Foreign Institutional Ownership and Corporate Carbon Emissions*

Jie (Jay) Cao
The Hong Kong Polytechnic University
E-mail: jie.cao@polyu.edu.hk

Xintong (Eunice) Zhan
Fudan University
E-mail: xintongzhan@fudan.edu.cn

Weiming (Elaine) Zhang
IE Business School
E-mail: elaine.zhang@ie.edu

Yaojia (Zoe) Zhang
The Chinese University of Hong Kong
E-mail: zoezhang@link.cuhk.edu.hk

Abstract

We document that foreign institutions reduce the carbon emissions of their investee companies, while domestic institutions have no effect. Using three exogenous shocks, we establish the causal effect of foreign institutions on corporate carbon emissions. We find that active engagement by foreign institutions drives the results. Specifically, firms with higher foreign institutional ownership have more green patents, more proposals on environmental and social issues, and their executive compensation is more tightly linked to carbon emission levels. The effect of foreign institutional ownership on carbon emission levels is more pronounced among firms with foreign sales and is weakened by corporate financial constraints.

* We thank Marcin Kacperczyk, Philipp Krüger, Kelvin Law, Pedro Matos, Laura Starks, Chishen Wei, Youchang Wu, George Yang, Hua Zhang, and seminar participants at IE Business School, Chinese University of Hong Kong, and Hong Kong Polytechnic University for helpful comments. The work described in this paper is supported by a grant from the Research Grant Council of the Hong Kong Special Administrative Region, China (Project No. GRF 14500621) and the National Natural Science Foundation of China (Grant No. 72271061). All errors are our own.

Foreign Institutional Ownership and Corporate Carbon Emissions

Abstract

We document that foreign institutions reduce the carbon emissions of their investee companies, while domestic institutions have no effect. Using three exogenous shocks, we establish the causal effect of foreign institutions on corporate carbon emissions. We find that active engagement by foreign institutions drives the results. Specifically, firms with higher foreign institutional ownership have more green patents, more proposals on environmental and social issues, and their executive compensation is more tightly linked to carbon emission levels. The effect of foreign institutional ownership on carbon emission levels is more pronounced among firms with foreign sales and is weakened by corporate financial constraints.

Keywords: Foreign institutional ownership, carbon emissions, active engagement, green innovation, executive pay-for-carbon sensitivity

1. Introduction

Climate change poses considerable challenges for investors, firms, and regulators. To overcome these challenges, many countries have implemented climate-related regulations to limit carbon emissions. For example, companies incorporated in the United Kingdom are required to disclose direct and indirect greenhouse gas (GHG) emissions according to the Regulations 2013 amendment to the Companies Act 2006. Though numerous countries have imposed carbon taxes on firms, countries differ substantially in the enforcement of carbon regulations and in carbon emission levels, indicating that public incentives may not be sufficient to reduce corporate carbon emissions.[1] In this paper, we study the impacts of foreign institutions, who potentially provide strong private incentives, on carbon emission levels to understand whether there are external solutions for corporate carbon emission reduction within a country.

Foreign institutions are important players in the global equity market and have been documented to influence corporate behaviors such as mergers and acquisitions (Ferreira, Massa, and Matos (2010)), board monitoring (Desender, Aguilera, López puertas-Lamy, and Crespi (2016)), investment (David, Yoshikawa, Chari, and Rasheed (2006) and Bena, Ferreira, Matos, and Pires (2017)), innovation (Luong, Moshirian, Nguyen, Tian, and Zhang (2017)), and earnings management (Lel (2019)). Such influence comes from the unique features of foreign institutions. For example, compared with local institutional investors, foreign institutions are less likely to have (potential) business ties with investee firms. Foreign institutions are thus more independent in monitoring firms and in exerting corporate control in the international market. For instance, foreign institutions are more likely to react to management actions that are not in line with the interests of shareholders. As a firm's high carbon emission

[1] For example, according to the Emission Database for Global Atmospheric Research (EDGAR) and the data for 182 countries from 1970 to 2021, country-level (per-capita) carbon emission has a mean of 198 million tons (8.5 tons) and a standard deviation of 765 million tons (14.8 tons).

level imposes sizable regulatory and transitory risks on shareholders, foreign institutions have stronger incentives to monitor and reduce the carbon emissions of firms in their portfolios. However, it is also possible that global institutions hold much more diversified portfolios and are less concerned about the risk associated with high carbon emissions. Alternatively, foreign institutions may focus on short-term financial returns (Douma, George, and Kabir (2006), Aguilera, Desender, Lamy, and Lee (2017)), and thus they are less motivated to monitor carbon emissions, which are associated with long-term risks and performance. Therefore, it is still an empirical question whether foreign institutions affect the carbon emission levels of the holding companies.

We examine this empirical question by studying a large sample of international firms in 56 countries from 2001 to 2020. We obtain corporate carbon emission levels from the Trucost database and global equity ownership from the FactSet database. We start with OLS panel regressions that control for a set of variables and fixed effects, and we find that a one-standard-deviation increase in foreign institutional ownership is associated with a 3.42% decrease in carbon emissions from direct production, as measured using the Scope 1 carbon intensity.[2] Domestic institutional ownership has no significant effect on corporate carbon emission levels. The negative relation between foreign institutional ownership and corporate carbon emission levels is robust.

We use three exogenous shocks to establish the causality of the effect of foreign institutional ownership on carbon emission levels. First, we study the changes in carbon emission levels around the MSCI All Country World Index (ACWI) inclusion, which exogenously leads to increased foreign institutional ownership (see, for example, Ferreira and Matos (2008), Cremers, Ferreira, Matos, and Starks (2016), and Kacperczyk, Sundaresan, and Wang (2021)). Using a difference-in-differences approach, we find strong

[2] Corporate carbon emissions are categorized into Scope 1, Scope 2, and Scope 3 emissions. Scope 1 emissions are the direct emissions from production. Scope 2 emissions are indirect emissions from the consumption of electricity, heat, or steam. Scope 3 emissions are other indirect emissions that occur in the value chain, including both upstream and downstream emissions. Throughout this paper, Scope 1 carbon intensity is defined as the natural logarithm of scaled (by total revenue) Scope 1 carbon emissions.

evidence that compared with matched control firms, firms included in the ACWI significantly reduce their carbon emissions afterwards. Second, we study the effect of foreign institutional investors' distraction on corporate carbon emissions. When other stocks in their holding portfolio experience industry shocks, foreign institutions may become distracted from the focal firm (Kempf, Manconi, and Spalt (2017) and Chen, Dong, and Lin (2020)) and pay less attention to its carbon emissions. Therefore, the negative relation between foreign institutional ownership and corporate carbon emissions would be attenuated. Indeed, we find supporting evidence that this is the case. Last, we study the effect of the Paris Agreement on our documented results. The Paris Agreement, an international treaty on climate change, has greatly raised public attention to global warming, carbon emission, and related risks. If foreign institutions regard high carbon emissions as potential risks, they will be more motivated to reduce corporate carbon emissions following the adoption of the Paris Agreement at COP 21 in Paris on 12 December 2015. Our empirical evidence shows that the negative relation between foreign institutional ownership and corporate carbon emission levels is significantly stronger after the adoption of the Paris Agreement.

Why would foreign institutions seek to reduce the carbon emissions of their holding companies? First, countries differ in their awareness of climate change and attitudes toward carbon emissions. Institutions from countries prepared to improve their resilience to climate change are likely to bring an ideology of low carbon emissions and even the knowledge, expertise, and resources to reduce carbon emissions to the firms in which they invest across borders. Indeed, we find that foreign institutions from countries with higher awareness of climate change are driving forces behind reduced carbon emissions. Second, evidence shows that foreign institutions tend to be long-term oriented (Bena, Ferreira, Matos, and Pires (2017) and Chen, Han, Li, Megginson, and Zhang (2022)); and long-term institutions pay more attention to the sustainability of the firms in which they invest (Starks, Venkat, and Zhu (2023)). Consistent with this hypothesis, we find that the

negative relation between foreign institutional ownership and corporate carbon emission levels is driven by long-term foreign institutions. Last, compared with domestic institutions, foreign institutions are more independent, which enables them to influence the policies of investee firms more effectively (see, for example, Ferreira and Matos (2008), Bena, Ferreira, Matos, and Pires (2017), and Luong, Moshirian, Nguyen, Tian, and Zhang (2017)). Consistent with this argument, we find that our results are driven by *independent* foreign institutions rather than *gray* foreign institutions that may have some business relationships with the holding firms.

Although foreign institutions have incentives to reduce the carbon emission levels of the firms in which they invest, firms will only cooperate and reduce carbon emissions when the benefits outweigh the costs. Resources are a major consideration whether firms respond to requests by stakeholders (Eesley and Lenox (2006)). Foreign institutions could bring resources to firms in the international market, thus motivating them to respond to requests like carbon emission reduction. Consequently, we hypothesize that firms exposed to the global market have more incentives to respond positively. In line with this argument, we document a stronger negative relation between foreign institutional ownership and carbon emission levels among firms with foreign sales. We also explore the impact of financial constraints, as it is costly for firms to reduce carbon emissions. Consistently, we find that the impact of foreign institutional investors is mitigated among financially constrained firms.

We explore the possible channels through which foreign institutional investors reduce corporate carbon intensity. First, there is knowledge spillover as foreign institutions invest across borders (Luong, Moshirian, Nguyen, Tian, and Zhang (2017)). It is possible that these foreign institutions facilitate the green innovation of their investee firms, thus reducing carbon emission levels (Carrion-Flores and Innes (2010) and Amore and Bennedsen (2016)). Our empirical analysis shows that foreign institutional ownership is positively related to the number of green patents and that these patents are more valuable.

Moreover, foreign institutions are more independent than domestic institutions in monitoring managers and shaping corporate policies. One effective tool to curb corporate carbon emissions is to link managerial compensation directly to carbon emission levels.[3] Flammer, Hong, and Minor (2019) study the adoption of CSR contracting in executive compensation and find a reduction in emissions. We find that when there is high foreign institutional ownership, executive compensation is strongly and negatively related to carbon emission levels. As a consequence, managers of investee firms have stronger incentives to reduce carbon emissions. Last, we examine the effect of foreign institutions on shareholder proposals. Foreign institutions can advocate for green corporate policies by initiating or voting for environmently-friendly proposals. Consistently, we document that foreign institutional ownership increases the number of proposals related to environmental and social issues. The evidence shows that foreign institutions proactively engage in corporate green policies and reduce carbon emission levels through their voice power.

To the best of our knowledge, we are the first to provide a detailed analysis of how foreign institutions affect the *carbon emission levels* of investee firms. We thus contribute to the literature on the real impacts of foreign institutions. Prior studies highlight that foreign institutions differ from domestic institutions in that they have fewer business ties with investee companies and are longer-term oriented. Thus, they can better monitor their investee firms. Foreign institutions are shown to have significant impacts on the corporate behaviors and financial performance of investee firms because of these unique features (see, for example, Aggarwal, Erel, Ferreira, and Matos (2011), and Luong, Moshirian, Nguyen, Tian, and Zhang (2017)). In this paper, we examine the impact of foreign institutions on an increasingly important yet underexplored aspect of corporate non-financial

[3] For example, Xcel Energy includes a so called "sustainability quotient" in its salary reviews and bonus allocations. While 75% of its incentives continue to be based on earnings per share growth, the remaining 25% include environmental footprint and decreases in carbon emissions (Singh, 2010).

performance, namely carbon emission levels, and establish a strong causal link. Our motivation and channel analyses of country-level climate awareness, green innovation, environmental proposals, and managerial compensation bring new insights into the real effect of foreign institutions on their investee firms.

Second, a growing body of literature examines corporate carbon performance, including both disclosure and levels. Some recent studies document that institutions, especially these from civil law countries, value and demand *carbon disclosure* (e.g., Ilhan, Krueger, Sautner, and Starks (2023) and Döring, Drobetz, Ghoul, Guedhami, and Schröder (2023)). The findings in our paper are distinct from theirs, as we focus on the *level of carbon emissions*. Studying carbon emission levels alleviates the concern of greenwashing, i.e., firms simbolically disclose carbon emission information as a response to the pressure of stakeholders (see, for example, Kim and Lyon (2015) and Marquis, Toffel, and Zhou (2016)). And our results hold when we control for disclosure effects.

Only few studies start to investigate the determinants of firms' carbon emissions levels. For example, Delmas and Montes-Sancho (2010) document firms that join the Climate Challenge program earlier spend more effort reducing carbon emissions. Shive and Forster (2020) find that private firms emit less greenhouse gas than public firms. Azar, Duro, Kadach, and Ormazabal (2021) document a negative effect of the Big-Three institutional investors (i.e., BlackRock, Vanguard, and State Street) on corporate carbon emissions. We examine a broader set of institutions, and we find that ownership structure matters for corporate carbon policies. Specifically, only foreign institutions reduce corporate carbon emissions. The focus on institutions all around the world also allows us to explore the motivations and roles of these foreign institutions in greater detail.

The remainder of this paper is organized as follows. In Section 2, we develop our hypotheses. In Section 3, we describe the data and construct the measures. In Section 4, we present our baseline results and identification strategies. In Section 5, we explore the motivations for foreign institutions to reduce corporate carbon emissions. In Section 6, we

present the channels through which foreign institutions reduce the carbon emissions of their investee firms. Finally, we conclude in Section 7.

2. Hypothesis Development

Whether foreign institutions affect investee firms' carbon emissions is an unanswered question. On the one hand, foreign institutions are less dependent than domestic institutions on local investee companies in businesses such as underwriting, and thus they can more effectively monitor investee firms' behaviors, such as earnings management (Lel (2019)). Given the systematic risks (see Bolton and Kacperczyk (2021)) associated with carbon emissions, foreign institutions have the incentive to actively manage these risks and reduce the carbon emissions of firms in their portfolios. Moreover, foreign institutions could help reduce carbon emissions, as they are long-term oriented and facilitate knowledge spillover across borders. For example, foreign institutions can effectively boost corporate innovation (Luong, Moshirian, Nguyen, Tian, and Zhang (2017)).

On the other hand, compared with domestic institutions, foreign institutions are more diversified and less subject to climate risks (e.g., floods or hurricanes) in a particular region. In addition, foreign institutions may focus on short-term financial returns (Douma, George, and Kabir (2006), Aguilera, Desender, Lamy, and Lee (2017)), and thus they are less motivated to monitor carbon emissions, which are associated with long-term risks and performance. Thus, how foreign institutions affect carbon emission and further stakeholder interests is still an under-explored question (see, DesJardine, Zhang, and Shi (2023) for a detailed discussion). To answer this empirical question, we postulate the following regarding the effect of foreign institutional ownership on investee firms' carbon emissions.

Hypothesis 1: Foreign institutional investors reduce investee firms' carbon emissions.

As we find evidence supporting Hypothesis 1, we test which unique features of foreign institutions motivate them to reduce the carbon emissions of firms in which they invest. Specifically, we test the following hypotheses.

Hypothesis 2a: Foreign institutions from countries with high awareness of climate changes have a greater impact on investee firms' carbon emissions.

Countries differ in their readiness to improve their resilience to climate changes. Institutions from countries with high readiness to respond to climate issues could bring new technologies, knowledge, and risk management techniques to firms across borders. Thus, we expect our results to be driven by foreign institutions from countries with high awareness of climate changes—that is, countries that are more ready to tackle related challenges.

Hypothesis 2b: Foreign institutions that are long-term oriented have a stronger impact on investee firms' carbon emissions.

Policies that reduce carbon emissions are likely to benefit firms in the long run. Investments and technologies to reduce carbon emissions may even impose costs in the short run. Therefore, we expect foreign institutions with a long-term orientation to be more motivated to reduce the carbon emissions of investee firms and to drive our documented patterns.

Hypothesis 2c: Independent foreign institutions have a stronger impact on investee firms' carbon emissions.

Business ties with investee firms are likely to weaken monitoring by foreign institutions. Because foreign institutions are motivated to reduce corporate carbon emissions, they will be in a better position to monitor investee firms if they are more

independent. Thus, our documented results should be driven by independent foreign institutions.

What are the real impacts of foreign institutions on investee firms that facilitate carbon emission reduction? On the basis of the motives and unique features of foreign institutions documented in the literature, we postulate the following hypotheses.

Hypothesis 3a: Foreign institutions boost green technologies and innovations of investee firms.

Technologies play a critical role in combating global warming and reducing corporate carbon emissions. Foreign institutions provide insurance for firm managers against innovation failure and promote knowledge spillovers from high-innovation economies (Luong, Moshirian, Nguyen, Tian, and Zhang (2017)). As the tests for Hypotheses 2a–c demonstrate the strong motivations for foreign institutions to reduce carbon emissions, it is possible that reductions occur through innovations related to green technologies. We examine the effect of foreign institutional ownership on both the quantity and quality of green innovations.

Hypothesis 3b: Foreign institutions enhance the sensitivity of managerial compensation to carbon emissions.

Foreign institutions are active monitors of investee firms. One possible way that foreign institutions align managers with carbon emission reduction goals is by strengthening the link between managerial compensation and carbon emissions (Flammer, Hong, and Minor (2019)). If managers are punished and receive lower compensation for higher levels of carbon emissions, they have stronger incentives to reduce such emissions.

Hypothesis 3c: Foreign institutions promote environmental- and social-related proposals.

Foreign institutions may also influence investee firms' carbon emission policies with activism, for example, by initiating environmental- and social-related proposals (Flammer, Toffel, and Viswanathan (2021)). If these proposals are supported by investors, managers may learn and change their firms' carbon emission policies even if the proposals are not binding. We therefore investigate the effect of foreign institutional ownership on the environmental- and social-related proposals of their investee firms.

3. Data and Measures

3.1. Data and sample

We obtain carbon emission data for worldwide firms for the fiscal years 2001 to 2020 from the Trucost database.[4] Trucost provides GHG emissions, measured by tons of carbon dioxide (CO_2), and classifies carbon emissions into Scope 1, Scope 2, and Scope 3. We focus on direct emissions by the focal firm (i.e., Scope 1 carbon emissions) because they are directly controlled by the firm. We follow Shive and Forster (2020) in using carbon intensity as our main measure (we discuss this measure in Section 3.2.1), and we show that our results hold for alternative measures of carbon emissions.

Institutional ownership data are retrieved from the FactSet Ownership database (LionShares), which provides detailed global equity holding data by institutions, fund portfolios, and non-institutional insiders, and is widely used in the literature (e.g., Ferreira and Matos (2008), and Bena, Ferreira, Matos, and Pires (2017)). Following Ferreira and Matos (2008), we use the latest reported data value at each calendar year-end to address concerns regarding different reporting frequencies by institutions from different countries.

We obtain stock market and accounting data from Compustat. After merging the three databases, we further limit our sample to country-year observations in which there are at least five firm observations with non-missing data on carbon emissions, institutional

[4] For firms with a fiscal year end between January and May, the fiscal year lags one year behind the calendar year.

ownership, and accounting variables. The final sample contains 75,650 firm-year observations and 11,379 unique firms from 56 countries. Panel A of Figure 1 plots the number of observations over time, and Appendix Table A1 presents the summary of the top 10 financial markets or industries containing the most firm-year observations.[5]

3.2. Variable construction

3.2.1. Carbon emissions

We focus on Scope 1 carbon emissions (CO_2, in tons), scale it by revenue (U.S. dollars, in millions), and then take the natural logarithm. We use the terms carbon emission *level* and *intensity* interchangeably in the paper. To capture the effect of carbon emission disclosure, we create a dummy variable ($SCOPE1\_DIS$) that equals one if the carbon emission data are disclosed by the firm (as indicated by Trucost), and zero otherwise.

3.2.2. Foreign institutional ownership

We follow Ferreira and Matos (2008) and use the ownership held by foreign institutions, with a slight adjustment. Specifically, we include both ordinary and preferred shares to calculate ownership by foreign institutions. We require shares to be listed in the domicile country of the focal firm. Total institutional ownership (IO) is the total market value of shares held by all of the institutions scaled by market capitalization. Foreign institutional ownership (IO_FOR) is the total market value of shares held by institutions domiciled in a different country (other than the domiciled country of the focal firm) scaled by market capitalization. Domestic institutional ownership (IO_DOM) is the total market value of shares held by institutions domiciled in the same country scaled by market capitalization.

3.2.3. Control variables

[5] We obtain the industry classification details from Kenneth R. French's data library.

We use the following firm characteristics as control variables. We measure firm size as the natural logarithm of total assets in U.S. dollars (millions), denoted by *Ln(AT)*. We calculate the level of leverage (*LEVERAGE*) as the sum of long-term debt and current liabilities scaled by total assets. Return on assets (*ROA*) is the ratio of operating income before depreciation scaled by total assets. Sales growth (*SALES_GROWTH*) is the change in sales scaled by total assets in the previous year. The market-to-book ratio is the natural logarithm of the market value of equity over the book value of equity, denoted by *Ln(MB)*. Cash holding (*CASH*) is defined as the ratio of current assets to total assets. For the intensity of research and development expense, denoted by *RD_INTENSITY*, we use R&D expense scaled by total assets.[6] *DIVIDEND* is a dummy that equals one if the firm has a nonzero dividend record and zero otherwise. Definitions of the variables are presented in the Supplementary Appendix.

3.3. Summary statistics

Panel A of Table 1 reports the summary statistics of the key variables, winsorized at the 1% and 99% levels. The average carbon emission level of our sample firms is 1,612,428 tons. Our key variable, *Ln(SCOPE1/REVENUE)*, has a mean of 3.560 and a standard deviation of 1.948. In addition, 32.5% of the sample firms disclose carbon emissions. The total institutional ownership is around 22.6%, and foreign institutional ownership is 5.9%. Thus, foreign institutions account for about 26% of the total institutional ownership.[7] We plot the cross-sectional averages of carbon emissions, foreign institutional ownership, and domestic institutional ownership over time in Figure 1. The distributions of the other variables are consistent with the literature.

[6] To address the issue of the missing R&D expense highlighted by Koh and Reed (2015), we first replace the missing data with the industry average within each country or with zero if the industry average is unavailable.

[7] Foreign institutions account for about 9% of the total institutional ownership for U.S. companies and almost 62% for companies in other countries. These numbers are largely consistent with those in Luong, Moshirian, Nguyen, Tian, and Zhang (2017). Our documented patterns hold when we exclude U.S. firms.

[Insert Table 1 about here]

[Insert Figure 1 about here]

Panel B of Table 1 reports the Pearson correlations of the variables. Carbon emission level is negatively correlated with institutional ownership for both foreign and domestic institutions. Foreign institutional ownership (*IO_FOR*) has low correlations with firm characteristics except for disclosure status (0.337), total institutional ownership (0.370), and firm size (0.333). Nevertheless, we control for these firm characteristics in our regressions to rule out any potential confounding effect.

4. Methods and Results

4.1. Baseline results

We first examine the relationship between foreign institutional ownership and carbon emissions by running the following OLS panel regression:

$$Y_{i,t} = \alpha + \beta \times IO\_FOR_{i,t-1} + \delta \times X_{i,t-1} + \upsilon_i + \omega_{l,t} + \varepsilon_{i,t}, \quad (1)$$

where $Y_{i,t}$ is the Scope 1 carbon intensity (*Ln(SCOPE1/REVENUE)*). The independent variable is foreign institutional ownership (*IO_FOR*) in the previous year. $X_{i,t-1}$ is a vector of the control variables, including domestic institutional ownership (*IO_DOM*), firm size (*Ln(AT)*), leverage ratio (LEVERAGE), return on assets ratio (ROA), sales growth (*SALES_GROWTH*), market-to-book ratio (*Ln(MB)*), cash holdings (*CASH*), dividend indicator (*DIVIDEND*), intensity of R&D expense (*RD_INTENSITY*), and the disclosure status of the Scope 1 carbon emissions (*SCOPE1_DIS*). υ_i indicates the firm fixed effects and $\omega_{l,t}$ is the country-year fixed effects. The coefficient of interest is β, which measures the effect of foreign institutional ownership on carbon emissions. Table 2 reports the regression results.

[Insert Table 2 about here]

Column (1) of Table 2 shows that the effect of foreign institutional ownership on carbon intensity is negative and statistically significant at the 1% level in a univariate regression.[8] In Column (2), we control for the impact of domestic institutional ownership and other firm fundamental characteristics. We further account for the effect of carbon emission disclosure in Column (3) to rule out the potential confounding effect of foreign institutions on corporate carbon disclosure as in Döring, Drobetz, Ghoul, Guedhami, and Schröder (2023). In terms of economic magnitude, a one-standard-deviation increase (0.064) in foreign institutional ownership is associated with a 3.42% (0.064×0.534) decrease in Scope 1 carbon intensity. In contrast, domestic institutional investors do not significantly influence the carbon emission intensity of the investee firm. In summary, the baseline result is consistent with our Hypothesis 1 that foreign institutional investors reduce firms' carbon emissions. In unreported tests, our results are robust to alternative measures of carbon emissions, including the carbon emission intensity measured by both Scope 1 and Scope 2 emissions (*Ln(SCOPE12/REVENUE)*) and the Scope 1 carbon emission intensity with an alternative scaler (*Ln(SCOPE1/AT)*).

4.2. Identification

The documented negative relationship between foreign institutional ownership and Scope 1 carbon intensity suffers from endogeneity concerns. For example, carbon intensity may decrease because of other firm characteristics correlated with foreign institutional ownership. In addition, foreign institutional investors may choose to invest in companies with a lower level of carbon emissions. In this subsection, we use three exogenous shocks

[8] Consistent with Shive and Forster (2020), the results hold when we use the natural logarithm of raw Scope 1 carbon emissions (*Ln(SCOPE1)*) as the dependent variable and control for the natural logarithm of contemporaneous revenue in the regression.

to establish the causal effect of foreign institutional ownership on corporate carbon emission intensity.

4.2.1. Evidence from MSCI index inclusion

We use the MSCI All Country World Index (ACWI) inclusion as the first exogenous shock. The ACWI is a typical benchmark for international portfolios, and inclusion creates exogenous variation in foreign institutional ownership, as some foreign institutions only hold index stocks. ACWI inclusion has been used in several studies, including Ferreira and Matos (2008), and Luong, Moshirian, Nguyen, Tian, and Zhang (2017). We identify control firms using a propensity score matching approach and estimate the effect of ACWI inclusion first on foreign institutional ownership and then on carbon emission levels using difference-in-differences regressions. For this analysis, we limit our sample to the years after 2005 because 2006 is the first year for which the MSCI provides inclusion data.

Treated firms are sample firms that are included in the ACWI index over the sample period. We only keep the treated firms that are not excluded from the index after inclusion. Non-treated firms are those that do not experience ACWI inclusion or exclusion. For each treated firm, we identify a control firm in the same year and country based on firm characteristics in the year before inclusion. Our matching variables include foreign institutional ownership (IO_FOR), total institutional ownership (IO), firm size ($Ln(AT)$), leverage ratio ($LEVERAGE$), return on assets ratio (ROA), sales growth ($SALES\_GROWTH$), cash holdings ($CASH$), dividend indicator ($DIVIDEND$), and the intensity of R&D expense ($RD\_INTENSITY$). Panel A of Table 3 demonstrates the quality of our matching. Before ACWI inclusion, the treated and control firms are similar. For example, the average foreign institutional ownership is 4.9% for the treated firms and 4.8% for the control firms. The differences are indistinguishable from zero.

We examine the effect of ACWI inclusion on institutional ownership and carbon emission intensity in Panel B of Table 3. We limit the window to 3 years before and 3

years after the index inclusion, with the event year excluded. To validate the parallel assumption before the shock and test the effect of ACWI inclusion, we run the following regression:

$$\begin{aligned} Y_{i,t} = \alpha &+ \beta_1 \times TREAT_i \times Pre_{2_{i,t}} + \beta_2 \times TREAT_i \times Pre_{1_{i,t}} \\ &+ \beta_3 \times TREAT_i \times AFTER_{i,t} + \beta_4 \times Pre_{2_{i,t}} + \beta_5 \times Pre_{1_{i,t}} + \beta_6 \times AFTER_{i,t} \\ &+ \delta \times X_{i,t-1} + \upsilon_i + \omega_{l,t} + \varepsilon_{i,t}, \end{aligned} \tag{2}$$

where $Y_{i,t}$ is a generic variable for *IO_FOR*, *IO_DOM*, and *Ln(SCOPE1/REVENUE)*. $TREAT_i$ is equal to one for the treated firms added to the MSCI ACWI index and zero for the matched control group. $Pre_{2_{i,t}}$ is equal to one for the second year before the treated firm is added to the index (i.e., time $t = -2$) and zero otherwise. $Pre_{1_{i,t}}$ is equal to one for the year before the treated firm is added to the index (i.e., time $t = -1$) and zero otherwise. $AFTER_{i,t}$ is equal to one for the period following the index addition year and zero otherwise. $X_{i,t-1}$ is a vector of the control variables. The coefficients of the interaction terms capture changes in the differences between the treated and control groups for the ownership and carbon emission measures around the event time.

[Insert Table 3 about here]

As shown in Panel B of Table 3, β_1 and β_2 are insignificant for *IO_FOR*, *IO_DOM*, and *Ln(SCOPE1/REVENUE)*, validating the parallel trend condition. β_3, which captures the effect of ACWI inclusion, is significantly positive for *IO_FOR*, insignificant for *IO_DOM*, and significantly negative for *Ln(SCOPE1/REVENUE)*. These findings indicate that treated firms experience an increase in foreign institutional ownership but no change in domestic institutional ownership. The results provide evidence that ACWI inclusion is a valid shock that exogenously increases foreign institutional ownership. The negative effect of ACWI inclusion on carbon emission levels in Column

(3) shows that after ACWI inclusion, treated firms significantly reduce their carbon emission levels compared with matched control firms. Thus, we establish a causal relationship between foreign institutional ownership and corporate carbon intensity.

4.2.2. Evidence from foreign institutions' attention to carbon emissions

If foreign institutions indeed make efforts to reduce the carbon emissions of investee firms, such effects should be attenuated when foreign institutions are distracted and strengthened when they pay more attention to climate-related issues. We use two different natural experiments to identify such channels.

First, we examine how the negative relation between foreign institutional ownership and carbon emissions changes when foreign institutions are distracted by industry return shocks to other firms in their portfolios. Specifically, we follow Kempf, Manconi, and Spalt (2017) and construct a firm-level distraction variable (*DISTRACTION*) to measure to what extent foreign institutions are distracted from the focal firm. We first define the industry return shock by identifying industries (Fama-French 48 industry classification) with the highest or lowest value-weighted annual return within each country. For firms in these industries, we set a return shock dummy equal to one. The return shock dummy equals zero for firms in the other industries in the same country. An institutional investor's degree of distraction for each firm is the weighted average of the return shock dummy for its portfolio firms in other industries. We then aggregate foreign institutional investors' degree of distraction to the focal firm level by taking the weighted average of the distraction levels of all foreign institutions holding its shares. To explore how the distraction of foreign institutions affects our documented results, we run the following regression:

$$\begin{aligned} Y_{i,t} = {} & \alpha + \beta_1 \times IO\_FOR_{i,t-1} + \beta_2 \times DISTRACTION_{i,t-1} \\ & + \beta_3 \times IO\_FOR_{i,t-1} \times DISTRACTION_{i,t-1} + \delta \times X_{i,t-1} + \upsilon_i + \omega_{l,t} \\ & + \varepsilon_{i,t}, \end{aligned} \tag{3}$$

The coefficient of interest is β_3, which indicates the effect of foreign institutional ownership on carbon intensity conditional on the distraction level of these foreign institutions. Panel A of Table 4 reports the regression results. The significantly positive coefficients of the interaction term imply that the impacts of foreign institutional ownership on Scope 1 carbon intensity are attenuated as the distraction level of foreign institutional investors increases. This test corroborates that foreign institutions indeed spend efforts on and actively manage the carbon emissions of investee firms.

[Insert Table 4 about here]

We also use the Paris Agreement (PA) as an additional shock to investors' climate awareness/attention. The Paris Agreement, adopted in December 2015, has increased investors' awareness of climate issues and is widely used in the literature (e.g., Bolton and Kacperczyk (2021)). We hypothesize that foreign institutional investors exert more effort to reduce their investee firms' carbon emissions after the adoption of the Paris Agreement. To test this hypothesis, we run the following regression:

$$Y_{i,t} = \alpha + \beta_1 \times IO\_FOR_{i,t-1} + \beta_2 \times IO\_FOR_{i,t-1} \times AFTER_t + \delta \times X_{i,t-1} + \upsilon_i + \omega_{l,t} + \varepsilon_{i,t}, \quad (4)$$

We restrict this analysis to the window of 3 years before and after the PA shock. $AFTER_t$ is a dummy equal to one from 2016 to 2018 and zero from 2013 to 2015. The coefficient of interest is β_2, which captures the change in the effect of foreign institutional ownership on carbon emissions after the PA shock. Panel B of Table 4 reports the regression results.

We obtain statistically negative coefficients for the interaction terms for all specifications. Since the adoption of the Paris Agreement, foreign institutions have paid more attention to climate change and made more efforts to reduce the carbon emission levels of the firms in which they invest.

5. Further discussions

5.1. Foreign institutional investor heterogeneity

Foreign institutional investors differ in their incentives and influences on local firms. In this section, we consider the heterogeneity across foreign institutions to understand their motives for carbon emission reduction. Specifically, we break down foreign institutional ownership according to the climate awareness level, investment horizon, and independence of the investee firm.

We start with country-level awareness of climate-related issues. Institutions from countries that are more aware of carbon emissions pay more attention to such issues in their investment. In the same vein, institutions from countries that are prepared to address climate challenges can bring more knowledge and experience to their investee firms across borders. We use the ND-GAIN Country Index to proxy for the country-level climate score, which takes into account a country's vulnerability to climate change, readiness to improve resilience, and ability to successfully implement adaptation solutions.[9] We classify foreign institutions into two categories according to the readiness score in the ND-GAIN Country Index of domiciled countries. Countries ranked in the top 10% according to the readiness score are designated HIGHSCORE countries, and institutions from these countries are HIGHSCORE institutions. Other institutions are LOWSCORE institutions. We aggregate the foreign institutional ownership of the two categories for a given firm-year to obtain *IO_FOR_HIGHSCORE* and *IO_FOR_LOWSCORE*.

As shown in Column (1) of Table 5, we find that the negative effect of foreign institutional ownership on corporate carbon emissions is significant for *IO_FOR_HIGHSCORE* and insignificant for *IO_FOR_LOWSCORE*. This evidence is consistent with our hypothesis that institutions from countries with higher awareness of

[9] The country index and detailed explanation of the methodology can be downloaded freely from https://gain.nd.edu/our-work/country-index/.

climate issues have stronger incentives to reduce the carbon emissions of their investee firms.

[Insert Table 5 about here]

We next consider the differences in investment horizons. In general, institutions with longer horizons pay more attention to ESG issues and carbon risks (Flammer, Toffel, and Viswanathan (2021); Starks, Venkat, and Zhu (2023)). We expect foreign institutions with longer investment horizons to reduce carbon emissions more pronouncedly. We decompose foreign institutional ownership according to institutional turnover. FactSet classifies institutional turnover into five categories: "Very Low," "Low," "Medium," "High," and "Very High."[10] We calculate the ownership by institutions that are in the categories of "Very Low" and "Low" to obtain the long-term foreign institutional ownership (IO_FOR_LT), and the ownership by other institutions is the short-term foreign institutional ownership (IO_FOR_ST). Column (2) of Table 5 shows that only ownership by long-term foreign institutions significantly reduces carbon emissions by the investee firms.

Last, we study the role of independence in our documented results. Foreign institutions are regarded as less dependent on investee firms given their lack of business ties, but they differ in their incentives and capacity to influence firms. Independent institutions such as mutual funds, investment advisors, and hedge funds are more active and independent than other institutions (Ferreira and Matos (2008)). We therefore expect the impacts of these institutions to be larger than those of other institutions. Following the literature, we classify foreign institutions as independent institutions, which include

[10] Factset calculates the turnover of institutions by dividing the average transactions by the market value of the portfolio and then decides the turnover label based on the number. For example, institutions with annual portfolio turnover less than 25% are labeled as having "Very Low" turnover, and institutions with annual portfolio turnover greater than 200% are as labeled having "Very High" turnover.

mutual funds, investment advisors, and hedge funds, or as gray institutions, which include other institutions.[11] We calculate the ownership by these two types of foreign institutions and obtain *IO_FOR_INDEP* and *IO_FOR_GRAY*. In Column (4) of Table 5, we present the results related to independent and gray foreign institutional ownership. Consistent with the literature, we find that only independent foreign institutions have the capacity to reduce carbon emissions.

5.2. Firm heterogeneity

We also exploit cross-sectional variations across firms to understand the effect of foreign institutions on corporate carbon emissions. First, firms exposed to foreign markets would benefit more from foreign institutional ownership and would thus cooperate with foreign institutions to reduce carbon emissions. Following Kacperczyk, Sundaresan, and Wang (2021), we construct the foreign sales ratio (FORSALE) using the percentage of a firm's foreign sales to its total sales. Firms with foreign sales have higher exposure to foreign markets than firms with zero foreign sales. We re-run our baseline regression specified in Equation (1) for these two groups of firms. As shown in Columns (1) and (2) of Table 6, the effect of foreign institutions on carbon emissions is indeed stronger among firms exposed to foreign sales, and the difference between the two groups is significant.

Second, financially constrained firms face higher environmental abatement costs (Xu and Kim (2022)) and thus are less likely to reduce carbon emissions than unconstrained firms. Following Bartram, Hou, and Kim (2022), we measure financial constraints using the Hadlock–Pierce index (HP Index, Hadlock and Pierce (2010)), which is calculated as follows:

[11] In unreported results, we further classify *IO_FOR_INDEP* depending on whether the foreign institutional investor is a mutual fund (*IO_FOR_MF*), hedge fund (*IO_FOR_HF*), or investment advisor (*IO_FOR_IA*), and we find that the results are mainly driven by active foreign institutional investors, especially those who are classified by Chen, Harford, and Li (2007) as independent (i.e., *IO_FOR_MF* and *IO_FOR_IA*). We also find that foreign hedge fund investors (*IO_FOR_HF*) who are considered "natural arbitragers" by Bolton and Kacperczyk (2021) do not have a significant effect on carbon emissions, which is reasonable because natural arbitragers are more likely to trade on quantitative signals.

$$HP\ Index = -0.737 \times Size + 0.043 \times Size^2 - 0.040 \times Age, \quad (5)$$

where *Size* is the natural logarithm of total assets in U.S. dollars (billions) and *Age* is the number of years since the initial public offering (IPO) year.[12] To test whether financial constraints weaken the effect of foreign institutions on carbon emission reduction, we sort firms into two groups according to the HP index for each country-year. We re-run our baseline regression specified in Equation (1) for the high and low HP firms. As shown in Columns (3) and (4) of Table 6, the effect of foreign institutions on carbon emissions is indeed stronger among firms that are not financially constrained, and the difference between the two groups is statistically significant.[13]

[Insert Table 6 about here]

5.3. Big-Three vs. Non-Big-Three Foreign Institutions

Azar, Duro, Kadach, and Ormazabal (2021) study the role of the Big-Three institutional investors (i.e., BlackRock, Vanguard, and State Street) in reducing carbon emissions. They document that the Big Three actively engage with firms on environmental issues and facilitate carbon emission reduction. One concern is that our results merely capture the effect of the Big Three on carbon emissions, given these institutions' substantial global investments and impacts. To address this concern, we first decompose foreign institutional ownership (*IO_FOR*) into foreign Big-Three institutional ownership (*IO_FOR_BIG3*) and foreign non-Big-Three institutional ownership (*IO_FOR_NONBIG3*). Note that on average, the non-Big-Three foreign institutional ownership is 7 times of Big-Three foreign institutional ownership. Thus, it is meaningful and important to explore the impacts of other foreign institutions rather than just those of Big-Three investors. We then test the

[12] Following Bartram, Hou, and Kim (2022), total assets are bound below $4.5 billion and age is bound below 37 years.

[13] Our results hold when we instead measure financial constraints using the Whited and Wu (2006) index.

effects of Big-Three and non-Big-Three foreign institutions on carbon emissions and report the results in Table 7.

[Insert Table 7 about here]

As Table 7 shows, *IO_FOR_BIG3* has a negative impact on carbon emissions, which is consistent with the findings of Azar, Duro, Kadach, and Ormazabal (2021). However, the coefficient of *IO_FOR_NONBIG3* is significantly negative, indicating that the effects of foreign institutions on carbon emissions are not concentrated on Big-Three institutions, but driven by a broader group of foreign institutions.

6. Underlying Mechanisms

We now consider the real impacts of foreign institutions on corporate policies and activities that reduce carbon emissions. Specifically, we examine three potential channels through which foreign institutions may actively engage with investee firms: green innovations, carbon-linked managerial compensation, and environmental and social-related proposals.[14]

6.1. Green innovations

Technological advances are potent tools that firms use to mitigate and adapt to climate issues (Carrion-Flores and Innes (2010) and Amore and Bennedsen (2016)). Foreign institutions are documented to boost corporate innovation because of knowledge spillover and tolerance of failure. It is plausible that foreign institutions promote corporate green innovation to achieve their carbon emission reduction goals.

[14] In unreported results, we find evidence that foreign institutions increase the usage of renewable energy and the amount of environmental expenditure using data from Refinitiv ESG. A concern regarding these results is limited data availability.

To test this possibility, we first use the dummy of green patent applications to indicate a firm's efforts for green innovation. Then we use the number and value of granted green patents to measure the outcomes (both quantity and quality) of green innovation.We obtain patent data from Orbis Intellectual Property, and we identify green patents according to the green International Patent Classification codes of the World Intellectual Property Organization. [15] We first create the dummy for green patent applications each year, denoted by *GP_DUM*. To measure the quantity and quality of a firm's green innovation applied in a year, we sum the number and value (measured in U.S. dollars) of its granted green patents.[16] To account for the possible trend in an industry, we scale the measures with an industry's aggregate number and value (measured in U.S. dollars) in each country-year. We examine the effect of foreign institutions on corporate green innovations in Panel A of Table 8. The coefficients of *IO_FOR* are all significantly positive. The results indicate that higher foreign institutional ownership is associated with more green innovations and that these patents are of higher value. These findings provide evidence that foreign institutional investors facilitate carbon emission reduction by promoting green innovation.

[Insert Table 8 about here]

6.2. Carbon-linked managerial compensation

A recent development of corporate governance is linking executive compensation to social and environmental performance (e.g., CO_2 emission targets), according to Flammer, Hong,

[15] The World Intellectual Property Organization assigns green IPC codes based on the United Nations Framework and categorizes green patents into the following seven classes: alternative energy production, transportation, energy conservation, waste management, agriculture/forestry, administrative regulatory or design aspects, and nuclear power generation.
https://www.wipo.int/classifications/ipc/en/green_inventory.

[16] Orbis Intellectual Property database provides the range of patent value (i.e., the min and max value) using the automated patent valuation method. Specifically, it combines the information of patent raw data, business data, and patent transactions to value a patent. We use the average of the latest available range as our measure for the patent value.

and Minor (2019). One way that foreign institutions could effectively incentivize firms to reduce carbon emissions is to link managerial compensation to carbon emission levels. We investigate this channel by studying the effect of foreign institutional ownership on the sensitivity of managerial compensation growth to carbon emission levels.

We obtain executive compensation data from BoardEx and measure the compensation growth of the firms' CEOs, denoted by $SALARY\_GROWTH$.[17] We then regress $SALARY\_GROWTH$ on the interaction of IO_FOR and the carbon emission level, *Ln(SCOPE1/REVENUE)*. Panel B of Table 8 reports the results. We find a significantly negative coefficient for the interaction term, indicating that compensation growth is lower for firms with high carbon emissions, conditional on the presence of foreign institutions.

6.3. Environmental and social-related proposals

Finally, we posit that foreign institutional investors initiate and support emission reduction proposals. Following Flammer (2015) and Cao, Liang, and Zhan (2019), we obtain voting proposals from the ISS Voting Analytics database.[18] Specifically, we use shareholder-sponsored proposals that focus on environmental and social issues (ES proposals) and are related to greenhouse gas emissions (GHG proposals).[19] We count the numbers of ES and GHG proposals and scale them by the number of proposals for a firm in the same year to avoid the potential effect of foreign institutions on general corporate proposals. We further create dummies for the presence of ES and GHG proposals. The variable ES_DUM (GHG_DUM) is a dummy equal to one if a firm has one or more ES (GHG) proposals within the year and zero otherwise.

[17] We focus on executive CEOs in BoardEx.

[18] ISS (formerly RiskMetrics) Voting Analytics covers both institutions filling for U.S. Securities and Exchange Commission (SEC) forms and global institutions outside SEC U.S. disclosures.

[19] Proposals related to GHG emissions have an ISSagendaItemID code of S0743.

As demonstrated in Panel C of Table 8, foreign institutions have significantly positive effects on the ES and GHG proposal proportions. Such effects are consistent with our hypothesis that foreign institutions reduce corporate carbon emissions through shareholder proposals.

7. Conclusion

Using a comprehensive sample of firms worldwide, we provide empirical evidence that foreign institutional investors significantly reduce corporate carbon emissions. We establish causality using three natural experiments. First, firms that are included in the the MSCI All Country World Index (ACWI), which exogenously increases foreign institutional ownership, reduce carbon emissions significantly more than the matched control firms. Second, the effect of foreign institutions on carbon emissions is attenuated when these institutions are exogenously distracted. Third, the relation is enhanced after the adoption of the Paris Agreement, which has increased attention to global warming and carbon emissions.

Moreover, we identify motives for foreign institutions to reduce corporate carbon emissions. Specifically, foreign institutions from countries with higher awareness of climate risks, foreign institutions that are long-term oriented, and independent foreign institutions are the main drivers of the reduced carbon emission levels. We also find that firms with foreign sales and lower financial constraints are the primary responders to foreign institutional investors regarding carbon emission reduction. Going a step further, we investigate the real impacts of foreign institutions on corporate policies that could reduce the carbon emission levels of a firm. First, foreign institutional ownership positively impacts the quantity and quality of green patents, which are technological advances to reduce carbon emissions. Second, foreign institutions incentivize managers to reduce carbon emissions by linking managerial compensation with corporate carbon performances.

Last, firms held by more foreign institutions make and support more environmental- and social-related proposals.

Our study has several practical implications. First, we show that foreign institutions are effective private monitors to reduce corporate carbon emission and help firms to manage climate change risks. As countries differ in carbon regulations, our paper sheds light on one potential external solutions for reducing carbon emissions. Second, our findings demonstrate that the awareness of climate change and technological advances travel with foreign institutions across borders. Local governments could synergize with these foreign institutions and jointly manage both local and global climate risks. Last, firms with exposure to global markets may leverage our findings. By collorating with foreign institutions and generating green innovations, they would gain competitiveness in both product and capital markets.

While our paper points out several channels through which foreign institutions reduce corporate carbon emissions, there is still space for future research. For example, it is important to explore the distinct types of environmentally-friendly technologies (see Gans (2012)), if we would like to fully understand the role of foreign institutions in green innovations. Moreover, it is interesting to analyze the shareholder proposals to explore how foreign institutions actively engage to reduce carbon emissions.

References

Aggarwal, Reena, Isil Erel, Miguel Ferreira, and Pedro Matos, 2011, Does governance travel around the world? Evidence from institutional investors, *Journal of Financial Economics* 100, 154-181.

Aguilera, Ruth V., Kurt A. Desender, Monica Lopez-Puertas Lamy, and Jun Ho Lee, 2017, The governance impact of a changing investor landscape, *Journal of International Business Studies* 48, 195-221.

Amore, Mario Daniele, and Morten Bennedsen, 2016, Corporate governance and green innovation, *Journal of Environmental Economics and Management* 75, 54-72.

Azar, José, Miguel Duro, Igor Kadach, and Gaizka Ormazabal, 2021, The Big Three and corporate carbon emissions around the world, *Journal of Financial Economics* 142, 674-696.

Bartram, Söhnke M., Kewei Hou, and Sehoon Kim, 2022, Real effects of climate policy: Financial constraints and spillovers, *Journal of Financial Economics* 143, 668-696.

Bena, Jan, Miguel A Ferreira, Pedro Matos, and Pedro Pires, 2017, Are foreign investors locusts? The long-term effects of foreign institutional ownership, *Journal of Financial Economics* 126, 122-146.

Bolton, Patrick, and Marcin Kacperczyk, 2021, Do investors care about carbon risk?, *Journal of Financial Economics* 142, 517-549.

Cao, Jie, Hao Liang, and Xintong Zhan, 2019, Peer effects of corporate social responsibility, *Management Science* 65, 5487–5503.

Carrion-Flores, Carmen E., and Robert Innes, 2010, Environmental innovation and environmental performance, *Journal of Environmental Economics and Management* 59, 27-42.

Chen, Lifang, Minghui Han, Yong Li, William L. Megginson, and Hao Zhang, 2022, Foreign ownership and corporate excess perks, *Journal of International Business Studies* 53, 72-93.

Chen, Tao, Hui Dong, and Chen Lin, 2020, Institutional shareholders and corporate social responsibility, *Journal of Financial Economics* 135, 483-504.

Chen, Xia, Jarrad Harford, and Kai Li, 2007, Monitoring: Which institutions matter?, *Journal of Financial Economics* 86, 279-305.

Cremers, Martijn, Miguel A. Ferreira, Pedro Matos, and Laura Starks, 2016, Indexing and active fund management: International evidence, *Journal of Financial Economics* 120, 539-560.

David, Parthiban, Toru Yoshikawa, Murali D. R. Chari, and Abdul A. Rasheed, 2006, Strategic investments in Japanese corporations: Do foreign portfolio owners foster underinvestment or appropriate investment?, *Strategic Management Journal* 27, 591-600.

Delmas Magali A., and Maria J. Montes-Sancho, 2010, Voluntary agreements to improve environmental quality: Symbolic and substantive cooperation, *Strategic Management Journal* 31, 575-601.

Desender, Kurt A., Ruth V. Aguilera, Mónica Lópezpuertas-Lamy, and Rafel Crespi, 2016, A clash of governance logics: Foreign ownership and board monitoring, *Strategic Management Journal* 37, 349-369.

DesJardine, Mark R., Muhan Zhang, and Wei Shi, 2023, How shareholders impact stakeholder interests: A review and map for future research, *Journal of Management* 49, 400-429.

Douma, Sytse, Rejie George, and Rezaul Kabir, 2006, Foreign and domestic ownership, business groups, and firm performance: Evidence from a large emerging market, *Strategic Management Journal* 27, 637-657.

Döring, Simon, Wolfgang Drobetz, Sadok El Ghoul, Omrane Guedhami, and Henning Schröder, 2023, Foreign institutional investors, legal origin, and corporate greenhouse gas emissions disclosure, *Journal of Business Ethics*, 182, 903-932.

Eesley, Charles, and Michael J. Lenox, 2006, Firm responses to secondary stakeholder action, *Strategic Management Journal* 27, 765-781.

Ferreira, Miguel A., Massimo Massa, and Pedro Matos, 2010, Shareholders at the gate? Institutional investors and cross-border mergers and acquisitions, *The Review of Financial Studies* 23, 601-644.

Ferreira, Miguel A., and Pedro Matos, 2008, The colors of investors' money: The role of institutional investors around the world, *Journal of Financial Economics* 88, 499-533.

Flammer, Caroline, 2015, Does corporate social responsibility lead to superior financial performance? A regression discontinuity approach, *Management Science* 61, 2549-2568.

Flammer, Caroline, Bryan Hong, and Dylan Minor, 2019, Corporate governance and the rise of integrating corporate social responsibility criteria in executive compensation: Effectiveness and implications for firm outcomes, *Strategic Management Journal* 40, 1097–1122

Flammer, Caroline, Michael W. Toffel, and Kala Viswanathan, 2021, Shareholder activism and firms' voluntary disclosure of climate change risks, *Strategic Management Journal* 42, 1850-1879.

Gans, Joshua S., 2012, Innovation and climate change policy, *American Economic Journal: Economic Policy* 4, 125-145.

Hadlock, Charles J., Joshua R. Pierce, 2010, New evidence on measuring financial constraints: Moving beyond the KZ index, *The Review of Financial Studies* 23, 1909-1940.

Ilhan, Emirhan, Philipp Krueger, Zacharias Sautner, and Laura T. Starks, 2023, Climate risk disclosure and institutional investors, *The Review of Financial Studies* forthcoming.

Kacperczyk, Marcin, Savitar Sundaresan, and Tianyu Wang, 2021, Do foreign institutional investors improve price efficiency?, *The Review of Financial Studies* 34, 1317-1367.

Kempf, Elisabeth, Alberto Manconi, and Oliver Spalt, 2017, Distracted shareholders and corporate actions, *The Review of Financial Studies* 30, 1660-1695.

Kim, Eun-Hee, and Thomas P. Lyon, 2015, Greenwash vs. brownwash: Exaggeration and undue modesty in corporate sustainability disclosure, *Organization Science* 26, 705-723.

Koh, Ping-Sheng, and David M. Reeb, 2015, Missing R&D, *Journal of Accounting and Economics* 60, 73-94.

Lel, Ugur, 2019, The role of foreign institutional investors in restraining earnings management activities across countries, *Journal of International Business Studies* 50, 895-922.

Luong, Hoang, Fariborz Moshirian, Lily Nguyen, Xuan Tian, and Bohui Zhang, 2017, How do foreign institutional investors enhance firm innovation?, *Journal of Financial and Quantitative Analysis* 52, 1449-1490.

Marquis, Christopher, Michael W. Toffel, and Yanhua Zhou, 2016, Scrutiny, norms, and selective disclosure: A global study of greenwashing, *Organization Science* 27, 483-504.

Shive, Sophie A., and Margaret M. Forster, 2020, Corporate governance and pollution externalities of public and private firms, *The Review of Financial Studies* 33, 1296-1330.

Singh, Aman, 2010, Executive bonuses and corporate responsibility, *Forbes*, Retrieved 8 March 2023, from https://www.forbes.com/sites/csr/2010/05/20/executive-bonuses-and-corporate-responsibility/?sh=485c75bc650c.

Starks, Laura, Parth Venkat, and Qifei Zhu, 2023, Corporate ESG profiles and investor horizons, Working Paper.

Whited, Toni M., and Guojun Wu, 2006, Financial constraints risk, *The Review of Financial Studies* 19, 531-559.

Xu, Qiping, and Taehyun Kim, 2022, Financial constraints and corporate environmental policies, *The Review of Financial Studies* 35, 576-635.

Table 1. Description Statistics

This table presents the descriptive statistics of the focal firm's emission, ownership, and accounting variables. Panel A reports the firm-year summary statistics of the natural logarithm of Scope 1 carbon intensity (*Ln(SCOPE1/REVENUE)*), disclosure status of the Scope 1 carbon emissions (*SCOPE1_DIS*), foreign institutional ownership (*IO_FOR*), domestic institutional ownership (*IO_DOM*), total institutional ownership (*IO*), and other firm characteristics. The sample period is from 2001 to 2020. Scope 1 carbon intensity is defined as the raw Scope 1 in tons of carbon dioxide (CO_2) provided by Trucost divided by a company's annual consolidated revenues (*REVENUE*) in US dollars (millions). SCOPE1_DIS is equal to one for the firm-year observation if Scope 1 carbon emissions are disclosed by the firm as indicated by Trucost. We use the latest reported values at each year-end in FactSet to calculate a firm's ownership variables. Total institutional ownership (*IO*) is the total market value of a firm's shares held by all the institutions as a percentage of market capitalization. Foreign institutional ownership (*IO_FOR*) is the total market value of a firm's shares held by institutions domiciled in a country other than the one where the focal firm is domiciled as a percentage of market capitalization. Domestic institutional ownership (*IO_DOM*) is the total market value of a firm's shares held by institutions domiciled in the same country where the focal firm is domiciled as a percentage of market capitalization. Other firm characteristics include the natural logarithm of total assets (*Ln(AT)*), leverage ratio (*LEVERAGE*), return on assets ratio (*ROA*), sales growth (*SALES_GROWTH*), the natural logarithm of the market to book ratio (*Ln(MB)*), cash holdings (*CASH*), dividend indicator (*DIVIDEND*), and intensity of R&D expense (*RD_INTENSITY*). The firm's ownership and accounting data are from the previous year. The variables' definitions are provided in the Supplementary Appendix. All the variables are winsorized at a 1% level. Panel B reports the Pearson correlations among all the variables.

Panel A. Descriptive statistics of key variables

2001-2020	Mean	Obs	Std	10-Pctl	Q1	Med	Q3	90-Pctl
Emission Variables								
Ln(SCOPE1/REVENUE)	3.560	75,650	1.948	1.470	2.425	3.168	4.546	6.413
SCOPE1_DIS	0.325	75,650	0.468	0.000	0.000	0.000	1.000	1.000
Ownership Variables								
IO_FOR	0.059	75,650	0.064	0.001	0.009	0.040	0.087	0.146
IO_DOM	0.165	75,650	0.301	0.000	0.000	0.012	0.108	0.808
IO	0.226	75,650	0.320	0.005	0.026	0.077	0.226	0.910
Accounting Variables								
Ln(AT)	7.460	75,650	1.708	5.308	6.237	7.396	8.603	9.747
LEVERAGE	0.219	75,650	0.169	0.002	0.072	0.205	0.333	0.450
ROA	0.109	75,650	0.102	0.029	0.066	0.105	0.154	0.215
SALES_GROWTH	0.082	75,650	0.203	-0.076	-0.005	0.045	0.131	0.276
Ln(MB)	0.758	75,650	0.921	-0.310	0.150	0.693	1.288	1.897
CASH	0.463	75,650	0.215	0.173	0.297	0.462	0.620	0.756
DIVIDEND	0.646	75,650	0.478	0.000	0.000	1.000	1.000	1.000
RD_INTENSITY	0.027	75,650	0.066	0.000	0.000	0.005	0.025	0.068

Panel B. Correlation statistics of key variables

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1)	*Ln(SCOPE1/REVENUE)*	1.000												
(2)	*SCOPE1_DIS*	0.080	1.000											
(3)	*IO_FOR*	-0.138	0.337	1.000										
(4)	*IO_DOM*	-0.097	-0.013	0.165	1.000									
(5)	*IO*	-0.117	0.058	0.370	0.976	1.000								
(6)	*Ln(AT)*	0.164	0.450	0.333	0.128	0.189	1.000							
(7)	*LEVERAGE*	0.221	0.139	0.010	0.049	0.048	0.328	1.000						
(8)	*ROA*	-0.018	0.095	0.147	0.036	0.064	0.093	-0.091	1.000					
(9)	*SALES_GROWTH*	-0.064	-0.094	-0.029	0.025	0.017	-0.099	-0.071	0.186	1.000				
(10)	*Ln(MB)*	-0.189	-0.036	0.131	0.192	0.207	-0.151	-0.047	0.260	0.211	1.000			
(11)	*CASH*	-0.311	-0.222	-0.113	-0.084	-0.105	-0.378	-0.435	-0.099	0.147	0.141	1.000		
(12)	*DIVIDEND*	0.014	0.090	0.047	-0.069	-0.056	0.159	-0.071	0.215	-0.017	-0.066	-	1.000	
(13)	*RD_INTENSITY*	-0.158	-0.086	-0.004	0.136	0.127	-0.249	-0.153	-0.318	0.007	0.170	0.238	-0.162	1.000

Table 2. Foreign Institutional Ownership and Corporate Carbon Intensity: Regression Evidence

This table presents an analysis of the relationship between foreign institutional ownership and the Scope 1 carbon intensity. The dependent variable is the natural logarithm of Scope 1 carbon intensity (*Ln(SCOPE1/REVENUE)*). The independent variable is foreign institutional ownership (*IO_FOR*). Control variables include domestic institutional ownership (*IO_DOM*), the natural logarithm of total assets (*Ln(AT)*), leverage ratio (*LEVERAGE*), return on assets ratio (*ROA*), sales growth (*SALES_GROWTH*), the natural logarithm of the market to book ratio (*Ln(MB)*), cash holdings (*CASH*), dividend indicator (*DIVIDEND*), and intensity of R&D expense (*RD_INTENSITY*), and the disclosure status of the Scope 1 carbon emissions (*SCOPE1_DIS*). The variables' definitions are provided in the Supplementary Appendix. All regressions control for country-year fixed effects and firm fixed effects. The t-statistics in the brackets are calculated from robust clustered standard errors by firm. ***, **, and * denote significance at the 0.01, 0.05, and 0.10 levels based on a two-sided test.

	Ln(SCOPE1/REVENUE)		
	(1)	(2)	(3)
IO_FOR	**-0.808*** **	**-0.590*** **	**-0.534*** **
	(-5.24)	**(-3.70)**	**(-3.41)**
IO_DOM		0.155	0.125
		(1.50)	(1.23)
Ln(AT)		-0.060***	-0.050**
		(-2.72)	(-2.30)
LEVERAGE		0.119*	0.125**
		(1.92)	(2.05)
ROA		-0.008	0.023
		(-0.09)	(0.27)
SALES_GROWTH		0.026	0.024
		(1.40)	(1.32)
Ln(MB)		-0.041***	-0.040***
		(-3.56)	(-3.44)
CASH		-0.082	-0.084
		(-1.16)	(-1.19)
DIVIDEND		-0.027**	-0.025*
		(-2.02)	(-1.85)
RD_INTENSITY		-0.012	0.000
		(-0.10)	(0.00)
SCOPE1_DIS			-0.292***
			(-11.10)
Country × Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	74,525	74,525	74,525
Adjusted R^2	0.91	0.91	0.92

Table 3. Identification from MSCI Shock

This table presents an analysis of the causal relationship between foreign institutional ownership and the Scope 1 carbon intensity based on MSCI shock. The treatment group includes 661 firms added to the MSCI ACWI index once during the sample period. The control group includes one firm that best matches each treated firm using the propensity scores matching method. Panel A compares the average values of the matching variables in the treatment and control groups one year before the index addition (time $t = -1$). Panel B shows the regression results for the DID model with a matching estimator. We keep the window of three years before and after the MSCI shock (excluding the index addition year) for the regression analysis. Dependent variables in Panels B include foreign institutional ownership (*IO_FOR*), domestic institutional ownership (*IO_DOM*), and the natural logarithm of Scope 1 carbon intensity (*Ln(SCOPE1/REVENUE)*) in year t. *Pre_2* is equal to one for the second year before the treated firm is added to the MSCI ACWI index (i.e., time $t = -2$) and zero otherwise. *Pre_1* is equal to one for the first year before the treated firm is added to the MSCI ACWI index (i.e., time $t = -1$) and zero otherwise. *AFTER* is equal to one for years after the treated firm is added to the MSCI ACWI index and zero otherwise. *TREAT* is equal to one if a firm is in the treatment group and zero otherwise. Columns (1), (2), and (3) show the results for *IO_FOR*, *IO_DOM*, and *Ln(SCOPE1/REVENUE)*, respectively. Control variables (omitted for brevity) contain all the matching accounting variables, including the natural logarithm of total assets (*Ln(AT)*), leverage ratio (*LEVERAGE*), return on assets ratio (*ROA*), sales growth (*SALES_GROWTH*), cash holdings (*CASH*), dividend indicator (*DIVIDEND*), and intensity of R&D expense (*RD_INTENSITY*) in the previous year. The variables' definitions are provided in the Supplementary Appendix. All regressions control for country-year fixed effects and firm fixed effects. The t-statistics in the brackets are calculated from robust clustered standard errors by firm. ***, **, and * denote significance at the 0.01, 0.05, and 0.10 levels based on a two-sided test.

Panel A. Pre-treatment comparison (time $t = -1$)

	Treatment Group	Control Group	Difference	t-test (p-value)
IO_FOR	0.049	0.048	0.001	0.740
IO	0.298	0.307	-0.009	0.676
Ln(AT)	7.792	7.780	0.012	0.871
LEVERAGE	0.210	0.215	-0.005	0.620
ROA	0.120	0.121	-0.001	0.894
SALES_GROWTH	0.144	0.132	0.012	0.337
CASH	0.483	0.488	-0.005	0.699
DIVIDEND	0.657	0.675	-0.018	0.478
RD_INTENSITY	0.030	0.027	0.003	0.301

Panel B. Ownership and carbon intensity

	IO_FOR	*IO_DOM*	*Ln(SCOPE1/REVENUE)*
	(1)	(2)	(3)
TREAT × *Pre_2*	0.002	0.005	-0.006
	(0.90)	(1.08)	(-0.19)
TREAT × *Pre_1*	0.003	0.002	-0.010
	(1.16)	(0.36)	(-0.29)
TREAT × *AFTER*	**0.015*****	-0.002	**-0.114****
	(5.22)	(-0.40)	**(-2.08)**
Pre_2	-0.000	0.000	0.026
	(-0.07)	(0.15)	(0.75)
Pre_1	-0.002	0.005	0.054
	(-0.99)	(1.32)	(0.94)
AFTER	0.000	-0.001	0.177
	(0.01)	(-0.22)	(1.46)
Controls	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	5,258	5,258	5,119
Adjusted R^2	0.86	0.98	0.95

Table 4. Identification from Attention Shock and Paris Agreement

This table presents an analysis of the causal relationship between foreign institutional ownership and the Scope 1 carbon intensity based on attention shock and PA shock. The dependent variable is the natural logarithm of Scope 1 carbon intensity (*Ln(SCOPE1/REVENUE)*). Panel A reports the results for attention shock using foreign institutional investors' distraction degree (*DISTRACTION*) in the previous year. Panel B reports the results for PA shock in December 2015. We keep the window of three years before and after the Paris Agreement (including the PA year) for Panel B (2013-2018). *PA_POST* is equal to one after the PA year (2016-2018) and zero before the PA year (2013-2015). Control variables (omitted for brevity) are the same as those used in Column (3) of Table 2. The variables' definitions are provided in the Supplementary Appendix. All regressions control for country-year fixed effects and firm fixed effects. The t-statistics in the brackets are calculated from robust clustered standard errors by firm. ***, **, and * denote significance at the 0.01, 0.05, and 0.10 levels based on a two-sided test.

Panel A. Attention shock

	Ln(SCOPE1/REVENUE)	
	(1)	(2)
DISTRACTION × *IO_FOR*	**14.578*****	**13.719*****
	(3.25)	**(3.14)**
DISTRACTION	-1.297***	-1.304***
	(-3.93)	(-4.01)
IO_FOR	-1.079***	-0.750***
	(-5.97)	(-4.10)
Controls	No	Yes
Country × Year FE	Yes	Yes
Firm FE	Yes	Yes
Observations	68,645	68,645
Adjusted R^2	0.92	0.92

Panel B. PA shock

	Ln(SCOPE1/REVENUE)	
	(1)	(2)
PA_POST × *IO_FOR*	**-0.318****	**-0.289****
	(-2.19)	**(-2.03)**
IO_FOR	-0.099	0.088
	(-0.54)	(0.48)
Controls	No	Yes
Country × Year FE	Yes	Yes
Firm FE	Yes	Yes
Observations	35,134	35,134
Adjusted R^2	0.95	0.95

Table 5. Foreign Institutional Investor Heterogeneity

This table presents an analysis of the relationship between the disaggregated level of foreign institutional ownership and the Scope 1 carbon intensity. The dependent variable is the natural logarithm of Scope 1 carbon intensity (*Ln(SCOPE1/REVENUE)*). Independent variables include the decomposed foreign institutional ownership measure based on different classifications. Column (1) decomposes foreign institutional investors into foreign investors with a high climate score (*IO_FOR_HIGHSCORE*) if they are domiciled in a country with a top 10 percentile climate score (measured by readiness) each fiscal year and foreign investors with a low climate score (*IO_FOR_LOWSCORE*) otherwise. Column (2) decomposes foreign institutional investors into long-term investors with "Very Low" or Low" turnover levels (*IO_FOR_LT*) and short-term investors with other turnover levels (*IO_FOR_ST*). Column (3) decomposes foreign institutional investors into independent investors (*IO_FOR_INDEP*) if they are classified as a mutual fund (MF), hedge fund (HF), or investment advisor (IA), and gray investors (*IO_FOR_GRAY*) otherwise. Control variables (omitted for brevity) are the same as those used in Column (3) of Table 2. The variables' definitions are provided in the Supplementary Appendix. All regressions control for country-year fixed effects and firm fixed effects. The t-statistics in the brackets are calculated from robust clustered standard errors by firm. ***, **, and * denote significance at the 0.01, 0.05, and 0.10 levels based on a two-sided test.

	Ln(SCOPE1/REVENUE)		
	(1)	(2)	(3)
IO_FOR_HIGHSCORE	**-0.521*** **		
	(-3.09)		
IO_FOR_LOWSCORE	-0.729		
	(-1.45)		
IO_FOR_LT		**-0.554*** **	
		(-2.99)	
IO_FOR_ST		-0.510	
		(-1.50)	
IO_FOR_INDEP			**-0.580*** **
			(-3.36)
IO_FOR_GRAY			-0.329
			(-0.78)
Controls	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	74,525	74,525	74,525
Adjusted R^2	0.92	0.92	0.92

Table 6. The Impact of Foreign Sales and Financial Constraints

This table presents an analysis of the relationship between foreign institutional ownership and the Scope 1 carbon intensity using different groups of sample firms. The dependent variable is the natural logarithm of Scope 1 carbon intensity (*Ln(SCOPE1/REVENUE)*). The independent variable is foreign institutional ownership (*IO_FOR*). In Columns (1) and (2), we sort firms into those with positive and zero foreign sales ratios based on the value in the previous fiscal year, and we report the results respectively. Foreign Sales Ratio (*FORSALE*) is defined as the percentage of a firm's foreign sales in its total sales (i.e., Foreign Sales/Total Sales). In Columns (3) and (4), we first sort firms in each country and year into high and low foreign institutional ownership based on the median, and next within each group we sort sample into high and low financial constraints, also based on the median split. Following Bartram, Hou, and Kim (2022), we measure financial constraints using the Hadlock-Pierce Index (HP Index, Hadlock and Pierce (2010)). Observed differences are the coefficient differences of *IO_FOR* between the two groups. *p*-values are estimated through 1000 bootstrap draws. Control variables (omitted for brevity) are the same as those used in Column (3) of Table 2. The variables' definitions are provided in the Supplementary Appendix. All regressions control for country-year fixed effects and firm fixed effects. The t-statistics in the brackets are calculated from robust clustered standard errors by firm. ***, **, and * denote significance at the 0.01, 0.05, and 0.10 levels based on a two-sided test.

	Ln(SCOPE1/REVENUE)			
	With FORSALE	Without FORSALE(=0)	Low Financial Constraints	High Financial Constraints
	(1)	(2)	(3)	(4)
IO_FOR	**-0.466****	-0.080	**-0.761*****	**-0.357***
	(-2.42)	(-0.28)	**(-3.22)**	**(-1.86)**
Controls	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	47,259	19,190	36,855	36,106
Adjusted R^2	0.91	0.95	0.93	0.92
Observed Differences	**-0.386***		**-0.405*****	
p-values	**0.092**		**0.006**	

Table 7. Big-Three vs. Non-Big-Three Foreign Institutions

This table presents the impact of Big-Three investors on the relationship between foreign institutional ownership and the Scope 1 carbon intensity. The dependent variable is the natural logarithm of Scope 1 carbon intensity (*Ln(SCOPE1/REVENUE)*). Independent variables include the decomposed foreign institutional ownership measure, *IO_FOR_BIG3*, and *IO_FOR_NONBIG3*, based on whether foreign institutional investors are Big Three (i.e., BlackRock, Vanguard, and State Street) related or not. Control variables (omitted for brevity) are the same as those used in Column (3) of Table 2. The variables' definitions are provided in the Supplementary Appendix. All regressions control for country-year fixed effects and firm fixed effects. The t-statistics in the brackets are calculated from robust clustered standard errors by firm. ***, **, and * denote significance at the 0.01, 0.05, and 0.10 levels based on a two-sided test.

	Ln(SCOPE1/REVENUE)	
	(1)	(2)
IO_FOR_NONBIG3	**-0.681*** **	**-0.457*** **
	(-4.29)	**(-2.85)**
IO_FOR_BIG3	-2.526***	-1.714**
	(-3.25)	(-2.21)
Controls	No	Yes
Country × Year FE	Yes	Yes
Firm FE	Yes	Yes
Observations	74,525	74,525
Adjusted R^2	0.91	0.92

Table 8. Active Engagement

This table presents the analysis of foreign institutional investors' active engagement to reduce corporate carbon intensity. Dependent variables include three engagement measures. Panels A, B, and C report foreign institutional investors' impacts on the green innovation, carbon-linked compensation, and shareholder-sponsored green proposals. In Panel A, the dependent variable of Columns (1) – (2) is a dummy variable which is equal to one for firms with any green patent (GP, classified using the IPC code) application for the year, and zero otherwise. The dependent variable of Columns (3) – (4) is the number of granted green patents (GGP) scaled by the total number of granted green patents in each FF48 industry of each country-year. The dependent variable of Columns (5) – (6) is the US dollar value of granted green patents scaled by the total US dollar value of granted green patents in each FF48 industry of each country-year. In Panel B, we interact foreign institutional ownership (*IO_FOR*) with *Ln(SCOPE1_REVENUE)*. *SALARY_GROWTH* is the annual growth rate of the average salary for a firm's executive CEOs each fiscal year. In Panel C, the environmental and social related shareholder proposal is defined as an "environmental, social, or environmental & social" proposal sponsored by the shareholder. The GHG emissions related shareholder proposal is defined as a proposal related to "GHG Emissions" sponsored by the shareholder. *ES_N* is the number of environmental- and social related shareholder proposals each year. *GHG_N* is the number of GHG emissions related shareholder proposals each year. *PROPOSAL_N* is the number of shareholder proposals for the focal firm each year. *ES_DUM* is equal to one for the focal firm submitting any environmental and social related shareholder proposal each year and zero otherwise. *GHG_DUM* is equal to one for the focal firm submitting any GHG emissions related shareholder proposal each year and zero otherwise. Dependent variables in Columns (1) and (3) are the number of relevant proposals scaled by the total number of proposals each year. Dependent variables in Columns (2) and (4) are the indicators for the relevant proposals. Control variables (omitted for brevity) are the same as those used in Column (3) of Table 2. The variables' definitions are provided in the Supplementary Appendix. All regressions control for country-year fixed effects and firm fixed effects. The t-statistics in the brackets are calculated from robust clustered standard errors by firm. ***, **, and * denote significance at the 0.01, 0.05, and 0.10 levels based on a two-sided test.

Panel A. Green innovation

	GP_DUM		# of GGP / Total # of industry GGP		$ value of GGP / Total $ value of industry GGP	
	(1)	(2)	(3)	(4)	(5)	(6)
IO_FOR	**0.391*****	**0.253*****	**0.115****	**0.084***	**0.136*****	**0.108****
	(4.45)	**(2.84)**	**(2.36)**	**(1.68)**	**(2.59)**	**(2.00)**
Controls	No	Yes	No	Yes	No	Yes
Country×Year	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	37,296	37,296	30,124	30,124	29,789	29,789
Adjusted R^2	0.53	0.53	0.76	0.76	0.70	0.70

Panel B. Carbon-linked compensation

	SALARY_GROWTH	
	(1)	(2)
IO_FOR	0.281	0.361**
	(1.59)	(1.98)
Ln(SCOPE1_REVENUE)	0.012	0.011
	(1.38)	(1.29)
Ln(SCOPE1_REVENUE) × *IO_FOR*	**-0.100****	**-0.112****
	(-2.13)	**(-2.43)**
Controls	No	Yes
Country × Year FE	Yes	Yes
Firm FE	Yes	Yes
Observations	8,830	8,830
Adjusted R^2	0.01	0.01

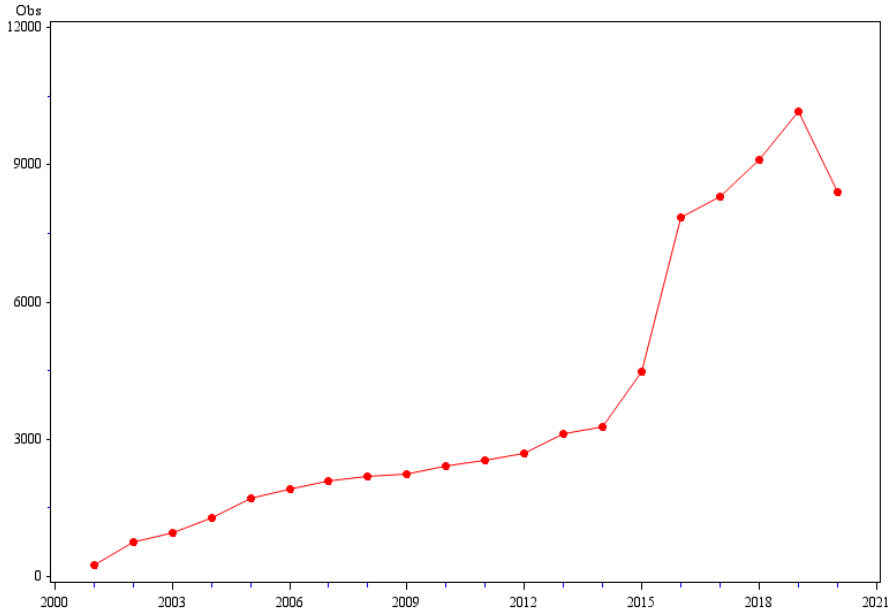
Panel C. Shareholder sponsored green proposal

	Environmental & Social Related Proposal		GHG Emissions Related Proposal	
	$\frac{ES\_N}{PROPOSAL\_N}$	*ES_DUM*	$\frac{GHG\_N}{PROPOSAL\_N}$	*GHG_DUM*
	(1)	(2)	(3)	(4)
IO_FOR	**0.873****	**0.819****	**0.188***	0.216
	(2.44)	**(1.97)**	**(1.68)**	(1.32)
Controls	Yes	Yes	Yes	Yes
Country × Year FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	3,001	3,001	3,001	3,001
Adjusted R^2	0.43	0.41	0.37	0.29

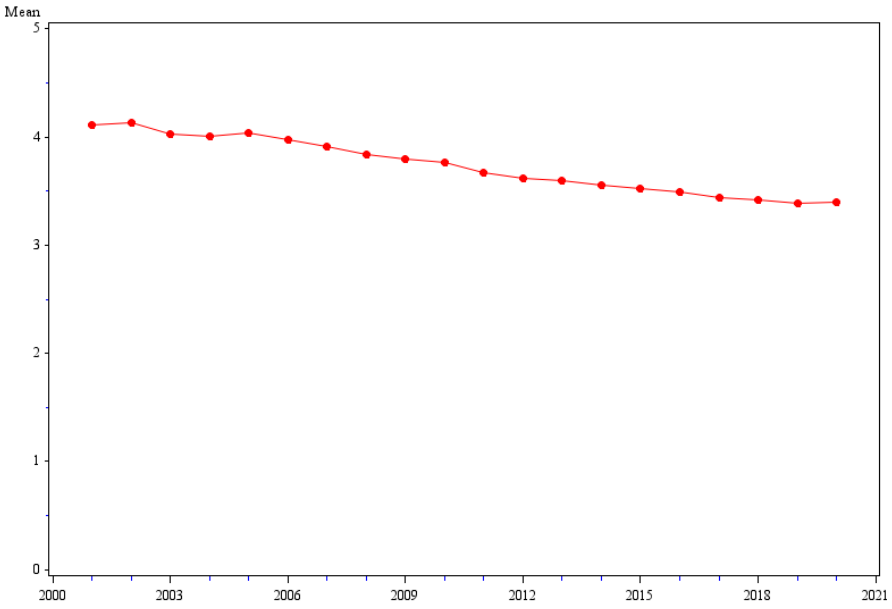
Figure 1. The Time-Series Distribution of Cross-Sectional Statistics

This figure plots the time series of cross-sectional statistics of carbon emission and institutional ownership measures from 2001 to 2020. In specific, Panel A reports the number of observations. Panels B – D report the means of the natural logarithm of Scope 1 carbon intensity (*Ln(SCOPE1/REVENUE)*), foreign institutional ownership (*IO_FOR*), and domestic institutional ownership (*IO_DOM*).

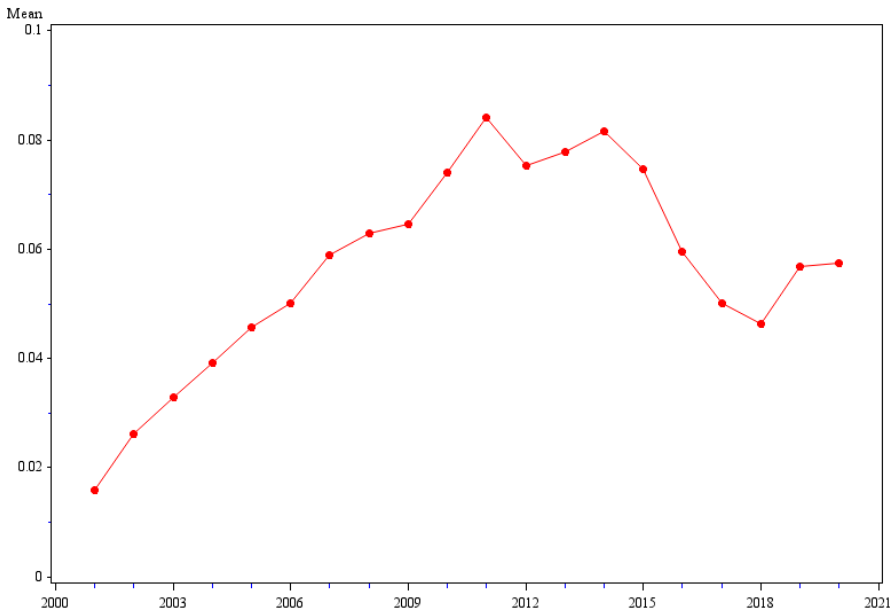
Panel A: The number of observations



Panel B: The cross-sectional average of emission measures (*Ln (SCOPE1/REVENUE)*)



Panel C: The cross-sectional average of foreign institutional ownership



Panel D: The cross-sectional average of domestic institutional ownership

Supplementary Appendix for

Foreign Institutional Investors and Corporate Carbon Emissions

Variable Definitions

Carbon Emission measures We use Trucost Database to construct all the emission measures. Trucost provides annual emission data using the disclosed value and the estimated value. Scope 1 emissions, measured in tons of carbon dioxide (CO_2), are the direct emissions during the manufacturing process. Scope 2 emissions, measured in tons of carbon dioxide (CO_2), are the indirect emissions from the consumption of electricity or steam. Scope 3 emissions, measured in tons of carbon dioxide (CO_2), are the emissions that occur in the value chain. We focus on Scope 1 carbon emissions because those emissions are directly controlled by the firm and not subject to much data validity concern.	
Ln(SCOPE1/REVENUE)	*Ln(SCOPE1/REVENUE)* is the natural logarithm of Scope 1 carbon intensity provided by Trucost. Scope 1 carbon intensity is the raw Scope 1 carbon emissions (SCOPE1) scaled by revenues (REVENUE) in US dollars (millions).
SCOPE1_DIS	*SCOPE1_DIS* is a dummy variable that indicates whether the firm discloses Scope 1 carbon emissions. Based on the classification in Trucost, it is equal to one if Scope 1 carbon emissions are disclosed by the firm each fiscal year.
Institutional Ownership measures We use the last reported value each year in the equity package of FactSet to calculate all the institutional ownership measures. FactSet maintains separate datasets for 13F institutions and international funds. To get complete institutional holding data, we sum up the fund's positions at the institutional level and combine it with 13F institutions. For the duplicated records, we keep the one with the largest ownership data. And a firm's shares to be considered in the calculation of both holdings and market capitalizations are required to satisfy two conditions: 1. They are in the classes of ordinary or preferred shares; 2. They are listed in the same country where the focal firm is domiciled.	
IO_FOR	Foreign institutional ownership (*IO_FOR*) is the total market value of a firm's shares held by institutions domiciled in a country other than the one where the focal firm is domiciled as a percentage of market capitalization.
IO_DOM	Domestic institutional ownership (*IO_DOM*) is the total market value of a firm's shares held by institutions domiciled in the same country where the focal firm is domiciled as a percentage of market capitalization.

IO	Total institutional ownership (*IO*) is the total market value of a firm's shares held by all the institutions as a percentage of market capitalization.
IO_FOR_BIG3	Foreign Big-Three institutional ownership (*IO_FOR_BIG3*) is the total market value of a firm's shares held by institutions classified as "Big Three (i.e., BlackRock, Vanguard, or State Street)" related institutions as a percentage of market capitalization.
IO_FOR_NONBIG3	Foreign non-Big-Three institutional ownership (*IO_FOR_NONBIG3*) is the total market value of a firm's shares held by institutions NOT classified as "Big Three (i.e., BlackRock, Vanguard, or State Street)" related institutions as a percentage of market capitalization.
IO_FOR_GRAY	Gray foreign institutional ownership (*IO_FOR_GRAY*) is the total market value of a firm's shares held by foreign institutions which are NOT classified as a mutual fund (MF), hedge fund (HF), or investment advisor (IA) as a percentage of market capitalization.
IO_FOR_INDEP	Independent foreign institutional ownership (*IO_FOR_INDEP*) is the total market value of a firm's shares held by foreign institutions that are classified as a mutual fund (MF), hedge fund (HF), or investment advisor (IA) as a percentage of market capitalization.
IO_FOR_LT	Long-term foreign institutional ownership (*IO_FOR_LT*) is the total market value of a firm's shares held by foreign institutions with a "Low" or "Very Low" turnover label as a percentage of market capitalization.
IO_FOR_ST	Short-term foreign institutional ownership (*IO_FOR_ST*) is the total market value of a firm's shares held by foreign institutions without a "Low" or "Very Low" turnover label as a percentage of market capitalization.
IO_FOR_HIGHSCORE	*IO_FOR_HIGHSCORE* is the total market value of a firm's shares held by foreign institutions which are domiciled in a country with a top 10 percentile climate score (measured by readiness score) each fiscal year as a percentage of market capitalization.
IO_FOR_LOWSCORE	*IO_FOR_HIGHSCORE* is the total market value of a firm's shares held by foreign institutions which are domiciled in a country without a top 10 percentile climate score (measured by readiness score) each fiscal year as a percentage of market capitalization.

Firm Characteristics	
We use Worldscope to construct the foreign sales ratio and Compustat to construct firms' other accounting characteristics. To get complete international accounting data, we combine Compustat North America and Compustat Global datasets. We also use the I/B/E/S database for exchange rates and the CRSP database for North American security prices.	
Ln(AT)	*Ln(AT)* is the natural logarithm of total assets in US dollars (millions).
LEVERAGE	*LEVERAGE* is long-term debt plus current liabilities divided by total assets in US dollars (millions).
ROA	Return on assets (*ROA*) is the ratio of operating income before depreciation deflated by total assets in US dollars (millions).
SALES_GROWTH	*SALES_GROWTH* is the change in sales divided by total assets in the previous year.
Ln(MB)	*Ln(MB)* is the natural logarithm of the market value of equity divided by the book value of equity. The market value of equity is calculated as price times shares outstanding.
CASH	Cash holdings (*CASH*) is the ratio of current assets over total assets.
DIVIDEND	*DIVIDEND* is a dummy variable equal to one for the firm with a nonzero dividend record and zero otherwise.
RD_INTENSITY	*RD_INTENSITY* is the R&D expense scaled by total assets. The missing R&D expense data is replaced by the country-industry average each year. We then replace the R&D expense with zero if it is still missing.
FORSALE	Foreign sales ratio (*FORSALE*) is the ratio of foreign sales over the total sales.

Table A1. Sample Distribution

This table presents the descriptive statistics of the focal firm's emission and ownership variables by financial market or industry using the 75,650 firm-year observations with non-missing baseline emission, ownership, and accounting data reported in Table 1. Panels A and B report the firm-year summary statistics by domiciled financial market and Fama-French 48 industry, respectively. We only report the top 10 financial markets and industries containing the most firm-year observations. In specific, Panels A and B report the total firm-year number of observations (#Obs), the ratio of observations (%Obs), and the mean of the natural logarithm of scaled Scope 1 carbon emissions (Ln(SCOPE1/REVENUE)), total institutional ownership (IO), domestic institutional ownership (IO_DOM), and foreign institutional ownership (IO_FOR) from 2001 to 2020. We report emission data in the current year and ownership data in the previous year. The variables' definitions are provided in the Supplementary Appendix.

Panel A. Sample distribution by financial market (Top 10)

	Total Obs		Mean			
	#Obs	% Obs	*Ln(SCOPE1/ REVENUE)*	*IO_FOR*	*IO_DOM*	*IO*
United States	13,539	18%	3.214	0.075	0.773	0.849
Japan	12,777	17%	3.353	0.046	0.004	0.050
China	7,505	10%	3.871	0.006	0.050	0.056
South Korea	4,953	7%	3.531	0.038	0.001	0.039
Taiwan	4,599	6%	3.573	0.050	0.010	0.060
United Kingdom	3,792	5%	2.964	0.077	0.107	0.184
India	3,047	4%	4.168	0.045	0.052	0.097
Australia	2,309	3%	3.735	0.067	0.014	0.081
Hong Kong	2,077	3%	3.719	0.059	0.015	0.073
France	1,976	3%	2.919	0.088	0.044	0.132

Panel B. Sample distribution by industry (Top 10)

	Total Obs		Mean			
	#Obs	% Obs	*Ln(SCOPE1/ REVENUE)*	*IO_FOR*	*IO_DOM*	*IO*
Business Services	6,447	9%	1.847	0.068	0.222	0.292
Electronic Equipment	4,499	6%	3.302	0.054	0.143	0.198
Retail	4,157	5%	2.480	0.068	0.197	0.265
Drugs	3,895	5%	2.886	0.057	0.210	0.267
Machinery	3,608	5%	2.792	0.062	0.176	0.238
Chemicals	3,578	5%	5.161	0.051	0.108	0.161
Transportation	3,383	4%	5.001	0.053	0.123	0.178
Utilities	3,109	4%	6.344	0.059	0.189	0.248
Wholesale	2,764	4%	3.186	0.054	0.180	0.234
Food	2,726	4%	4.100	0.052	0.108	0.160