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Do foreign institutional investors influence corporate climate change disclosure quality? International evidence

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Abstract

Research Question/Issue: We examine the association between foreign institutional ownership and climate change disclosure quality from 2006 to 2018 across 34 countries. We find that firms with a higher level of foreign institutional ownership demonstrate better quality climate change disclosures, whereas domestic institutional ownership has immaterial impacts on such disclosures. We utilize a difference-in-differences (DiD) analysis using a firm's addition to the Morgan Stanley Capital International (MSCI) index as an exogenous shock to control for endogeneity. Our findings are robust to various other endogeneity controls. We also establish evidence on an indirect effect of climate change disclosure quality in mediating the positive association between foreign institutional investors and firm valuation.

Research Findings/Insights: We find that the positive association between foreign institutional ownership and climate change disclosure quality is more pronounced for (1) firms domiciled in stakeholder-orientated countries, (2) firms domiciled in countries that adopt emission trading schemes, and (3) firms with a greater level of information asymmetry. Additionally, our results are more robust when foreign investors are domiciled in countries that care more about the environment.

Theoretical/Academic Implications: Our study contributes to climate change disclosures, corporate governance, and international business literature by showing that foreign rather than domestic institutional investors contribute to improved corporate climate change disclosure quality in their portfolio firms.

Practitioner/Policy Implications: Our study urges regulators to increase their market oversight, especially in firms with less foreign institutional ownership. This is required because such firms are prone to exhibiting poorer accountability for their climate risk management practices, and their disclosures are bereft of effective external monitoring mechanisms.

KEYWORDS

corporate governance, CDP, climate change disclosures, cross-country, firm valuation, foreign institutional ownership

[Corrections made on 02 June 2023, after first online publication: The second author's name and authors' biographies have been corrected and updated in this version.]

1 | INTRODUCTION

> *"Once an issue for 'green funds' … ESG and climate are now firmly established as high priority issues [for investors]."* (Baer Pettit, MSCI president)

Institutional investors are increasingly focused on environmental issues such as climate change and environmental disclosures (Carbon Disclosure Project [CDP], 2018; Krueger et al., 2020; Matsumura et al., 2014). For instance, BlackRock requires firms in its portfolio to disclose, monitor, and manage climate-related risks (CDP, 2018; Krueger et al., 2020). By integrating sustainability and climate change factors into its investment approach, BlackRock creates transparency in portfolio firms by encouraging disclosure of climate risks and environment-related policies. One consideration when assessing the effectiveness of institutional investors in improving disclosure is whether they are foreign or domestic investors. Aggarwal et al. (2011) show that institutions based in non-US countries with strong protections for minority shareholder rights improve firm-level governance. Institutional investors with different geographic origins may have different monitoring incentives. Foreign investors are more likely to be exposed to uncertainty and information asymmetry than local investors; consequently, they may demand more transparency around climate issues. In this study, we investigate whether foreign institutional investors fundamentally drive the quality of firms' climate change disclosures.

The motivation for our study is twofold. First, extant studies have observed inconclusive evidence on the relationship between institutional ownership and the quality of climate change disclosure. For instance, Cotter and Najah (2012) focus on the largest 500 FTSE global index firms and find that institutional owners successfully prompt investee firms to disclose climate change risks. However, Stanny and Ely (2008) find no significant impact of institutional ownership on carbon disclosures by US firms, while Ott et al. (2017) did not find significant associations between institutional ownership and firms' CDP response in an international setting. Liao et al. (2015) observe a negative association using the UK sample, suggesting that institutional investors deter such disclosures. These studies have collectively treated institutional investors homogenously, potentially accounting for the mixed and ambiguous evidence. To overcome this limitation, we seek to determine whether these inconsistent results are driven by the domicile of investors, that is, foreign versus domestic institutional investors, recognizing the heterogeneity in their informational advantage and monitoring incentives or effectiveness (Baik et al., 2013; Kim et al., 2019; Tsang et al., 2019).[1]

Second, most studies have investigated how a country's information environment attracts and influences foreign institutional investors' investment decisions (e.g., Aggarwal et al., 2005; Covrig et al., 2007; Leuz et al., 2009). However, Kim et al. (2019) claim there is a dearth of research examining how foreign institutional investors influence the information environment of investee firms *once* they have invested in such businesses. We extend this literature by examining whether foreign institutional investors promote more transparency in the disclosure quality of climate change for firms in their portfolios versus domestic investors. Exploring this is important since policymakers want to understand how effective corporate governance mechanisms promote climate change disclosures. Such mechanisms can reduce information asymmetry, stabilize financial systems, and facilitate the nation's smooth transition to a low-carbon economy (CDP, 2018; World Economic Forum [WEF], 2019).

This study focuses on the quality of climate change disclosures to the CDP. Firms can disclose climate risks via various communication channels such as corporate annual reports, corporate sustainability reports, or responses to the CDP (previously, Carbon Disclosure Projects) questionnaires. While companies' annual reports are subjective and not uniform (Gray & Bebbington, 2000), the CDP questionnaires are standardized, structured, and formatted responses, which provides us with a level platform to evaluate the quality of climate change disclosures (Ben-Amar et al., 2017; Depoers et al., 2016). As Ott et al. (2017, p. 15) point out, the standardized nature of the CDP disclosure "provides a globally consistent, though voluntary, disclosure standard."[2]

Our sample covers 34 countries from 2006 to 2018. In our base estimations, we observe a positive association between foreign institutional ownership and climate change disclosure quality but do not find a similar association for domestic institutional ownership. A challenge for institutional investor studies is to isolate the impact of ownership from confounding factors around the same time. To address this issue, we also use a quasi-natural experiment that arises from the firm's addition to the Morgan Stanley Capital International (MSCI) index as an exogenous shock to institutional ownership.

Our results withstand several robustness tests, including controlling for the firm- and country-fixed effects, a change specification, and a two-stage least squares (2SLS) regression with the instrumental variable approach. We further find that the positive association between foreign institutional ownership and climate change disclosure quality is accentuated for firms domiciled in stakeholder-oriented countries or those with emission trading schemes (ETSs) potentially because of pressure from stakeholders and regulators. The positive association between foreign institutional ownership and climate change disclosure quality is also more pronounced for firms exhibiting information asymmetry. Specifically, we show that the relationship between foreign ownership and higher climate change disclosure quality is more robust for firms displaying greater bid–ask spread and operating in countries prone to earnings management practices. However, the relationship is weakened when firms have more analysts following or are cross-listed due to an existing informational and monitoring environment facilitated by external parties. Finally, we find that climate change disclosure quality is a potential channel that explains the relationship between foreign institutional ownership and firm value.

We explore why foreign investors may push for better climate change disclosure to understand our results. Existing literature shows that investors focused on environmental issues may be able to directly influence their portfolio firms' carbon footprints (Azar et al., 2021). We examine whether investors from more developed countries or

countries with strong environmental values encourage better disclosures, as these investors may be more conscientious about the environment. Foreign investors from developed countries, the European Union (EU), or environmentally friendly countries drive our results. Our findings suggest that foreign ownership only improves disclosures if the foreign owners are environmentally minded.

Our study offers several contributions to the literature on this subject. First, we integrate the climate change and corporate governance literature by documenting that foreign institutional investors influence corporate climate change disclosure quality, while domestic institutional investors have immaterial impacts on such disclosures. We also explain the inconclusive results on the association between overall institutional ownership and climate change disclosures documented in earlier studies by highlighting the need to differentiate between foreign and domestic institutional investors (e.g., Cotter & Najah, 2012; Liao et al., 2015; Ott et al., 2017; Stanny & Ely, 2008). This insight is meaningful from an international business perspective, as US-centric studies have often overlooked foreign institutional investors, given that domestic institutional investors dominate the ownership of US firms (Tsang et al., 2019).

Second, our findings suggest that foreign institutional investors may be integral in improving corporate climate change disclosures, which is relevant for regulators and policymakers. Deng et al. (2018) find that foreign investors help to reduce information asymmetry by mitigating the effects of local culture. We extend their findings and show that foreign ownership enhances the financial system's stability, especially concerning climate change and attaining national goals (e.g., emission reduction targets) set under the Paris Agreement. Globally, some regulators and policymakers are concerned with foreign institutional investors acting as opportunistic "locusts," steering managers away from pursuing long-term growth for immediate returns (Bena et al., 2017; Organisation for Economic Co-Operation and Development [OECD], 2015). However, we find evidence that foreign institutional investors, particularly those from environmentally minded countries, improve climate transparency, confirming their roles in leading global financial integration and liberalization.

The paper proceeds as follows. Section 2 provides the literature review and develops the hypothesis. Sections 3, 4, and 5 present the research design, primary results, robustness, and additional analyses, respectively. Section 6 concludes the study.

2 | HYPOTHESIS DEVELOPMENT

Mark Carney, Governor of the Bank of England from 2013 to 2020, emphasized that climate change can influence a firm's financial stability by exposing it to physical, liability, and transition risks (Carney, 2015). Potential damage and costs associated with extreme weather and climatic impacts (e.g., storms, droughts, floods, etc.) on material assets accentuate the physical risk that threatens business operations, business model, supply chain, performance, and viability (Addoum et al., 2020; Bergmann et al., 2016; Schultz & Williamson, 2005; Winn et al., 2011). Shareholders, consumers, and activists may also file lawsuits against firms regarding loss or damage caused by climate change, giving rise to liability risk (KPMG, 2019).

Krueger et al.'s (2020) survey reveals institutional investors' increasing concerns about the financial implications of climate risks, particularly regulatory ones, for their portfolio firms. As countries around the globe endeavor to reduce greenhouse gas (GHG) in support of the Paris Agreement, firms face disruptions and asset revaluations in the transition to low-carbon economies. Such transition risk, coupled with public policy and public awareness, compels firms to potentially revisit business models and operations to be "greener" or environmentally friendly (Haque et al., 2016). There is a potential boon for firms during this transition as low-carbon products may enhance business operations and cash flows and result in cost savings (Ang & Copeland, 2018). Hence, climate change can act as both a material risk and an opportunity, which may influence investment decisions (Mercer, 2013; Solomon et al., 2011). Correspondingly, institutional investors have increasingly integrated climate-related filters into their investment, resource allocation, and asset valuation decisions by forming a portfolio of environmentally friendly investments (Ang & Copeland, 2018; Fink, 2020).

Institutional investors, particularly foreign investors, may be able to profit from and aid their portfolio companies in their transition to more environmentally friendly practices and disclosures. Information disadvantages from geographic distance, language, and cultural barriers pose significant uncertainty and information search-processing costs for foreign institutional investors (Baik et al., 2013; La Porta et al., 1998). Foreign institutional investors are incentivized to improve the portfolio firm's information environment and transparency to reduce this informational disadvantage. For instance, Tsang et al. (2019) and Kim et al. (2019) show that foreign institutional investors influence management to issue accurate business forecasts and appoint high-quality auditors. Insufficient and poor-quality climate change disclosures can result in mispricing and capital misallocation (CDP, 2018; Kolk et al., 2008). Dyck et al. (2019) find that European foreign institutional investors drive firms to focus on social responsibility because of their societal social norms. In response to divestment threats and pressures inflicted by foreign institutional investors, firms are prompted to institutionalize the expectations and beliefs espoused by foreign institutional investors into the corporate policy and practice (Fischer & Baron, 2015; Gillan & Starks, 2007; Reuters, 2018) and, specifically in our context, by providing high-quality climate change disclosures. Hence, we anticipate foreign institutional investors to be the primary driver of such disclosure quality, especially as it reduces the information asymmetry between domestic and foreign institutional investors (Coval & Moskowitz, 2001; Maffett, 2012). However, Dyck et al. (2019) find that foreign investors only care about their portfolio firms' social and environmental performance if they are catering to the demand for socially responsible companies. Specifically, they find that only certain geographic regions care about the environment. Therefore, we seek to answer the following question:

RQ1. Is there an association between foreign institutional ownership and climate change disclosure?

In contrast, domestic investors have a competitive information advantage from knowledge about localized climate risk and environmental standards (Coval & Moskowitz, 1999; Kang & Stulz, 1997). Familiarity with local businesses and the relevant industrial environment may reduce domestic institutional investors' incentives to push for high-quality climate change disclosures due to their inherent informational advantage. Common business ties with local firms may further enhance domestic institutional investors' informational advantages, which negates the need for investees to engage in costly climate change disclosures (Ferreira & Matos, 2008). Such potential ties can also hinder domestic institutional investors' independent monitoring and efforts from holding management accountable for climate risks and the quality of climate change disclosures (Tsang et al., 2019). Domestic institutional investors might even deter climate change disclosures, given their concerns over proprietary costs, compliance costs, litigation risks, and greater public scrutiny associated with voluntary disclosures (Li et al., 1997; Matsumura et al., 2014).

Conversely, Dyck et al. (2019) suggest that domestic investors are influenced by the same societal norms that guide managers of their portfolio companies. A firm's environmental performance can directly impact the environment where domestic investors live. Subsequently, domestic investors may be more concerned about understanding a firm's CDP performance since they have to live with the resulting pollution. We, therefore, examine the role of domestic institutional ownership in the following question:

RQ2. Is there an association between domestic institutional ownership and climate change disclosure?

3 | RESEARCH DESIGN

3.1 | CDP questionnaire

Each year, the CDP, an independent non-profit entity backed by 515 institutional investors with $35 trillion in assets as of September 2019 (CDP, 2019), issues questionnaires to large firms worldwide. These firms are invited to disclose annual firm-specific information about the risks and opportunities related to climate change, encompassing assessments of the financial impact of physical, liability, and transitional risks on their operations under various time horizons and scenario analyses. The CDP questionnaires also require firms to disclose their governance and business strategy in response to climate change-related risks on top of their targeted and actual carbon emissions data (CDP, 2020). Firms' voluntary responses to the CDP questionnaires are shared among institutional investors to obtain insights on the climate risk profiles of the firms and what they add to global warming (Kolk et al., 2008). Responding firms may also publish their responses on the CDP website to facilitate meaningful conversations between firms and other stakeholders about their climate risk exposures and management (Ott et al., 2017; Reid & Toffel, 2009).[3]

The CDP voluntary disclosure aims to enhance the transparency of participating firms' climate risks and allows these firms to signal how they can remain profitable, sustainable, and competitive in the transition to a carbon-constrained economy with relevant management strategies (OECD, 2017). Qian and Schaltegger (2017) find that CDP disclosures augment an "outside-in"-driven effect for firms to improve subsequent carbon performance. The market may view companies that fail to disclose information adversely and penalize such firms for causing investors to bear information search and processing costs (Milgrom, 1981). Additionally, the standardized CDP questionnaire helps make cross-company and cross-country comparisons. Therefore, this paper focuses on climate change disclosures using the CDP dataset.

3.2 | Sample and data

We start with all firms that responded to the CDP questionnaire from 2006 to 2018.[4] We collect cross-country institutional ownership data from FactSet. Firms' financial and non-financial data are derived from Refinitiv Worldscope and Refinitiv ESG (previously, Thomson Reuters ASSET4) databases, while the stock market and analysts' forecast data are from the Refinitiv DataStream and Institutional Brokers' Enterprise Systems (I/B/E/S) databases. We collect country-level ETS data from the International Carbon Action Partnership (ICAP). We source other country-level data from the World Bank database. After merging all databases and excluding missing observations, we generate a sample of 8427 firm–year observations with 1595 unique firms across 34 countries for our primary analysis. Panel A of Table 1 details the sample selection procedure.

Panel B of Table 1 shows that the three most prominent industry representations for our sample are financial (14.96%), transportation (9.09%), and computers (6.78%).[5] Panel C of Table 1 shows that 2006 accounts for the lowest observations (1.39%). Since this was the first year of the CDP survey, it is unsurprising. The steadily increasing number of observations reflects more firms' participation in the CDP reporting over time.

3.3 | Climate change disclosure quality

Climate change disclosure quality (*CCDS*) is captured by the CDP ratings on the level and comprehensiveness of firm-level climate change disclosures across several dimensions, including climate change-related risk and opportunities, business strategy, governance, emission targets, and performance, firms' initiatives in reducing carbon emissions, verification of carbon emissions, and carbon pricing (CDP, 2019). From 2006 to 2014, the CDP rated firms' climate change disclosures from 0 to 100 but, starting in 2015, it changed its rating approach to performance band (i.e., A, A-, B, B-, C, C-, D, and D-). The climate change scores provided by the CDP cover varying scopes over

TABLE 1 Sample selection and industry distribution.

Panel A: Sample selection	
CDP data coverage from CDP2006 to CDP2019	16,762
Less: Firm–year observations not matched with other databases	4843
Firms available with climate change disclosure scores	11,919
Less: Firms dropped due to the missing firm- and country-level control variables	3492
Final test sample from 2005 to 2018	8427

Panel B: Industry and year distributions of sample firms					
Name of industry	**Number of firms**	**% of sample**	**CDP year**	**Number of firms**	**% of sample**
Mining/construction	500	5.93	2006	117	1.39
Food	432	5.13	2007	103	1.22
Textiles/print/publish	310	3.68	2008	226	2.68
Chemicals	433	5.14	2009	356	4.22
Pharmaceuticals	293	3.48	2010	502	5.96
Extractive	380	4.51	2011	722	8.57
Manufacturing: Rubber/glass/etc.	147	1.74	2012	811	9.62
Manufacturing: Metal	174	2.06	2013	912	10.82
Manufacturing: Machinery	320	3.80	2014	946	11.23
Manufacturing: Electrical equipment	223	2.65	2015	900	10.68
Manufacturing: Transport equipment	389	4.62	2016	1011	12.00
Manufacturing: Instruments	265	3.14	2017	1022	12.13
Manufacturing: Miscellaneous	41	0.49	2018	799	9.48
Computers	571	6.78		8427	100
Transportation	766	9.09			
Utilities	552	6.55			
Retail: Wholesale	128	1.52			
Retail: Miscellaneous	496	5.89			
Retail: Restaurant	52	0.62			
Financial	1261	14.96			
Insurance/real estate	133	1.58			
Services	536	6.36			
Others	25	0.30			
Total sample	**8427**	**100**			

Note: This table presents the sample selection process (Panel A) and industry and year distributions of sample firms (Panel B). Underline and bold are for the total numbers of firms across every year.

time. For example, in 2017, the CDP started including climate change-related financial disclosures according to the Task Force on Climate-Related Financial Disclosures (TCFD) framework in its rating system. As the raw CDP scores have changed over time, these scores are not comparable across years. However, this comparison is necessary for our study as we are interested in the time series and cross-sectional dimensions of climate change disclosure quality (*CCDS*). Therefore, we create a weighted measure for *CCDS* that compares *CCDS* across countries, years, and industries with a value ranging between 0 and 1, where 0 is the lowest level of climate change disclosure quality and 1 is the highest level.[6] We also examine the robustness of our findings using some of the individual components of CDP climate change disclosure and find similar findings.

3.4 | Empirical model

As our base model, we estimate the following ordinary least squares (OLS) lead–lag model to examine our research questions:

$$\begin{aligned} CCDS_{i,t+1} = {} & \beta_0 + \beta_1 FIO_{i,t} + \beta_2 DIO_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 ROA_{i,t} + \beta_5 LEV_{i,t} \\ & + \beta_6 FAGE_{i,t} + \beta_7 MB_{i,t} + \beta_8 DISC_{i,t} + \beta_9 RISK_{i,t} \\ & + \beta_{10} FOREIGN_{i,t} + \beta_{11} RDINT_{i,t} + \beta_{12} CAPEX_{i,t} \\ & + \beta_{13} SGROWTH_{i,t} + \beta_{14} CGOV_{i,t} + \beta_{15} CSR\_PERF_{i,t} \\ & + \beta_{16} CSR\_DISC_{i,t} + \beta_{17} CROSS_{i,t} + \beta_{18} LNGDP_{i,t} + \beta_{19} STAKE_{i,t} \\ & + \beta_{20} ENFORCE_{i,t} + \sum Year_{i,t} + \sum Industry_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (1)$$

We run a lead–lag approach to estimate Equation (1) to ensure reverse causality is not driving our results. Appendix A describes the

variables in detail. *CCDS* denotes the climate change disclosure quality as described in Section 3.3. *FIO* represents foreign institutional ownership, measured as foreign investors' ownership percentage. We examine RQ1 to test whether the quality of a firm's climate change disclosure is positively related to the level of foreign institutional ownership.

Domestic institutional investors' ownership (*DIO*) captures domestic institutional investors' role in facilitating the quality of climate change disclosures. To test our second research question (RQ2), we examine whether domestic institutional investors effectively prompt quality climate change disclosures of investee firms.

Focusing on control variables, we include firm-specific controls that may be related to climate change disclosure. Larger and more profitable companies possess more financial resources and face more significant social, economic, and regulatory pressures and scrutiny to provide quality climate change information (Clarkson et al., 2008; Daradkeh et al., 2022; Dhaliwal et al., 2014), and therefore, we expect positive coefficients on firm size (*SIZE*) and profitability (*ROA*). We control for leverage (*LEV*) but do not offer a predicted sign on this variable since some studies argue that firms facing financial constraints tend to disclose less carbon information (Clarkson et al., 2011). Meanwhile, others suggest a greater propensity to provide climate change disclosures by highly indebted firms that satisfy lenders' information needs (Ott et al., 2017). We further control for firm age (*FAGE*) because older firms tend to have the necessary infrastructure to manage and report climate change issues (Bose et al., 2022).

Next, we expect that firms with information asymmetry proxied by stock return volatility (*RISK*) and growth opportunities proxied by the market-to-book ratio (*MB*) and sales growth (*SGROWTH*) are incentivized to provide quality climate change disclosures to reduce the information asymmetry, which facilitates favorable market valuations (Clarkson et al., 2008; Stanny & Ely, 2008). We also control for firm-level management forecasts to control for overall disclosure quality (*DISC*). Firms with overseas operations (*FOREIGN*) face external pressure to reduce their carbon footprint and provide better climate change disclosures (Stanny & Ely, 2008). Prior studies argue that firms with higher research and development (R&D) invest more in corporate social responsibility (CSR)-related activities (Kim et al., 2012; McWilliams & Siegel, 2001). Therefore, we hypothesize that greater innovation (*RDINT*) and capital intensity (*CAPEX*) will also be linked to quality climate change disclosures. Moreover, firms on multiple stock exchanges (*CROSS*) face greater capital market and regulatory pressures (Dhaliwal et al., 2012) on climate change disclosures. Clarkson et al. (2008) find that firms with positive environmental performance (*ENVPERF*) report more environmental disclosures to signal market participants about this superior performance. Similarly, Donnelly and Mulcahy (2008) find that better corporate governance improves disclosure (*CGOV*), while Bacha and Ajina (2020) find that higher CSR improves disclosure (*CSR_PERF*). We expect positive *RISK*, *MB*, *SGROWTH*, *FOREIGN*, *RDINT*, *CAPEX*, *ENVPERF*, *CROSS*, *CGOV*, and *CSR_PERF* coefficients.

To account for country-specific factors that drive firms' climate change disclosures, we control for several country-level factors. We control for the country-level gross domestic product (*GDP*) because wealthier countries have the most advanced technology and resources and are potentially environmentally conscious. We also control for country-level stakeholder orientation (*STAKE*) and legal environment (*ENFORCE*), anticipating firms domiciled in stakeholder-orientated countries (i.e., code law countries) and in countries with strong legal protection for shareholders have more significant incentives to give quality climate change disclosures (Bose et al., 2022). We predict positive coefficients on *GDP*, *STAKE*, and *ENFORCE*. Finally, we include industry- and year-fixed effects and cluster standard errors at the firm level for our primary analysis and also include firm- and country-fixed effects in alternative specifications to address the omitted variable bias.

4 | EMPIRICAL RESULTS

4.1 | Descriptive statistics and correlation analysis

Table 2 provides the descriptive statistics for the variables used in Equation (1). Panel A shows the univariates for the total sample, while Panel B segments the sample into whether the firm has above or below median foreign ownership. In Panel A, we find that the average (median) of climate change disclosure quality (*CCDS*) is 0.600 (0.667). The average (median) of foreign institutional ownership (*FIO*) is 13.90% (11.70%), whereas the average (median) of domestic institutional ownership is 24.70% (9.30%). Notably, the average size of sample firms is 9.122, equivalent to a total market capitalization of US $24.011 billion. This relatively larger sample of firms is not unexpected, given that the CDP covers the world's largest firms.

In Panel B of Table 2, we find that firms with high foreign ownership have 11.60% better disclosures than those with low foreign ownership.[7] High foreign ownership firms have higher levels of domestic institutional ownership. Additionally, they are larger, perform better, owe less debt, and invest in more R&D than firms with low institutional ownership. These firms also have higher environmental performance and are more likely to be cross-listed than firms with lower foreign institutional ownership. These results suggest that foreign investors look for larger firms that may already be more transparent and potentially focused on environmental issues.

Table 3 shows the breakout of the variables of interest by country. Ireland has the highest (49.60%) *FIO*, followed by the Netherlands (32.00%), while Bermuda (0.01%) has the lowest percentage of foreign investment. Unsurprisingly, the United States exhibits the greatest *DIO* (59.00%) and has relatively less *FIO* (9.70%) than other countries. Ireland has the highest average *CCDS* (0.941). *STAKE* reveals 12 (22) common (code) law countries in our sample. New Zealand and Singapore demonstrate the strongest legal enforcement (*ENFORCE*), whereas Mexico and the Philippines display the weakest.

Although we do not report the correlations for brevity, we find that *CCDS* is significantly and positively correlated to *FIO* but significantly and negatively correlated to *DIO*. Since no correlation coefficient exceeds 0.8 and all variables' variance inflation factors (VIFs) are

TABLE 2 Descriptive statistics.

Panel A: Descriptive statistics for variables in Equation (1)						
	N	Mean	Std. dev.	Median	1st quartile	3rd quartile
CCDS	8427	0.600	0.365	0.667	0.333	0.970
FIO	8427	0.139	0.103	0.117	0.072	0.182
DIO	8427	0.247	0.280	0.093	0.033	0.467
SIZE	8427	9.122	1.358	9.110	8.128	10.073
ROA	8427	0.048	0.057	0.042	0.014	0.076
LEV	8427	0.250	0.161	0.235	0.130	0.353
FAGE	8427	2.315	0.892	2.485	1.792	2.996
MB	8427	2.777	3.262	1.937	1.187	3.324
RISK	8427	0.020	0.008	0.018	0.014	0.023
FOREIGN	8427	0.801	0.399	1.000	1.000	1.000
RDINT	8427	0.023	0.046	0.000	0.000	0.025
CAPEX	8427	0.045	0.042	0.035	0.015	0.062
SGROWTH	8427	0.035	0.161	0.027	−0.051	0.102
CGOV	8427	0.598	0.226	0.633	0.448	0.779
CSR_PERF	8427	0.401	0.331	0.451	0.000	0.703
CSR_DISC	8427	0.774	0.418	1.000	1.000	1.000
CROSS	8427	2.016	1.281	2.000	1.000	2.000
LNGDP	8427	10.607	0.583	10.750	10.582	10.875
STAKE	8427	0.414	0.493	0.000	0.000	1.000
ENFORCE	8427	2.499	0.851	2.586	2.434	3.057

Panel B: Mean and median difference for variables in Equation (1)						
	HIGH_FIO		*LOW_FIO*		Mean test	Median test
	Mean	Median	Mean	Median	(*p*-value)	(*p*-value)
CCDS	0.633	0.729	0.567	0.667	.000	.000
DIO	0.269	0.115	0.224	0.075	.000	.000
SIZE	9.392	9.361	8.851	8.785	.000	.000
ROA	0.051	0.046	0.045	0.037	.000	.000
LEV	0.243	0.227	0.256	0.242	.001	.006
FAGE	2.318	2.485	2.313	2.485	.767	.884
MB	2.785	2.005	2.770	1.868	.005	.056
RISK	0.020	0.018	0.020	0.018	.000	.000
FOREIGN	0.827	1.000	0.775	1.000	.000	.000
RDINT	0.027	0.000	0.019	0.000	.000	.000
CAPEX	0.044	0.034	0.045	0.035	.432	.176
SGROWTH	0.034	0.028	0.035	0.027	.798	.669
CGOV	0.641	0.678	0.554	0.580	.000	.000
CSR_PERF	0.419	0.495	0.383	0.397	.000	.000
CSR_DISC	0.806	1.000	0.741	1.000	.000	.000
CROSS	2.132	2.000	1.901	2.000	.000	.000
LNGDP	10.608	10.750	10.607	10.749	.926	.862
STAKE	0.414	0.000	0.414	0.000	.989	.989
ENFORCE	2.500	2.586	2.498	2.586	.921	.996

Note: Panel A shows the descriptive statistics for the variables in Equation (1). Panel B reports the mean and median difference for variables in Equation (1). All variables are defined in Appendix A.

TABLE 3 Descriptive statistics by country.

	N	% of sample	*FIO* (%)	*DIO* (%)	Average *CCDS*	*STAKE*	*ENFORCE*
Australia	327	3.88	0.113	0.042	0.630	0	3.192
Austria	27	0.32	0.101	0.078	0.444	1	2.780
Belgium	18	0.21	0.161	0.019	0.646	1	2.475
Bermuda	2	0.02	0.001	0.024	0.000	0	2.033
Brazil	147	1.74	0.183	0.032	0.544	1	−0.245
Canada	456	5.41	0.189	0.266	0.597	0	3.175
Chile	1	0.01	0.150	0.007	1.000	1	1.960
Columbia	15	0.18	0.069	0.000	0.578	1	−0.140
Denmark	73	0.87	0.185	0.044	0.548	1	3.478
Finland	1	0.01	0.018	0.004	0.000	1	0.100
France	83	0.98	0.200	0.103	0.560	1	3.500
Germany	457	5.42	0.174	0.089	0.591	1	2.319
Greece	351	4.17	0.187	0.075	0.578	1	2.970
Hong Kong	49	0.58	0.076	0.015	0.623	0	3.140
India	86	1.02	0.164	0.054	0.626	0	−0.403
Ireland	35	0.42	0.496	0.003	0.941	0	2.867
Italy	90	1.07	0.131	0.027	0.556	1	0.709
Japan	1180	14.00	0.118	0.054	0.632	1	2.459
Mexico	4	0.05	0.078	0.011	0.750	1	−0.449
Netherlands	67	0.80	0.320	0.033	0.686	1	3.304
Norway	106	1.26	0.139	0.099	0.498	1	3.353
New Zealand	35	0.42	0.081	0.069	0.562	0	3.536
Philippines	7	0.08	0.087	0.035	0.500	1	−0.449
Portugal	15	0.18	0.123	0.043	0.467	1	1.681
South Africa	297	3.52	0.144	0.049	0.611	0	0.265
South Korea	211	2.50	0.143	0.008	0.591	1	1.492
Singapore	25	0.30	0.098	0.023	0.527	0	3.511
Spain	158	1.87	0.146	0.033	0.584	1	1.652
Sweden	197	2.34	0.164	0.258	0.511	1	3.465
Switzerland	224	2.66	0.218	0.072	0.624	1	3.296
Thailand	8	0.09	0.131	0.001	0.750	0	−0.148
Turkey	54	0.64	0.151	0.002	0.588	1	0.008
United Kingdom	1173	13.92	0.155	0.200	0.588	0	3.013
United States	2448	29.05	0.097	0.590	0.606	0	2.545
Total/average	**8427**	**100.00**	**0.139**	**0.247**	**0.600**		**2.499**

Note: Bold is for the total numbers.

well below 10 (Gujarati, 2003), our results are unlikely to suffer from multicollinearity threats.

4.2 | Main results

Panel A of Table 4 reports the main regression results, controlling for year- and industry-fixed effects and robust standard errors. Column (1) shows the baseline regression results of *CCDS* on *FIO* excluding control variables, while Column (2) shows the regression results, including all control variables. The coefficient on *FIO* is positive and significant at the 1% level in Columns (1) and (2), suggesting that firms with higher foreign institutional ownership also have better climate change disclosure quality. In economic terms, using the coefficient estimates in Column (2), we find that, on average, a 1% increase in foreign institutional ownership leads to a 4.08% (0.176 × 0.39/0.600) increase in the climate change disclosure quality. In contrast, the coefficient on *DIO* is negative and insignificant.

Regarding control variables, the coefficients on firm size (*SIZE*), corporate governance performance (*CGOV*), CSR performance

TABLE 4 Climate change disclosure quality and foreign institutional ownership.

Panel A: Multivariate analysis using percentage of foreign and domestic ownership as variables of interest				
	Dependent variable = *CCDS*			
	(1)	(2)	(3)	(4)
FIO	0.375***	0.176***	0.194**	0.114**
	(6.653)	(2.774)	(2.214)	(2.164)
DIO		−0.037	0.002	0.028*
		(−0.867)	(0.112)	(1.752)
SIZE		0.059***	0.020	0.067***
		(8.670)	(1.674)	(7.546)
ROA		−0.223**	0.118	−0.244**
		(−2.260)	(1.076)	(−2.328)
LEV		−0.076*	−0.024	−0.061
		(−1.697)	(−0.367)	(−1.366)
FAGE		0.010	0.021	0.010
		(1.468)	(0.997)	(1.402)
MB		0.002	0.001	0.002*
		(1.559)	(1.560)	(1.932)
DISC		0.024	−0.014	−0.001
		(1.016)	(−0.566)	(−0.029)
RISK		−0.473	−0.770	−0.416
		(−0.678)	(−0.992)	(−0.523)
FOREIGN		−0.004	−0.002	0.001
		(−0.213)	(−0.048)	(0.067)
RDINT		0.040	0.214	0.009
		(0.179)	(0.437)	(0.041)
CAPEX		0.166	−0.342	0.143
		(0.848)	(−1.217)	(0.747)
SGROWTH		−0.004	−0.024	0.005
		(−0.137)	(−0.741)	(0.165)
CGOV		0.137***	0.076***	0.129***
		(5.578)	(2.807)	(5.643)
CSR_PERF		0.030*	0.049	0.035**
		(1.811)	(1.336)	(2.475)
CSR_DISC		0.077***	0.010	0.070***
		(4.596)	(0.785)	(3.923)
CROSS		0.012	—	0.015
		(1.241)		(1.345)
LNGDP		−0.052*	−0.172**	−0.240***
		(−1.818)	(−2.720)	(−5.383)
STAKE		−0.019	—	0.151*
		(−1.071)		(1.699)
ENFORCE		0.019	0.029	−0.009
		(0.962)	(0.592)	(−0.266)
Intercept	0.537***	0.345	2.049***	2.381***
	(10.765)	(1.286)	(3.079)	(4.514)

TABLE 4 (Continued)

Panel A: Multivariate analysis using percentage of foreign and domestic ownership as variables of interest				
	Dependent variable = *CCDS*			
	(1)	(2)	(3)	(4)
Year-fixed effects	Yes	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	No	Yes
Firm-fixed effects	No	No	Yes	No
Country-fixed effects	No	No	No	Yes
Observations	8427	8427	8427	8427
Adjusted R^2	.029	.120	.599	.133

Panel B: Multivariate analysis using indicator if foreign ownership is greater than domestic ownership as the variable of interest			
	Dependent variable = *CCDS*		
	(1)	(2)	(3)
FIO_DUM	0.046***	0.052**	0.030*
	(3.110)	(2.272)	(1.931)
Intercept	0.375	2.092***	2.410***
	(1.581)	(3.164)	(4.171)
Controls	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes
Industry-fixed effects	Yes	No	Yes
Firm-fixed effects	No	Yes	No
Country-fixed effects	No	No	Yes
Observations	8427	8427	8427
Adjusted R^2	.120	.599	.132

Panel C: Alternate measures of climate change disclosure					
	(1) *Scope1_dum*	(2) *Scope2_dum*	(3) *Scope3_dum*	(4) *Assurance*	(5) *Climate_Incentives*
FIO	0.584***	0.482***	0.089	0.456**	0.293*
	(3.265)	(2.760)	(0.525)	(2.421)	(1.849)
DIO	0.384***	0.293***	0.059	−0.504***	0.146*
	(4.754)	(3.675)	(0.746)	(−5.363)	(1.823)
Intercept	−0.580	−0.789	1.440**	−2.194***	−0.052
	(−0.914)	(−1.258)	(2.107)	(−2.938)	(−0.086)
Controls	Yes	Yes	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	8427	8310	7981	8310	8207
Pseudo-R^2	.111	.080	.179	.400	.196

Note: This table presents regression results on climate change disclosure quality and foreign institutional ownership (*FIO*). Panel A shows the base estimation. Panel B uses an indicator variable if the foreign ownership is greater than domestic ownership. Panel C shows the regression results of the association of Scope 1, Scope 2, Scope 3, GHG assurance, and linking climate incentives with executives' compensation with foreign institutional ownership (*FIO*). Two-tailed *t*-statistics are presented in parentheses. Standard errors are clustered at the firm level except when the firm-fixed effect is incorporated. All variables are defined in Appendix A.

***Statistically significant at the 1% level.

**Statistically significant at the 5% level.

*Statistically significant at the 10% level.

(*CSR_PERF*), and CSR disclosure (*CSR_DISC*) are positive and significant. Counterintuitively, the coefficients on *ROA*, *LEV*, and *LNGDP* are negative and significant, suggesting that profitable, highly leveraged, and higher GDP countries are associated with reduced climate change disclosure quality. Our results illustrate that large or well-established firms, firms with higher corporate governance and CSR performance, and firms that issue CSR reports have better quality climate change disclosures. The model's explanatory power (adjusted R^2) in Column (2) suggests that the independent variables collectively capture a 12% variation in the climate change disclosure quality. To assess the incremental contribution of *FIO* to the explanatory power of our regression analysis, we re-estimate Equation (1) by excluding *FIO* and find that the explanatory power of this regression drops to 9.76% (untabulated). Then, we compute the *F*-statistic based on Gujarati (2003) using the R^2 statistics reported for the regressions with and without *FIO* to test the null hypothesis that including *FIO* as an explanatory variable does not affect the explanatory power of our regression analysis. The untabulated Gujarati (2003) *F*-statistic is 32.65 and is significant at the 1% level, suggesting that *FIO* significantly increases the explanatory power of the regression model.

To attenuate the concerns for omitted variable bias, we further control for firm- and country-fixed effects. Specifically, we re-estimate Equation (1) with year- and firm-fixed effects and report the results in Column (3) and with year-, industry-, and country-fixed effects and report the results in Column (4). The coefficient on *FIO* is positive and significant at the 5% level under both alternative specifications. *DIO* remains insignificant in Model (3) but significant in Model (4). The adjusted R^2 increases to 59.90% and 13.30%, respectively, under each alternative specification.[8]

In Panel B, we test whether there needs to be a critical mass of foreign investors compared to domestic investors to influence climate change disclosure effectively. We create an indicator variable equal to 1 if the firm has more foreign institutional ownership than domestic institutional ownership and 0 otherwise. We re-run Panel A and use this indicator instead of the foreign and domestic variables. We find that a critical mass of foreign institutional investors improves climate disclosures by 3%–5.20%, a significant increase. These findings support the idea that a critical mass of foreign investors who care about carbon disclosures must lead to improved carbon disclosures.

In Panel C of Table 4, we report the regression results using some of the individual components of CDP climate change disclosure. The CDP provides a composite score for measuring climate change disclosures that cover firm-level climate governance, climate change-related risk and opportunities, business strategy, climate change-related targets, and performance, firms' initiatives for the reduction of carbon emissions, verification of carbon emissions, carbon pricing, and firm-level engagement with value chain partners regarding climate change-related activities. Most of this information is provided by firms as a qualitative response. The CDP creates a composite score after assessing all this information, which makes it difficult to decompose the score into its various components. However, we have collected individual data from CDP regarding climate change disclosure, for example, whether firms disclose their Scope 1, 2, and 3 emissions, whether firms obtain external assurance services for the carbon emissions, and whether firms link executive compensation to climate-related activities. We have run a logit regression model using this information, and the results are reported in Panel C of Table 4. We find qualitatively similar results using the individual items of climate change disclosures.

5 | ADDITIONAL ANALYSES

5.1 | Difference-in-differences (DiD)

We employ a DiD analysis framework to address endogeneity concerns in our findings. The DiD analysis compares changes in the *CCDS* of treatment firms to changes in the *CCDS* of control firms. We exploit a quasi-natural experiment created by firms being added to the MSCI All-country World Index for our DiD analysis. According to the MSCI's methodology, MSCI follows several screening criteria for including a firm in the MSCI All-country World Index. These criteria include trading frequency, trading volume, float-adjusted market capitalization, and the percentage of shares open to purchase by foreign investors (Kim et al., 2019; Tsang et al., 2019). Therefore, a firm's inclusion in the MSCI index is mostly exogenous to its disclosure of climate change information and foreign ownership. However, a firm's addition to the MSCI index is generally followed by a greater increase in foreign institutional ownership due to the greater visibility of firms to foreign institutional investors (Kim et al., 2019; Tsang et al., 2019). Since many international portfolio managers closely track the MSCI index, it provides an ideal setting to conduct a DiD analysis to examine the effect of a firm's addition to the MSCI index on its *FIO* and *CCDS*.

Following Kim et al. (2019) and Tsang et al. (2019), we employ a 5-year window around MSCI index additions. When a firm is added to the MSCI index in year t, we use 2 years before the firm is added to the index (i.e., years $t-1$ and $t-2$) and 2 years after the firm is added to it (i.e., years $t+1$ and $t+2$) for the analysis. We find a sample of 172 additions to the MSCI index during our sample period for which we have *FIO* and *CCDS* data in the 2 years before and after the event. These index addition firms comprise our treatment firms. We define control firms as the neighbor firms from the same country and year but not added to the MSCI index, and they have the same *CCDS* and the closest *FIO* at year $t-1$. We employ the following model to estimate the DiD analysis:

$$\begin{aligned} CCDS_{i,t+1} = {} & \beta_0 + \beta_1 TREAT_{i,t} + \beta_2 TREAT_{i,t} \times POST_{i,t} + \beta_3 POST_{i,t} \\ & + \beta_4 DIO_{i,t} + \beta_5 SIZE_{i,t} + \beta_6 ROA_{i,t} + \beta_7 LEV_{i,t} + \beta_8 FAGE_{i,t} \\ & + \beta_9 MB_{i,t} + \beta_{10} DISC_{i,t} + \beta_{11} RISK_{i,t} + \beta_{12} FOREIGN_{i,t} \\ & + \beta_{13} RDINT_{i,t} + \beta_{14} CAPEX_{i,t} + \beta_{15} SGROWTH_{i,t} + \beta_{16} CGOV_{i,t} \\ & + \beta_{17} CSR\_PERF_{i,t} + \beta_{18} CSR\_DISC_{i,t} + \beta_{19} CROSS_{i,t} \\ & + \beta_{20} LNGDP_{i,t} + \beta_{21} STAKE_{i,t} + \beta_{22} ENFORCE_{i,t} + \sum Year_{i,t} \\ & + \sum Industry_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{2}$$

where *TREAT* is an indicator variable taking the value of 1 for the treatment firms (i.e., firms added to the MSCI index) and 0 otherwise,

while *POST* takes the value of 1 for 2 years after the firm is added to the MSCI index (i.e., years $t + 1$ and $t + 2$) and 0 otherwise; all other variables are defined in Appendix A. Our variable of interest is the coefficient for *TREAT* × *POST*, which captures the changes in *CCDS* for our treatment sample, which is relative to the changes in *CCDS* for our control sample following a firm's addition to the MSCI index. A positive and significant coefficient on *TREAT* × *POST* supports our prediction.

Panel A of Table 5 presents the DiD analysis results. We estimate Equation (2) under different combinations of fixed effects. The coefficients for *TREAT* × *POST* are positive and significant at the 5% or 1% levels across all specifications. The results show that the addition to the MSCI improves the disclosure scores for treatment firms but not for the control firms. One explanation may be because of the increase in FIO following the addition. These results further suggest that endogeneity is unlikely to account for the positive relationship between *FIO* and *CCDS*.

Panel B of Table 5 segments the estimation into whether there is a significant increase in foreign institutional ownership before versus after the MSCI addition. We measure the change in *FIO* from $t - 1$ to $t + 1$, where $t = 0$ is the year the firm was added to the index. Then we use the change in FIO to capture whether the addition leads to an increase in actual FIO ownership for the firm. We segment the change in FIO into above or at the median (*High Chg FIO*) and below median (*Low Chg FIO*) groups. Column (1) shows the high change group and Column (2) shows the low change group. We find that the coefficient for *TREAT* × *POST* is only positive and significant for the *High Chg FIO* group, but not the below median group. This strongly suggests that joining the MSCI improves disclosure only for treatment firms that experienced a subsequent increase in foreign ownership.

5.2 | Parallel trends

In Table 5, we assume that a firm's inclusion in the MSCI index is unrelated to its disclosure of climate change information and foreign institutional ownership, which may not be valid given the non-uniform index addition. Therefore, there is a risk that the relationship between a firm's MSCI inclusion and its climate change disclosure quality may be spurious. To address this concern, we use the split-difference estimation method proposed by Goodman-Bacon (2021), which involves evaluating the impact of the treatment at different points surrounding its application. If a difference is not seen beforehand but visible afterward, it can be attributed to the treatment.

Table 6 examines the timeline over which index addition impacts foreign ownership and affects a firm's climate change disclosure. Focusing on the sample of the 172 MSCI additions in our sample, we use the parallel trend assumption test in the pre-period to rule out reverse causality concerns. In a DiD analysis, the parallel trend in the pre-period is integral to show that the effect observed is not due to inherent differences between treatment and control firms before the treatment. To examine the timing differences, we include indicator variables, $YEAR_{t-2}$, $YEAR_{t-1}$, $YEAR_{t+1}$, and $YEAR_{t+2}$, that take the value of 1 if the year is $t - 2$, $t - 1$, $t + 1$, or $t + 2$ around the index adoption, respectively. Given that climate change disclosure can vary significantly among firms, the −2 to 2-year window is appropriate. By using these indicator variables, we can identify when the effect of foreign institutional ownership kicks in and whether there is any pre-trend before the index addition, which casts doubt on the validity of the empirical design. All models include controls from Table 4, including firm- and year-fixed effects.

For the parallel trend assumption to hold, the coefficient of variables that indicate years prior to the increase should be insignificant. A positive and significant coefficient mitigates concerns of reverse causality and bias in the post-period. The coefficients for all pre-period variables are insignificant, which validates our parallel trend assumption. We also rule out reverse causality as the coefficients increase sharply in the first year after index addition and become economically and statistically significant in the following years. These results show that climate change disclosure improvement around index addition is not spurious.

5.3 | Alternative endogeneity controls

Our current results show that foreign investors invest in good disclosure firms. However, this highlights a correlation between foreign ownership and disclosure quality. In order to determine whether foreign ownership may foster better disclosure, we examine first-order changes in ownership and the change in control variables from $t - 1$ to t, where disclosure is measured at time $t + 1$, enabling us to control for time-invariant factors affecting climate change disclosure quality and foreign institutional ownership. We report the results of this analysis in Panel A of Table 7. The coefficient on *ΔFIO* is positive and significant at the 5% level. In contrast, the coefficient on *ΔDIO* is insignificant, thus corroborating our findings that there is a causal relationship between foreign ownership and disclosures—an increase in foreign ownership results in enhanced disclosure quality.

In Panel B of Table 7, we employ 2SLS regression with instrumental variables to account for endogenous selection on unobserved variables, whereby foreign institutional investors may prefer to invest in or attach themselves to firms with better quality climate change disclosures. Following Ferreira and Matos (2008), we use firms' inclusion in the MSCI World Index as an instrumental variable. This instrument captures foreign institutional investors' preference or bias towards investing in firms in the MSCI World Index. Ferreira and Matos (2008) find that foreign institutional investors prefer firms in the MSCI World Index for their investment. However, this instrument is unlikely to explain firm-specific climate change disclosure practices and quality. We measure firms' membership with MSCI as an indicator variable that equals 1 if the firm is a member of the MSCI All-country World Index and 0 otherwise.

In the first stage, we regress *FIO* on *MSCI* and other control variables used in Equation (1). We report the results of the first-stage regression in Column (1) of Panel B, Table 7, and find that the coefficient on *MSCI* is positive and significant at a 1% level. In the second

TABLE 5 Difference-in-differences analysis.

Panel A: Difference-in-differences analysis				
	Dependent variable = *CCDS*			
	(1)	(2)	(3)	(4)
TREAT	−0.000	−0.069**	−0.053	−0.053
	(−0.003)	(−2.142)	(−1.639)	(−1.601)
TREAT × *POST*	0.061*	0.108***	0.108***	0.107***
	(1.840)	(3.672)	(3.677)	(3.622)
POST	−0.034	−0.086***	−0.081***	−0.087***
	(−1.467)	(−4.243)	(−4.466)	(−4.283)
Intercept	1.720	0.417	0.793	0.764
	(1.034)	(0.314)	(1.283)	(1.157)
Controls	Yes	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes	No
Industry-fixed effects	No	Yes	Yes	Yes
Firm-fixed effects	Yes	No	No	No
Country-fixed effects	No	Yes	No	No
Observations	1001	1001	1001	1001
Adjusted R^2	.686	.289	.267	.279

Panel B: Difference-in-differences analysis portioning by high versus low foreign institutional ownership		
	Dependent variable = *CCDS*	
	High Chg FIO (1)	*Low Chg FIO* (2)
TREAT	−0.125***	−0.069
	(−2.764)	(−1.579)
TREAT × *POST*	0.121***	0.061
	(3.321)	(1.396)
POST	−0.089***	−0.104***
	(−3.911)	(−4.248)
Intercept	0.741	1.904**
	(0.998)	(1.972)
Controls	Yes	Yes
Year-fixed effects	Yes	Yes
Industry-fixed effects	Yes	Yes
Country-fixed effects	Yes	Yes
Observations	698	578
Adjusted R^2	.291	.267

Note: This table presents the difference-in-differences analysis using the firm's addition to the MSCI index as an exogenous shock. *TREAT* is an indicator variable taking the value of 1 for the treatment firms (i.e., firms added to the MSCI index) and 0 otherwise, while *POST* takes the value of 1 for 2 years after the firm is added to the MSCI index (i.e., years $t + 1$ and $t + 2$) and 0 otherwise. Panel A shows the results for the full sample. Panel B estimates whether the firm had an above-median change in FIO or a below-median change in FIO around the addition. Two-tailed *t*-statistics are presented in parentheses. Standard errors are clustered at the firm level except when the firm-fixed effect is incorporated. Other variables are defined in Appendix A.

***Statistically significant at the 1% level.

**Statistically significant at the 5% level.

*Statistically significant at the 10% level.

TABLE 6 Parallel trend analysis.

	Dependent variable = *CCDS*	
	(1)	(2)
$TREAT \times YEAR_{t-2}$	−0.237*	−0.202**
	(−1.709)	(−2.052)
$TREAT \times YEAR_{t-1}$	0.182	0.035
	(0.914)	(0.194)
TREAT	−0.235	−0.010
	(−1.179)	(−0.055)
$TREAT \times YEAR_{t+1}$	0.056*	0.047
	(1.790)	(1.244)
$TREAT \times YEAR_{t+2}$	0.178*	0.002
	(1.731)	(0.013)
$YEAR_{t-1}$	0.206	0.026
	(1.031)	(0.136)
$YEAR_{t-2}$	0.446**	0.224
	(2.203)	(1.284)
$YEAR_{t+1}$	−0.069***	−0.042**
	(−3.643)	(−1.989)
$YEAR_{t+2}$	−0.150	0.000
	(−1.465)	(0.003)
Intercept	0.933	1.117
	(1.536)	(0.795)
Controls	Yes	Yes
Year-fixed effects	Yes	Yes
Industry-fixed effects	Yes	No
Firm-fixed effects	No	Yes
Country-fixed effects	Yes	No
Observations	1001	1001
Adjusted R^2	.301	.667

Note: This table extends the results of Table 5 and presents the difference-in-differences analysis using the firm's addition in the MSCI index as an exogenous shock but focuses on the parallel trends. *TREAT* is an indicator variable taking the value of 1 for the treatment firms (i.e., firms added to the MSCI index) and 0 otherwise. $YEAR_{t-2}$ ($YEAR_{t-1}$) is an indicator variable that equals 1 if the index addition occurs in year $t + 2$ ($t + 1$) and 0 otherwise. $YEAR_{t+1}$ ($YEAR_{t+2}$) is an indicator variable that equals 1 if the index addition occurred in year $t - 1$ ($t - 2$) and 0 otherwise. Two-tailed *t*-statistics are presented in parentheses. Standard errors are clustered at the firm level except when the firm-fixed effect is incorporated. Other variables are defined in Appendix A.

***Statistically significant at the 1% level.

**Statistically significant at the 5% level.

*Statistically significant at the 10% level.

stage, we regress *CCDS* on the predicted *FIO* (i.e., instrumented version of *FIO*) and control variables in Equation (1). In the second stage (Column 2), the coefficient on predicted *FIO* continues to be positive and significant at a 1% level, which shows that, even controlling for the potential endogeneity from omitted variable bias, our primary results still hold. We further assess the strength of the instrumental

TABLE 7 Change regression and instrumental variable analysis.

Panel A: Change regression	
	Dependent variable = *ΔCCDS* (1)
ΔFIO	0.118**
	(2.007)
ΔDIO	0.003
	(0.140)
Intercept	0.032
	(0.507)
Firm controls	Yes
Year-fixed effects	Yes
Industry-fixed effects	Yes
Observations	7705
Adjusted R^2	.031

Panel B: Two-stage least squares regression		
	First stage DV = *FIO* (1)	Second stage DV = *CCDS* (2)
PREDICTED_FIO		1.807**
		(2.174)
DIO	−0.006	−0.030
	(−0.910)	(−1.453)
MSCI	0.015***	
	(4.420)	
Intercept	−0.558	−0.558
	(0.262)	(−1.122)
Controls	Yes	Yes
Year-fixed effects	Yes	Yes
Industry-fixed effects	Yes	Yes
Observations	8427	
R^2	.144	
Shea's partial R^2	.003	
Partial *F*-statistic	19.533	
Test of endogeneity	4.819**	

Note: Panel A presents the change specification regression results where we capture a change in foreign and domestic ownership from $t - 1$ to time *t*, and disclosure quality is measured at time $t + 1$. We also include the change in firm controls over the same period. Panel B presents the two-stage least squares (2SLS) analysis results. The two instruments employed in the first-stage regression include (i) the industry–year median of foreign institutional ownership (*FIO_INS1*) and (ii) the country–year median of foreign institutional ownership (*FIO_INS2*). The second-stage regressions use the instrumented values of FIO (*Predicted_FIO*) as the main explanatory variable. Two-tailed *t*-statistics based on standard errors clustered by the firm are presented in parentheses. All variables are defined in Appendix A.

***Statistically significant at the 1% level.

**Statistically significant at the 5% level.

*Statistically significant at the 10% level.

variable. Shea's partial R^2 values are 3%, while the partial *F*-statistic of the first-stage model is 19.533. Based on the analysis by Stock et al. (2002), this *F*-statistic suggests that our instruments are not weak.[9]

5.4 | Legal and regulatory influences on climate change disclosure

We investigate how the association between foreign institutional ownership and climate change disclosure quality varies across country legal and regulatory environments since they influence investee firms' reporting incentives and pressures. La Porta et al. (1998) assert that investor protection is stronger in common law than in code law countries due to more significant disclosure requirements, better legal protection of minority investors, and a more extensive base of share ownership, which can fundamentally determine a firm's monitoring and information environment. Zhou et al. (2016) offer evidence that firms operating in code law countries value transparency, which may translate to better carbon emissions disclosure. Stulz (2005), Ferreira et al. (2010), and Aggarwal et al. (2011) show that foreign institutional investors play a more critical role in improving the governance of firms operating in countries with weaker shareholder protection systems in place. As such, we expect foreign institutional investors to exhibit a greater demand for quality climate change disclosures for portfolio firms in code law countries to improve governance and enrich information flows. We expand Equation (1) with an indicator variable that equals 1 if investee firms are in a code law country and 0 otherwise (*STAKE*), as well as an interaction between *STAKE* and *FIO*. We expect that the coefficient on the interaction variable will be positive. The results reported in Column (1) of Panel A, Table 8, support this expectation. The coefficient on *FIO* × *STAKE* is positive and significant at the 1% level.[10]

Second, a climate policy such as a carbon trading scheme or ETS may influence the quality of climate change disclosures as these regulations internalize carbon charges, fees, or taxes in the operating costs of emitting firms. Schiemann and Sakhel (2019) argue that investors prioritize climate change-related issues when the portfolio firms are regulated by climate policy, which may signal successful efforts in minimizing such operating costs and help avoid financial penalties. Luo et al. (2012) find that CDP disclosure is higher when countries support ETS. In response to such economic and regulatory pressures, we expect foreign institutional investors to foster quality climate change disclosures in their invested firms domiciled in countries with ETSs. In Equation (1), we include an indicator variable that equals 1 if investee firms are domiciled in a country with *ETS* and 0 otherwise (*ETS*) and interaction between *ETS* and *FIO*. The results reported in Column (2) of Panel A, Table 8, support this expectation since the coefficient on *FIO* × *ETS* is positive and significant at the 5% level.

Kim et al. (2019) and Tsang et al. (2019) find that portfolio firms with foreign institutional investors have less information asymmetry when they operate in more opaque information environments. Similarly, we expect a stronger relationship between foreign institutional investors and climate change disclosure quality when their investee firms exhibit greater information asymmetry (Hong et al., 2019; Kolk et al., 2008). To analyze whether information asymmetry influences the relationship between disclosure quality and foreign investors, we include information asymmetry measures and interact these with *FIO*. We use one country-level information asymmetry measure, the earnings management index (*EM_SCORE*), which was developed by Leuz et al. (2003). A higher value of *EM_SCORE* captures a country's financial reporting opacity to a greater degree. We also employ three firm-level information asymmetry measures, specifically analyst following (*ANALYST*), bid–ask spread (*SPREAD*), and cross-listing (*CROSS*). We expect that a greater analyst following is linked to better transparency. Similarly, cross-listed firms tend to provide more disclosures to meet requirements imposed by foreign stock exchanges, suggesting greater information transparency. Finally, we expect that larger spreads reflect greater information and stock pricing uncertainties.

We report the results of this analysis in Panel B of Table 8. The coefficients on *FIO* × *EM_SCORE* and *FIO* × *SPREAD* are positive and significant at the 5% and 10% levels, respectively, suggesting that the role of foreign institutional investors in driving quality climate change disclosures is more pronounced when investee firms exhibit greater country-level financial reporting opacity and firm-level information uncertainty. The coefficients on *FIO* × *ANALYST* and *FIO* × *CROSS* are negative and significant at the 1% level, confirming that the push by foreign institutional investors for quality climate change disclosures is weakened when investee firms have more financial analysts or are cross-listed, reflective of an ex ante richer information environment. Collectively, these results support our expectation that the positive association between foreign institutional investors and climate change disclosure quality is stronger for investee firms beset with information asymmetry where the foreign investors need more transparency.

5.5 | Foreign investors' countries of origin

Dyck et al. (2019) find that foreign institutional ownership is positively related to a firm's investment in CSR. However, their findings are nuanced in that foreign institutional investors impact firms' CSR performance only when these investors are from countries where social norms reveal a greater demand for CSR performance. Therefore, we examine the role of the specific domicile of the foreign institutional investors following Dyck et al. (2019) by segmenting our sample into different groups based on the country of origin of the foreign investors. For example, we classify the country of origin of the foreign institutional investors into (i) common law versus civil law countries, (ii) European versus non-European countries, (iii) developed versus developing countries, and (iv) higher environment regulatory stringency versus lower environment regulatory stringency countries. Specifically, we re-run Equation (1), splitting the sample based on the above classifications.[11] Columns (1) and (2) of Panel A, Table 9, show the regression results based on the country of origin of the foreign institutional investors into common law and civil law, respectively. The results suggest that foreign ownership improves CCDS regardless of the legal origin of the foreign investors. Columns (3) and (4) of

TABLE 8 Moderating impacts of institutional constellations and information asymmetry.

Panel A: Country-driven results		
	Dependent variable = *CCDS*	
	STAKE **(1)**	***ETS*** **(2)**
FIO	0.033	−0.065
	(0.269)	(−0.364)
FIO × *STAKE*	0.435***	
	(3.218)	
FIO × *ETS*		0.347**
		(2.225)
STAKE	−0.085***	
	(−3.066)	
ETS		−0.044**
		(−2.567)
DIO	−0.035	−0.040
	(−0.799)	(−0.932)
Intercept	0.382	0.336
	(1.395)	(1.207)
Controls	Yes	Yes
Year- and industry-fixed effects	Yes	Yes
Observations	8427	8427
Adjusted R^2	.111	.123

Panel B: Information asymmetry				
	Dependent variable = *CCDS*			
	EM_SCORE **(1)**	***ANALYST*** **(2)**	***SPREAD*** **(3)**	***CROSS*** **(4)**
FIO	0.010	0.717***	0.040	0.525***
	(0.074)	(5.288)	(0.420)	(5.168)
FIO × *EM_SCORE*	0.016**			
	(2.093)			
EM_SCORE	0.000			
	(0.063)			
FIO × *ANALYST*		−0.103***		
		(−4.789)		
ANALYST		−0.000		
		(−0.016)		
FIO × *SPREAD*			3.395*	
			(1.710)	
SPREAD			−0.331	
			(−1.672)	
FIO × *CROSS*				−0.735***
				(−4.562)
CROSS				0.094**
				(2.569)

(Continues)

TABLE 8 (Continued)

Panel B: Information asymmetry				
	Dependent variable = *CCDS*			
	EM_SCORE **(1)**	***ANALYST*** **(2)**	***SPREAD*** **(3)**	***CROSS*** **(4)**
DIO	−0.024	−0.036	−0.007	−0.024
	(−0.576)	(−0.898)	(−0.194)	(−0.576)
Intercept	0.259	0.209	0.134	0.294
	(0.976)	(0.967)	(0.525)	(1.095)
Controls	Yes	Yes	Yes	Yes
Year- and industry-fixed effects	Yes	Yes	Yes	Yes
Observations	8169	8346	8285	8427
Adjusted R^2	.127	.124	.218	.133

Note: Panel A shows both the interaction of code law countries and FIO, countries with emission trading schemes (ETS) and FIO, and the segmentation of European versus non-European countries. Panel B interacts with various proxies of information asymmetry with FIO: earnings management score (*EM_SCORE*), the number of analysts following the firm (*ANALYST*), the bid–ask spread (*SPREAD*), and whether the firms are cross-listed (*CROSS*). The dependent variable is climate change disclosure quality. Two-tailed *t*-statistics based on standard errors clustered by the firm are presented in parentheses. All variables are defined in Appendix A.

***Statistically significant at the 1% level.

**Statistically significant at the 5% level.

*Statistically significant at the 10% level.

Panel A show the regression results based on the country of origin of the foreign institutional investors into European and non-European, respectively. We find that foreign institutional investors domiciled in Europe positively affect CCDS. Considering that the EU is focused on curbing climate change, this suggests that the baseline effect is more robust when foreign investors come from more environmentally minded countries.

Columns (5) and (6) of Panel A show the regression results based on the foreign institutional investors domiciled in developed and developing countries, respectively. The results suggest that foreign institutional investors domiciled in developed countries positively affect CCDS. Similarly, Columns (7) and (8) of Panel A show the regression results based on the foreign institutional investors domiciled in higher environment regulatory stringency versus lower environment regulatory stringency countries, respectively. The results suggest that foreign institutional investors domiciled in higher environment regulatory stringency countries positively affect CCDS. Our results show that foreign investors are not homogenous in their influence over carbon disclosures. Instead, foreign investors transfer their beliefs regarding the environment to companies where their resources are invested.

In Panel A, we focused on the country of origin of the foreign investors. Panel B focuses on the company and foreign institutional investor characteristics. We examine whether specific firm characteristics, like whether the firm issued an anti director rights (ADR) or the investors are independent, are located in the United States or have block ownership drive the results. Columns (1) and (2) of Panel B, Table 9, show ADR results. Column (1) is for firms that issued an ADR, while Column (2) is for firms that did not. We find that non-ADR firms

TABLE 9 Regressions based on the classification of origins of foreign institutional ownerships.

Panel A: Regression results of the association between climate change disclosure quality and different classifications of origins of foreign institutional owners

	Dependent variable = *CCDS*							
	(1) *Common Law*	(2) *Civil Law*	(3) *EU*	(4) *Non-EU*	(5) *Developed*	(6) *Developing*	(7) *Envir Focused*	(8) *Non-Envir Focused*
FIO	0.176**	0.343**	0.019**	0.000	0.003*	0.001	0.003*	0.006
	(2.498)	(2.439)	(2.380)	(0.227)	(1.838)	(0.132)	(1.819)	(0.712)
Intercept	0.439*	0.524**	−0.590	−0.322	−0.547	−0.300	−0.541	−0.297
	(1.823)	(2.152)	(−0.900)	(−0.523)	(−0.742)	(−0.533)	(−0.733)	(−0.519)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8427	8427	1834	1821	1834	1821	1834	1821
Adjusted R^2	.120	.118	.156	.145	.154	.145	.153	.145

Panel B: Regression results of the association between climate change disclosure quality and foreign institutional ownership: Role of moderating factors

	Dependent variable = *CCDS*							
	(1) *ADR*	(2) *NO ADR*	(3) *FIO_GREY*	(4) *FIO_INDEP*	(5) *FIO_US*	(6) *FIO_NON-US*	(7) *BLOCK_FIO*	(8) *NO BLOCK_FIO*
FIO	−0.027	0.187**					0.141*	0.237
	(−0.248)	(2.371)					(1.967)	(0.293)
FIO_GREY			0.562**					
			(2.487)					
FIO_INDEP				0.271**				
				(2.472)				
FIO_US					0.185**			
					(2.548)			
FIO_NON-US						0.337**		
						(2.406)		
Intercept	−0.016	−0.123	0.533*	0.949***	0.364	0.399	0.150	1.102***
	(−0.034)	(−0.562)	(2.022)	(3.107)	(1.334)	(1.392)	(0.999)	(3.739)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2297	6130	8427	8427	8427	8427	6323	1192
Adjusted R^2	.163	.105	.120	.148	.120	.120	.214	.278

Note: This table presents the regression results of climate change disclosure quality and foreign intuitional ownership (FIO) based on the classification of origins of foreign institutional owners. Two-tailed *t*-statistics are presented in parentheses. Standard errors are clustered at the firm level except when the firm-fixed effect is incorporated. All variables are defined in Appendix A.

***Statistically significant at the 1% level.

**Statistically significant at the 5% level.

*Statistically significant at the 10% level.

TABLE 10 Mediation analysis between firm valuation, foreign institutional ownership, and climate change disclosure quality.

Panel A: Firm performance as measured by Tobin's Q			
	DV = *TOBINQ* (1)	DV = *CCDS* (2)	DV = *TOBINQ* (3)
FIO	0.193**	0.120***	0.160**
	(2.520)	(4.000)	(2.097)
CCDS			0.276***
			(9.989)
DIO	0.119***	−0.016	0.124***
	(3.170)	(−1.060)	(3.306)
SIZE	0.083***	0.046***	0.070***
	(10.890)	(15.290)	(9.156)
LEV	0.235***	−0.004	0.236***
	(4.580)	(−0.190)	(4.626)
SGROWTH	0.056	−0.044**	0.068
	(1.080)	(−2.200)	(1.329)
FAGE	−0.016**	0.009***	−0.019**
	(−1.970)	(2.640)	(−2.272)
ROA	6.489***	−0.171***	6.536***
	(41.390)	(−2.770)	(41.916)
LIQUIDITY	−0.011*	−0.005**	−0.010
	(−1.840)	(−2.080)	(−1.621)
DISC	−0.103***	0.002	−0.104***
	(−4.850)	(0.180)	(−4.900)
RISK	5.046***	0.007	5.044***
	(3.710)	(0.010)	(3.732)
FOREIGN	0.067***	0.015*	0.063***
	(3.210)	(1.860)	(3.028)
CAPEX	0.063	0.119	0.030
	(0.280)	(1.360)	(0.135)
CGOV	−0.156***	0.133***	−0.193***
	(−4.050)	(8.780)	(−5.008)
CSR_PERF	0.009	0.055***	−0.006
	(0.380)	(5.830)	(−0.255)
CSR_DISC	−0.012	0.055***	−0.027
	(−0.560)	(6.690)	(−1.287)
CROSS	−0.022***	0.007***	−0.024***
	(−3.330)	(2.750)	(−3.647)
LNGDP	0.074**	−0.067***	0.092***
	(2.440)	(−5.610)	(3.057)
STAKE	−0.153***	0.006	−0.155***
	(−7.110)	(0.690)	(−7.232)
ENFORCE	0.001	0.038***	−0.010
	(0.040)	(4.890)	(−0.493)
Intercept	−0.189	0.213*	−0.248
	(−0.640)	(1.850)	(−0.850)
Year-fixed effects	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes

(Continues)

TABLE 10 (Continued)

Panel A: Firm performance as measured by Tobin's Q			
	DV = *TOBINQ* (1)	DV = *CCDS* (2)	DV = *TOBINQ* (3)
Observations	8399	8399	8399
Adjusted R^2	.423	.155	.430
Mediating effects			
Indirect effect: *CCDS* × *FIO*		0.033***	
z-statistic for indirect effect: *CCDS* × *FIO*		(3.710)	
Direct effect		0.160	
Total effect		0.193	
% of the total mediated effect		20.82%	
Panel B: Firm performance as measured by returns (*RET*)			
	DV = *RET* (1)	DV = *CCDS* (2)	DV = *RET* (3)
FIO	0.010*	0.123***	0.009
	(1.720)	(4.060)	(1.574)
CCDS			0.007***
			(3.225)
DIO	0.008***	−0.016	0.008***
	(2.660)	(−1.020)	(2.694)
SIZE	0.002**	0.046***	0.001*
	(2.300)	(15.360)	(1.735)
LEV	−0.003	−0.001	−0.003
	(−0.760)	(−0.070)	(−0.756)
SGROWTH	0.013***	−0.045**	0.014***
	(3.310)	(−2.220)	(3.385)
FAGE	−0.001	0.009***	−0.000
	(−0.450)	(2.600)	(−0.539)
ROA	−0.041***	−0.172***	−0.040***
	(−3.310)	(−2.790)	(−3.215)
LIQUIDITY	−0.001**	−0.005**	−0.001*
	(−1.970)	(−2.090)	(−1.901)
DISC	−0.001	0.002	−0.000
	(−0.130)	(0.210)	(−0.139)
RISK	0.328***	−0.006	0.328***
	(3.080)	(−0.010)	(3.082)
FOREIGN	−0.001	0.015*	−0.000
	(0.927)	(1.810)	(−0.156)
CAPEX	−0.003	0.111	−0.003
	(−0.150)	(1.270)	(−0.193)
CGOV	0.003	0.131***	0.002
	(0.340)	(8.670)	(0.647)
CSR_PERF	−0.003*	0.055***	−0.004*
	(−1.680)	(5.800)	(−1.882)
CSR_DISC	0.002	0.055***	0.002
	(1.150)	(6.670)	(0.912)

TABLE 10 (Continued)

Panel B: Firm performance as measured by returns (*RET*)			
	DV = *RET* (1)	DV = *CCDS* (2)	DV = *RET* (3)
CROSS	−0.002***	0.007***	−0.002***
	(−2.940)	(2.740)	(−3.042)
LNGDP	0.005*	−0.067***	0.005**
	(1.940)	(−5.630)	(2.135)
STAKE	0.006***	0.005	0.006***
	(3.400)	(0.630)	(3.382)
ENFORCE	−0.004**	0.039***	−0.004**
	(−2.390)	(4.930)	(−2.565)
Intercept	−0.053	0.453***	−0.056**
	(−2.200)	(3.760)	(−2.336)
Year-fixed effects	Yes	Yes	Yes
Industry-fixed effects	Yes	Yes	Yes
Observations	8426	8426	8426
Adjusted R^2	.052	.149	.053
Mediating effects			
Indirect effect: *CCDS* × *FIO*		0.001**	
z-statistic for indirect effect: *CCDS* × *FIO*		(2.526)	
Direct effect		0.009	
Total effect		0.010	
% of the total mediated effect		8.33%	

Note: This table presents the regression results for a path analysis by estimating a structural equation model (SEM) that examines the direct effect of foreign institutional investors on firm value proxied by Tobin's Q (*TOBINQ*) in Panel A and long-run returns in Panel B and its indirect effect via climate change disclosure quality as a mediating variable. The mediation effect test statistics are reported at the bottom section of the table. Two-tailed *t*-statistics based on standard errors clustered by the firm are presented in parentheses. All variables are defined in Appendix A.

***Statistically significant at the 1% level.

**Statistically significant at the 5% level.

*Statistically significant at the 10% level.

drive our results. Firms with ADRs do not have a relationship between climate change disclosure and foreign institutional ownership. However, the non-ADR firms show a positive and significant relationship between foreign ownership and CCDS. We also test whether the foreign owners are independent or grey with the firm, where independent FIOs are mutual funds and independent investment advisers and grey institutions are bank trusts, insurance companies, and other institutions. We find that independent and affiliated FIOs positively correlate with better climate change performance disclosure.

In the United States, institutional shareholders are focused on maximizing shareholder value, whereas foreign institutional owners may have a more holistic approach to investing. Therefore, in Columns (5) and (6) of Panel B, we segment the foreign ownership into whether FIOs are US based. We find that both US-based FIOs and non-US-based FIOs improve CCDS but that the effect is more significant for non-US-based FIOs. Shleifer and Vishny (1986) show that shareholders' optimal level of monitoring increases with the size of their equity ownership, suggesting that our results may be stronger for FIOs with larger stakes. Therefore, we segment our sample on whether the FIOs are block holders (hold more than 5%) or not in Columns (7) and (8). Our results are driven by foreign institutional investors that are block holders versus those foreign investors with smaller equity stakes.

5.6 | Firm value enhancement

One driver of improving disclosure for institutional investors may be a potential improvement in stock market liquidity (Balakrishnan et al., 2014) and firm valuation, which maximizes investors' returns (Tsang et al., 2019). Following Tsang et al. (2019), we undertake a path analysis by estimating a structural equation model (SEM) that examines the direct effect of foreign institutional investors on firm value proxied by Tobin's Q (*TOBINQ*) and long-run returns (*RET*) to show its

indirect effect via climate change disclosure quality as a mediating variable. The SEM is a hybrid of factor analysis and path analysis. One benefit of SEM over other estimation methods is that we can test a factor structure and examine relationships among predictor variables. Using a SEM analysis enables us to understand the channels through which institutional ownership is related to CCDS disclosure. The SEM estimation consists of two regressions: (1) *TOBINQ* (*RET*) is regressed on *FIO*, *CCDS* (i.e., the mediating variable), and control variables in the main model; and (2) climate change disclosure quality (*CCDS*) is regressed on *FIO* and control variables in the main model. The indirect effect of *FIO* on *TOBINQ* (*RET*) is the product of the effect of *FIO* on *CCDS* and the effect of *CCDS* on *TOBINQ*.

We report the results of the path analysis in Table 10 and graph the direct versus indirect effects in Figures 1 and 2. Column (1) of Panel A, Table 10, shows that the direct effect of *FIO* on *TOBINQ* (coefficient = 0.193) is significant at the 5% level, while such direct effect (coefficient = 0.160) is significant at 5% in Column (3). Column (2) shows that the coefficient of *FIO* on *CCDS* is 0.120, and Column (3) shows that the coefficient of *CCDS* on *TOBINQ* is 0.276. Both are highly statistically significant and give rise to an indirect coefficient for *FIO* on *TOBINQ* equal to 0.033 with a significant *z*-statistic of 3.710. In Panel B, we replicate the analysis using long-run returns. Like the Tobin's Q results, we find a positive relationship between

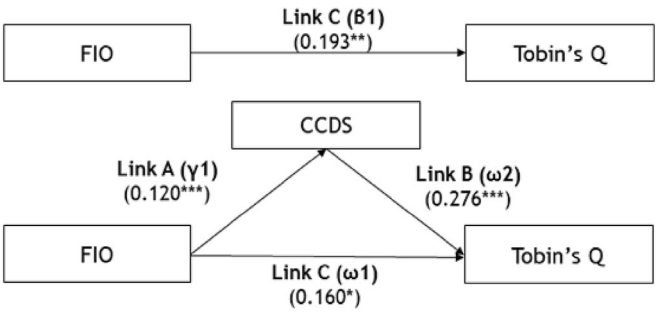

FIGURE 1 Mediation analysis between CCDS, FIO, and Tobin's Q. The figure graphs the direct versus indirect effects of foreign institutional ownership on performance using Tobin's Q and disclosure quality based on the SEM path estimation shown in Panel A of Table 10.

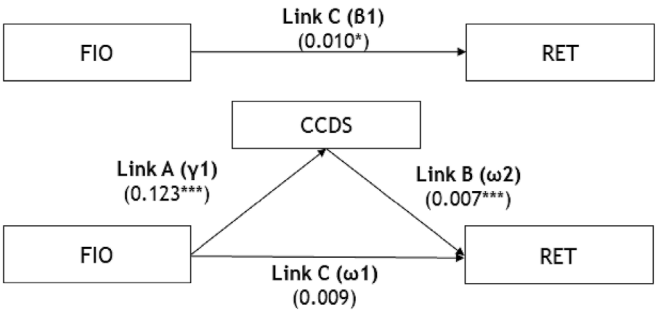

FIGURE 2 Mediation analysis between CCDS, FIO, and RET. The figure graphs the direct versus indirect effects of foreign institutional ownership on performance using stock return and disclosure quality based on the SEM path estimation shown in Panel B of Table 10.

foreign ownership and long-run returns (*RET*). Hence, the results support the indirect effect and indicate that climate change disclosure quality is a critical channel through which foreign institutional investors enhance firm valuation.

6 | CONCLUSION

This study investigates the impact of foreign institutional investors on firms' climate change disclosure quality. Our cross-country analysis shows that firms with foreign institutional ownership provide better quality climate change disclosures. We attribute this to more substantial informational needs of foreign institutional investors that have driven investee firms to supply more comprehensive climate change information, enabling foreign institutional investors to accurately and comprehensively value assets of the investee firms and correspondingly infer efficient investment and pricing decisions. Utilizing a quasi-natural experiment arising from a firm's inclusion in the MSCI index, we find that disclosures improve for our treatment firms after they are included in the index. Our results are robust to several endogeneity tests, including controlling for the firm- and country-fixed effects, change specification, and 2SLS instrumental variable approach. Furthermore, we find that the positive association between foreign institutional ownership and climate change disclosure quality is more pronounced for (1) firms domiciled in stakeholder-orientated countries; (2) firms domiciled in countries that adopt ETSs; and (3) firms with a greater level of information asymmetry, which magnifies foreign institutional investors' incentives to drive such disclosures in response to regulatory-economic pressures and information uncertainties. Finally, we find that climate change disclosure quality is a critical channel through which foreign institutional investors enhance companies' valuations.

Our study contributes to climate change disclosures, corporate governance, and international business literature by documenting that foreign rather than domestic institutional investors fundamentally contribute to corporate climate change disclosure quality. Our study resolves the inconclusive evidence on the association between overall institutional ownership and climate change disclosures, as prior studies did not differentiate between the types of institutional investors (e.g., Cotter & Najah, 2012; Liao et al., 2015; Stanny & Ely, 2008), foreign institutional investors, who want to see the overall corporate climate change disclosure quality improve. Such an improvement will have widespread outcomes, including reducing information asymmetry, enhancing financial stability, and facilitating firms' smooth transition to a climate-resilient economy. Firms prone to exhibiting poorer accountability for climate risk management practices and disclosures are bereft of effective external monitoring mechanisms. Our study urges regulators to increase market oversight, especially firms with less foreign institutional ownership.

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CONFLICT OF INTEREST STATEMENT

There are no conflicts of interest for this paper.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from The data is from paid subscriptions. Restrictions apply to the availability of these data, which were used under license for this study. Data are available from the author(s) with the permission of The data is from paid subscriptions.

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NOTES

[1] Since we employ the climate change disclosure score rated by the CDP in our study, we follow the CDP in defining the "quality" of climate change disclosure as the level and comprehensiveness of firms' communication to the CDP questionnaires on climate change issues, management methods, and initiatives taken to address these issues (CDP, 2020).

[2] Dobler (2008) identifies misleading information as a potential concern of voluntary disclosures. However, Schiemann and Sakhel (2019) claim that the repeated disclosures and diverse users of CDP reports reduce the likelihood of CDP disclosing firms making deliberately false or misleading voluntary disclosures.

[3] Institutional investors are also given a list of firms that declined to respond to the questionnaires.

[4] The CDP survey began in CDP2006.

[5] We follow the industry classification used by Dhaliwal et al. (2012).

[6] We use the actual score from 2006 to 2014. From 2015 onward, we assign 8 for performance band A, 7 for A-, 6 for B, 5 for B-, 4 for C, 3 for C-, 2 for D, and 1 for D-. We construct *CCDS* as the ratio of the difference between the original value of *CCDS* and the sample minimum value of the *CCDS* over the difference between the sample maximum value of the *CCDS* and the sample minimum value of the *CCDS* for firms within the same country and industry for each year. Prior studies (e.g., Bose et al., 2022; Kim et al., 2017) use this scoring system for US data. As our study focuses on cross-country context, we also include country when we compute our *CCDS* measure.

[7] We compute higher foreign ownership versus lower foreign ownership based on country–year median of foreign institutional investors' ownership.

[8] In unreported tests, we exclude the United States from our analysis and find that the results are qualitatively similar.

[9] If the partial *F*-statistic for one instrumental value falls below 8.96, the instrument is considered weak (Stock et al., 2002). Based on this threshold, we can infer that our instrumental variable is reasonable.

[10] For the sake of brevity, we do not report the control variable results.

[11] Our sample differs from our primary sample for these tests (except common law vs. civil law) because of data limitations in finding the country of origin for all the foreign investors in our sample. We only have country of origin for 3655 firm–year observations in our sample up to 2010. Currently, these data are not downloadable from the FactSet terminal. One of the authors has downloaded these data up to 2010 when the terminal allowed to download. However, FactSet provides the computed foreign ownership data based on common law and civil law origin of foreign investors. We compute other classifications based on the available data.

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APPENDIX A: DEFINITIONS OF VARIABLES

Variable		Explanation	Source
CCDS	Climate change disclosure quality	The climate change disclosure quality score is assessed based on the level and comprehensiveness of firms' communication to the CDP questionnaires on climate change issues, management methods, and initiatives taken to address climate change issues. *CCDS* is measured as the ratio of the difference between the original value of *CCDS* and the minimum sample value of the *CCDS* over the difference between the maximum sample value of the *CCDS* and the minimum sample value of the *CCDS* for firms within the same country and industry for each year.	CDP
FIO	Foreign institutional ownership	The percentage of ownership held by foreign institutional investors.	FactSet
DIO	Domestic institutional ownership	The percentage of ownership held by domestic institutional investors.	FactSet
SIZE	Firm size	The natural logarithm of market capitalization at the beginning of the year.	Worldscope
ROA	Profitability	The ratio of net income before extraordinary items to total assets.	Worldscope
LEV	Leverage	The ratio of total debt to total assets.	Worldscope
FAGE	Firm age	The natural logarithm of the years since the firm first appears in the Worldscope database.	Worldscope
MB	Market-to-book ratio	The ratio of the market value of equity to the book value of equity.	Worldscope
DISC	Overall disclosure quality	An indicator variable that takes a value of 1 if the firm reports management forecast and 0 otherwise.	Capital IQ
RISK	Firm risk	The standard deviation of the daily stock return over the fiscal year.	Worldscope
FOREIGN	Foreign operations	An indicator variable equals 1 if a firm has foreign operations and 0 otherwise.	Worldscope
RDINT	Research and development	The ratio of research and development expenditures to total assets.	Worldscope
CAPEX	Capital expenditure	Total capital expenditures scaled by total assets.	Worldscope
SGROWTH	Sales growth	Annual sales growth.	Worldscope
CGOV	Corporate governance	Corporate governance performance score from the Refinitiv database.	Refinitiv ESG
CSR_PERF	Environmental performance	The average of the social and environmental pillar score from the Refinitiv database.	Refinitiv ESG
CSR_DISC	CSR disclosure	An indicator variable that takes a value of 1 if the firm issues a CSR report and 0 otherwise.	Refinitiv ESG
CROSS	Cross-listing	A count of the number of stock exchanges on which the firm is listed.	Worldscope
MSCI	MSCI membership	An indicator variable that takes a value of 1 if a firm is a member of the MSCI All-country World Index and 0 otherwise.	MSCI
LNGDP	Gross domestic product	The natural logarithm of the gross domestic product (GDP).	World Bank
STAKE	Stakeholder-oriented countries	An indicator variable equals 1 if the firm is domiciled in a code law country and 0 if the firm is domiciled in a common law country.	Djankov et al. (2008)
ENFORCE	Enforcement	Country-level legal score.	World Bank

Variable		Explanation	Source
ETS	Emission trading scheme	An indicator variable equals 1 if a firm is domiciled in a country with emission trading schemes and 0 otherwise.	ICAP
EM_SCORE	Earnings management score	Country-level earnings management score.	Leuz et al. (2003)
ANALYST	Analysts	The natural logarithm of the number of analysts following a firm.	I/B/E/S
SPREAD	Bid–ask spread	The annual average of the daily closing bid–ask spread as a percentage of the daily closing price.	DataStream
TOBINQ	Firm valuation	The book value of total assets plus the market value of equity minus the book value of equity divided by total assets.	Worldscope
RET	Stock returns	Long-term stock returns are the annualized daily stock returns over the fiscal year.	DataStream

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