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Voluntary Climate Disclosures: A Tale of Two Venues

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Voluntary Climate Disclosures: A Tale of Two Venues

ABSTRACT

We examine the relationship between firms' voluntary climate disclosures across two venues: corporate social responsibility (CSR) reports and the CDP (formerly the Carbon Disclosure Project). We find that a firm's CDP disclosure is positively associated with its prior CSR disclosure, suggesting that firms use these venues as complementary channels. Firms with prior CSR disclosures are less likely to disclose through the CDP when they face more climate-related shareholder resolutions, higher carbon emissions, or tighter financial constraints. Following their first-time CDP disclosure, firms experience improved liquidity, higher ESG ratings, increased analyst coverage, and reduced emissions—but only if they have not previously disclosed through CSR reports. Overall, our findings suggest that the determinants and consequences of a firm's CDP disclosure depend on its prior CSR disclosure, highlighting the importance of studying disclosure decisions across multiple venues rather than in isolation.

Keywords: Climate-related disclosure; disclosure venue; CDP; sustainability report; shareholder activism; Big 3

JEL Classifications: G11, Q54, M41

1. Introduction

Climate change is widely regarded as one of the most consequential societal challenges of our time. Not surprisingly, investors and regulators have been steadily increasing the demand for information about the effects of climate change on a firm's financial risk, value, and performance (Ilhan, Krueger, Sautner and Starks, 2023).[2] In response, firms have been disclosing various forms of climate-related information, including the extent to which they influence and are influenced by physical and transitional climate risks.[3] To date, only a few standardized mandatory disclosure requirements exist for firm-level climate-related information.[4] As a result, climate disclosures are predominantly voluntary, leaving firms with discretion not only over whether and what to disclose but also over where to disclose their climate-related information.[5]

Two prominent venues for voluntary climate disclosures are the CDP (formerly the Carbon Disclosure Project) and corporate social responsibility (CSR) reports.[6][7] A growing body of research has examined firms' voluntary climate disclosures on these two venues separately (e.g., Flammer et al., 2021; Christensen et al., 2021). However, firms' disclosures across these venues may be interrelated (e.g., Depoers et al., 2016; Grewal and Serafeim, 2020). While several studies

[2] Ilhan et al. (2023) report that almost eight out ten firms that they surveyed believe that climate risk disclosure is "*…at least as important as financial reporting*" and one out three firms consider such disclosure as even more important to their investment decisions.

[3] Physical risk stems from the physical effects of climate change such as hurricanes, wildfires, floods, or droughts. Transition risk arises from adverse regulatory changes as we transition to a low-carbon economy.

[4] Only recently have regulators across the globe begun proposing mandatory regulations on disclosing climate-related information. Notable initiatives include the Corporate Sustainability Reporting Directive in the European Union (Corporate Sustainability Reporting, 2023); the Climate Corporate Data Accountability Act in California (California State Legislature, 2023); the Enhancement and Standardization of Climate-Related Disclosures for Investors by the U.S. Security and Exchange Commission (SEC, 2024). Although this SEC rule has since been stayed (Binnie, 2024) and on 27 March, 2025, the Commission submitted a letter to the court stating its intent not to defend the rule (SEC, 2025).

[5] Climate disclosures are firms' disclosures of their climate-related information.

[6] A corporate disclosure venue is "any medium of expression through which a firm describes its economic condition.'' (Mayew, 2012, p.838). Other terms that are used in the literature to describe disclosure venues include outlets, channels, media, and vehicles.

[7] CSR reports take various names, such as corporate sustainability reports, sustainability reports, or ESG (Environmental, Social, and Governance) reports. In this paper, we use CSR reports as the catch-all phrase for all types of sustainability reports.

have investigated the determinants and consequences of firms' strategic choices of disclosure venues (e.g., Bamber and Cheon, 1998; Davis and Tama-Sweet, 2011; Skinner, 2024), they do not explore the interdependencies among disclosures across these venues. The literature on interactions among disclosures through multiple venues is limited (e.g., Beyer et al., 2010). Existing studies on disclosure interactions primarily focus on the relationship between voluntary and mandatory disclosures (e.g., Ball et al., 2012; Noh et al., 2020; Heinle et al., 2023; Martin and Timmermans, 2024), leaving a gap in understanding the interplay between voluntary disclosures across different venues.[8]

In this paper, we aim to fill this gap in the literature by examining the relationship between voluntary climate disclosures through the CDP and CSR reports. Specifically, we ask: Do firms view disclosure through these venues as complementary or substitutive? How do investor demand for climate disclosure, firms' greenhouse gas (GHG) emissions, and financial constraints influence the relationship between disclosure through the CDP and CSR reports? What are the real and capital market consequences of this relationship?

Our research questions are important for several reasons. First, understanding firms' climate disclosure decisions is crucial, as these decisions determine how effectively climate-related information reaches investors and other stakeholders, influence firms' transparency, and ultimately shape capital allocation. By examining whether firms view these disclosure venues as complements or substitutes, we can better understand how firms navigate the evolving landscape of climate reporting and respond to increasing stakeholder demands for credible climate disclosures. Second, understanding the real and capital market consequences of disclosure through

[8] A notable exception is Kirk and Markov (2016), which study the interdependencies between firms' voluntary disclosures across two venues: analyst/investor days and conference presentations.

these two venues is important because it helps us understand whether additional consequences arise from disclosure through the CDP when a firm has disclosed through CSR reports.

Once a firm decides to make voluntary climate disclosures, it faces a strategic choice of disclosure venues—the CDP, CSR reports, or both—based on a cost-benefit trade-off. The two venues differ markedly in their characteristics, offering distinct advantages depending on a firm's objectives and stakeholder needs. Disclosure through the CDP is granular, highly structured, and standardized, designed to address the needs of institutional investors through detailed questionnaires. In contrast, CSR reports are less structured, target a broader audience of multiple stakeholders, and allow firms significant discretion over content and format. While the CDP focuses primarily on climate-related information, such information is often embedded within broader sustainability topics in CSR reports.

Our first hypothesis pertains to the relationship between firms' voluntary climate disclosures through the CDP and CSR reports. The nature of this relationship is unclear ex ante. Firms may treat disclosures through these venues as either complements or substitutes. These disclosures could act as complements for several reasons. First, firms might use multiple venues to increase stakeholder awareness, as different stakeholders may prefer or rely on different channels to access climate-related information. Second, firms may view that the information provided through each venue itself be complementary. CSR reports typically present qualitative narratives on a firm's environmental strategies and broader sustainability goals, while CDP filings offer structured, quantitative data regarding greenhouse gas emissions, climate risks, and mitigation strategies. Firms could thus employ both channels to provide stakeholders with a more comprehensive understanding of their climate-related initiatives. Conversely, disclosures could serve as substitutes if firms perceive additional CDP disclosures as redundant once similar

information has been provided through CSR reports. Or if firms aim to avoid the greater scrutiny associated with the detailed, standardized disclosures required by CDP filings.[9]

Our next set of hypotheses pertains to how investor demand for climate disclosure influences the association between CDP and CSR disclosures. We focus on two channels of investor demand: Big 3 institutional investor engagement (BlackRock, Vanguard, State Street) and shareholder resolutions. Using Big 3 ownership as a proxy for engagement (e.g., Azar et al., 2021), we hypothesize that it positively affects the association between a firm's current CDP disclosure and prior CSR disclosure (Hypothesis 2A). Institutional ownership is known to promote voluntary climate disclosures (e.g., Ilhan et al., 2023; Cohen et al., 2023), with the Big 3 wielding significant influence over investee firms (e.g., Bebchuk and Hirst, 2019; Gormley et al., 2023). Since the CDP questionnaire specifically addresses institutional investors' information demands, which CSR reports may not fully meet, we expect higher Big 3 ownership to have a positive impact on the association between a firm's current CDP disclosure and prior CSR disclosure.

Our next hypothesis is that climate-related shareholder resolutions negatively affect the association between a firm's current CDP disclosure and prior CSR disclosure (Hypothesis 2B). Institutional investors, particularly large ones, typically influence firms through direct engagement, while smaller investors rely on shareholder resolutions (e.g., Ilhan et al, 2023). Firms often address these resolutions through CSR reports, which target a broader audience. Thus, we expect firms with more climate-related resolutions to be less likely to disclose through the CDP if they have previously disclosed through CSR reports.

[9] For instance, Facebook refused to disclose carbon emissions information to CDP because it "already publicly shares data on our emissions, energy use, and energy sources on an annual basis". The CEO of CDP later commented that "the most common reasons for not disclosing through CDP are that the firms already publish CSR information or that they don't have the resources to complete the questionnaire." See https://www.theguardian.com/sustainable-business/2014/oct/15/facebook-cdp-transparency-carbon-emissions

Our last two hypotheses focus on a firm's greenhouse gas (GHG) emissions and its financial constraints. Our third hypothesis is that a firm's GHG emissions have no effect on the association between its current CDP disclosure and prior CSR disclosure. The effect of a firm's GHG emissions is unclear *ex ante*. On one hand, firms with higher emissions are less likely to disclose to the CDP to avoid adverse market reactions. Prior studies find that firms with higher GHG emissions suffer discounts in their market valuations (e.g., Matsumura et al., 2014; Griffin et al., 2017) and face higher financing costs (e.g., Altavilla et al., 2024; Financial Times, 2024). On the other hand, firms with higher emissions are more likely to disclose through the CDP because of stronger investor demand for climate disclosure. A firm's emission levels, apart from its size, is the most important criterion by which CDP selects a firm to fill in CDP questionnaire (CDP Climate change Sample—Investors request 2021).

Our fourth hypothesis posits that a firm's financial constraints have no effect on the association between its current CDP disclosure and prior CSR disclosure. The significant costs of CDP disclosures may discourage financially constrained firms from disclosing, particularly if they have already disclosed through CSR reports, as such commitments can divert limited resources from shareholder value-maximizing activities and exacerbate agency problems (Friedman, 1970; Jensen, 2002). However, firms may be more likely to disclose as such disclosures can potentially alleviate financial constraints. Prior research indicates that CSR disclosures can lower the cost of capital (Dhaliwal et al., 2011), improve access to capital (Cheng et al., 2014), and, in the case of environmental disclosures, reduce financial constraints (Yao et al., 2019).

We test our predictions based on a sample of S&P 500 firms between 2010 to 2020. We measure voluntary climate disclosure on the CDP following prior research and identify a disclosing

firm based on climate risk related questions in the CDP questionnaire (e.g., Flammer et al. 2021). We measure CSR disclosure based on whether the firm has issued a CSR report.[10]

We begin our empirical analysis by documenting that the fraction of S&P 500 firms that make voluntary climate disclosure in CSR reports (CDP) has grown from 40% (40%) in 2010 to almost 75% (63%) in 2020. Notably, about one-third of firm-year observations involve disclosures through both venues, while an equal share involves neither, indicating that firms' disclosure choices across these venues are interdependent. The remaining third is evenly divided between firms disclosing through only one of the two venues.

Next, we examine the relationship between disclosure through CSR reports and the CDP at the firm level. We find that a firm's current CDP disclosure is positively associated with its prior CSR disclosure, consistent with Hypothesis 1. This positive association suggests that firms treat disclosures through CSR reports and the CDP as complements. The result underscores the value firms derive from disclosing to the CDP, even if they have previously disclosed through CSR reports.

We next examine the role of investor demand for climate-related information in influencing voluntary climate disclosure through the two venues. We use two measures of investor demand: climate-related shareholder resolutions and ownership by the Big 3 institutional investors (as a proxy for direct engagements by the Big 3, as in Azar et al., 2021). We do not find evidence supporting Hypothesis 2A. Specifically, while Big 3 ownership positively correlates with a firm's disclosure through the CDP, it does not have any additional influence on CDP disclosure if the

[10] We obtain firms' CSR reports from the Corporate Register, the world's most comprehensive database of non-financial reports. We find that over 85% of CSR reports contain climate risk-related words. Therefore, we start by identifying a firm as disclosing via CSR reports based on whether the firm has issued any CSR reports in that year. Later, in the robustness analysis section, we show that our results hold when we code a firm disclosing via CSR reports based on whether any of its CSR reports specifically include climate risk related words.

firm has already disclosed through CSR reports. However, consistent with our prediction in Hypothesis 2B, we find that climate-related shareholder resolutions are negatively associated with a firm's likelihood of CDP disclosure if the firm has previously disclosed through CSR reports. These findings collectively suggest that the impact of investor demand for climate disclosures on CDP disclosure is contingent on the firm's prior disclosure status through CSR reports.

Next, we examine the relationship between disclosures through CSR reports and the CDP by considering firm-level emissions as one of the determinants of voluntary climate disclosure. We use three measures of GHG emissions: first, an indicator of whether a firm belongs to any of the top three emitting industries (mining, manufacturing, utilities); second, an indicator of whether a firm's Scope 1 emissions are in the top quartile of the same industry; and third, the logarithm of a firm's Scope 1 emissions. We find that for firms with past disclosure via CSR reports, a high level of emissions significantly lowers a firm's likelihood of disclosing to the CDP, rejecting the null relationship in Hypothesis 3. To complement the measures of emissions, we use a measure based on a firm's exposure to climate risk. We use a measure developed by Sautner et al. (2022) who identify a firm's climate change exposure from the transcripts of its earnings conference calls. We find that firms with past disclosure via CSR reports and high exposure to climate change are less likely to disclose to the CDP, confirming the results based on emissions. Finally, we find that firms that are more capital-constrained are less likely to disclose through the CDP if they made prior CDR disclosure, providing evidence against the null relationship proposed in Hypothesis 4.

After documenting various factors influencing a firm's climate disclosure through the CDP based on its prior (non-)disclosure through CSR reports, we now turn to the implications of such disclosure. Specifically, we examine the potential economic consequences of a firm's first-time climate disclosure to the CDP, considering both real and capital market effects. Cohen et al. (2023) investigate firm outcomes in the year a firm initiates disclosure through the CDP. Consistent with

Cohen et al. (2023), we find that a firm's Scope 1 emissions decline after initiating disclosure. However, this effect is driven by firms with no prior CSR disclosure.

Additionally, we observe an increase in support for management in shareholder voting—and a decrease in support for shareholder resolutions—following firms' first-time disclosure to the CDP. This finding aligns with prior research showing that firms disclosing environmental and social information following BlackRock's annual Dear CEO letter received greater support for management on shareholder proposals from BlackRock (e.g., Pawliczek et al, 2021). We also find that firms experience an improvement in ESG ratings immediately after initiating CDP disclosure. Consistent with prior research highlighting the relevance of ESG information to financial analysts (He and Li, 2024; Roger, 2024; Wu et al., 2024), we document a significant increase in analyst coverage post-disclosure, suggesting heightened investor attention to CDP reporting. Importantly, these capital market responses are primarily driven by firms that had not previously disclosed climate-related information through CSR reports, underscoring the role of prior voluntary disclosures in shaping the market's reaction to CDP participation.

Turning to market liquidity, we find a reduction in bid-ask spreads following CDP disclosure initiation, but only among firms that had not previously disclosed through CSR reports. This suggests that prior CSR disclosure pre-emptively reduces information asymmetry, thereby attenuating the capital market effects of CDP disclosure. Collectively, these findings highlight the importance of a firm's prior disclosure status in shaping the real and market consequences of its climate reporting decisions.

Our paper contributes to several streams of literature. First, it advances the growing body of research on voluntary climate disclosure by examining the discretion managers exercise in selecting *where* to disclose climate-related information. Prior studies have primarily focused on firms' voluntary climate disclosures through either CDP filings (e.g., Cohen et al., 2023; Ilhan et

al., 2021; Flammer et al., 2019; Demers and Metzner, 2021) or CSR reports (e.g., Depoers et al., 2016). Our study is the first to examine both disclosure venues simultaneously in a firm's decision of where to disclose climate-related information and to explore how the determinants and consequences of voluntary disclosure in one venue relate to disclosure in another.[11] Specifically, we identify a complementary relationship between a firm's prior climate disclosures in CSR reports and its current disclosures through CDP filings. Furthermore, we provide evidence that the determinants and consequences of a firm's CDP disclosure are significantly influenced by its prior disclosures through CSR reports.

More broadly, our topic of firms' choice of disclosure venues relates to prior work on strategic dissemination, which refers to "firms choosing to use or not use certain channels of communication to distribute both voluntary and mandatory information" (Jung et al., 2018, p.225). Jung et al. (2018) demonstrate that firms strategically choose between social media and traditional disclosure channels based on audience characteristics and disclosure content. While Blankespoor et al. (2014) do not find evidence of strategic dissemination, they show that direct dissemination via social media reduces information asymmetry, especially for firms with limited visibility through traditional media. Our paper complements this literature by identifying an important determinant of a firm's strategic dissemination decision—namely, its prior dissemination through another venue. Specifically, we provide evidence that a firm's decision to disseminate climate-related information through the CDP is positively associated with its prior dissemination through CSR reports. We further show that several firm-level characteristics—including the number of

[11] In a sample of 120 French firms for the period of 2007-2009, Depoers et al. (2016) find that firms report significantly lower GHG emissions in CSR reports than in the CDP. They attribute this result to disclosure in CSR reports being less traceable than the same on the CDP. Our results are consistent with Depoers et al. (2016), but the focus and scope of our paper is fundamentally different from that paper.

shareholder resolutions, carbon emissions, and financial constraints—affect the relationship between firms' dissemination through these two venues.

Second, our paper contributes to the broader corporate disclosure literature on the interdependencies among firm disclosures across different information environments. Our analysis of the interdependencies between climate disclosures through the CDP and CSR reports addresses calls to study disclosure choices and their impact on a firm's information environment when multiple disclosure channels exist (Beyer et al., 2010). Prior literature on this topic is limited. Studies on disclosure venues have primarily focused on the determinants and consequences of firms' strategic venue choices (Bamber and Cheon, 1998; Davis and Tama-Sweet, 2011; Myers et al., 2013; Skinner, 2024) and do not explore interactions among disclosures across these venues. Conversely, the literature on disclosure interactions has predominantly examined the interdependencies between voluntary and mandatory disclosures, with some evidence suggesting substitutive relationships between these disclosures (Li, 2013; Guay et al., 2016; Glaeser, 2018; Noh et al., 2019; Heinle et al., 2023; Martin and Timmermans, 2024) and other evidence pointing to complementary relationships (Ball et al., 2012; Li and Yang, 2016).

Our paper extends this literature by providing empirical evidence of the interdependencies between two types of voluntary disclosures, each made through different venues, in the context of voluntary climate disclosure, and by examining two venues that have not been previously explored in this literature.[12]

Third, our paper contributes to the literature on the consequences of voluntary disclosure. Prior studies show that voluntary disclosure can lower the cost of capital (Diamond and Verrecchia,

[12] Similar to our paper, Kirk and Markov (2016) also present evidence of interdependencies between voluntary disclosures across multiple venues. Specifically, they find that the choice and information content of disclosure at analyst/investor days are influenced by disclosures made during conference presentations. In contrast to their study, our paper focuses on climate disclosure, examining the interplay between disclosure through CSR reports and the CDP.

1991; Dhaliwal et al., 2011; Heinle and Smith, 2017), increase market liquidity (Balakrishnan et al., 2014), pre-empt regulatory threats (Hsueh, 2019; Kim and Lyon, 2011), improve shareholder voting outcomes (Pawliczek et al., 2021), and reduce the likelihood of facing capital constraints (Cheng et al., 2014). In the context of voluntary climate disclosures, prior research finds that disclosing firms exhibit higher market valuations (e.g., Matsumura et al. 2014), lower cost of capital (Matsumura et al. 2024), greater ownership dispersion, improved market liquidity and efficiency (Luo et al., 2025), and reduced emissions (Cohen et al., 2023). Regarding mandatory disclosures, studies show that ESG disclosure mandates are associated with higher Tobin Q (Ioannou and Serafeim, 2019) and greater stock liquidity (Krueger et al., 2024), while mandated GHG emissions disclosure is associated with lower emissions (Tomar, 2023).

Our paper complements this literature by showing that firms experience higher market liquidity, improved ESG ratings, increased analyst coverage, stronger shareholder support for management in voting, and lower emissions following their first-time disclosure through the CDP. Importantly, we document that these effects accrue only to firms that had not made any prior CSR disclosure. This finding shows that the consequences of firm's voluntary climate disclosure through one venue depend on their prior disclosure through another, underscoring the importance of studying both venues simultaneously rather than in isolation.

2. Literature on Disclosure Venues and Hypotheses Development

2.1 CSR Reports

The demand for information about firms' social and environmental activities has surged in the past decade (Cohen et al., 2023; Krueger et al., 2020). CSR reports, or sustainability reports, are one of the most popular ways for firms to voluntarily communicate their social and environmental impact to stakeholders, with the number of S&P 500 companies publishing these

reports rising from 20% in 2011 to 96% in 2021 (Governance and Accountability Institute.[13] Prior studies document that firm size (Thorne et al., 2014; Wickert et al., 2016), ownership structure (Höllerer, 2013), corporate governance (Dalla Via and Perego, 2018; Ferrell et al., 2016), industry (Byrd et al., 2014; Gamerschlag et al., 2011), and stakeholder pressure (Huang and Watson, 2015) can impact firms' decision to issue CSR reports. CSR disclosures are also value-relevant, as studies link them to lower cost of capital (Dhaliwal et al., 2011; Lambert et al., 2012) and higher stock returns (Khan et al., 2016; Berchicci and King, 2021).

2.2 CDP Questionnaires

Founded in 2000, the CDP is a non-profit organization that runs a global system for investors, companies, cities, and regions to manage their environmental impact. It is the leading platform for (voluntary) climate disclosure and the most comprehensive global repository of carbon emissions data. Each year, CDP sends questionnaires to a broad set of companies, largely based on their inclusion in indexes such as the S&P 500, FTSE 600, ASX 200, and MSCI ACWI. These questionnaires cover climate-related risks, opportunities, emissions, governance, external verification, and other topics. Companies can choose whether or not to respond to the questionnaires. Often, institutional investors pass on their requests through CDP for certain firms to disclose. Large firms may also use CDP to ask their suppliers to participate. While most disclosures are in response to CDP requests, fewer than 10% come from firms that voluntarily disclose without formal requests from CDP.[14] CDP requires third-party verification of responses and since 2018 aligns its climate questionnaire with the Task Force on Climate-related Financial

[13] https://www.ga-institute.com/research/ga-research-directory/sustainability-reporting-trends/2022-sustainability-reporting-in-focus.html

[14] As shown in Fig. OA1 in the Online Appendix, among the S&P 500 firms, over 50% disclose in response to a CDP request, while less than 10% disclose without a CDP request (left panel). The remaining 40% are firms that did not disclose (right panel). In this study, we do not differentiate between these two types of CDP respondents when measuring CDP disclosure.

Disclosure (TCFD) recommendations endorsed by the Financial Stability Board.[15] Recognized as the "gold standard of environmental reporting" (CDP, 2021), its data shows that two-thirds of S&P 500 firms disclosed climate-related information as of 2020.

Prior studies document that larger firms, those with more institutional ownership by CDP signatories (Cohen et al., 2023), and those facing higher environmental activism (Flammer et al., 2021) are more likely to disclose through the CDP. Furthermore, CDP reporters exhibit higher market value and lower carbon emissions compared to non- reporters (Cohen et al., 2023; Griffin et al., 2017; Matsumura et al., 2014).

2.3 Hypotheses

Our first hypothesis pertains to the relationship between firms' voluntary climate disclosures through the CDP and CSR reports. The nature of this relationship is unclear ex ante. On one hand, the two forms of disclosure could act as complements. Climate disclosures through CSR reports tend to be less structured, less climate-specific, and aimed at multiple stakeholders. Managers may choose to supplement or augment these disclosures with CDP disclosures, which are more granular, climate-specific, and tailored specifically to institutional investors. Firms committed to robust CSR disclosure may view CDP reporting as an integral component of their broader strategy to enhance transparency and accountability.

On the other hand, the two forms of disclosure could function as substitutes, given that both provide information useful for assessing firms' climate performance. Once disclosed through CSR reports, firms might perceive further disclosure through the CDP as redundant. Indeed, a commonly reported reason for firms not disclosing through the CDP is that they already publish this information in a CSR report.[16] Thus, the provision of CSR disclosures could diminish the net

[15] For third-party verification, see https://www.cdp.net/en/guidance/verification
[16] See https://www.theguardian.com/sustainable-business/2014/oct/15/facebook-cdp-transparency-carbon-emissions

benefits of CDP disclosure, making firms that provide comprehensive CSR reports less likely to engage in CDP reporting, as it may be seen as unnecessary or redundant. This leads to our first hypothesis, where we remain agnostic about whether the association between firms' prior CSR disclosures and their current CDP disclosures is complementary or substitutive.

H1*: Firms' prior CSR disclosures are associated with their current CDP disclosures.*

Our next set of hypotheses examines how investor demand for climate-related information influences the association between a firm's prior CSR disclosure and its current CDP disclosure. Two most commonly used channels by which investors express their demand to their investee firms are engaging directly with the firms and submitting shareholder resolutions. Prior research shows that institutional investors positively affect corporate voluntary disclosure (Ajinkya et al., 2005; Bushee and Noe, 2000), with index funds favoring public disclosure to reduce monitoring costs (Bird and Karloyi, 2016; Boone and White; Jung, 2013). Specifically for climate disclosures, institutional ownership, especially if the institutions are CDP signatories or climate-conscious, is positively associated with firms' disclosures to the CDP (Cohen et al. 2023; Ilhan et al. 2023).

The Big 3 institutional investors are often the largest shareholders in their portfolio firms, making them pivotal voters (Bebchuk and Hirst, 2019; Griffin, 2020) with significant influence (Fisch et al., 2020; Gormley et al., 2023; Kahan and Rock, 2020). BlackRock's annual "Dear CEO" letter has been found to positively influence a firm's voluntary disclosure of environmental and social issues (Pawliczek et al., 2021). Using Big 3 ownership as a proxy for engagement (e.g., Azar et al., 2021), we argue that higher Big 3 ownership increases a firm's likelihood of disclosing through the CDP, even if it has previously disclosed through CSR reports. This is for two reasons. First, the CDP questionnaire is specifically designed to address the information demands of institutional investors. These demands are not necessarily met through CSR reports, which cater to a broad range of stakeholders, including shareholders, employees, and customers. Second, the

CDP platform is dedicated exclusively to disclosing firms' climate-related information, whereas CSR reports cover a wide array of sustainability topics, where climate-related information often constitutes only a small component.

Shareholder resolutions, as another channel of investor demand, address a wide range of issues, including executive compensation, labor rights, and environmental responsibility. Under Rule 14a-8 of the Securities Exchange Act of 1934, even minority shareholders with relatively small holdings can influence significant corporate affairs by submitting proposals for inclusion in proxy materials. Since CSR reports cater to a broad audience, including small and large investors, firms are more likely to address climate-related resolutions through CSR reports rather than the CDP. The CDP, by contrast, primarily targets institutional investors, with large ones, in particular, tending to influence firms' climate disclosures primarily through direct engagement (e.g., Ilhan et al., 2023).17 Thus, we argue that climate-related shareholder resolutions reduce a firm's likelihood of disclosing to the CDP if it has already disclosed through CSR reports.

H2A: *Big 3 ownership has a positive effect on the association between a firm's prior CSR disclosure and current CDP disclosure.*

H2B: *Climate-related shareholder resolutions have a negative effect on the association between a firm's prior CSR disclosure and current CDP disclosure.*

Our next hypothesis focuses on firms' GHG emissions. The effect of GHG emissions on the association between a firm's current CDP disclosure and prior CSR disclosure is unclear ex ante. On one hand, higher emissions may discourage firms from disclosing through the CDP. Firms

[17] Institutional investors, particularly large ones, influence firms' climate disclosure decisions primarily through direct engagement, using voting against directors or shareholder resolutions as escalation mechanisms if engagement fails. For example, State Street, a Big 3 investor, stated in its *Guidance on Climate-Related Disclosures* (January 2022): "we will first approach our climate-related disclosure expectations…through engagements…If we encounter laggards that are not making sufficient progress…we will consider taking action using our votes…We view this policy as a natural escalation…"

with significant emissions face heightened transition climate risk.[18] Prior research has shown that such firms often experience valuation discounts in financial markets (Matsumura et al., 2014; Griffin et al., 2017) and incur higher costs of capital (e.g., Altavilla et al., 2024; Harris, 2024). Moreover, disclosures through the CDP are more granular, standardized, and tailored to institutional investors, subjecting them to greater scrutiny from market participants. As a result, firms may prefer to avoid disclosing the "bad news" of their high emissions through the CDP.

On the other hand, firms with higher emissions may have stronger incentives to disclose through the CDP. Beyond firm size, the CDP's primary criterion for selecting firms to complete its climate change questionnaire is their level of emissions (CDP Climate Change Sample—Investors Request, 2021). As a result, top-emitting firms face greater investor demand for climate disclosure on the CDP platform, a requirement that does not extend to CSR reports. Overall, supply-side arguments suggest that top-emitting firms are less likely to disclose through the CDP, while demand-side arguments indicate they are more likely to do so. Therefore, we present our next hypothesis in its null form.

H3: *GHG emissions have no effect on the association between a firm's prior CSR disclosure and current CDP disclosure.*

Our next hypothesis examines the role of financial constraints. The impact of a firm's financial constraints on the relationship between its current CDP disclosure and prior CSR disclosure is unclear ex ante. On one hand, the significant costs associated with climate disclosures may deter financially constrained firms from reporting to the CDP, particularly if they have already

[18] This risk arises from uncertainties surrounding future government regulations aimed at reducing carbon emissions, which could harm carbon-intensive companies, as well as from shifting investor and consumer preferences that increasingly favor low-emission ("green") firms over high-emission ("brown") firms (Pastor et al., 2021).

disclosed through CSR reports.19 Significant resource commitments to CDP disclosures can be perceived as diverting firms' already constrained resources to activities that do not maximize shareholder wealth, potentially exacerbating agency problems (Friedman, 1970; Jensen, 2002). On the other hand, firms may be more likely to disclose to the CDP, as such disclosures could potentially mitigate their financial constraints. Prior research suggests that corporate social responsibility disclosures can alleviate financial constraints by lowering firms' cost of capital (e.g., Dhaliwal et al., 2011) or improving access to capital (e.g., Cheng et al., 2014), and specifically for environmental disclosure, Yao et al. (2019) find a decrease in financial constraints for a sample of Chinese firms from 2004 to 2011 following their environmental disclosures. Overall, the effect of financial constraints on the relationship between a firm's current CDP disclosure and prior CSR disclosure remains an open empirical question. This leads to our next hypothesis.

H4: *Financial constraints have no effect on the association between a firm's prior CSR disclosure and current CDP disclosure.*

3. Data and Key Variables

We begin with S&P 500 firms from 2010 to 2020, using the PERMNO-based historical list of S&P 500 constituents from CRSP, which includes the dates firms entered and exited the index. A firm is included in our sample for year t if it appears on the CRSP list for that year. However, the CRSP list does not always contain exactly 500 members at any given time and may not immediately remove delisted securities. We exclude firm-year observations without annual market

[19] The monetary cost of reporting to the CDP is relatively small—for example, an annual fee of $3,100 in North America (CDP, 2024). However, completing the CDP questionnaire involves significant preparation costs, as the instructions alone span over 100 pages. Preparing such detailed disclosures requires firms to invest considerable effort and resources in data collection, estimation, and verification. A recent survey by Environmental Resources Management (ERM), commissioned by Ceres and Persefoni, reports that corporate filers spend an average of $677,000 annually on climate disclosure activities (ERM, 2022). Beyond these financial costs, firms also face substantial reputational risks and potential damage to their public image if their climate actions fail to align with their disclosures.

value, resulting in an initial sample of 5,528 observations. Finally, we merge this sample with the variables described below, yielding a regression sample of 4,734 firm-year observations. The number of observations varies across analyses due to different model specifications and data availability.

3.1 Climate Disclosure

Our first venue for climate disclosure is the CDP. Following Flammer et al. (2021), we use the CDP questionnaire's CC5.1 question, which asks firms to disclose information on three categories of climate risks: regulatory, physical, and other risks. Two measures related to CDP disclosure are used. The first is an indicator variable, *CDP_Discl,* which equals one if a firm discloses at least one climate-related risk and zero otherwise. The second measure, *CDP_Score,* captures the content of the disclosure by measuring the number of risks disclosed. Specifically, we assign a score of two to firms that disclose both physical and regulatory climate risks, one to firms that disclose only one type of risk, and zero otherwise. Together, *CDP_Discl* captures the likelihood of climate disclosure on the CDP, while *CDP_Score* captures the intensity of climate disclosure, conditional on firms disclosing to the CDP.

The second venue for climate disclosure is CSR reports. We obtain stand-alone sustainability reports from Corporate Register, the world's most comprehensive online database of non-financial reporting from various organizations, including corporates, universities, governments, and trade associations.[20] The CSR disclosure measure, *CSR_Discl,* is an indicator variable that equals one if a firm has issued a sustainability report in a given year and zero otherwise. ADD Robustness

[20] Both stand-alone non-financial reports and annual (financial) reports are included in the Corporate Register dataset as long as there are at least six pages of relevant non-financial information, or the entire report is 'integrated'.

3.2 Shareholder Resolutions

The data on shareholder resolutions are collected from the Institutional Shareholder Services (ISS) voting analytics database. ISS, a prominent proxy advisory firm, provides voting recommendations on shareholder proposals and aggregates all shareholder resolutions for Russell 3000 companies. The ISS database includes detailed information on meeting dates, proposal topics, descriptions, ISS recommendations, management recommendations, and shareholder support. Proposals are categorized into two topics: governance and socially responsible investing (SRI). This paper's sample includes all shareholder proposals—those included in proxies, those allowed for exclusion by the SEC, and withdrawn proposals.

To identify climate-related shareholder resolutions, we use climate-related keywords sourced from: 1) the "Climate Change" topic on the CERES website,[21] 2) Engle et al. (2020), and 3) Alok et al. (2020). A list of the keywords is provided in Online Appendix OA1. A fuzzy matching algorithm is applied to search for these keywords in the titles of shareholder resolutions. We focus on resolutions classified as climate-related under all three criteria and then manually review and recode each resolution to confirm its classification. Finally, we construct a firm-year indicator variable, *SH_RES_Climate*, which equals one if a firm-year observation includes at least one climate-related shareholder resolution.

3.3 The Big 3 Investors

Institutional holding data are sourced from Thomson Reuters 13F filings. We calculate the average institutional holdings across the four quarters for each firm-year. Following Azar et al. (2021), we identify holdings by the "Big 3" institutional investors: BlackRock, Vanguard, and State Street. The Big 3 have been increasingly active and vocal in advocating for climate

[21] CERES is a non-profit organization that provides a subset of shareholder resolutions that are classified into 15 topic categories. We pick the topic "Climate Change" as one source for climate-related keywords.

disclosures by firms. Therefore, we separately examine the relationship between climate disclosure and ownership by the Big 3 versus non-Big 3 investors. Specifically, *Big3* represents the percentage of holdings by the Big 3 and serves as our proxy for engagement efforts.

3.4 Other Variables

We obtain greenhouse gas emissions (GHG) data from Trucost. Following the GHG Protocol, Trucost provides data on three types of GHG emissions: Scope 1, Scope 2, and Scope 3. Scope 1 emissions are direct greenhouse gas emissions generated by the focal firm. Scope 2 emissions are indirect emissions associated with the purchase of electricity, steam, heat, or cooling. Scope 3 emissions are indirect emissions from both the upstream and downstream supply chains of the focal firm. Analyst following data are collected from IBES, and control variables for the analyses are sourced from Compustat. Following Flammer et al. (2021), we include the following controls: *Size*, defined as the natural logarithm of the market value of assets; *ROA*, return on assets, calculated as net income divided by the book value of assets; *MTB*, market-to-book ratio, defined as the market value of common equity divided by its book value; *LEV*, leverage, defined as debt divided by the book value of assets; and *Cash*, the ratio of cash equivalents to the book value of assets. As firms with higher capital assets may be more exposed to physical climate risks, we include *CAPX*, capital expenditure scaled by total assets. Additionally, we control for *SH_RES*, an indicator variable equal to one if the firm has at least one shareholder resolution.

4. Descriptive Statistics

The summary statistics of our analysis are presented in **Table 1**, Panel A. On average, 55% of sample firms receive a shareholder resolution, while 10% receive a climate-related shareholder resolution. The average market value of the sample firms is $34 billion, with a standard deviation of $40 billion. The typical firm holds about 12% of its assets in cash and has a book leverage of 27%. The mean (median) market-to-book ratio is 4.1 (2.9), indicating that investors anticipate

strong earnings growth for these firms. Big 3 institutional investors hold an average of 15.6% of a sample firm's shares, compared to 53.4% for non-Big 3 institutional investors. About 53% of S&P 500 firms publish CSR reports (*CSR_Discl*) during the analysis period. The average *CDP_Discl* is 0.51, indicating that just over half of the S&P 500 firms voluntarily disclose climate-related information on the CDP platform. The average intensity of voluntary climate disclosure on the CDP, measured by *CDP_Discl*, is 0.92 with a standard deviation of 0.95, suggesting substantial variation in firms' climate disclosure strategies, conditional on their decision to disclose.

In Panel B of **Table 1,** we assess the differences not only between firms that disclose to the CDP, and those that do not disclose, but also between firms that disclose to the CSR, and those that do not disclose by comparing the key variables used in our analysis. The average market value of firms voluntarily disclosing on the CDP ($38 billion) is significantly larger than firms that do not disclose on the CDP ($23 billion). Book leverage for disclosing firms is significantly higher than non-disclosing firms, while their market-to-book and ROA are similar. While Big3 ownership tends to be higher for both CDP and CSR disclosure firms, the number of climate-related shareholder resolutions for CDP disclosers and CDP non-disclosers is not significantly different from each other. Similarly, CSR disclosers have larger size, more leverage, more Big 3 ownership, and more likely to disclose on CDP than CSR non-disclosers. In addition, the number of climate-related shareholder resolutions for disclosing firms is significantly higher than non-disclosing firms.

In Panel C of **Table 1**, we provide descriptive statistics of firms providing CSR reports and disclosing climate-related information on the CDP. Approximately one-third of observations are associated with dual reporting via CSR reports and the CDP, and an equal fraction is associated with neither, suggesting that the choice to disclose climate-related information using the two

platforms is jointly determined. The remaining one-third of the firm-year sample is almost evenly split between firms that disclose only on the CDP, or via CSR reports.

Fig. 1 shows the time trend of climate disclosures in the CDP and CSR reports. The proportion of S&P 500 firms making voluntary climate disclosures on the CDP (CSR reports) increased from 40% in 2010 to 60% (75%) in 2020. **Fig. 2** presents the time trends for firms disclosing climate-related information across four mutually exclusive categories: firms disclosing only through the CDP, only through CSR reports, through both venues, and through neither venue. Panel A of **Fig. 2** shows a declining trend in firms disclosing exclusively through the CDP and a rising trend in those disclosing exclusively through CSR reports. Panel B indicates a continuous decline in the number of firms with no climate disclosures on either platform, suggesting growing awareness of climate disclosures among S&P 500 firms. In contrast, the percentage of firms disclosing through both venues more than doubled between 2010 and 2020, reflecting an increasing trend in dual-platform disclosures.

5. Research Design and Results

5.1 Climate Disclosure on the CDP

Our first set of analyses tests hypothesis H1. We begin our empirical analysis by examining the association between a firm's prior disclosure through CSR reports (the lagged value of CSR_Discl) and its current disclosure through the CDP (CDP_Discl). A positive coefficient for *CSR_Discl* suggests a complementary relationship between a firm's prior CSR disclosure and its current CDP disclosure, while a negative coefficient indicates a substitutive relationship between the two venues. We further include the two variables representing investor demand for climate disclosure—i.e., climate -related shareholder resolutions (*SH_RES_Climate*) and Big 3

engagement (*Big3*)—in our model to examine their effects on a firm's CDP disclosure.[22] We estimate the following equation:

$$CDP\_Discl_{it} = \beta_1 CSR\_Discl_{it-1} + \beta_2 Big3_{it-1} + \beta_3 SH\_RES\_Climate_{it-1} + \beta_4 CDP\_Discl_{it-1} + Controls_{i,t-1} + Year\ FE + Industry\ FE + \epsilon_{it} \quad (1)$$

Control variables include firm size, firm performance, cash holdings, leverage ratio, market-to-book ratio, non-Big 3 ownership, and capital expenditure. Unlike prior studies (e.g., Flammer et al., 2021), we also account for the lagged values of CDP disclosure. Given the fixed costs associated with establishing a disclosure system, we posit that incumbency significantly affects current disclosure status. Specifically, a firm that disclosed climate information through the CDP in the previous year is likely to face a lower marginal cost of disclosure on the same platform in the current year. We also include year and SIC 4-digit industry fixed effects in the analysis.

Table 2 presents the results of the analysis. In column (1), we report results including only CSR disclosure, industry fixed effects, and year fixed effects. The coefficient for prior CSR disclosure is 0.261 and significant at the 1% level, rejecting the null hypothesis of H1. The positive coefficient suggests that a firm's current CDP disclosure has a complementary relationship with its prior CSR disclosure. In column (2), we include additional variables capturing the demand for climate information, Big 3 engagement, and whether the firm received a climate-related shareholder resolution. In column (3), we further control for other firm characteristics as specified in equation (1). Across all specifications, the coefficient for prior CSR disclosure remains positive and significant.

[22] Following Azar et al. (2021), we measure engagements by the Big 3 as being proportional to their ownership in the investee firm. Azar et al. (2021) has confirmed that Big 3 ownership is significantly positively related to actual engagements by the Big 3 investors. In the subsequent tables, we use Big 3 ownership as the proxy for their direct engagements.

The coefficient for Big 3 engagement is positive and significant at the 1% level in both columns (2) and (3), indicating a strong association between Big 3 engagement efforts and firms' voluntary climate disclosure decisions. Economically, a one standard deviation increase in Big 3 ownership raises the likelihood of CDP disclosure by 5.9% (0.380 * 0.156), representing an 11.6% increase relative to the unconditional probability of 50.9% for the sample. By contrast, climate-related shareholder resolutions are not significantly associated with CDP disclosure. We also include ownership by other institutional investors, non-Big 3 investors, based on the presumption that smaller investors may choose to divest from non-disclosing investee firms, unlike the Big 3, which are universal investors due to their size and the scope of their investments. We find that ownership by non-Big 3 institutional investors is significantly negatively associated with CDP disclosure. Ilhan et al. (2023) adopt a similar classification, drawing on the concept of Universal Ownership (Hawley and Williams, 2000), which posits that very large institutions have no choice but to internalize the externalities produced by their investee firms.

Among control variables, larger firms are more likely to disclose on the CDP, consistent with fixed costs of disclosure. Firms with lower market-to-book ratios, indicating assets-in-place, are also more likely to disclose. However, profitability does not significantly influence disclosure. CDP disclosure is notably sticky, as firms that disclosed in the prior year are highly likely to disclose in the current year. In columns (4) to (6), replacing the dependent variable with *CDP_Score*, we find the primary variable of interest remains statistically significant, with results qualitatively similar to those in columns (1) to (3).

5.2 Engagement, Activism, CSR Reports and Disclosure on the CDP

Our next set of analyses tests hypotheses H2A and H2B. In the preceding section, we examined the unconditional effects of Big3 and shareholder resolutions on a firm's CDP disclosure. Here, we analyze their effects conditional on the firm's prior CSR disclosure. We modify Equation

(1) by interacting a firm's prior CSR disclosure status with Big 3 holdings and climate-related shareholder resolutions, respectively.

The results of the analysis are presented in **Table 3**. The coefficient for *Big3* is positive and significant across all specifications. However, the interaction term between *Big3* and *CSR_Discl* is insignificant in column (1), suggesting that Big 3 engagement does not significantly influence CDP disclosure once a firm has already disclosed through CSR reports. Thus, we do not find support for Hypothesis H2a. The coefficient for climate-related shareholder resolutions (*SH_RES_Climate*) is also insignificant. However, in column (2), the interaction between *SH_RES_Climate* and *CSR_Discl* is significantly negative, supporting Hypothesis H2b. This indicates that firms with more climate-related shareholder resolutions are less likely to disclose to the CDP if they have made prior CSR disclosures. For instance, a one-standard-deviation increase in the likelihood of prior CSR disclosure reduces the effect of climate-related shareholder resolutions on CDP disclosure by 69.1% (0.090 * 0.499 / 0.065). In columns (3) and (4), we replace the dependent variable with the CDP disclosure score and find consistent results. In all specifications, we find that CDP disclosure is sticky, as indicated by the significance of the lagged CDP status, suggesting that firms remain committed to their CDP disclosure strategy. Control variables such as size, leverage, and market-to-book ratio exhibit similar effects as in Table 2.

5.3 GHG Emissions, CSR Reports and Disclosure on the CDP

Our next set of analyses test hypothesis H3. We investigate the effect of a firm's GHG emissions on the association between its current CDP disclosure and prior CSR disclosure. We extend our baseline model by interacting *CSR_Discl* with firm emission measures. In column (1) of **Table 4**, we interact *CSR_Discl* with an indicator for firms from high-emitting industries, namely, mining, manufacturing, and utilities. We find the coefficient of *CSR_Discl* is positive and significant at 1% while this association between *CSR_Discl* and *CDP_Discl* is significantly

attenuated if the firm is from a high-emitting industry. These findings reject the null hypothesis in H3, suggesting that firms from high-emitting industries are less likely to disclose to the CDP if they made prior disclosure through CSR reports.

Similar to column (1), in column (2) we interact *CSR_Discl* with firm-level Scope 1 emissions, and in column (3) with *Top_Emitter*, a variable capturing firms within the same industry that are in the top quartile for Scope 1 emissions. In both cases, the interaction terms are significantly negative, consistent with the results in column (1). For example, a 1% increase in Scope 1 emissions reduces the effect of CSR reports on CDP disclosure by approximately 6.7% (0.015 / 0.224). The coefficient for Scope 1 emissions alone is negative but insignificant, while the coefficient for *CSR_Discl* remains significantly positive in both columns. In columns (4) to (6), where the dependent variable is *CDP_Score*, we observe qualitatively similar results. Overall, these findings support the supply-side argument of Hypothesis 3, which posits that high-emission firms are less likely to disclose to the CDP to avoid adverse market reactions, such as valuation discounts, particularly if they have already disclosed through CSR reports.

We extend our analysis of the effect of GHG emissions—often used as a proxy for a firm's exposure to transition climate risk—by incorporating a broader set of climate risk exposure measures from Sautner et al. (2022).[23] The results, presented in **Table 5**, align with our findings using GHG emissions. The interaction terms between *CSR_Discl* and two out of three measures of climate change exposure are negative, indicating that firms with higher climate risk exposure are less likely to disclose to the CDP if they have previously disclosed through CSR reports.

[23] Based on managers' voluntary disclosure from earnings call transcripts, Sautner (2022) identify a main variable CC_EXP by counting the climate-related words in the transcripts. They further decompose that measure into two: CC_CENT by counting the number of climate change bigrams after conditioning on the presence of the positive or negative tone words in Loughran and McDonald (2011) and CC_RISK by counting the relative frequency of the climate change bigrams mentioned in the same sentence with words "risk," "uncertainty," or their synonyms.

5.4 Financial Constraints, CSR Reports and Disclosure on the CDP

In this section, we test the hypothesis 4. We examine if financial constraints affect the association between a firm's current CDP disclosure and prior CSR disclosure. We proxy firms' financial constraints using two measures – the net leverage ratio (e.g., Sharpe 1994; Halling et al. 2016), and the KZ index (e.g., Kaplan and Zingales 1997; Baker et al. 2003). Firms face stricter financial constraints with higher values in these two measures.

In column (1) of **Table 6**, we interact *CSR_Discl* with the firm-level KZ index. The coefficient for *CSR_Discl* is significantly positive, while the interaction term between *CSR_Discl* and the KZ index is negative and significant at 10% level. This finding, albeit relatively weak, rejects the null hypothesis in H4 and supports the argument that the significant costs associated with CDP disclosure may deter financially constrained firms, particularly those that have previously disclosed through CSR reports, as such commitments can divert limited resources from shareholder value-maximizing activities. Similar to column (1), we interact *CSR_Discl* with the firm's net leverage ratio in Column (2) and find consistent results. In terms of economic significance, a one-stand-deviation increase in net leverage ratio attenuates the effect of CSR reports on the CDP disclosure by 28.6% (0.143*0.180/0.090). We also find qualitatively similar results in columns (3) to (4) when the dependent variable is *CDP_Discl* respectively.

5.5 First-time CDP Disclosure and Scope 1 Emissions

In this section, we examine whether climate disclosure through the CDP has real effects on the reporting firm, conditional on its prior disclosure through CSR reports. Cohen et al. (2023) find that CDP disclosures, particularly during a firm's first disclosure to the CDP, are associated with a subsequent decrease in GHG emissions. They attribute this to institutional investors using CDP information to pressure firms to improve their carbon performance. We extend their analysis by investigating the relationship between the initiation of CDP disclosure and a firm's Scope 1

emissions, conditional on prior CSR disclosure. For this analysis, we construct a [-5, 5] yearly event window around each CDP disclosure initiation and apply a difference-in-differences test using the following equation:

$$Y_{i,t} = \beta_1 Treat \times Post + \beta_2 CSR\_Discl_{it-1} + Controls_{it-1} + Year\ FE + Firm\ FE + \epsilon_{it} \quad (3)$$

$Y_{i,t}$ represents the natural logarithm of Scope 1 emissions. *Treat* is an indicator variable for firms that have ever disclosed to the CDP, with zero for all other firms. *Post* is an indicator variable that equals one for years following the initiation year and zero otherwise. **Table 7** presents the findings of the analysis. Column (1) shows that treated firms report significantly lower Scope 1 emissions after their first-time disclosure to the CDP, consistent with Cohen et al. (2023). Our analysis differs by conditioning on prior CSR disclosure.[24]

We further investigate whether these results are driven by firms with prior CSR disclosure or those without it. To address this question, we repeat the analysis from column (1) on subsamples of firms split by their prior CSR disclosure status. As shown in columns (2) and (3) of **Table 7**, the results from column (1) are primarily driven by firms without prior CSR disclosure. Collectively, the findings in **Table 7** suggest that initiating disclosure through the CDP exerts real effects: firms that begin CDP disclosure report lower Scope 1 emissions, but this effect is observed only among firms that did not previously disclose through CSR reports.

5.6 First-time CDP Disclosure and Stakeholders' Reaction

In this section, we examine the broader capital market consequences of a firm's first-time CDP disclosure, conditional on its prior CSR disclosure. First, we analyze how ESG rating

[24] Given our difference in differences design, we validate our parallel trends assumption by re-estimating equation (3) by replacing *Post* with separate indicator variables, each marking one year over the t-5 to t+5 period relative to the year of the first-time CDP initiation. As shown in **Fig. 3**, we find no evidence of differential pre-treatment trends in firms' Scope 1 emissions.

agencies perceive the climate information provided by firms. Second, we assess whether CDP disclosure reduces voting against management (or increases support for shareholder resolutions) by meeting investors' demand for climate information. Third, we explore whether CDP disclosure attracts greater analyst attention by evaluating changes in analyst coverage. Prior research suggests that financial analysts consider ESG information in their evaluations (He and Li, 2024; Roger, 2024; Wu et al., 2024). Consistent with this literature, we expect a positive association between CDP disclosure initiation and analyst coverage.

Finally, we examine the impact of CDP disclosure on market liquidity, using the Amihud illiquidity measure and the bid-ask spread scaled by the closing price. If CDP disclosure reduces information asymmetry regarding a firm's climate-related risks, it may mitigate adverse selection concerns and enhance secondary market liquidity. Collectively, these analyses provide insights into how first-time CDP disclosure shapes market perceptions and investor behavior, conditional on firms' prior engagement with CSR reporting.

Using the identification strategy discussed in Section 5.5, we report the regression results in **Table 8**, Panel A. Treated firms receive 4.3% higher ESG performance ratings, 18.7% less support for shareholder resolutions, 1.3% more analyst coverage, and a 9% improvement in market liquidity after initiating CDP disclosure, compared to the sample period sample period.[25][26] In Panel B, we find these effects are primarily driven by firms without prior CSR disclosure. Overall, **Table 8** suggests that initiating CDP disclosure alters stakeholder reactions: firms gain higher environmental performance scores, fewer votes against management, increased analyst coverage, and improved liquidity—but only when they have not previously disclosed through CSR reports.

[25] Pre-parallel trend assumptions also hold for these consequences variables.
[26] We also report the results of the effect of CDP initiation on the ratings of E, S, and G pillar, separately, in Online Appendix Table OA1. We find qualitatively similar results for E and S pillars, but no results for G pillar.

6. Robustness Analyses

6.1 Alternative Measure of CSR_Discl

To refine our measure of CSR disclosure, we perform a textual analysis to identify firms that specifically discuss climate-related risks in their CSR reports. We create an alternative variable, *CSR_Climate*, which equals one if a firm addresses climate-related issues in its CSR reports and zero otherwise.[27] This variable is used to replicate our prior analyses, with results reported in Online Appendix Table OA2. The findings remain consistent: firms that disclosed climate-related information in CSR reports the previous year are more likely to disclose to the CDP across all panels. Panel B shows that climate-related shareholder resolutions are less effective in influencing CDP disclosure for firms with prior CSR disclosures. Additionally, Panels C through E indicate that firms with higher carbon emissions, greater climate risk exposure, and tighter financial constraints are less likely to disclose to the CDP, but only if they previously disclosed climate information in a CSR report.

6.2 Engagement of CDP Signatories

In Section 5.2, we document that while Big 3 ownership positively affects a firm's CDP disclosure, this effect disappears if the firm has previously disclosed climate information through CSR reports. Here, we extend our analysis to examine the impact of CDP signatories—stakeholders with exclusive access to climate data collected by the CDP—on a firm's CDP disclosure. Becoming a CDP signatory is a public declaration of demanding climate information from companies (Cohen et al., 2023). Many institutional investors, including the Big 3, register as CDP signatories and directly request climate disclosures via the CDP platform.

[27] The detailed process is described in Online Appendix OA2. Fig. OA2 presents the comparison of *CSR_Climate* and *CSR_Discl* by year.

To test this effect, we construct *CDP_Request*, an indicator variable equal to one if the CDP, on behalf of its signatories, requests a firm to disclose climate information, and zero otherwise. We add *CDP_Request* to Equation (1) and interact it with *CSR_Discl.* Results, presented in Online Appendix Table OA3, show a positive and significant association between *CDP_Request* and *CDP_Discl* across all specifications. However, prior CSR disclosure does not moderate this effect, indicating that both Big 3 investors and CDP signatories are unaffected by a firm's prior CSR disclosure when demanding climate-related information through the CDP.

6.3 Scope 1 Emissions Disclosure on the CDP

In Section 5.3, we show that firms under stronger climate pressure—proxied by higher GHG Scope 1 emissions or greater climate change exposure—are less likely to disclose climate-related information to the CDP if they have previously disclosed through CSR reports. While *CDP_Discl* reflects a broad measure of climate risk disclosure, this section examines whether a firm's specific disclosure of Scope 1 emissions to the CDP is influenced by climate pressure. We construct an indicator variable, *Scope1_Discl*, equal to one if a firm discloses Scope 1 emissions to the CDP and zero otherwise. Regression results, presented in Online Appendix Table OA4, are similar to earlier findings. The interaction term between *CSR_Discl* and climate pressure is negative and significant, indicating that firms under stronger climate pressure are less likely to disclose Scope 1 emissions to the CDP if they made prior disclosure through CSR reports.

7. Conclusion

Firms currently face minimal standardized mandatory requirements for disclosing climate-related information, giving them significant discretion over whether, what, and where to disclose. The two most widely used venues for voluntary climate disclosures are the CDP and CSR reports. CDP disclosures are more standardized, granular, and climate-specific than CSR reports, making them more verifiable but also subject to greater scrutiny from stakeholders. While prior research

has focused on CDP and CSR disclosures independently, this paper examines their interrelationship, how it varies with factors like investor demand, GHG emissions, and financial constraints, and the resulting real and capital market effects.

Using a panel of S&P 500 companies from 2010 to 2020, we document that the determinants and consequences of a firm's CDP disclosure depend on its past CSR disclosure status, highlighting a strategic motive in venue choice. Firms with prior CSR disclosures are more likely to disclose to the CDP, indicating a complementary relationship between the two venues. Big 3 institutional investor ownership has a positive impact on disclosure through both venues, however, this effect disappears for firms with prior CSR. Climate-related shareholder resolutions negatively affect CDP disclosure, but only for firms with prior CSR reports. Similarly, firms with prior CSR disclosures are less likely to disclose to the CDP if they face higher GHG emissions, greater climate risk exposure, or stronger financial constraints. In terms of outcomes, firms initiating CDP disclosure for the first time experience greater liquidity, reduced Scope 1 emissions, higher ESG ratings, fewer votes against management, and increased analyst coverage. However, these benefits are observed only for firms without prior CSR disclosures.

Overall, our findings highlight that the determinants and outcomes of CDP disclosure are shaped by prior CSR disclosures. This underscores the strategic nature of firms' disclosure choices and the need to analyze climate disclosure across multiple venues rather than in isolation.

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Appendix A: Variable definition

Variable	Definition
Climate disclosure:	
CDP_Discl	An indicator variable that equals one if the firm-year responds to the CDP question "Have you identified any inherent climate change risks that have the potential to generate a substantive change in your business operations, revenue or expenditure?", and zero otherwise.
CDP_Score	A categorical variable that equals 2 if a firm identifies both regulatory and physical climate risks, 1 if a firm identifies regulatory or physical climate risk, and 0 otherwise.
CDP_Request	An indicator variable that equals one if the firm is requested by CDP to answer the questionnaire, and zero otherwise.
Scope1_Discl	An indicator variable that equals one if the firm discloses Scope 1 emissions in CDP, and zero otherwise.
CSR_Discl	An indicator variable that equals one if the firm issues a standalone CSR/Sustainability report, and zero otherwise.
CSR_Climate	An indicator variable that equals one if the firm issues a standalone CSR/Sustainability report that contains climate-related information, and zero otherwise.
Firm fundamentals:	
Size	Log of market value
ROA	EBIT divided by total assets
MTB	Number of Shares times price per share divided by book value of equity
Lev	Long-term Debt plus current portion of long-term debt then divided by total assets
Cash	Cash and cash equivalent divided by total assets
CAPX	Capital expenditure divided by total assets
Big3	Institutional ownership of BlackRock, Vanguard, and State Street
NonBig3	Institutional ownership other than BlackRock, Vanguard, and State Street
SH_RES	An indicator variable that equals one if the firm-year has at least one shareholder resolution, and zero otherwise
SH_RES_Climate	An indicator variable that equals one if the firm-year has at least one climate-related shareholder resolution, and zero otherwise.
EmissionInd	Industries including mining, manufacturing, and utilities
Top_emitter	An indicator variable that equals one if firm's Scope 1 emissions are in the top quartile of the same industry, and zero otherwise
KZ	-1.001909*(ib+dp)/lagged ppent + 0.2826389*(at+ csho*prcc_f -ceq-txdb)/at + 3.139193*(dltt+dlc)/(dltt+dlc+seq) - 39.3678*(dvc+dvp)/lagged ppent -1.314759* che/ lagged ppent
NetLev	The ratio of total debt less cash plus short-term investments to book value of total assets.
CC_EXP	A text-based measure by Suntner et al. 2023 which captures the relative frequency with which bigrams related to climate change occur in the transcripts of earnings conference calls, divide by the total number of bigrams in the transcripts.
CC_SENT	A text-based measure by Suntner et al. 2023 which captures the relative frequency with which bigrams related to climate change are mentioned together with positive and negative tone words that are summarized by Loughran and McDonald (2011) in one sentence in the transcripts of earnings conference calls, divide by the total number of bigrams in the transcripts.

CC_RISK	A text-based measure by Sautner et al. 2023 which captures the relative frequency with which bigrams related to climate change are mentioned together with the words "risk" or "uncertainty" (or synonyms thereof) in one sentence in the transcripts of earnings conference calls, divide by the total number of bigrams in the transcripts.
Outcome variables:	
Log(Scope1)	Natural logarithm of Scope 1 emissions
VoteSupports	Number of votes supporting shareholder resolutions from all investors, divided by the number of total votes from all investors.
COVERAGE	Log of the number of analysts following the firm
ILLIQ	$\frac{1}{T}\sum_{1}^{T}\frac{\lvert r_t\rvert}{VolD_t}$, where r is the daily return, VolD is the one dollar of trading volume, T is the number of trading days in a given year.
SPREAD	$\frac{2\lvert Bid-Ask\rvert}{Bid+Ask}$, where Ask and Bid are CRSP bid and ask quotes. Zero bid-ask spreads, and the ones higher than 50% are discarded before taking the yearly average.
ESG_Score	The rating on the environmental, social and governance pillar from Refinitiv.
E_Score	The rating on the environmental pillar from Refinitiv.
S_Score	The rating on the social pillar from Refinitiv.
G_Score	The rating on the governance pillar from Refinitiv.

Fig. 1. Time Trend of Climate Disclosure

Fig. 1 shows the time evolution of climate disclosure via the CDP and CSR reports. We plot the time trend for % of S&P 500 firms that disclosed climate-related information on the CDP (red, solid line) and via CSR reports (blue, dotted line) from 2010 to 2020.

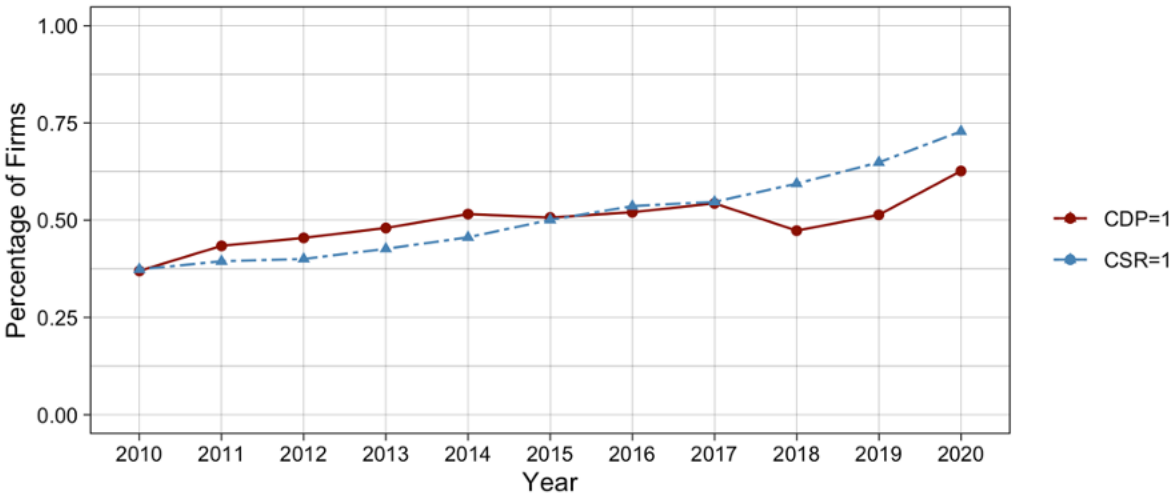
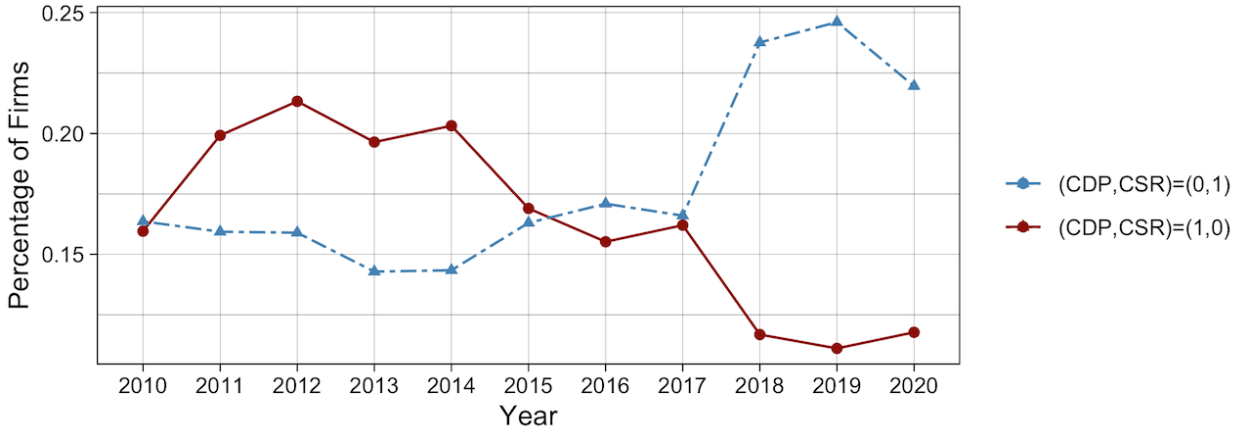


Fig. 2. Time Trend of Climate Disclosure via Four Choices

Fig. 2 shows the time evolution of firms' climate disclosure via four choices: (i) disclosure only on the CDP but not via CSR reports (panel A, red, solid line); (ii) disclosure only via CSR reports but not on the CDP (panel A, blue, dotted line); (iii) disclosure in both the CDP and CSR reports (panel B, red, solid line); and (iv) disclosure neither on the CDP nor via CSR reports (panel B, blue, dotted line).

Panel A



Panel B

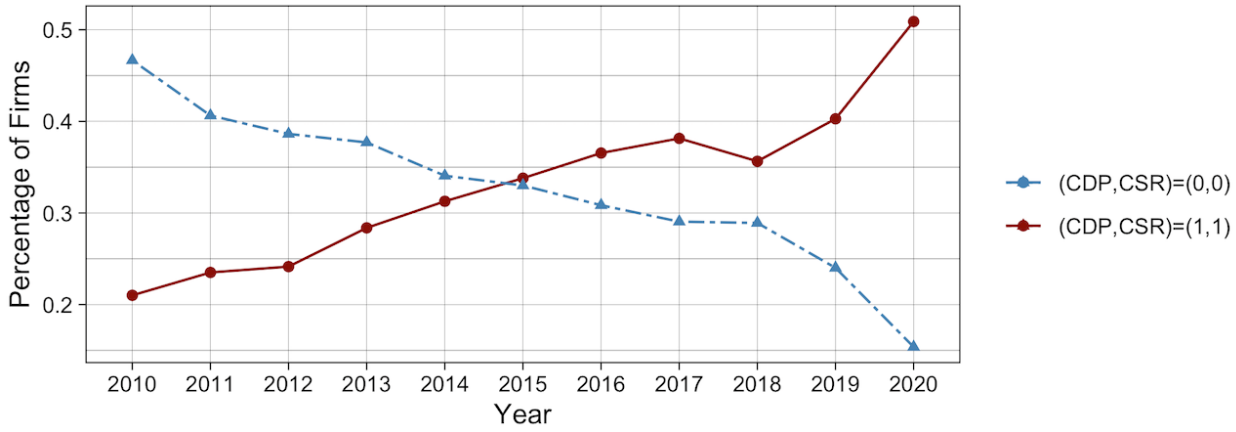


Fig. 3. Parallel Trend Test of the CDP Initiation on Scope 1 Emissions

Fig. 3 displays the dynamic effects of the first-time disclosure to CDP on firms' Scope 1 emissions. We plot the estimated coefficients of the interaction terms and the 95% confidence intervals.

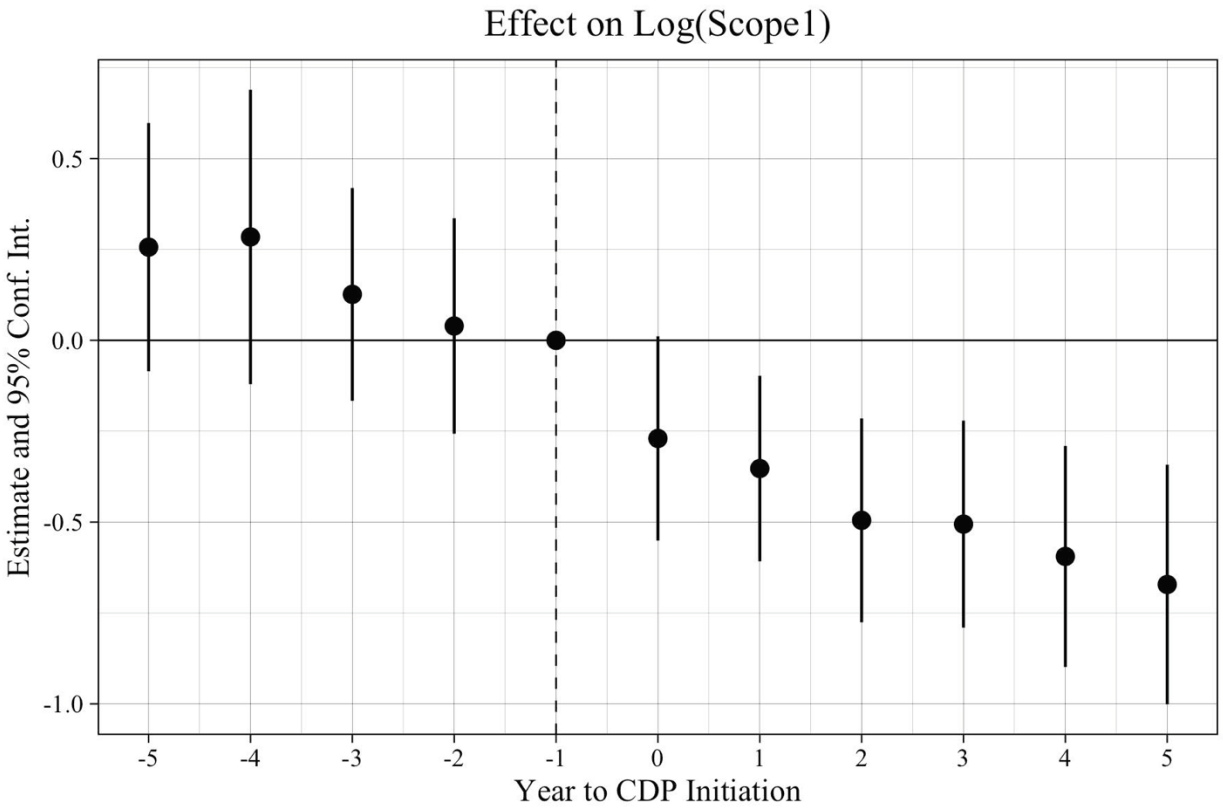


Table 1. Descriptive Statistics

This table reports descriptive statistics of the sample used in the empirical analyses. The sample consists of S&P 500 firms from 2010 to 2020. Panel A presents descriptive statistics for the full sample. Panel B reports the distribution by CDP disclosure. Panel C reports the matrix on the CDP and CSR disclosure. Definitions of variables can be found in Appendix A. All continuous variables are winsorized at 5% and 95%.

Panel A: Univariate Statistics

Statistic	N	Mean	St. Dev.	Pctl25	Median	Pctl75
Shareholder Resolutions						
SH_RES_Climate	4,734	0.103	0.304	0	0	0
SH_RES	4,734	0.545	0.498	0	1	1
Climate Disclosure						
CSR_Discl	4,734	0.529	0.499	0	1	1
CSR_Climate	4,734	0.388	0.487	0	0	1
CDP_Discl	4,734	0.509	0.500	0	1	1
CDP_Score	4,734	0.920	0.946	0	1	2
Other Variables						
Big3	4,734	0.156	0.064	0.133	0.168	0.198
NonBig3	4,734	0.534	0.219	0.447	0.594	0.692
Size	4,734	9.828	0.959	9.127	9.677	10.427
ROA	4,734	0.102	0.064	0.051	0.091	0.140
MTB	4,734	4.144	3.439	1.792	2.933	5.056
Lev	4,734	0.271	0.158	0.151	0.264	0.381
Cash	4,734	0.118	0.114	0.029	0.076	0.169
CAPX	4,734	0.038	0.033	0.013	0.028	0.055
MV	4,734	33.587	40.194	9.597	17.262	37.242
EmissionInd	4,734	0.610	0.488	0	1	1
Log(Scope1)	4,659	11.944	2.502	10.065	11.629	13.572
Top_Emitter	4,659	0.250	0.433	0.000	0.000	0.000
KZ	4,091	-10.673	15.689	-13.900	-4.175	0.001
NetLev	4,593	0.228	0.180	0.092	0.226	0.359
CC_EXP	4,495	0.124	0.307	0.015	0.034	0.084
CC_RISK	4,495	0.004	0.013	0.000	0.000	0.000
CC_SENT	4,495	0.030	0.104	0.000	0.007	0.026

Panel B: Distribution by CDP/CSR disclosure

	CDP_Discl =1	*CDP_Discl* =0	**Mean Diff**	*CSR_Discl* =1	*CSR_Discl* =0	**Mean Diff**
SH_RES_Climate	0.109	0.097	0.012	0.124	0.080	0.044***
CSR_Discl	0.634	0.318	0.316***	-	-	-
CDP_Discl	-	-	-	0.613	0.314	0.299***
Big3	0.159	0.153	0.006***	0.167	0.144	0.023***
NonBig3	0.524	0.544	-0.020***	0.545	0.521	0.024***
ROA	0.100	0.104	-0.004**	0.102	0.101	0.001
Cash	0.116	0.119	-0.003	0.113	0.122	-0.009***
Size	10.043	9.604	0.439***	10.092	9.531	0.561***
Lev	0.286	0.256	0.030***	0.280	0.260	0.020***
MTB	4.093	4.196	-0.103	4.254	4.020	0.234**
CAPX	0.039	0.037	0.002**	0.039	0.036	0.003***
MV	37.658	23.425	14.232***	38.821	21.527	17.294***
Observations	2,411	2,323		2,504	2,230	

Panel C: 2×2 matrix of CSR and CDP disclosure

Numbers of observations (Percent of observations)			
	CDP_Discl		
CSR_Discl	0	1	Total
0	1,452 (30.7%)	778 (16.4%)	2,230 (47.1%)
1	871 (18.4%)	1,633 (34.5%)	2,504 (52.9%)

Table 2. Climate Disclosure on the CDP

The table reports OLS regression results on the determinants of firms' CDP disclosure. The sample consists of S&P 500 firms from 2010 to 2020. The dependent variable is *CDP_Discl* from column (1) to (3), an indicator variable that equals one if firms disclose climate-related information on the CDP and zero otherwise, and *CDP_Score* from column (4) to (6) that varies from zero to two. *CSR_Discl* is an indicator variable that equals one if the firm discloses a CSR report, and zero otherwise. *Big3* is the ownership of the Big 3 investors. *SH_RES_Climate* is an indicator variable that equals one if a firm has at least one climate-related shareholder resolution, and zero otherwise. *NonBig3* is the ownership of non-Big3 institutional investors. *SH_RES* is an indicator variable that equals one if the firm has at least one shareholder resolution, and zero otherwise. *Size* is the natural logarithm of market value. *ROA* is EBIT divided by total assets. *MTB* is the market value of equity divided by the book value of equity. *Lev* is the ratio of debt to total assets. *Cash* is the ratio of cash equivalents to total assets. *CAPX* is the ratio of capital expenditure to total assets. All control variables are lagged by one year. Standard errors are clustered at the firm level and presented in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

	Dependent variable:					
	CDP_Discl			*CDP_Score*		
	(1)	(2)	(3)	(4)	(5)	(6)
CSR_Discl $_{t-1}$	0.261***	0.246***	0.054***	0.486***	0.455***	0.086***
	(0.025)	(0.024)	(0.012)	(0.047)	(0.046)	(0.022)
Big3 $_{t-1}$		0.967***	0.380**		1.907***	0.719**
		(0.365)	(0.158)		(0.708)	(0.283)
SH_RES_Climate $_{t-1}$		0.005	0.011		-0.010	0.010
		(0.029)	(0.018)		(0.055)	(0.031)
NonBig3 $_{t-1}$		-0.306***	-0.087**		-0.569***	-0.151**
		(0.102)	(0.043)		(0.196)	(0.077)
SH_RES $_{t-1}$		0.076***	0.009		0.154***	0.023
		(0.022)	(0.011)		(0.041)	(0.020)
Size $_{t-1}$			0.031***			0.052***
			(0.007)			(0.013)
ROA $_{t-1}$			0.068			0.188
			(0.117)			(0.200)
CDP_Discl$_{t-1}$			0.714***			
			(0.015)			
CDP_Score $_{t-1}$						0.740***
						(0.014)
MTB $_{t-1}$			-0.004*			-0.010***
			(0.002)			(0.004)
Lev $_{t-1}$			0.147***			0.218***
			(0.044)			(0.078)
Cash $_{t-1}$			-0.042			-0.035
			(0.062)			(0.111)
CAPX $_{t-1}$			0.399			0.852*
			(0.273)			(0.478)
Observations	4,734	4,734	4,734	4,734	4,734	4,734
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.340	0.348	0.690	0.355	0.364	0.720
Adjusted R^2	0.306	0.314	0.673	0.322	0.331	0.705

Table 3. Engagement, Activism, CSR and Disclosure on the CDP

The table reports the OLS regression results on the effects of the demand for climate information on the CSR-CDP disclosure strategy. The sample consists of S&P 500 firms from 2010 to 2020. The dependent variable is *CDP_Discl* in column (1) and (2), an indicator variable that equals one if firms disclose climate-related information in CDP and zero otherwise, and *CDP_Score* in column (3) and (4) that varies from zero to two. *CSR_Discl* is an indicator variable that equals one if the firm discloses a CSR report, and zero otherwise. *Big3* is the ownership of the Big 3 investors. *SH_RES_Climate* is an indicator variable that equals one if a firm has at least one climate-related shareholder resolution, and zero otherwise. *NonBig3* is the ownership of non-Big3 institutional investors. *SH_RES* is an indicator variable that equals one if the firm has at least one shareholder resolution, and zero otherwise. *Size* is the natural logarithm of market value. *ROA* is EBIT divided by total assets. *MTB* is the market value of equity divided by the book value of equity. *Lev* is the ratio of debt to total assets. *Cash* is the ratio of cash equivalents to total assets. *CAPX* is the ratio of capital expenditure to total assets. All control variables are lagged by one year. Standard errors are clustered at the firm level and presented in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

	Dependent variable:			
	CDP_Discl		*CDP_Score*	
	(1)	(2)	(3)	(4)
$Big3_{t-1}$	0.482***	0.377**	0.877***	0.714**
	(0.166)	(0.157)	(0.298)	(0.282)
$Big3_{t-1} \times CSR\_Discl_{t-1}$	-0.255		-0.394	
	(0.171)		(0.308)	
$SH\_RES\_Climate_{t-1}$	0.010	0.065**	0.010	0.102**
	(0.018)	(0.029)	(0.031)	(0.050)
$SH\_RES\_Climate_{t-1} \times CSR\_Discl_{t-1}$		-0.090**		-0.151**
		(0.036)		(0.064)
CSR_Discl_{t-1}	0.095***	0.063***	0.150***	0.101***
	(0.030)	(0.012)	(0.055)	(0.022)
$NonBig3_{t-1}$	-0.098**	-0.088**	-0.168**	-0.151**
	(0.043)	(0.042)	(0.078)	(0.076)
SH_RES_{t-1}	0.010	0.008	0.024	0.021
	(0.011)	(0.011)	(0.020)	(0.020)
$Size_{t-1}$	0.030***	0.031***	0.050***	0.052***
	(0.007)	(0.007)	(0.013)	(0.013)
ROA_{t-1}	0.071	0.067	0.192	0.186
	(0.117)	(0.117)	(0.201)	(0.201)
CDP_Discl_{t-1}	0.715***	0.715***		
	(0.015)	(0.014)		
CDP_Score_{t-1}			0.741***	0.741***
			(0.014)	(0.014)
MTB_{t-1}	-0.004*	-0.004*	-0.010***	-0.010***
	(0.002)	(0.002)	(0.004)	(0.004)
Lev_{t-1}	0.146***	0.147***	0.215***	0.217***
	(0.044)	(0.043)	(0.078)	(0.078)
$Cash_{t-1}$	-0.047	-0.040	-0.042	-0.032
	(0.062)	(0.062)	(0.111)	(0.111)
$CAPX_{t-1}$	0.402	0.431	0.857*	0.906*
	(0.272)	(0.274)	(0.476)	(0.478)
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	4,734	4,734	4,734	4,734
Adjusted R2	0.673	0.673	0.024	0.021

Table 4. GHG Emissions, CSR and Disclosure on the CDP

The table reports the OLS regression results on the effects of GHG emissions on the CSR-CDP disclosure strategy. The sample consists of S&P 500 firms from 2010 to 2020. The dependent variable is *CDP_Discl* in column (1) and (2), an indicator variable that equals one if firms disclose climate-related information in CDP and zero otherwise, and *CDP_Score* in column (3) and (4) that varies from zero to two. *CSR_Discl* is an indicator variable that equals one if the firm discloses a CSR report, and zero otherwise. *Big3* is the ownership of the Big 3 investors. *SH_RES_Climate* is an indicator variable that equals one if a firm has at least one climate-related shareholder resolution, and zero otherwise. *NonBig3* is the ownership of non-Big3 institutional investors. *SH_RES* is an indicator variable that equals one if the firm has at least one shareholder resolution, and zero otherwise. *Size* is the natural logarithm of market value. *ROA* is EBIT divided by total assets. *MTB* is the market value of equity divided by the book value of equity. *Lev* is the ratio of debt to total assets. *Cash* is the ratio of cash equivalents to total assets. *CAPX* is the ratio of capital expenditure to total assets. *Log(Scope1)* is the natural logarithm of Scope 1 emissions. *EmissionInd* is an indicator variable that equals one if the industry is mining, manufacturing or utilities, and zero otherwise. *Top_emitter* is an indicator variable that equals one if the firm's Scope 1 emissions are in the top quartile of the same industry, and zero otherwise. All control variables are lagged by one year. Standard errors are clustered at the firm level and presented in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

	Dependent variable:					
	CDP_Discl			*CDP_Score*		
	(1)	(2)	(3)	(4)	(5)	(6)
CSR_Discl_{t-1}	0.094***	0.224***	0.065***	0.145***	0.415***	0.107***
	(0.018)	(0.053)	(0.014)	(0.033)	(0.094)	(0.024)
$EmissionInd \times CSR\_Discl_{t-1}$	-0.066***			-0.098**		
	(0.022)			(0.039)		
$Log(Scope1_{t-1}) \times CSR\_Discl_{t-1}$		-0.015***			-0.028***	
		(0.004)			(0.008)	
$Top\_Emitter_{t-1} \times CSR\_Discl_{t-1}$			-0.061**			-0.110**
			(0.025)			(0.044)
$Log(Scope1_{t-1})$		-0.007			-0.007	
		(0.006)			(0.011)	
$Top\_Emitter_{t-1}$			0.031			0.034
			(0.022)			(0.038)
$Big3_{t-1}$	0.398**	0.421***	0.398**	0.746***	0.788***	0.748***
	(0.157)	(0.160)	(0.159)	(0.282)	(0.286)	(0.283)
$NonBig3_{t-1}$	-0.089**	-0.112***	-0.103**	-0.154**	-0.193**	-0.178**
	(0.042)	(0.043)	(0.043)	(0.077)	(0.078)	(0.077)
$SH\_RES\_Climate_{t-1}$	0.011	0.013	0.012	0.010	0.015	0.014
	(0.018)	(0.018)	(0.018)	(0.031)	(0.032)	(0.031)
SH_RES_{t-1}	0.009	0.010	0.009	0.023	0.026	0.025
	(0.011)	(0.011)	(0.011)	(0.020)	(0.020)	(0.020)
$Size_{t-1}$	0.031***	0.041***	0.032***	0.053***	0.066***	0.056***
	(0.007)	(0.009)	(0.008)	(0.013)	(0.016)	(0.014)
ROA_{t-1}	0.068	0.017	0.025	0.189	0.107	0.114
	(0.116)	(0.115)	(0.116)	(0.200)	(0.198)	(0.201)
CDP_Discl_{t-1}	0.714***	0.712***	0.712***			
	(0.014)	(0.015)	(0.015)			
CDP_Score_{t-1}				0.740***	0.739***	0.740***
				(0.014)	(0.014)	(0.014)
MTB_{t-1}	-0.004*	-0.005**	-0.004*	-0.009**	-0.011***	-0.010**
	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)	(0.004)
Lev_{t-1}	0.141***	0.148***	0.140***	0.208***	0.213***	0.210***
	(0.044)	(0.045)	(0.045)	(0.079)	(0.081)	(0.081)
$Cash_{t-1}$	-0.048	-0.065	-0.045	-0.043	-0.058	-0.031
	(0.062)	(0.063)	(0.063)	(0.112)	(0.112)	(0.113)
$CAPX_{t-1}$	0.408	0.503*	0.446	0.866*	0.978**	0.918*
	(0.274)	(0.280)	(0.276)	(0.479)	(0.492)	(0.488)
Industry, Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,734	4,659	4,659	4,734	4,659	4,659
Adjusted R2	0.674	0.674	0.673	0.706	0.708	0.707

Table 5. Climate Change, CSR and Disclosure on the CDP

The table reports the OLS regression results on the effects of climate change exposure on the CSR-CDP disclosure strategy. The sample consists of S&P 500 firms from 2010 to 2020. The dependent variable is *CDP_Discl* in column (1) and (2), an indicator variable that equals one if firms disclose climate-related information on the CDP and zero otherwise, and *CDP_Score* in column (3) and (4) that varies from zero to two. *CSR_Discl* is an indicator variable that equals one if the firm discloses a CSR report, and zero otherwise. *Big3* is the ownership of the Big 3 investors. *SH_RES_Climate* is an indicator variable that equals one if a firm has at least one climate-related shareholder resolution, and zero otherwise. *NonBig3* is the ownership of non-Big3 institutional investors. *SH_RES* is an indicator variable that equals one if the firm has at least one shareholder resolution, and zero otherwise. *Size* is the natural logarithm of market value. *ROA* is EBIT divided by total assets. *MTB* is the market value of equity divided by the book value of equity. *Lev* is the ratio of debt to total assets. *Cash* is the ratio of cash equivalents to total assets. *CAPX* is the ratio of capital expenditure to total assets. *CC_EXP* is a textual measure from earnings call transcripts that captures the climate change exposure. *CC_SENT* is a textual measure from earnings call transcripts that captures the sentiment of climate change. *CC_RISK* is a textual measure from earnings call transcripts that captures the climate change risk. All control variables are lagged by one year. Standard errors are clustered at the firm level and presented in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

	Dependent variable:					
	CDP_Discl			*CDP_Score*		
	(1)	(2)	(3)	(4)	(5)	(6)
CSR_Discl_{t-1}	0.069***	0.064***	0.060***	0.113***	0.103***	0.096***
	(0.013)	(0.013)	(0.013)	(0.024)	(0.023)	(0.023)
$CC\_EXP_{t-1} \times CSR\_Discl_{t-1}$	-0.094***			-0.166***		
	(0.033)			(0.062)		
$CC\_SENT_{t-1} \times CSR\_Discl_{t-1}$		-0.242***			-0.407***	
		(0.083)			(0.151)	
$CC\_RISK_{t-1} \times CSR\_Discl_{t-1}$			-0.882			-1.402
			(0.818)			(1.561)
CC_EXP_{t-1}	0.077**			0.145**		
	(0.035)			(0.064)		
CC_SENT_{t-1}		0.171**			0.337***	
		(0.066)			(0.116)	
CC_RISK_{t-1}			0.718			1.081
			(0.741)			(1.367)
$Big3_{t-1}$	0.369**	0.372**	0.376**	0.697**	0.706**	0.710**
	(0.164)	(0.163)	(0.163)	(0.295)	(0.295)	(0.294)
$NonBig3_{t-1}$	-0.108**	-0.112**	-0.113**	-0.172**	-0.179**	-0.179**
	(0.044)	(0.044)	(0.044)	(0.080)	(0.080)	(0.080)
$SH\_RES\_Climate_{t-1}$	0.003	0.003	0.004	-0.002	-0.002	-0.001
	(0.018)	(0.018)	(0.018)	(0.032)	(0.032)	(0.032)
SH_RES_{t-1}	0.012	0.012	0.013	0.030	0.029	0.031
	(0.012)	(0.012)	(0.012)	(0.021)	(0.021)	(0.021)
$Size_{t-1}$	0.031***	0.032***	0.032***	0.052***	0.052***	0.052***
	(0.008)	(0.008)	(0.008)	(0.014)	(0.014)	(0.014)
ROA_{t-1}	0.028	0.027	0.028	0.102	0.100	0.099
	(0.122)	(0.122)	(0.122)	(0.213)	(0.213)	(0.213)
CDP_Discl_{t-1}	0.704***	0.705***	0.706***			
	(0.015)	(0.015)	(0.015)			
CDP_Score_{t-1}				0.729***	0.731***	0.732***
				(0.014)	(0.014)	(0.014)
MTB_{t-1}	-0.004	-0.004*	-0.004*	-0.009**	-0.009**	-0.009**
	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)	(0.004)
Lev_{t-1}	0.140***	0.141***	0.144***	0.204**	0.206**	0.209**
	(0.047)	(0.046)	(0.047)	(0.083)	(0.083)	(0.083)
$Cash_{t-1}$	-0.031	-0.034	-0.033	-0.018	-0.024	-0.022
	(0.066)	(0.066)	(0.066)	(0.119)	(0.119)	(0.119)
$CAPX_{t-1}$	0.473	0.467	0.482	0.936*	0.922*	0.953*
	(0.295)	(0.295)	(0.296)	(0.511)	(0.512)	(0.513)
Industry, Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,495	4,495	4,495	4,495	4,495	4,495
Adjusted R2	0.671	0.671	0.671	0.703	0.703	0.703

Table 6. Financial Constraints, CSR and Disclosure on the CDP

The table reports the OLS regression results on the effects of financial constraints on the CSR-CDP disclosure strategy. The sample consists of S&P 500 firms from 2010 to 2020. The dependent variable is *CDP_Discl* in column (1) and (2), an indicator variable that equals one if firms disclose climate-related information on the CDP and zero otherwise, and *CDP_Score* in column (3) and (4) that varies from zero to two. *CSR_Discl* is an indicator variable that equals one if the firm discloses a CSR report, and zero otherwise. *Big3* is the ownership of the Big 3 investors. *SH_RES_Climate* is an indicator variable that equals one if a firm has at least one climate-related shareholder resolution, and zero otherwise. *NonBig3* is the ownership of non-Big3 institutional investors. *SH_RES* is an indicator variable that equals one if the firm has at least one shareholder resolution, and zero otherwise. *Size* is the natural logarithm of market value. *ROA* is EBIT divided by total assets. *MTB* is the market value of equity divided by the book value of equity. *Lev* is the ratio of debt to total assets. *Cash* is the ratio of cash equivalents to total assets. *CAPX* is the ratio of capital expenditure to total assets. *NetLev* is the ratio of total debt less cash plus short-term investments to the book value of total assets. *KZ* is the financial constraint index from Kaplan and Zingales 1997. All control variables are lagged by one year. Standard errors are clustered at the firm level and presented in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

	Dependent variable:			
	CDP_Discl		*CDP_Score*	
	(1)	(2)	(3)	(4)
CSR_Discl_{t-1}	0.043***	0.090***	0.071**	0.151***
	(0.016)	(0.019)	(0.028)	(0.034)
$KZ_{t-1} \times CSR\_Discl_{t-1}$	-0.001*		-0.002	
	(0.001)		(0.001)	
$NetLev_{t-1} \times CSR\_Discl_{t-1}$		-0.143**		-0.263**
		(0.059)		(0.107)
KZ_{t-1}	0.001*		0.002*	
	(0.001)		(0.001)	
$NetLev_{t-1}$	0.057	0.120***	0.083	0.183**
	(0.038)	(0.044)	(0.071)	(0.078)
$Big3_{t-1}$	0.436**	0.389**	0.780**	0.725**
	(0.187)	(0.168)	(0.336)	(0.298)
$NonBig3_{t-1}$	-0.108**	-0.089**	-0.174**	-0.151*
	(0.049)	(0.045)	(0.089)	(0.080)
$SH\_RES\_Climate_{t-1}$	0.007	0.006	0.006	0.005
	(0.018)	(0.018)	(0.032)	(0.031)
SH_RES_{t-1}	0.014	0.012	0.034	0.026
	(0.012)	(0.011)	(0.021)	(0.020)
$Size_{t-1}$	0.029***	0.028***	0.052***	0.049***
	(0.008)	(0.007)	(0.014)	(0.013)
ROA_{t-1}	0.085	0.027	0.229	0.130
	(0.128)	(0.120)	(0.225)	(0.208)
CDP_Discl_{t-1}	0.702***	0.714***		
	(0.016)	(0.015)		
CDP_Score_{t-1}			0.729***	0.741***
			(0.015)	(0.014)
MTB_{t-1}	-0.002	-0.002	-0.007	-0.006*
	(0.002)	(0.002)	(0.004)	(0.004)
$Cash_{t-1}$	-0.078	-0.060	-0.089	-0.074
	(0.070)	(0.064)	(0.132)	(0.116)
$CAPX_{t-1}$	0.209	0.303	0.424	0.652
	(0.297)	(0.275)	(0.517)	(0.480)
Industry, Year FE	Yes	Yes	Yes	Yes
Observations	3,983	4,593	3,983	4,593
Adjusted R2	0.675	0.674	0.707	0.707

Table 7. First-time CDP Disclosure and Firm's Response

The table reports the OLS regression results on the firm's response in Scope 1 emissions in response to the first-time CDP disclosure. The dependent variable is *Log(Scope1)*, the natural logarithm of Scope 1 emissions. *Treat* is set to one for firms which have ever disclosed to CDP. *Post* is set to one in years after the first-time CDP initiation and zero otherwise. The sample consists of S&P 500 firms from 2010 to 2020 and we create a [-5, 5] event window for each CDP initiation. *CSR_Discl* is an indicator variable that equals one if the firm discloses a CSR report, and zero otherwise. *Big3* is the ownership of the Big 3 investors. *SH_RES_Climate* is an indicator variable that equals one if a firm has at least one climate-related shareholder resolution, and zero otherwise. *NonBig3* is the ownership of non-Big3 institutional investors. *SH_RES* is an indicator variable that equals one if the firm has at least one shareholder resolution, and zero otherwise. *Size* is the natural logarithm of market value. *ROA* is EBIT divided by total assets. *MTB* is the market value of equity divided by the book value of equity. *Lev* is the ratio of debt to total assets. *Cash* is the ratio of cash equivalents to total assets. *CAPX* is the ratio of capital expenditure to total assets. All control variables are lagged by one year. Standard errors are clustered at the firm-level and presented in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

	Dependent variable:		
	Log(Scope1)		
	(1)	(2)	(3)
Treat × *Post*	-0.350***	-0.453***	-0.060
	(0.069)	(0.099)	(0.150)
CSR_Discl $_{t-1}$	-0.028		
	(0.034)		
Big3 $_{t-1}$	1.307**	1.359*	0.989
	(0.526)	(0.703)	(0.903)
NonBig3 $_{t-1}$	-0.302**	-0.253	-0.278
	(0.134)	(0.182)	(0.259)
SH_RES_Climate $_{t-1}$	-0.066	-0.074	-0.082
	(0.048)	(0.089)	(0.052)
SH_RES $_{t-1}$	0.011	0.007	-0.006
	(0.025)	(0.036)	(0.038)
Size $_{t-1}$	0.336***	0.401***	0.135
	(0.045)	(0.062)	(0.086)
ROA $_{t-1}$	0.601	0.836	-0.651
	(0.531)	(0.639)	(0.900)
MTB $_{t-1}$	-0.032***	-0.033*	-0.014
	(0.010)	(0.018)	(0.014)
Lev $_{t-1}$	0.350	0.287	-0.046
	(0.218)	(0.285)	(0.408)
Cash $_{t-1}$	-0.047	-0.411	0.739
	(0.281)	(0.429)	(0.461)
CAPX $_{t-1}$	-0.089	0.272	-2.373*
	(0.836)	(1.125)	(1.313)
Sample		*CSR_Discl = 0*	*CSR_Discl = 1*
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	3,128	1,941	1,187
Adjusted R2	0.964	0.956	0.974

Table 8. First-time CDP Disclosure and Stakeholders' Reaction

The table reports the regression results on other stakeholders' reactions in response to the first-time CDP disclosure. The sample consists of S&P 500 firms from 2010 to 2020 and we create a [-5, 5] yearly event window for each CDP initiation. Panel A reports the results using the full sample. Panel B reports the results using the subsamples split by CSR status. The dependent variable is *ESG_Score* in column (1), the rating on the environmental, social, and governance pillars. *VoteSupport* in column (2) is defined as the percentage of "For" votes to all shareholder resolutions. The dependent variable is *COVERAGE* in column (3), defined as the natural logarithm of the number of analysts following the firm, and *ILLIQ* in column (4), defined as the annualized Amihud illiquidity, and *SPREAD* in column (5), defined as the annualized daily bid-ask spread. *Treat* is set to one for firms which have ever disclosed to CDP. *Post* is set to one in years after the first-time CDP initiation and zero otherwise. *CSR_Discl* is an indicator variable that equals one if the firm discloses a CSR report, and zero otherwise. *Big3* is the ownership of the Big 3 investors. *SH_RES_Climate* is an indicator variable that equals one if a firm has at least one climate-related shareholder resolution, and zero otherwise. *NonBig3* is the ownership of non-Big3 institutional investors. *SH_RES* is an indicator variable that equals one if the firm has at least one shareholder resolution, and zero otherwise. *Size* is the natural logarithm of market value. *ROA* is EBIT divided by total assets. *MTB* is the market value of equity divided by the book value of equity. *Lev* is the ratio of debt to total assets. *Cash* is the ratio of cash equivalents to total assets. *CAPX* is the ratio of capital expenditure to total assets. All control variables are lagged by one year. Standard errors are clustered at the firm-level and presented in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

Panel A: Full sample

	Dependent variable:				
	ESG_Score	*VoteSupport*	*COVERAGE*	*ILLIQ*	*SPREAD*
	(1)	(2)	(3)	(4)	(5)
Treat × *Post*	2.236**	-0.062**	0.039***	-0.003	-0.263***
	(0.950)	(0.029)	(0.015)	(0.003)	(0.077)
CSR_Discl $_{t-1}$	1.632***	-0.026*	0.003	0.002	-0.065
	(0.459)	(0.015)	(0.012)	(0.002)	(0.047)
Big3 $_{t-1}$	7.651	-0.240	-0.280	-0.127**	-0.111
	(9.319)	(0.308)	(0.192)	(0.058)	(0.893)
NonBig3 $_{t-1}$	0.857	0.145*	0.078	0.032**	-0.261
	(2.591)	(0.081)	(0.067)	(0.015)	(0.263)
SH_RES_Climate $_{t-1}$	-0.022	0.039**	0.010	0.004	0.114*
	(0.691)	(0.016)	(0.012)	(0.003)	(0.065)
SH_RES $_{t-1}$	0.699	-0.054***	-0.008	-0.0004	0.039
	(0.453)	(0.020)	(0.009)	(0.002)	(0.042)
Size $_{t-1}$	1.792**	-0.034*	0.095***	-0.075***	-0.941***
	(0.774)	(0.020)	(0.017)	(0.005)	(0.099)
ROA $_{t-1}$	-9.197	0.014	0.111	-0.162***	-3.281***
	(7.173)	(0.249)	(0.140)	(0.039)	(0.803)
MTB $_{t-1}$	-0.506***	0.003	-0.009***	-0.0004	-0.004
	(0.138)	(0.005)	(0.003)	(0.001)	(0.016)
Lev $_{t-1}$	4.906	-0.268**	0.161**	0.002	0.405
	(3.500)	(0.108)	(0.063)	(0.018)	(0.423)
Cash $_{t-1}$	14.258***	0.138	-0.030	-0.039**	-0.455
	(4.378)	(0.126)	(0.091)	(0.020)	(0.480)
CAPX $_{t-1}$	41.730**	-0.464	0.409	0.010	0.983
	(18.513)	(0.460)	(0.310)	(0.077)	(1.809)
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	2,256	1,126	3,239	2,607	2,607
Adjusted R2	0.849	0.519	0.889	0.860	0.823

Panel B: Subsample split on lagged CSR disclosure

Sample: CSR_Discl $_{t-1}$ =0	*Dependent variable:*				
	ESG_Score	*VoteSupport*	*COVERAGE*	*ILLIQ*	*SPREAD*
	(1)	(2)	(3)	(4)	(5)
Treat × Post	4.011***	-0.047	0.047**	-0.006	-0.296**
	(1.260)	(0.039)	(0.022)	(0.005)	(0.130)
Firm, Year FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
Observations	1,350	594	2,021	1,588	1,588
Adjusted R2	0.833	0.562	0.864	0.853	0.809

Sample: CSR_Discl $_{t-1}$ =1	*Dependent variable:*				
	ESG_Score	*VoteSupport*	*COVERAGE*	*ILLIQ*	*SPREAD*
	(1)	(2)	(3)	(4)	(5)
Treat × Post	-1.070	-0.024	0.037	0.005	-0.112
	(1.771)	(0.034)	(0.025)	(0.007)	(0.119)
Firm, Year FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
Observations	906	532	1,218	1,019	1,019
Adjusted R2	0.804	0.733	0.962	0.916	0.912

Online Appendix

Appendix OA1. Lists of climate-risk related keywords in shareholder resolutions

1. Climate keywords of CERES:

- **Unigram keywords:** ghg, energy, emissions, climate, methane, oil, renewable, hydraulic, shale, coal, deforestation, palm, carbon, renewable, gas, sands, natural, mountaintop, ca100, offshore, fuel, fossil, clean, water, rainforest, refrigerants, biomass, coastal, wetlands, solar, greenhouse
- **Bigram keywords**: reduction targets, ghg reduction, adopt ghg, 2 degree, degree analysis, on ghg, climate change, methane emissions, on methane, emissions reduction, ghg emissions, on energy, renewable energy, energy risks, hydraulic fracturing, shale energy, chain deforestation, emissions targets, on climate, energy efficiency, energy goals, palm oil, deforestation impacts, on renewable, efficiency renewables, renewables programs, net zero, coal risks, oil policy, adopt climate, carbon asset, emissions and, stranded carbon, energy management, energy targets, set renewable, coal ash, targets net, distributed energy, oil supply, oil sands, energy use, zero ghg, sands operations, deforestation policy, natural gas, coal mountaintop, mountaintop removal, carbon financing, high carbon, gas use, of natural, ca100 benchmark, on ca100, offshore oil, oil wells, on offshore, transition risks, product energy, fossil fuel, and gas, gas transport, oil and, by climate, energy strategy, adopt methane, methane reduction, climate related, flaring reduction, on rainforest, rainforest impacts, assess climate, clean energy, climate mitigation, chain climate, regulatory risk, energy independence, us energy, reduce refrigerants, refrigerants contribution, to climate, energy sources, fuel demand, on fossil, changed carbon, fleet ghg, on water, water use, carbon energy, energy policy, low carbon, add fossil, fuel free, oil pricing, biomass power, stop biomass, gas pricing, on natural, energy projects, energy purchasing, adopt coastal, coastal wetlands, wetlands policy, develop fuel, fuel cells, climate risk, study climate, energy options, sustainable energy, climate friendly, divest fossil, fuel holdings, climate lobbying, corporate climate, paris agreement, and fossil, fuel reserves, water impacts, reduce water, water risk, global warming

2. Climate keywords of Engle et al. and Alok et al.:

- **Unigram keywords:** aerosols, temperatures, power, specific, capacity, circulation, international, developing, sources, amount, refers, biomass, implementation, system, gases, ocean, nations, scenarios, world, period, convention, radiation, activity, earth, melting, gas, fossil, d1oxide, warming,forcing, temperature, based, state, trading, called, model, pressure, forests, fuels, process, layer, parties, heat, systems, number, natural, earths, surface, organisms, dth, species, sut, emissions, atmospheric, climate, total, weather, anthropogenic, oceans, environmental, action, mitigation, measures, management, states, pm, reductions, set, costs, form, terms, stl, rate, environment, timeproduction, feedback, economic, adaptations, land, ecosystem, chemical, country, zoncert, report, concentrations, atmosphere, plants, development, policies, unfccc, defined, technology, effects, fuel, scenario, include, reduction, variability, activities, projects, radiative, ice, potential, due, region, high, cyclemethane, human, conditions, kyoto, project, annex, relative, infrared, protocol, impacts, processes, area, agreement, information, bun, cop, unit, developed, increase, mechanism, future, reduce, emission, including, system, average, carbon, dioxide, social
- **Bigram keywords**: organic balance, global warming, fossil fuels, developing countries, radiative forcing, infrared radiation, convertiori climate, kyoto protocol, greenhouse gases, climate change, united nations, carbon dioxide, winter weather, severe storm, drought lightning, tropical storm

Appendix OA2. Multigram of climate risk related keywords in CSR reports

climate risk, climate related risk, climate-related risk, climate change risk, climate change business risk, climate change financial risk, climate change financing risk, financial risk of climate change, financial risks of climate change, climate change water risk, climate-related water risk, extreme weather risk, physical climate risk, physical risk of climate change, physical risks of climate change, transition climate risk, transition risk of climate change, transition risks of climate change, regulatory risk of climate change, regulatory risks of climate change, policy risk of climate change, policy risks of climate change, legal risk of climate change, legal risks of climate change, reputation risk of climate change, reputation risks of climate change, climate reputation risk, market risk of climate change, market risks of climate change, technology risk of climate change, technology risks of climate change, operational risk of climate change, operational risks of climate change, stranded carbon asset risk, risk of stranded carbon asset, risks of stranded carbon asset, risk of stranded natural gas asset, risk of stranded fossil fuel asset, risk of lower fossil fuel demand, risks of lower fossil fuel demand, financial risk of coal reliance, financial risks of coal reliance, low carbon economy, carbon tax, physical risk, transition risk

Fig. OA1. CDP Respondents

Fig. OA1 reports the time trend of CDP respondents and CDP non-respondents. We partition the sample into respondents (non-respondents) who received requests from CDP or not.

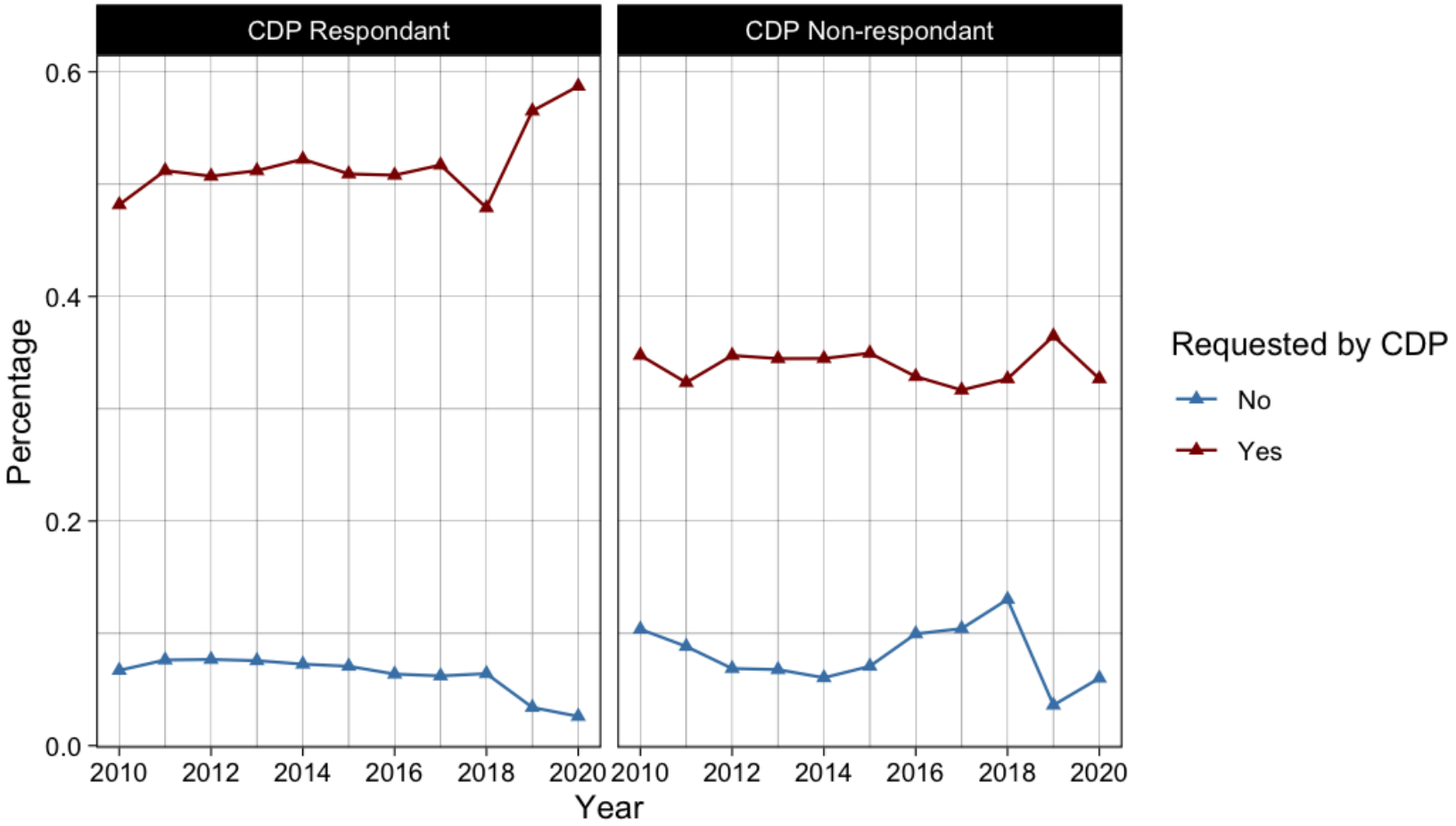


Fig. OA2. Time Evolution of Climate-Related Information in CSR Reports

Fig. OA2 reports the time trend of climate-related information via CSR reports. *CSR_Climate* is an indicator variable that equals one if the CSR reports contain climate-related information and zero otherwise. *CSR_Discl* is an indicator that equals one if firms have CSR reports and zero otherwise.

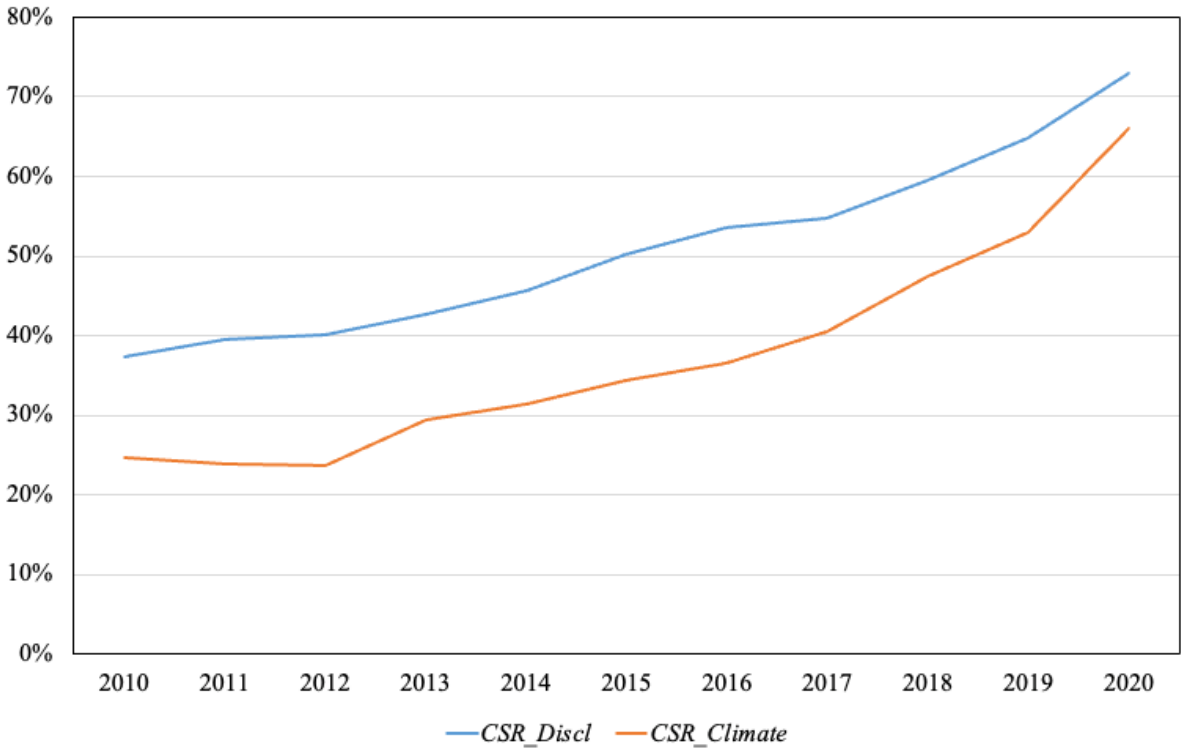


Table OA1. First-time CDP Disclosure and Rating in E, S and G Pillar.

The table reports the regression results on the rating of the E, S and G pillar, respectively, in response to the first-time CDP disclosure. The sample consists of S&P 500 firms from 2010 to 2020 and we create a [-5, 5] event window for each CDP initiation. Panel A reports the results using the full sample. Panel B reports the results using the subsamples split by CSR status. The dependent variable is *E_Score* in column (1), the rating on the environmental pillar. The dependent variable is *S_Score* in column (1), the rating on the social pillar. The dependent variable is *G_Score* in column (1), the rating on the governance pillar. *Treat* is set to one for firms which have ever disclosed to CDP. *Post* is set to one in years after the first-time CDP initiation and zero otherwise. *CSR_Discl* is an indicator variable that equals one if the firm discloses a CSR report, and zero otherwise. *Big3* is the ownership of the Big 3 investors. *SH_RES_Climate* is an indicator variable that equals one if a firm has at least one climate-related shareholder resolution, and zero otherwise. *NonBig3* is the ownership of non-Big3 institutional investors. *SH_RES* is an indicator variable that equals one if the firm has at least one shareholder resolution, and zero otherwise. *Size* is the natural logarithm of market value. *ROA* is EBIT divided by total assets. *MTB* is the market value of equity divided by the book value of equity. *Lev* is the ratio of debt to total assets. *Cash* is the ratio of cash equivalents to total assets. *CAPX* is the ratio of capital expenditure to total assets. All control variables are lagged by one year. Standard errors are clustered at the firm level and presented in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

Panel A: Full sample

	Dependent variable:		
	E_Score	*S_Score*	*G_Score*
	(1)	(2)	(3)
Treat × Post	4.057***	3.952***	-1.688
	(1.369)	(1.045)	(1.459)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Observations	2,256	2,256	2,256
Adjusted R2	0.859	0.833	0.666

Panel B: Sample split by *CSR_Discl*

Sample: CSR_Discl =0	*Dependent variable:*		
	E_Score	*S_Score*	*G_Score*
	(1)	(2)	(3)
Treat × Post	5.280***	6.203***	-0.580
	(1.942)	(1.258)	(1.953)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Observations	2,256	2,256	2,256
Adjusted R2	0.878	0.868	0.783

Sample: CSR_Discl =1	*Dependent variable:*		
	E_Score	*S_Score*	*G_Score*
	(1)	(2)	(3)
Treat × Post	2.489	-1.705	-2.235
	(2.363)	(2.312)	(2.606)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Observations	2,256	2,256	2,256
Adjusted R2	0.889	0.873	0.728

Table OA2. Alternative Measurement for CSR Disclosure

Panel A of this table reports the OLS regression results on the determinants of CDP disclosure. Panel B to Panel E reports the OLS regression results on the effect of demand for climate information, GHG emissions, climate change exposure, and financial constraints on the CSR-CDP strategy, respectively. Panel F reports the OLS results on the stakeholders' reactions to the first-time CDP disclosure. The sample consists of S&P 500 firms from 2010 to 2020. The dependent variable is *CDP_Discl*, an indicator variable that equals one if firms disclose climate-related information on the CDP and zero otherwise, and *CDP_Score* that varies from zero to two. *CSR_Climate* is an indicator variable that equals one if the firm discloses climate-related information in the CSR report and zero otherwise. *CSR_Discl* is an indicator variable that equals one if the firm discloses a CSR report, and zero otherwise. *Big3* is the ownership of the Big 3 investors. *SH_RES_Climate* is an indicator variable that equals one if a firm has at least one climate-related shareholder resolution, and zero otherwise. *NonBig3* is the ownership of non-Big3 institutional investors. *SH_RES* is an indicator variable that equals one if the firm has at least one shareholder resolution, and zero otherwise. *Size* is the natural logarithm of market value. *ROA* is EBIT divided by total assets. *MTB* is the market value of equity divided by the book value of equity. *Lev* is the ratio of debt to total assets. *Cash* is the ratio of cash equivalents to total assets. *CAPX* is the ratio of capital expenditure to total assets. *Log(Scope1)* is the natural logarithm of Scope 1 emissions. *EmissionInd* is an indicator variable that equals one if the industry is mining, manufacturing or utilities, and zero otherwise. *Top_emitter* is an indicator variable that equals one if the firm's Scope 1 emissions are in the top quartile of the same industry, and zero otherwise. *CC_EXP* is a textual measure from earnings call transcripts that captures the climate change exposure. *CC_SENT* is a textual measure from earnings call transcripts that captures the sentiment of climate change. *CC_RISK* is a textual measure from earnings call transcripts that captures the climate change risk. *NetLev* is the ratio of total debt less cash plus short-term investments to the book value of total assets. *KZ* is the financial constraint index from Kaplan and Zingales 1997. All control variables are lagged by one year. Standard errors are clustered at the firm level and presented in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

Panel A: CDP disclosure and climate-specific CSR report

	Dependent variable:	
	CDP_Discl	*CDP_Score*
	(1)	(2)
CSR_Climate	0.068***	0.110***
	(0.013)	(0.024)
Observations	4,734	4,734
Controls	Yes	Yes
Industry, Year FE	Yes	Yes
Adjusted R^2	0.674	0.706

Panel B: CDP disclosure and climate information demand

	Dependent variable:			
	CDP_Discl		*CDP_Score*	
	(1)	(2)	(3)	(4)
CSR_Climate	0.101***	0.076***	0.171***	0.120***
	(0.032)	(0.013)	(0.058)	(0.024)
Big3 × CSR_Climate	-0.200		-0.365	
	(0.178)		(0.323)	
SH_RES_Climate × CSR_Climate		-0.067**		-0.076
		(0.033)		(0.061)
Industry, Year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	4,734	4,659	4,659	4,734
Adjusted R2	0.674	0.674	0.706	0.706

Panel C: CDP disclosure and emissions

	Dependent variable:					
	CDP_Discl			*CDP_Score*		
	(1)	(2)	(3)	(4)	(5)	(6)
CSR_Climate	0.118***	0.215***	0.087***	0.187***	0.361***	0.145***
	(0.020)	(0.057)	(0.015)	(0.036)	(0.104)	(0.028)
EmissionInd × CSR_Climate	-0.079***			-0.121***		
	(0.023)			(0.042)		
Log(Scope1) × CSR_Climate		-0.012***			-0.021**	
		(0.004)			(0.008)	
Top_Emitter × CSR_Climate			-0.075***			-0.134***
			(0.023)			(0.042)
Industry, Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,734	4,659	4,659	4,734	4,659	4,659
Adjusted R2	0.675	0.675	0.674	0.707	0.708	0.708

Panel D: CDP disclosure and climate change exposure

	Dependent variable:					
	CDP_Discl			*CDP_Score*		
	(1)	(2)	(3)	(4)	(5)	(6)
CSR_Climate	0.082***	0.078***	0.074***	0.134***	0.127***	0.119***
	(0.014)	(0.014)	(0.013)	(0.026)	(0.025)	(0.025)
CC_EXP × CSR_Climate	-0.071**			-0.114*		
	(0.032)			(0.060)		
CC_SENT × CSR_Climate		-0.175*			-0.300*	
		(0.090)			(0.171)	
CC_RISK × CSR_Climate			-0.651			-0.561
			(0.714)			(1.380)
Industry, Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,495	4,495	4,495	4,495	4,495	4,495
Adjusted R2	0.672	0.672	0.671	0.704	0.704	0.704

Panel E: CDP disclosure and financial constraints

	Dependent variable:			
	CDP_Discl		*CDP_Score*	
	(1)	(2)	(3)	(4)
CSR_Climate	0.056***	0.106***	0.102***	0.182***
	(0.016)	(0.019)	(0.030)	(0.036)
KZ × CSR_Climate	-0.001		-0.0002	
	(0.001)		(0.001)	
NetLev × CSR_Climate		-0.144**		-0.283***
		(0.058)		(0.108)
Industry, Year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	4,091	4,593	4,091	4,593
Adjusted R2	0.673	0.675	0.704	0.709

Panel F: CDP disclosure and stakeholders' reaction

	Dependent variable:					
	Log(Scope1)	*ESG_Score*	*VoteSupport*	*COVERAGE*	*ILLIQ*	*SPREAD*
	(1)	(2)	(3)	(4)	(5)	(6)
Treat × Post	-0.351***	2.059**	-0.063**	0.039**	-0.003	-0.258***
	(0.070)	(0.951)	(0.029)	(0.015)	(0.003)	(0.077)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,128	2,256	1,126	3,239	2,607	2,607
Adjusted R2	0.964	0.849	0.517	0.889	0.860	0.823

Table OA3. Engagement of CDP Signatories

The table reports the OLS regression results on the effects of CDP requests on the CSR-CDP strategy. The sample consists of S&P 500 firms from 2010 to 2020. The dependent variable is *CDP_Discl* in column (1), an indicator variable that equals one if firms disclose climate-related information on the CDP and zero otherwise, and *CDP_Score* in column (2) which varies from zero to two. *CDP_Request* is an indicator variable that equals one if the firm is requested by CDP to disclose, and zero otherwise. *CSR_Discl* is an indicator variable that equals one if the firm discloses a CSR report, and zero otherwise. *Big3* is the ownership of the Big 3 investors. *SH_RES_Climate* is an indicator variable that equals one if a firm has at least one climate-related shareholder resolution, and zero otherwise. *NonBig3* is the ownership of non-Big3 institutional investors. *SH_RES* is an indicator variable that equals one if the firm has at least one shareholder resolution, and zero otherwise. *Size* is the natural logarithm of market value. *ROA* is EBIT divided by total assets. *MTB* is the market value of equity divided by the book value of equity. *Lev* is the ratio of debt to total assets. *Cash* is the ratio of cash equivalents to total assets. *CAPX* is the ratio of capital expenditure to total assets. All control variables are lagged by one year. Standard errors are clustered at the firm level and presented in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

	Dependent variable:	
	CDP_Discl	*CDP_Score*
	(1)	(2)
CDP_Request	0.035**	0.055***
	(0.016)	(0.018)
CDP_Request × CSR_Discl	-0.021	-0.015
	(0.040)	(0.041)
CSR_Discl	0.067*	0.064
	(0.039)	(0.040)
Big3	0.339**	0.324*
	(0.160)	(0.176)
SH_RES_Climate	-0.094**	-0.106**
	(0.043)	(0.048)
NonBig3	0.011	0.014
	(0.018)	(0.019)
SH_RES	0.007	0.008
	(0.011)	(0.012)
Size	0.030***	0.031***
	(0.007)	(0.009)
ROA	0.064	0.030
	(0.116)	(0.137)
CDP_Discl	0.713***	
	(0.015)	
CDP_Score		0.365***
		(0.008)
MTB	-0.004*	-0.001
	(0.002)	(0.003)
Lev	0.150***	0.171***
	(0.043)	(0.052)
Cash	-0.047	-0.103
	(0.062)	(0.079)
CAPX	0.406	0.187
	(0.273)	(0.303)
Industry FE	Yes	Yes
Year FE	Yes	Yes
Observations	4,734	4,734
Adjusted R2	0.673	0.645

Table OA4. Scope 1 Emissions Disclosure in CDP

The table reports the OLS regression results on the effects of GHG emissions on the CSR-CDP disclosure strategy. The sample consists of S&P 500 firms from 2010 to 2020. The dependent variable is *Scope1_Discl* in column (1) and (2), an indicator variable that equals one if firms disclose Scope 1 emissions in CDP and zero otherwise, and *CDP_Score* in column (3) and (4) that varies from zero to two. *CSR_Discl* is an indicator variable that equals one if the firm discloses a CSR report, and zero otherwise. *Big3* is the ownership of the Big 3 investors. *SH_RES_Climate* is an indicator variable that equals one if a firm has at least one climate-related shareholder resolution, and zero otherwise. *NonBig3* is the ownership of non-Big3 institutional investors. *SH_RES* is an indicator variable that equals one if the firm has at least one shareholder resolution, and zero otherwise. *Size* is the natural logarithm of market value. *ROA* is EBIT divided by total assets. *MTB* is the market value of equity divided by the book value of equity. *Lev* is the ratio of debt to total assets. *Cash* is the ratio of cash equivalents to total assets. *CAPX* is the ratio of capital expenditure to total assets. *Log(Scope1)* is the natural logarithm of Scope 1 emissions. *EmissionInd* is an indicator variable that equals one if the industry is mining, manufacturing or utilities, and zero otherwise. *Top_emitter* is an indicator variable that equals one if the firm's Scope 1 emissions are in the top quartile of the same industry, and zero otherwise. All control variables are lagged by one year. Standard errors are clustered at the firm level and presented in parentheses. ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

	Dependent variable:					
	Scope1_Discl					
	(1)	(2)	(3)	(4)	(5)	(6)
CSR_Discl	0.067***	0.147***	0.040***	0.052***	0.047***	0.043***
	(0.015)	(0.047)	(0.012)	(0.011)	(0.011)	(0.011)
EmissionInd × *CSR_Discl*	-0.048***					
	(0.018)					
Log(Scope1) × *CSR_Discl*		-0.010**				
		(0.004)				
Top_Emitter × *CSR_Discl*			-0.024			
			(0.022)			
Log(Scope1)		-0.010				
		(0.006)				
Top_Emitter			0.008			
			(0.020)			
CC_EXP × *CSR_Discl*				-0.071**		
				(0.030)		
CC_SENT × *CSR_Discl*					-0.150*	
					(0.080)	
CC_RISK × *CSR_Discl*						-0.299
						(0.845)
CC_EXP				0.063**		
				(0.030)		
CC_SENT					0.146***	
					(0.052)	
CC_RISK						0.189
						(0.793)
Scope1_Discl	0.765***	0.764***	0.766***	0.756***	0.757***	0.758***
	(0.015)	(0.016)	(0.015)	(0.016)	(0.016)	(0.016)
Industry, Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,734	4,659	4,659	4,495	4,495	4,495
Adjusted R2	0.753	0.754	0.753	0.751	0.751	0.751