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Voluntary Disclosure of Climate Risk: Some Early Evidence from CDP Participation

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ABSTRACT

Investors increasingly recognize that climate presents a systemic risk to their investment portfolio, and demand information about climate risk as part of a company's financial health profile. In this study, we document the voluntary supply of climate risk information by firms to the CDP (formerly known as Carbon Disclosure Project) for the period 2010-2020 and explore the cross-sectional variation in a firm's propensity to file and disclose climate risk information with the CDP. Our main result is unsurprising. First, we find that among US firms, S&P500 firms represent twice as many as non-S&P500 firms on the CDP as are non-S&P500 firms. Second, among the S&P500 filers, there is a distinct pecking order, with the top quintile of S&P500 firms (based on market cap) being twice as likely as the bottom quintile to file with the CDP. Controlling for market cap, we find that higher institutional ownership is associated with a lower propensity to file or disclose with the CDP perhaps because institutions with higher ownership have access to alternative channels (for example, private engagements) for obtaining climate risk information. We find that profitable assets-in-place firms (higher ROA and lower Q-ratios) are more likely to disclose climate risk on the CDP. Shareholder resolutions have little influence on a firm's propensity to file or disclose climate risk with CDP, downplaying the importance of direct shareholder activism vis-à-vis private engagements by large investors in influencing firm disclosure decisions.

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Introduction

Climate change is widely regarded as one of the most consequential societal challenges of our time.[1] Future damages from climate change can range from 1.5 to 23 percent of GDP per capita between now and 2100 (Bank of Canada, 2019). While 2100 seems far away for most of us, climate-related costs are already impacting us today. For example, current estimates put the cost of large climate disasters in the U.S. between $300-500 billion on a five-year cycle.[2]

Investors increasingly demand information about the effects of climate change on a company's financial health to assess their risk exposure. CDP Global (a London-based charity that asks companies to disclose their environmental impact, and their strategies to fight climate change; formerly known as Carbon Disclosure Project) reports that in 2020, 515 investors with $106 trillion in assets and over 147 large purchasers with over $4 trillion in procurement spending have requested companies to disclose their environmental data through CDP.

Climate disclosures are information publicly disclosed by companies, for use by investors, lenders, and other stakeholders, about companies' climate change related risks and opportunities. In North America, there are very few mandatory climate disclosure regulations—the vast majority of disclosures are voluntary. Only recently, in the US, the Securities and Exchange Commission (SEC) has started

[1] Climate change is a significant change in the measures of climate, such as temperature, rainfall, or wind, lasting for an extended period—decades or longer, as defined by Environmental Protection Agency (EPA), the United States (see https://ww.epa.ie/climate).

[2] NOAA: National Oceanic and Atmospheric Administration (2020).

taking measures to develop mandatory climate disclosure rules (Gensler 2021; Lee 2020). The lack of mandatory rules has led to significant differences in climate disclosure across companies—some companies disclose, some do not; some companies disclose more, some disclose less. There are few guidelines, and penalties for non-disclosure are largely in the form of investor displeasure. Despite the recent progress in research on climate disclosures (e.g., Griffin et al. 2017; Matsumura et al. 2014; Clarkson et al. 2013, 2008), we still do not have a clear understanding of the set of factors that determine the variation in firm-level climate disclosure.

In this study, we focus on one such voluntary disclosure platform called the CDP. CDP is based in London, and counts amongst its filers many of the world's largest corporations. For instance, we find that among US firms, S&P500 firms represent twice as many filers with CDP vis-à-vis non-S&P500 firms. Second, among the S&P500 firms that file with the CDP, there is a distinct pecking order, with the top quintile of S&P500 firms (based on market cap) being twice as likely as the bottom quintile to file with the CDP. Overall, at the end of 2020, just over 2/3^{rds} of the S&P500 members filed with the CDP.

We explore what factors influence a firm's decision to file and disclose climate risk with the CDP. In particular, we want to know if shareholder activism, measured via climate-risk related shareholder resolutions, has a material impact on a firm's decision to report climate risk voluntarily with the CDP. We do not find any evidence supporting such a conjecture, in contrast to the findings in Flammer et al (2021). Instead, we find that firms with higher institutional ownership are *less* likely to file with the CDP, perhaps because large institutions have alternate channels to engage with firms and directly acquire climate

risk information. Our finding is consistent with Solomon et al. (2011), who report that large institutions engage privately with investee firms to obtain climate risk information; a similar conclusion is reached based on a survey of investors compiled by Ilhan et al. (2019). When we exclude the top 3 largest institutional shareholders, this result gets stronger, supporting the inference regarding private channels of communication by large investors in general.

Most firms that file with the CDP also disclose climate risk in their filings, and not surprisingly, the cross-sectional correlates of climate risk disclosure at the CDP are virtually identical to that of CDP filers. For instance, the likelihood of disclosing climate risk information decreases in institutional ownership, for reasons pointed out above. Moreover, shareholder resolutions do not have a significant incremental power in explaining climate disclosure, once again in contrast to the findings in Flammer et al (2021). As was the case with CDP filers, we find that assets-in-place firms (as opposed to high growth firms as measured by Q-ratios) are more likely to disclose climate risk when they file with the CDP, indicating that physical climate risk is of greater concern to investors vis-à-vis transition or regulatory risk. A similar conclusion is reached in the survey of investors conducted by Ilhan et al (2019).

We also examine firms that initiate disclosure at the CDP for the first time. By construction, this sample contains firms that did not disclose climate risk at the CDP in prior years, but chose to do so for the first time in the current year. We find that firms with higher liquidity, more profits, and larger size have a higher likelihood of

initiating climate disclosure on the CDP. Overall, our results indicate that large investors prefer to engage privately with firms in gathering climate risk related information. More profitable assets-in-place type of firms appear to be more likely to choose voluntary forms of disclosure. Shareholder resolutions do not seem to influence a firm's decision to file or disclose climate risk information on the CDP.

The rest of the paper proceeds as follows. In section 2 we provide a brief survey of the nascent literature on climate risk disclosure and our contribution. In section 3, we describe our data source. In section 4 we present our main findings. Conclusions are provided in section 5.

2. **Related Literature and Contribution**

Our study contributes to several strands of literature. First, we provide direct empirical evidence of how investor demand for climate risk information affects firms' decision of voluntary climate disclosure. Firms are more likely to supply disclosure when investor demand for the same is high (Ajinkya et al. 2005) or when they 'cater to' investor demand (Baker & Wurgler 2004). Disclosure, however, can bring out bad news or proprietary information (Hope et al. 2016; Verrecchia and Weber 2006). Thus, the extent to which firms cater to investor demand for climate disclosure is an empirical question.

Flammer et al. (2021) study the effect of environmental shareholder activism on firms' voluntary disclosure of climate risks. Considering S&P500 firms for the period 2010-2016, the authors find that the number of environment-related SRI (socially responsible investment) proposals submitted by firms' shareholders is positively associated with firms'

voluntarily disclosure of climate risks to CDP, especially if these proposals are initiated by institutional investors with a long time-horizon.

Our paper finds no association between the number of a firm's climate-risk-disclosure related proposals and its likelihood of voluntary climate risk filing, disclosure, or the initiation of disclosure to CDP. We also find no such association in the subsamples of 2010-2016 and 2017-2020. Our sample covers S&P 500 companies for the period of 2010-2020, the entire period of clean data available in the CDP database.[3] One plausible reason for the difference in results between our paper and Flammer et al. (2021) is that climate-risk-disclosure proposals from shareholders are more precisely (and narrowly) defined in our paper than in Flammer et al. (2021). We consider only those shareholder proposals that include words related to climate risks and disclosure, whereas Flammer et al include the broader class of SRI proposals related to environment. As well, their proposal choice does not consider words pertaining to disclosure. Another plausible reason is that a firm's likelihood of disclosure in the prior year, a variable often found to explain a firm's propensity for voluntary disclosure in the current year (e.g., *Griffin et al. 2017;* Matsumura et al. 2014) and is highly significant in all of our models, is controlled for in our disclosure regressions, but not in theirs (2021).

Second, our study adds to the literature on investor demand for climate disclosure. Information about a firm's climate risk exposure is useful to investors for assessing the firm's valuation. Research to date provides some indirect evidence

[3] CDP now sells data only from 2010, because they cannot guarantee the correctness of data before 2010.

of investor demand for climate disclosure by showing that investors reward climate disclosures by firms that are vulnerable to transition climate risk. For example, firms vulnerable to higher transition risk have lower market value or higher cost of equity, but by disclosing their climate risks, firms can either lower or even fully mitigate the negative effects of their risks (Matsumura et al. 2017, 2014; Jung et al. 2016). Evidence on whether investors understand, or even care about, physical climate risk is mixed. Some studies find that physical climate risk is not adequately priced in the market (Bolton and Kacperczyk 2020; Kölbel et al. 2020; Hong et al. 2019), implying investors' lack of understanding or concern about physical climate risk. Other studies, however, find that physical risk is priced in specific markets (Baldauf et al. 2020; Bansal et al. 2016; Chava 2015). More direct evidence of investor demand for climate disclosure is provided by Ilhan et al. (2019), who find in their survey that institutional investors share a strong belief that climate risk disclosure is important. The survey reveals that a significant fraction of these investors believes climate risk reporting to be as important as, or even more important than, traditional financial reporting.

Third, our study also contributes to the literature on the effect of large shareholders on corporate disclosure. Prior research provides mixed evidence on the effect of large shareholders on shaping corporate disclosure environment. On the one hand, based on the theory that more public information limits large shareholders' private information advantage (Diamond 1985; Gao and Liang 2013), prior research documents that large investors prefer and benefit from less transparent disclosure environment (Bushee and Goodman 2007; Maffett 2012; Bok et al. 2020). On the other hand, research shows that

large equity ownership is positively associated with corporate information environment (O'Brien and Bhusan 1990; Bushee and Noe 2000; Ajinkya et al. 2005).

Our study contributes to this literature by showing that institutional ownership is negatively associated with a firm's likelihood of voluntary climate risk disclosure, supporting the view that large shareholders utilize private engagements in obtaining information when public disclosure is sparse. Our result is consistent with Solomon et al. (2011), who find that institutional investors often obtain climate risk information by engaging privately with the firms to compensate for the lack of quality climate disclosures. Krueger et al. (2020) also find that many institutional investors, especially large long-term investors, consider direct engagement, rather than divestment, to address climate risks in their portfolio firms.

Finally, our study contributes to the growing literature on climate disclosure. Prior research shows that firms have incentives to disclose some types of information voluntarily, because disclosure can lower their cost of capital (Diamond and Verrecchia 1991; Easley and O'Hara 2004; Heinle and Smith 2016) or increase market liquidity (Balakrishnan et al. 2014). Specific to climate risk disclosure, research shows that companies that are vulnerable to transition climate risk (such as emitting substantial greenhouse gases [GHG] or releasing toxic waste) disclose more climate-related information to pre-empt regulatory threat (Hsueh 2019; Kim and Lyon 2011). To the extent that poor environmental performance (e.g., higher GHG emissions) increases a company's transition risk, evidence about the impact of transition risk on a company's voluntary climate disclosure is mixed. Some scholars

find that companies with poor environmental performance disclose more, based on the premise that poorly performing companies disclose more to improve their legitimacy (Cho & Patten 2007; Patten 2002). Others find that companies with superior environmental performance disclose more, based on the economic theory that better-performing companies signal their superior quality by disclosing more information (Clarkson et al. 2008; Al-Tuwaijri et al. 2004).

Research also reveals that firms more likely to make voluntary disclosure of GHG emissions tend (a) to be large and environmentally proactive, (b) have made prior voluntary disclosures, and (c) have higher growth options and leverages (Griffin et al. 2017; Matsumura et al. 2014). Our paper contributes to this literature by showing that firms more likely to disclose climate risk to CDP have (a) larger size, (b) higher ROA and lower Q-ratios, (c) made voluntary climate disclosure in prior year, and (d) low institutional ownership.

3. Data and Key Variables

We obtain data on firm-level shareholder resolutions, and climate risk disclosures from two primary sources - CDP and ISS Voting Analytics. The sample construction process is described below. We restrict our analysis to S&P 500 for the overlap of coverage in data between our data sources required for our analysis.

3.1 Climate Risk Disclosure

Our data on climate risk disclosures is from CDP. CDP is a not-for-profit that runs the disclosure system for investors, firms, government agencies. CDP, on behalf of their investors and customers, asks companies around the world annually to disclose information on climate change and environmental impact. Specifically, CDP sends a questionnaire asking companies to identify and disclose information on risks, opportunities, and other information pertaining to their exposure to climate risk, and on their management strategies. Given the comprehensive nature of the data in the CDP, it is widely recognized as the "gold standard of environmental reporting" (CDP 2021). As of 2020, nearly two-thirds of firms in the S&P 500 disclose their climate risk information to the CDP.

We focus on investor CDP data, and consider two channels of climate disclosures for our empirical analysis 1) the likelihood of responding (or filing) to CDP and 2) the specific disclosure of climate risk information on the CDP. The first variable, *CDP_Filing*, likelihood of responding to the CDP questionnaire, is a dummy variable that identifies whether a firm responded to the CDP questionnaire in a given year. The second variable builds on the definition in Flammer et al. (2021) and considers the CDP questionnaire question CC5.1, which asks companies to disclose information for three types of climate risks – regulatory, physical, and other risks. This question is identified in each year of the CDP, and we code a dummy variable, *CDP_Discl*, equals to 1, if a company discloses at least one of the climate risk information and 0 otherwise. Therefore, the first variable captures the likelihood of responding to CDP, while the second variable captures the likelihood of disclosing

climate risk to CDP, conditional on responding to CDP. Over Ninety-five percent of firms that respond to the CDP questionnaire, also specifically disclose their climate risk information.

3.2 Shareholder Resolutions

The data on shareholder resolutions are collected from the Institutional Shareholder Services (ISS) voting analytics. ISS is an influential proxy advisory firm that provides recommendations to clients about how to vote in regards to shareholder proposals. The ISS database contains detailed information on company meeting dates, topic, description of the resolution, ISS recommendation for the resolution, management recommendation for the resolution, and shareholder support for US-listed firms. ISS categorizes proposals in two categories – Governance related, and socially responsible investing (SRI). The sample used for the empirical analysis in this paper considers all proposals submitted by shareholders: those included in the proxy, those that the SEC allows for exclusion, and those that are withdrawn.

We consider both Governance and SRI related proposals. Climate related proposals are identified by reading the description of the resolution type, and then coding the resolution as climate related. We follow a narrow (precise) approach in the coding of climate related resolution. Specifically, we choose resolutions, regardless of whether they are SRI or Governance type, that contain words related to "climate risk" and "disclosure/reporting." The variable *SH_RES* is a dummy variable measuring whether a company has any climate disclosure related resolution in a given year.

3.3 Institutional Investors Data

Institutional investor data are taken from the Thomson Reuters 13F filings. We calculate the percentage of shares in a firm held by institutional investors. To align the timings of measurement in institutional holdings with CDP disclosure, we use ownership reproted in the fourth quarter of institutional holdings for a firm. In addition, we follow Azar et al. (2021) and identify holdings by "Big Three" institutional investors – namely BlackRock, Vanguard, and State Street. The "Big Three" have recently been active and vocal in their activism related to climate related disclosure for firms. Therefore, we separately consider the relationship between Big-Three ownership percentage and climate risk disclosure.

3.4 Other Control Variables

The control variables for the analysis are collected from Compustat, which is merged to the list of S&P 500 firms that are in the intersection of CDP and ISS. Following Flammer et al. (2021), we use Size, defined as the natural logarithm defined as the book value of the assets; return on assets *ROA*, defined as operating income over book value of assts, market to book *MTB*, defined as market value of common stock to its book value; Leverage *LEV*, defined of debt to book value of assets; Cash *Cash* is defined as the ratio of cash to book value of assets.

3.5 Descriptive Statistics

Figure 1 shows the percentage of firms in the CDP. There are 289 S&P 500 firms that are in the CDP in 2010. The number of S&P 500 firms in the CDP has seen a modest increase over the last decade, but virtually has remained flat until 2018. The number of S&P 500 firms in the CDP in 2020 is 322. We also find that among US firms,

S&P 500 firms represent twice as many as non-S&P 500 firms on the CDP as are non-S&P 500 firms. In Figure 2, we sort the S&P 500 firms into five quintiles based on their market cap, and identify the percent of each quintile responding to the CDP. We then plot the percentage of each quintile on CDP across time. We find there is a distinct pecking order – the top quintile of S&P 500 firms being twice as likely as the bottom quintile to respond to the CDP, suggesting the largest firms by market cap continue to voluntarily respond to CDP.

Panel A of Table 1 presents the descriptive statistics of key variables from our sample used in our empirical examination. We assess whether CDP filers, and CDP non-filers are similar in their characteristics. The average size of a CDP filer firm is 95 billion, while the average size of the CDP non-filer is significantly smaller at 32 billion. The average percentage of institutional ownership for a CDP filer is 75%, relatively smaller than the average percentage of institutional ownership of a CDP non-filer, which is 81%. The average holdings of "Big Three" for CDP filer is 19.8% and very similar to the average holdings of "Big Three" for CDP non-filer is 20.3%. The financial characteristics of the CDP filer and CDP non-filer are very similar allaying any concerns that the non-filers are not a good control to CDP filers. Panel B of Table 1 contains pairwise correlation coefficients.

4. Empirical Results

We begin our empirical analysis focusing on the relationship between shareholder activism and the likelihood of disclosing to CDP.

4.1 Relationship between Shareholder Activism and Filing on CDP

Throughout our analysis, we estimate using rank regression approach for key variables of interest and control variables. Table 2 presents the results of our regression analysis. In column 1, we include *SH_RES; Rank_INST_13F,* the rank of the institutional holdings of the firm in year T. We transform the right-hand variables into ranks rather than use their actual value to get less skewed distribution of each variable. A key variable that we explicitly control is the firm's likelihood of disclosure to the CDP in the prior year, *CDP_Filing_previous_year.* We then include firm level controls in ranks – *Size, ROA, MTB, Lev, and Cash.* The coefficient of *SH_RES* is insignificant, and we find no association between whether a firm receives a climate-risk related resolution, and its likelihood of voluntarily filing disclosure to the CDP. We find that disclosure likelihood is sticky – the likelihood of a firm disclosing to the CDP in the prior year is highly associated with disclosing in the current year as observed in the positive coefficient of *CDP_Filing_previous_year*. In other words, firms that disclose climate risk with the CDP tend to continue doing so in the subsequent years.

The coefficient of *Rank_INST_13F* in column 1 is positive at 5% significance, suggesting a larger rank is associated with filing to the CDP. The interpretation is that higher institutional ownership is negatively associated with a firm's likelihood of voluntary filing to the CDP. The inference is consistent with large institutional investors using alternative channels, such as private engagements, in obtaining climate information from firms. *Rank_Size* is negatively associated with filing with the CDP, suggesting that larger firms are more likely to file disclosure to the CDP. In column 2, we include the term *SH_RES*Rank_INST_13F* to control for the interactive effect on firms with large institutional holdings and that receive climate risk related

proposal(s). The coefficient of *Rank_INST_13F* continues to be positive, albeit somewhat weaker at 10% significance. The coefficients of *SH_RES* continues to be insignificant, while the *CDP_Filing_previous_year* remains unchanged.

In column 3 and column 4, we repeat the estimates of column 1 and 2, but split *Rank_INST_13F* into shareholdings of Big 3 and non-Big 3, identified by *Rank_Big3* and *Rank_NonBig3* respectively. We do this to check if the results are driven by very large investors, or if the private engagement possibility extends to other investors too. In column 3, we include the main effects of *Rank_Big3* and *Rank_NonBig3,* while in column 4 we include the interaction term *SH_RES*Rank_Big3* and *SH_RES*Rank_NonBig3.* We observe that the coefficient of *SH_RES* continues to exhibit no association with the likelihood of filing disclosure to the CDP. Across columns 3 and 4, we find the coefficient of *CDP_Filing_previous_year* is positive at 1% significant. The coefficient of *Rank_NonBig3* is positive at 5% significance level, suggesting that non-Big3 ownership is negatively associated with a firm's likelihood of voluntary filing to the CDP. The inference is that that the relationship between institutional holdings and CDP filings documented in column 1, and 2 is driven primarily by non-Big 3 ownership. The coefficient of *Rank_Big3* is negative, and insignificant.

4.2 Relationship between Shareholder Activism and Climate Risk Disclosure

The analysis thus far focused on the likelihood of filing with the CDP, i.e., responding to the CDP questionnaire. In this section, we focus explicitly on firm's climate risk disclosure to the CDP. Table 3 presents the results of the analysis, where we replace the dependent variable from the analysis in table 2 with the likelihood of firm voluntarily disclosing climate risk related disclosure, conditional on responding to the CDP. Note, as previously discussed, there

is a high correlation of firms disclosing their climate risk related disclosure and the firms filing any disclosure (responding) to the CDP. Our estimates in Table 3 follow the estimates in Table 2.

Most of our inferences in table 2 remain unchanged when we use climate risk disclosure as a dependent variable. This is not surprising given the very high correlation between CDP_Filing and CDP_Discl, and that over 95% of CDP filers also disclose their climate risk. In column 1 and column 2, we continue to find no association between climate risk related shareholder resolution and a firm's likelihood of voluntarily disclosing climate risk with the CDP. The likelihood of a firm disclosing climate risk is strongly correlated with its disclosure to the CDP in the previous year is strongly associated with climate risk disclosure in the current year. The coefficient of *Rank_INST_13F* is positive (at 5%) suggesting a larger rank is associated with the likelihood of climate risk disclosure to the CDP, and that firms with larger institutional ownership is negatively associated with a firm's likelihood of voluntary disclosing climate risk. The coefficient of *SH_RES*Rank_Big3* is insignificant. The coefficient of *Rank_Size Rank_ROA, and Rank_Lev* are negative at 5%, 1%, and 1% respectively.

In columns 3, and 4 we split Rank_INST_13F into *Rank_Big3* and *Rank_NonBig3.* We find that the main effect of *Rank_NonBig3* is positively associated with likelihood of disclosing climate risks, suggesting that it is the NonBig 3 that is driving our primary results of the relationship between institutional ownership and climate risk disclosure. In column 4, we find the coefficient of *SH_RES*Rank_Big3* is weakly positively significant at 10%, somewhat different to the results documented

in column 4 in table 2. Taken together, the findings from this section suggests that the association between a firm receiving a climate-risk related proposal, and its likelihood of voluntarily disclosing climate risk; and the association between a firm's institutional ownership and its likelihood of firm voluntarily disclosing climate risk are consistent with the discussion presented in the previous section.

4.3 Effects of Shareholder Activism on CDP Climate Risk Disclosure Initiation

While the previous sections focus on firms responding to CDP, and disclosing climate risk, in this section, we examine firms that initiate disclosure at the CDP for the first time. The main difference in this analysis is to examine the differences of climate risk disclosures of firms in the CDP. We first construct our dependent variable as a firm initiating CDP climate risk disclosure for the first time in year T, and zero otherwise. Therefore, by construction we consider all S&P 500 firms that did not disclose climate risk to CDP in prior year, but chose to do so for the first time in the current year. Considering the nature of analysis, we do not include the variable *CDP_Discl_previous_year* in our estimates.

In table 4, we present the result of the analysis. Columns 1-4 mirror the estimates of the analysis in table 2 and table 3, but with somewhat lower significance levels. Our findings in the examination of climate risk initiation to CDP remain consistent to the analysis presented before. We find that firms with higher cash, higher profitability, and larger size have a higher likelihood of initiating climate risk disclosure on the CDP. Importantly, we again find that large (institutional) investors prefer to engage with firms for receiving climate risk related information and shareholder resolutions play no role in the initiation of climate risk disclosure.

5. Conclusion

We study the effects of shareholder activism, measured by climate-risk related shareholder resolutions, and institutional ownership on a firm's decision to disclose its climate risk voluntarily at the CDP, formerly the Carbon Disclosure Project. We find no association between shareholder activism and a firm's voluntary climate risk disclosure, counter to the findings in Flammer et al. (2021). Instead, we find evidence that firms with higher institutional ownership have a *lower* likelihood of climate risk disclosure, suggesting that large institutions use alternate channels such as private engagements to obtain climate risk information directly from the firms. Our findings are consistent with Solomon et al. (2010) and Krueger et al. (2020) which document that large institutional investors frequently use private engagements to complement inadequate climate risk disclosure by their investee firms.

We also find that larger and more profitable assets-in-place firms (higher ROA and lower Q-ratios) tend to disclose more of their climate risk information voluntarily. Overall, our findings suggest a limited role of shareholder resolutions in inducing firms to voluntarily disclose their climate risk information, and instead point to private engagements as the preferred route taken by large investors take to obtain climate risk information directly from their investee firms.

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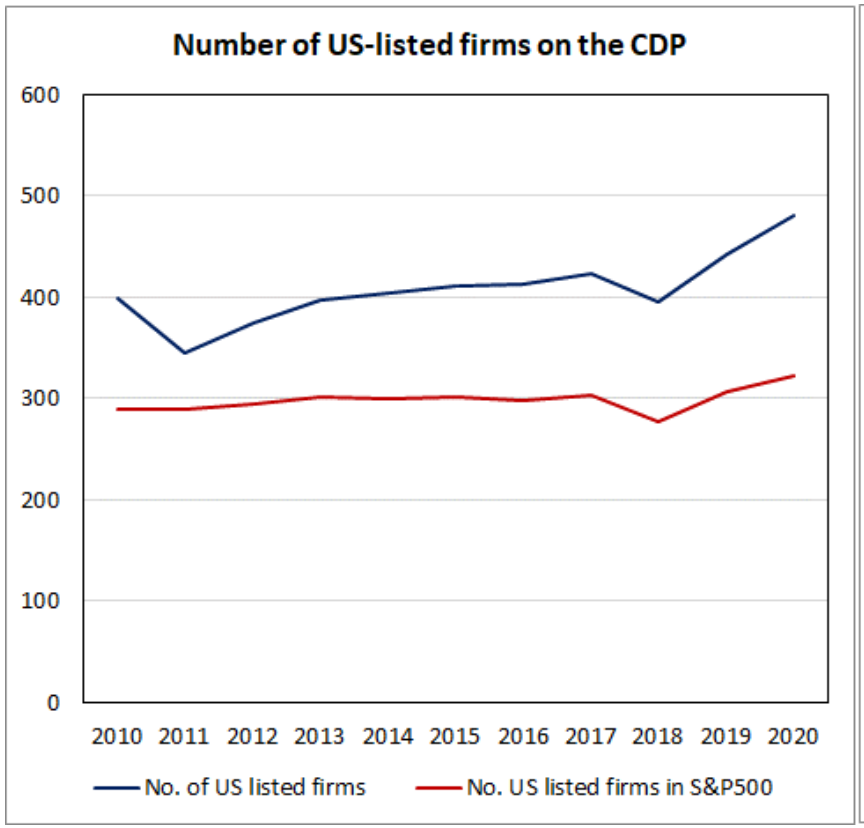
Figure 1

Firms Self-reporting on CDP in Calendar Time

The first graphs shows US-listed firms and the second graph shows non-US firms.



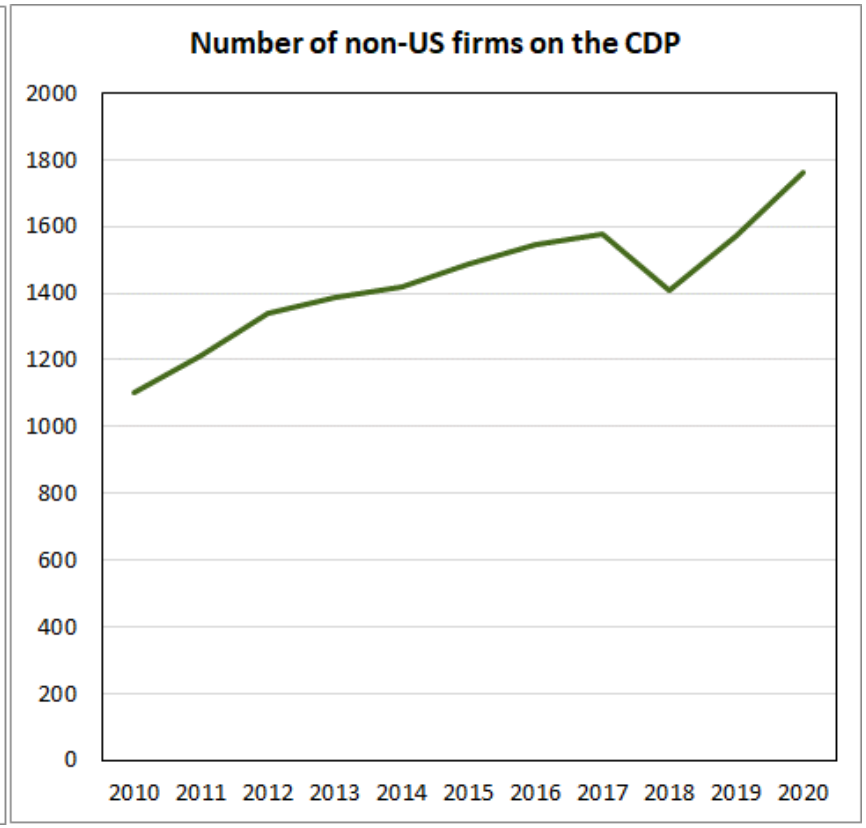


Figure 2

S&P500 Quintiles on CDP in Calendar Time

S&P100 represents the top 100 S&P500 firms, and S&P401-500 represents the bottom hundred by market value. Each year the graphs represents the fraction of S&P500 firms on the CDP in each S&P500 market value quintile.

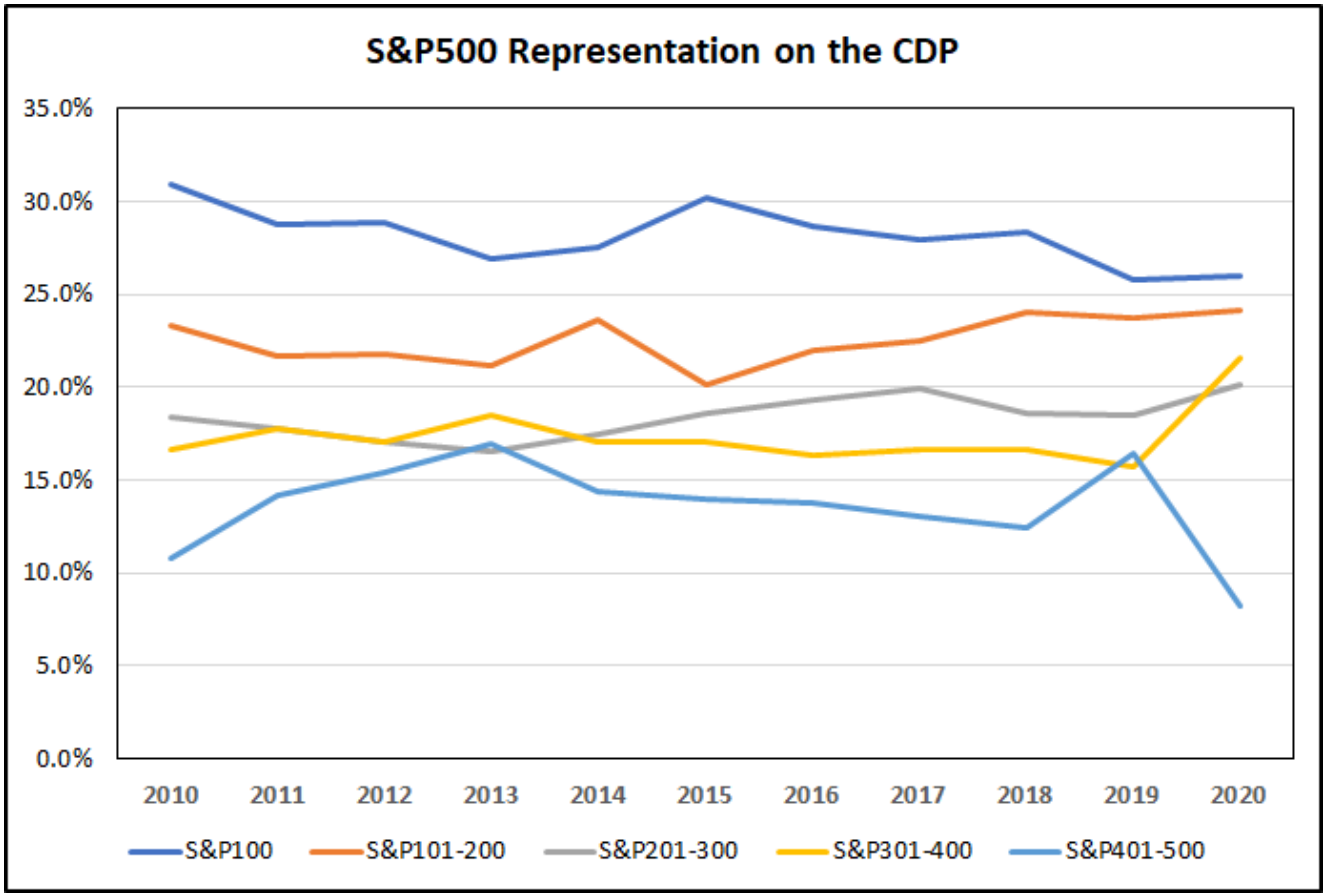


Table 1A

Table 1A

Descriptive Statistics

Sample covers 2010-2020 and contains S&P500 firms that file with and disclose climate related risk to to the CDP. Firms that filed with CDP are denoted as filers and otherwise are denoted as non-filers. Firms that disclose climate risks in CDP questionnaires are denoted as disclosers and otherwise are denoted as non-disclosers. Firms that disclosed in CDP in the current year but didn't disclose in the previous year are denoted as disclosure-initiators and otherwise are denoted as non-disclosure-initiators. SH_RES denotes if there was a climate related shareholder resolution in that year. Inst_13F represents institutional holdings in the firm measured at the end of the last quarter of the previous year. Big3 represents the three largest investors, namely Blackrock,Vanguard and Statestreet. Size is measured in market value, ROA is operating income scaled by assets, MTB refers to the firm's market to book ratio, LEV and CASH refer to a firm's book leverage based on long-term debt and cash and equivalents scaled by book

Mean	Filers	Non-filers	Disclosers	Non-disclosers
S&P500, percent	52.68	47.32	48.36	51.64
Size, millions $	95,060	31,626	91,093	40,628
INST_13F	75.5%	81.1%	75.8%	80.2%
Big3_13F	19.8%	20.3%	19.7%	20.0%
Non-Big3_13F	80.2%	79.7%	80.3%	80.0%
ROA	12.9%	12.7%	12.9%	12.7%
MTB	3.85	3.51	3.71	3.66
Lev	0.28	0.28	0.28	0.27
Cash	0.13	0.12	0.13	0.12

Table 1B

Table 1B

Matrix of correlations

Sample covers 2010-2020 and contains S&P500 firms that file with and disclose climate related risk to to the CDP. P-value is presented below each correlation coefficient. Values of INST_13F, ROA, Assets, MTB, Lev, Cash, Big3, and Non_big3 are in the previous year. SH_RES denotes if there was a climate related shareholder resolution in that year. Inst_13F represents institutional holdings in the firm measured at the end of the last quarter of the previous year. Big3 represents the three largest investors, namely Blackrock,Vanguard and Statestreet. Size is measured in market value, ROA is operating income scaled by assets, MTB refers to the firm's market to book ratio, LEV and CASH refer to a firm's book leverage based on long-term debt and cash and equivalents scaled by book assets. p-values are below the coefficients.

CDP_filing	1											
CDP_Discl	0.899	1										
	0.00											
CDP_Discl_Initiation	0.114	0.127	1									
	0.00	0.00										
SH_RES	-0.005	-0.001	-0.009	1								
	0.77	0.94	0.56									
INST_13F	-0.182	-0.146	-0.043	-0.082	1							
	0.00	0.00	0.01	0.00								
ROA	0.003	-0.005	0.019	-0.067	-0.011	1						
	0.83	0.78	0.25	0.00	0.47							
Size	0.271	0.255	0.028	0.120	-0.249	-0.429	1					
	0.00	0.00	0.08	0.00	0.00	0.00						
MTB	0.003	-0.048	0.044	-0.062	-0.062	0.462	-0.331	1				
	0.85	0.00	0.01	0.00	0.00	0.00	0.00					
Lev	0.047	0.049	0.005	0.042	-0.021	0.020	0.100	0.236	1			
	0.00	0.00	0.77	0.01	0.18	0.21	0.00	0.00				
Cash	0.006	-0.025	0.004	-0.078	0.083	0.212	-0.291	0.244	-0.252	1		
	0.71	0.12	0.79	0.00	0.00	0.00	0.00	0.00	0.00			
Big3	-0.054	-0.060	0.016	0.023	0.150	-0.120	-0.030	-0.007	0.157	-0.149	1	
	0.00	0.00	0.33	0.14	0.00	0.00	0.06	0.68	0.00	0.00		
Non_big3	-0.171	-0.133	-0.047	-0.089	0.973	0.017	-0.244	-0.061	-0.059	0.118	-0.084	1
	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.00	0.00	0.00	0.00	

Table 2

Table 2

Effects of shareholder activism on CDP filing by S&P500 Firms

The dependent variable is equal to 1 if there was a CDP filing by the firm in year T, and equals 0 otherwise. Rank denotes the variables transformed into ranks, with rank 1 being the highest value and coefficients being reported as 10^{-3}. SH_RES denotes if there was a climate related shareholder resolution in that year. Inst_13F represents institutional holdings in the firm measured at the end of the last quarter of the previous year. Big3 represents the three largest investors, namely Blackrock, ... Size is measured in market value, ROA is operating income scaled by assets, MTB refers to the firm's market to book ratio, LEV and CASH refer to a firm's book leverage based on long-term debt and cash and equivalents scaled by book assets. Sample spans 2010-2020. ***, ** and * denote significance at the 1%, 5% and 10% levels.

	1	2	3	4
SH_RES	-0.00636	-0.0104	-0.00622	-0.0341
	(0.0121)	(0.0352)	-0.0123	-0.0513
CDP_Filing_previous_year	0.821 ***	0.821 ***	0.819***	0.819 ***
	(0.0114)	(0.0114)	-0.0117	-0.0115
Rank_INST_13F	0.080 **	0.079 *		
	(0.0341)	(0.0414)		
SH_RES*Rank_INST_13F		0.015		
		(0.1310)		
Rank_Big3			-0.006	-0.017
			(0.0340)	(0.0000)
Rank_NonBig3			0.089 **	0.093 **
			(0.0322)	(0.0355)
SH_RES*Rank_Big3				0.172
				(0.1330)
SH_RES*Rank_NonBig3				-0.044
				(0.1280)
Rank_Size	-0.113 **	-0.113 **	-0.115 **	-0.115 **
	(0.0396)	(0.0395)	(0.0415)	(0.0413)
Rank_ROA	-0.041	-0.041	-0.042	-0.043
	(0.0331)	(0.0332)	(0.0342)	(0.0345)
Rank_MTB	-0.034	-0.035	-0.037	-0.036
	(0.0262)	(0.0262)	(0.0267)	(0.0269)
Rank_Lev	-0.048	-0.048	-0.050	-0.050
	(0.0301)	(0.0304)	(0.0301)	(0.0302)
Rank_Cash	-0.059	-0.059	-0.066	-0.065
	(0.0360)	(0.0362)	(0.0371)	(0.0376)
Constant	0.23 ***	0.23 ***	0.234 ***	0.236 ***
	(0.0228)	(0.0224)	(0.0277)	(0.0272)
Observations	3,955	3,955	3,943	3,943
R-squared	0.715	0.715	0.715	0.715
Year FE	YES	YES	YES	YES

Table 3

Table 3

Effects of shareholder activism on CDP climate risk disclosure by S&P500 Firms

The dependent variable is equal to 1 if there was a CDP climate risk disclosure by the firm in year T, and equals 0 otherwise. Rank denotes the variables transformed into ranks, with rank 1 being the highest value, and coefficients being reported as 10^{-3}. SH_RES denotes if there was a climate related shareholder resolution in that year. Inst_13F represents institutional holdings in the firm measured at the end of the last quarter of the previous year. Big3 represents the three largest investors, namely Blackrock, ... Size is measured in market value, ROA is operating income scaled by assets, MTB refers to the firm's market to book ratio, LEV and CASH refer to a firm's book leverage based on long-term debt and cash and equivalents scaled by book assets. Sample spans 2010-2020. ***, ** and * denote significance at the 1%, 5% and 10% levels.

	1	2	3	4
SH_RES	-0.00344	-0.0138	-0.0036	-0.042
	(0.0142)	(0.0318)	-0.0145	-0.0459
CDP_Discl_previous_year	0.792 ***	0.792 ***	0.79 ***	0.79 ***
	(0.0094)	(0.0094)	-0.00927	-0.00918
Rank_INST_13F	0.079 **	0.076 **		
	(0.0285)	(0.0319)		
SH_RES*Rank_INST_13F		0.039		
		(0.0001)		
Rank_Big3			-0.019	-0.034
			(0.0345)	(0.0343)
Rank_NonBig3			0.088 ***	0.092 ***
			(0.0218)	(0.0238)
SH_RES*Rank_Big3				0.223
				(0.1190)
SH_RES*Rank_NonBig3				-0.048
				(0.1030)
Rank_Size	-0.130 **	-0.130 **	-0.137 **	-0.136 **
	(0.0493)	(0.0492)	(0.0515)	(0.0511)
Rank_ROA	-0.057 *	-0.057 *	-0.058	-0.059 *
	(0.0258)	(0.0258)	(0.0267)	(0.0271)
Rank_MTB	-0.011	-0.012	-0.015	-0.014
	(0.0301)	(0.0302)	(0.0298)	(0.0299)
Rank_Lev	-0.068 *	-0.068 *	-0.069 *	-0.070 *
	(0.0374)	(0.0376)	(0.0374)	(0.0373)
Rank_Cash	-0.001	-0.001	-0.009	-0.008
	(0.0436)	(0.0439)	(0.0458)	(0.0461)
Constant	0.239 ***	0.24 ***	0.247 ***	0.249 ***
	(0.0308)	(0.0305)	(0.0356)	(0.0345)
Observations	3,955	3,955	3,943	3,943
R-squared	0.661	0.661	0.66	0.66
Year FE	YES	YES	YES	YES

Table 4

Table 4

Effects of shareholder activism on CDP climate risk disclosure initiation by S&P500 Firms

The dependent variable is equal to 1 if the firm initiated a CDP climate risk disclosure in year T, and equals 0 otherwise. Rank denotes the variables transformed into ranks, with rank 1 being the highest value, and coefficients being reported as 10^{-3}. SH_RES denotes if there was a climate related shareholder resolution in that year. Inst_13F represents institutional holdings in the firm measured at the end of the last quarter of the previous year. Big3 represents the three largest investors, namely Blackrock, ... Size is measured in market value, ROA is operating income scaled by assets, MTB refers to the firm's market to book ratio, LEV and CASH refer to a firm's book leverage based on long-term debt and cash and equivalents scaled by book assets. Sample spans 2010-2020. ***, ** and * denote significance at the 1%, 5% and 10% levels.

	1	2	3	4
SH_RES	-0.0031	0.0178	-0.00792	0.0144
	(0.0060)	(0.0236)	-0.00667	-0.0288
Rank_INST_13F	0.028 *	0.034 **		
	(0.0145)	(0.0165)		
SH_RES*Rank_INST_13F		-0.081		
		(0.0975)		
Rank_Big3			0.016	0.014
			(0.0124)	(0.0107)
Rank_NonBig3			0.031 **	0.040 *
			(0.0141)	(0.0184)
SH_RES*Rank_Big3				0.032
				(0.0659)
SH_RES*Rank_NonBig3				-0.113
				(0.0946)
Rank_Size	-0.030 **	-0.030 **	-0.026 *	-0.026 *
	(0.0128)	(0.0127)	(0.0000)	(0.0122)
Rank_ROA	-0.023	-0.023	-0.029 *	-0.029 *
	(0.0255)	(0.0255)	(0.0151)	(0.0149)
Rank_MTB	-0.006	-0.006	-0.004	-0.003
	(0.0127)	(0.0127)	-0.009	(0.0084)
Rank_Lev	0.006	0.006	0.001 *	0.001
	(0.0136)	(0.0139)	(0.0147)	(0.0147)
Rank_Cash	-0.026 **	-0.027 **	-0.028	-0.027 *
	(0.0110)	(0.0114)	(0.0122)	(0.0127)
Constant	0.109 ***	0.108 ***	0.0332*** ***	0.0317 ***
	(0.0143)	(0.0153)	(0.0087)	(0.0075)
Observations	4,436	4,436	4,069	4,069
R-squared	0.033	0.033	0.023	0.024
Year FE	YES	YES	YES	YES