a) Statistically significant at the 0.001 level using a 2-tail Cross-sectional standard deviation test and a 2-tail Jackknife test.
(b) Statistically significant at the 0.01 level using a 2-tail Cross-sectional standard deviation test and a 2-tail Jackknife test.
(c) Statistically significant at the 0.01 level using a 2-tail cross-sectional standard deviation test and statistically significant at the 0.001 level using a 2-tail Jackknife test.
Table 10. The Effects of Russia’s Kyoto Ratification using a portfolio approach

<table>
<thead>
<tr>
<th>Kyoto Ratification Status(^1)</th>
<th>Abnormal Return (-1,1)</th>
<th>heteroskedasticity-consistent t statistic</th>
<th>R-squared</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Countries that had Ratified Kyoto - All</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GHG Industry(^2)</td>
<td>CDP2 Participation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>0.38**</td>
<td>2.95</td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
<td>0.24</td>
<td>1.26</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>0.01</td>
<td>0.10</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
<td>0.13</td>
<td>1.74</td>
</tr>
<tr>
<td><strong>Countries that had not Ratified Kyoto - All</strong></td>
<td>-0.41%***</td>
<td>-10.82</td>
<td>0.944</td>
</tr>
<tr>
<td>GHG Industry</td>
<td>CDP2 Participation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>0.43***</td>
<td>7.53</td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
<td>0.26*</td>
<td>2.59</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>-0.54***</td>
<td>-5.85</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
<td>-0.52***</td>
<td>-81.99</td>
</tr>
<tr>
<td><strong>Energy Industry(^3)</strong></td>
<td>CDP2 Participation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>0.54***</td>
<td>6.55</td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
<td>0.19***</td>
<td>44.20</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>-0.51***</td>
<td>-5.73</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
<td>-0.50***</td>
<td>-307.3</td>
</tr>
</tbody>
</table>

The symbols $*,**, and *** denote statistical significance at the 0.10, 0.05, 0.01 and 0.001 levels, respectively, using a 2-tail test. The risk-free rate used to calculate excess returns is the US Treasury bill return and taken from the K. R. French’s website. The Treasury bill return is the simple daily rate that, over the number of trading days in the month, compounds to 1-month Treasury Bill rate from Ibbotson and Associates, Inc. [http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html).

\(^1\) The Kyoto ratification status indicates whether the country had already ratified the Kyoto Protocol when Russia ratified Kyoto on Oct 22, 2004.

\(^2\) GHG industry indicates whether a firm is in the GHG emitting industries, especially those covered by the EU ETS. The Yes category includes companies in energy, production and processing of ferrous metals, mineral, and pulp and paper industries. The No category includes all other industries. *Application of the emissions trading directive by EU Member States*, European Environmental Agency (2006), p.43.

\(^3\) Energy Industry includes electric utilities, oil refineries and coke ovens. *Application of the emissions trading directive by EU Member States*, European Environmental Agency (2006), p.43.