Does Foreign Institutional Capital Promote Green Growth for Emerging Market Firms?*

Sophia Chiyoung Cheong	Jaewon Choi	Sangeun Ha	Ji Yeol Jimmy Oh
City University of Hong Kong	University of Illinois Urbana-Champaign	Copenhagen Business School	Sungkyunkwan University

This draft: March 15, 2023

Abstract

We examine how foreign institutional capital affects carbon emissions in emerging-market firms. As shocks to foreign institutional capital, we consider firm-level inclusion in the MSCI Index as well as market-level inclusion of China A-Shares. After index inclusion, both outputs and emissions of emerging-market firms grow, but emissions grow at a faster rate than outputs, such that emissions intensities increase. Higher emissions intensities occur with lower abatement expenditures. We find greater increases in emissions intensities in countries with weaker environmental policies and with more foreign capital from green investors. In contrast, emissions intensities tend not to increase in developed-market firms after index inclusion. Overall, our results suggest that environmental considerations may be assigned lower priority when emerging-market firms utilize foreign capital to boost growth.

JEL Classification: G15, G23, Q54

Keywords: Carbon emissions, climate risk, corporate social responsibility, ESG, international institutional investors, emerging markets, MSCI

We thank Tatyana Deryugina, Jiekun Huang, Tim Johnson, Angie Low, George Pennacchi, Aaron Yoon, Luigi Zingales, and seminar participants at the 2022 Global AI Finance Research Conference, Copenhagen Business School, University of Illinois Urbana-Champaign, Tsinghua University, Australian National University, University of New South Wales, and Victoria University of Wellington.

* Sophia Chiyoung Cheong, Department of Economics and Finance, City University of Hong Kong. E-mail: c.cheong@cityu.edu.hk. Jaewon Choi, University of Illinois Urbana-Champaign. E-mail: jaewchoi@illinois.edu. Sangeun Ha, Copenhagen Business School. Email: sha.fi@cbs.dk. Ji Yeol Jimmy Oh, Department of FinTech, SKK Business School, Sungkyunkwan University. E-mail: jyjoh@skku.edu.

Does Foreign Institutional Capital Promote Green Growth for Emerging Market Firms?

This draft: March 15, 2023

Abstract

We examine how foreign institutional capital affects carbon emissions in emerging-market firms. As shocks to foreign institutional capital, we consider firm-level inclusion in the MSCI Index as well as market-level inclusion of China A-Shares. After index inclusion, both outputs and emissions of emerging-market firms grow, but emissions grow at a faster rate than outputs, such that emissions intensities increase. Higher emissions intensities occur with lower abatement expenditures. We find greater increases in emissions intensities in countries with weaker environmental policies and with more foreign capital from green investors. In contrast, emissions intensities tend not to increase in developed-market firms after index inclusion. Overall, our results suggest that environmental considerations may be assigned lower priority when emerging-market firms utilize foreign capital to boost growth.

JEL Classification: G15, G23, Q54

Keywords: Carbon emission, climate risk, corporate social responsibility, ESG, international institutional investors, emerging market, MSCI

1. Introduction

Achieving net-zero carbon emissions has become a primary goal among global asset managers. Despite the sustained efforts of developed economies, net-zero would be extremely difficult to achieve without accompanying greenhouse gas (GHG) reductions in emerging economies, as emissions in emerging economies have exceeded those of developed economies.[2] Nevertheless, reliance on fossil fuels is viewed by many as an unavoidable cost to be paid to drive growth in emerging economies. In this paper, we examine whether global asset managers, most of whom are based in developed markets (DMs), help to reduce GHG emissions in emerging market (EM) firms while also facilitating their growth—that is, green growth for these EM companies.

Carbon emissions are a joint product of output, so firms are expected to produce emission when they grow—but then, by how much? We provide a simple conceptual framework in which to develop intuitions to answer this question. Within this framework, *emissions intensity* (i.e., emissions per output) *should drop* as firms' outputs grow with foreign capital, given the same level of environmental awareness among investors. The intuition is that an influx of foreign investors cheapens the cost of capital, which in turn should make pollution relatively more expensive, so firms will actively undertake more extensive emission-abatement efforts. Instead, our empirical results show that emissions intensities increase with foreign capital, which strongly suggests that EM firms have reduced their emissions-abatement efforts.

Our results seem to run counter to the argument that foreign institutional investors should extend effective environmental, social, and governance (ESG) practices to international firms.[3]

[2] As of 2019, China's GHG emissions alone, at 14 gigatons per year, surpassed the emissions of all developed countries combined (https://rhg.com/research/chinas-emissions-surpass-developed-countries/).

[3] Aggarwal et al. (2011), e.g., show that foreign institutional investors spread shareholder-centric governance practices to international firms. Dyck et al. (2019) document that institutional investors drive better environmental and social (ES) performance worldwide, without distinguishing ES performance in EM firms from that in DM firms. In their survey, Stroebel and Wurgler (2021) find that researchers and practitioners view pressure from institutional investors as the most powerful force for change in addressing climate change.

Nevertheless, foreign investors might not necessarily stimulate carbon emissions reduction in EM firms. First, foreign investors do not fully bear the local environmental externalities and thus are not incentivized to pressure management in local countries to invest in green corporate policies. Second, environmental regulations and social pressure may be weaker in EMs.[4] If the pressure on foreign investors to encourage "greenness" differs between EMs and DMs, their incentives to improve environmental performance in their portfolios may diverge in EMs. Third, foreign investors may choose to focus on financial performance in EMs, while compromising environmental performance, as EM stock returns can be higher. As shown in prior studies, ESG-friendly assets can underperform (e.g., Hong and Kacperczyk, 2009; Chava, 2014; Barber, Morse, and Yasuda, 2021; Liang, Sun, and Teo, 2022), an equilibrium outcome that reflects varying tastes for ESG investing (Pástor, Stambaugh, and Taylor, 2021). Institutional investors may opt to compensate for such compromised financial performance in DM investments with high-return EM investments. Thus, to the extent that foreign investors have diverging incentives to invest in DM and EM firms, the relationship between foreign investment and carbon emissions in DM firms does not necessarily extend to EM firms.

To examine whether foreign investors drive green growth (or the lack thereof), we focus on index inclusions in the Morgan Stanley Capital International (MSCI) Emerging Markets (EM) Index as an exogenous driver of foreign capital. Our first identification setting uses firm-level inclusion in the MSCI EM Index, in line with an approach adopted in previous studies (Aggarwal, Erel, Ferreira, and Matos, 2011; Bena, Ferreira, Matos, and Pires, 2017; Dyck, Lins, Roth, and Wagner, 2019; Kacperczyk, Sundaresan, and Wang, 2021). We corroborate the first identification setting and address firm-level omitted variable issues with a second setting that exploits market-level inclusions of China A shares in the MSCI EM Index. In 2018 and 2019, for the first time, Chinese large- and mid-cap A

[4] As Matos (2020) notes, "[d]ifferent regions around the world are proceeding at different speeds on ESG regulation (p. 11)," with the European Union setting a particularly aggressive agenda compared with the rest of the world.

shares were added *en masse* to the index. This event was not driven by unobservable factors involving any individual firm, enabling us to examine the impact of an exogenous influx of foreign capital on carbon emissions.

These MSCI index inclusions provide us with a nice laboratory in which to study green growth. Given the sheer volume of investor money that follows the MSCI EM Index (equivalent to US$1.6 trillion as of 2017), the influx of foreign capital into an EM would provide newly indexed firms with expansion opportunities by reducing the cost of capital. At the same time, many global asset managers are subject to investor scrutiny and proactively assess climate risks in their portfolios (e.g., Krueger, Sautner, and Starks, 2020 and Atta-Darkua, Glossner, Krueger, and Matos, 2023). Thus, an influx of foreign capital into EM firms may not only reduce the cost of capital for portfolio firms but also reshape their ESG practices.

Using MSCI inclusions for the period running from 2003 through 2020, we first examine the extent to which foreign capital entry increases output and emissions in EM firms. We employ portfolio holdings data for global equity mutual funds provided by Morningstar and firm-level GHG emission data from Trucost.[5, 6] We confirm that emerging market firms' inclusion in the MSCI Index leads to a substantial immediate increase of 2.3 percentage points in foreign mutual fund shareholdings, which should provide these firms with expansion opportunities, with significant increases in assets and sales. We further document a corresponding increase in these firms' GHG emission levels, across both direct (Scope 1) and indirect (Scopes 2 and 3) measures, as production capacity expands.

[5] In particular, by focusing on an objective, output-based measure of carbon emissions rather than a potentially subjective assessment of a firm's general environmentally relevant activities, we abstract from the ongoing debate over whether conventional ESG scores truly capture a firm's environmental performance in light of huge discrepancies in ESG scores computed by different rating agencies (e.g., Gibson, Krueger, and Schmidt, 2021; Avramov, Cheng, Lioui, and Tarelli, 2022; Berg, Kölbel, and Rigobon, 2022; Gibson, Glossner, Krueger, Matos, and Steffen, 2022; Kim and Yoon, 2022).

[6] Trucost is a widely accepted source of carbon emissions data used by both MSCI and Standard and Poor's (S&P) in their ESG index evaluation (Azar, Duro, Kadach, and Ormazabal, 2021).

As emissions can be viewed as a joint product of output, it might not be particularly surprising to find that emissions increase with output growth. We thus turn to our study's central question, guided by our conceptual framework: How does GHG emissions intensity in EM firms change following MSCI index inclusion? We find that firms significantly increase their emissions intensity, both directly and indirectly, with indirect measures of GHG emissions intensity exhibiting particularly strong statistical significance. This result, according to the predictions of our framework, indicates that firms relax their abatement efforts, perhaps as a result of weaker pressure from shareholders to adopt greener business practices. This result also contrasts with the idea that foreign investors spread more effective environmental practices and thereby promote green growth.

These increases in emissions intensity are particularly evident in manufacturing-heavy regions such as China and South and Southeast Asia when compared with other regions, including Europe, the Americas, and East Asia. Industry-wise, the power generation (i.e., energy) and manufacturing sectors exhibit the most pronounced increases. In contrast to these results for EM firms, we find little evidence of increases in GHG emissions in DM firms following inclusion in the MSCI DM Index, except for some limited evidence of increases in indirect GHG emissions intensity.[7] As further corroborating evidence for weaker abatement efforts in EM firms following MSCI Index inclusion, we find that such firms set less aggressive carbon emissions reduction targets and cut back on environmental expenditures. This result also suggests that rises in emissions intensity reflect rollbacks in abatement efforts in response to reduced pressure from shareholders.

This drop in abatement efforts may stem from two sources. The first source is rather benign—foreign investors do not fully bear the local environmental costs of pollution and thus are not incentivized to pressure management to invest in green corporate policies. The second source involves

[7] Throughout this paper, we refer to the MSCI World Index, which consists of DM markets only, to avoid confusion with the MSCI All-Country Weighted Index (ACWI), which includes both DM and EM markets.

the active "relocation of pollution" within their portfolios, from countries that apply stringent environmental standards to those that apply weaker standards, which is essentially the "pollution-haven" hypothesis. If those foreign investors also try to maintain the outward appearance of environmental friendliness in their home countries, then shifting investments to pollution havens also amounts to "greenwashing." We find evidence supporting the occurrence of pollution relocation and greenwashing. Increases in emissions intensity in index-included firms are more pronounced with environmentally friendly ("green") foreign funds that score highly on carbon-risk or portfolio environmental scores and with funds that originate from countries that apply stringent environmental policy standards. Correspondingly, increases in emissions intensity are also most pronounced in EM firms operating in countries that feature weak environmental policy standards and high levels of GHG emissions per capita, in clear support of the pollution-haven hypothesis (Brunnermeier and Levinson, 2004; Copeland and Taylor, 2004; Gibson, 2019).

Such an incentive-driven pollution story raises a natural question: What would persuade these green funds to allow their EM portfolio firms to cut back on abatement, knowing that such cutbacks would cause the carbon and environmental scores of their portfolios to fall? Our analysis of MSCI-included firms reveals that EM firms' post-inclusion stock returns are substantially higher than those on DM firms. Thus, those green funds may be willing to sacrifice their portfolios' environmental performance to some degree to generate higher returns for their investors. As further evidence that our treated EM firms assign lower priority to environmental performance, we collect firm-level environmental violation news events from RepRisk and document significant increases in such events among our EM firms following index inclusion. In contrast, we find no increases in adverse environmental events among DM firms after MSCI inclusion.

Literature Review. We contribute to the literature in the following ways. First, we contribute to the rich literature that examines the relationship between financial development and economic growth

(King and Levine, 1993; Jayaratne and Strahan, 1996; Demirgüç-Kunt, and Maksimovic, 1998; Rajan and Zingales, 1998). Our contribution to this strand of the literature lies in documenting whether access to foreign investor financing acts as a catalyst not only for expansion but also for better corporate environmental performance. Our evidence suggests that, while there is significant growth in sales and profit margins, such expansion occurs at the expense of significantly higher direct and indirect GHG emissions intensity, suggesting that the increased presence of foreign mutual fund investors is insufficient to promote green growth in EM firms.

Second, we contribute to the literature that studies the impact of institutional investor engagement on portfolio firms, particularly regarding ESG issues (e.g., Dimson, Karakaş, and Li, 2015; Iliev and Lowry, 2015; McCahery, Sautner, and Starks, 2016; Dyck, Lins, Roth, and Wagner, 2019; Kim, Wan, Wang, and Yang, 2019; Krueger, Sautner, and Starks, 2020; Azar, Duro, Kadach, and Ormazabal, 2021; Dimson, Karakaş, and Li, 2021; He, Kahraman, and Lowry, 2022; Atta-Darkua, Glossner, Krueger, and Matos, 2023). Our contribution to this line of the literature lies in revealing that institutional investors' presence may have a differential impact on their portfolio firms' environmental performance in EMs and DMs. By employing a plausibly exogenous shock to foreign investor holdings—the inclusion of Chinese A shares in the MSCI EM Index—we reveal a causal link between higher shareholding by foreign institutional investors and their portfolio firms' carbon emissions in EMs. In so doing, we also contribute to the broader, blossoming literature on climate change and pollution risk (e.g., Andersson, Bolton, and Samama, 2016; Bansal, Ochoa, and Kiku, 2021; Bolton and Kacperczyk, 2021a; 2021b; Hsu, Li, and Tsou, 2022) by revealing that the role of institutional investors in reducing climate risk in portfolio firms may not be homogeneous across the world and that, in EMs, they may actually exacerbate these risks.

Finally, our paper is also related to the literature on investors' ESG preferences. While some studies find that investors do respond to sustainability profiles when they consider mutual funds (e.g., Hartzmark and Sussman, 2019), other studies reveal some noticeable differences in the degree to which investors prefer assets that exhibit strong ESG characteristics. Indeed, a number of recent papers theoretically explore the asset-pricing implications of ESG investors on the premise that heterogeneity in ESG preferences exists (e.g., Pástor, Stambaugh, and Taylor, 2021; Pedersen, Fitzgibbons, and Pomorski, 2021; Goldstein, Kopytov, Shen, and Xiang, 2022). Our empirical results reveal the possibility of "greenwashing" (e.g., Kim and Yoon, 2022), whereby the increased presence of investors with stronger ESG preferences ironically worsens GHG emissions intensity among firms that operate in countries that feature poor environmental regulatory standards. In fact, our evidence appears largely consistent with the "outsourcing" of pollution standards, whereby investors from stringent regulatory environments accept higher GHG emissions by their portfolio firms in less stringent environments (e.g., Dai, Duan, Liang, and Ng, 2022). Thus, we find that investors' ESG preferences may not yield identical corporate GHG emissions outcomes across firms operating in dissimilar regulatory environments.

2. Conceptual Framework: Would Emissions Increase or Decrease as Firms Grow?

In this section, we provide a simple conceptual framework that we use to better understand the relationship between output growth and emissions. This framework formalizes the following arguments:

a. With a lower cost of capital, outputs will grow. However, emissions intensity, calculated as emissions per output, should fall with the lower cost of capital, holding the level of environmental awareness (or the cost of pollution) constant.
b. Emissions intensity is a decreasing function of abatement efforts. Thus, if emissions intensities increase, firms must have relaxed their abatement efforts.

c. There is no clear prediction regarding the volume of emissions. Emissions can either increase or decrease.

Emissions represent a joint output of production. The first step in our analysis is to illustrate how emissions can also be interpreted as a factor input instead of an output. Let us consider a firm that produces output using capital as the sole factor. That is, the production function is given by $F(K)$, where F satisfies decreasing returns to scale and is increasing with capital K. For illustrative purposes, we treat capital as the only factor but this setting could be easily extended to a multifactor case.

Production also generates GHG emissions. As emissions are undesirable, a firm can choose to exert effort to achieve abatement, which we refer to as θ. Abatement is costly and reduces production by $(1-\theta)$. Thus, the firm's final output is given as

$$X = (1-\theta)F(K). \quad (1)$$

The volume of emissions depends on the firm's abatement efforts. Specifically, the dollar-equivalent volume of emissions, z, is determined as follows:

$$z = \phi(\theta)F(K), \quad (2)$$

where ϕ is the technology function that transforms the firm's abatement efforts into emissions. We assume that $\phi(\theta)$ is decreasing with θ, with $\phi(0) = 1$, $\phi(1) = 0$, and $\phi''(\theta) > 0$ for all $\theta \in [0,1]$. One may interpret this outcome in the following way: The firm chooses "intermediate" output $F(K)$, a θ fraction of which is then used as input for abatement activities, with the remaining $1-\theta$ fraction becoming the final output.

Let us define emissions intensity in this scenario as $e \equiv \frac{z}{X} = \frac{\phi(\theta)}{1-\theta}$. We first show that intensity monotonically decrease with the firm's abatement efforts:

Proposition 1. Emissions intensity (e) decreases with the firm's abatement efforts (θ).

Proof. See the Appendix.

Now, let us show that emissions can be interpreted as a production factor instead of a joint output. From Eqs. (1) and (2), we can derive the following:

$$X = \left(1 - \phi^{-1}\left(\frac{z}{F(K)}\right)\right) F(K) \equiv g(z, F). \tag{3}$$

The firm's problem is now transformed into a conventional two-factor production problem with a constant return-to-scale production function. That is, even though GHG emissions are a by-product of production, Eq. (3) allows us to treat those emissions as though they constitute an input factor. This representation of production is handy as we can use the usual tools to solve the firm's cost-minimization problem, for example by using the isoquants and iso-cost lines.

We now show that the emissions-to-output ratio, $\frac{z}{F(K)}$, as well as emissions intensity, $\frac{z}{X}$, increase with a lower cost of capital, which represents an exogenous influx of foreign capital. We then need to introduce the costs associated with both production factors. Let us denote r as the cost of capital (K) and τ as the cost of pollution (z). The latter may capture explicit emissions costs such as pollution taxes as well as implicit emissions costs associated with shareholder or external social pressure (Shapira and Zingales, 2017; Ramelli, Wagner, Zeckhauser, and Ziegler, 2021; Xu, 2022). The firm's optimization problem then becomes:

$$\max X - (\tau z + rK) \text{ s.t. } \tau z + rK = E, \tag{4}$$

where E is the firm's cost budget. As an interim step, we first prove that the marginal rate of technical substitution is a positive number:

Proposition 2. Whenever $\theta < 1$, the marginal rate of technical substitution $\frac{\partial X}{\partial K} / \frac{\partial X}{\partial z} > 0$.

Proof. See the Appendix.

The optimality condition requires this marginal rate of technical substitution to equal the factor–price ratio:

$$\frac{\partial X}{\partial K} \Big/ \frac{\partial X}{\partial z} = \frac{\phi(\theta)-(1-\theta)\phi\prime(\theta)}{F} \frac{dF}{dK} = \frac{r}{\tau}. \tag{5}$$

If we express this in the pollution-potential output (i.e., z-F) space, we have:

$$\frac{\partial X}{\partial F} \Big/ \frac{\partial X}{\partial z} = \frac{\phi(\theta)-(1-\theta)\phi\prime(\theta)}{F} = \frac{r}{\tau}\left(\frac{dF}{dK}\right)^{-1}. \tag{6}$$

We now demonstrate the impact of a drop in the cost of capital (r). As is evident from Figure 1, this drives the optimal "input mix", $\frac{z}{F} = \phi(\theta)$, lower. This can occur only if the optimal abatement effort, θ, increases (as ϕ is decreasing with θ). In other words, when the firm's access to capital becomes cheaper, the firm will engage more proactively in abatement activities because emissions are now relatively more expensive than capital. Emissions intensity, e, will also fall as a result because it is a decreasing function of θ. Note, however, that the level of emissions itself, i.e., z, can either increase or decrease, depending on the shape of the isoquant.

FIGURE 1 HERE

Emissions intensity can increase within this framework only if the cost of pollution falls along with the cost of capital. This case is presented in Figure 2. If the influx of foreign institutional capital drives both the cost of pollution and the cost of capital down, it is then possible for emissions intensity, e, to subsequently rise. This circumstance arises only when the firm optimally cuts back on its abatement effort, θ.

FIGURE 2 HERE

3. Data

In this section, we outline the data used in our empirical analysis. We begin with the data on MSCI global index constituents. We combine these data with data on GHG emissions from S&P

Global Trucost Environmental, global fund-holdings data from Morningstar, and international financial-statement data from Datastream Worldscope. In addition to the GHG emissions data, we collect data on adverse ESG-related events from RepRisk and shareholder voting agendas and mutual fund voting records from ISS Voting Analytics.

3.1. MSCI equity indices

MSCI's international equity indices are widely used by institutional investors, with assets under management by exchange-traded funds (ETFs) following MSCI's All-Country Weighted Index (ACWI), World, and Emerging Markets indices exceeding $170 billion dollars. MSCI classifies global stock markets into World (developed) Markets, Emerging Markets, and Frontier Markets, with countries not included in any of these indices comprising the Standalone Market. MSCI first defines its equity universe by identifying eligible securities listed on each country's stock market. Inclusion depends on a mechanical set of criteria, the details of which are illustrated in the Appendix. We classify firms as operating in DMs if they operate in countries constituting the MSCI World Index and in EMs if the countries are included in the MSCI EM index.

For the purposes of our paper, we consider the inclusion of Chinese A shares in MSCI EMs. Chinese A shares had initially been designed to be purchased by mainland Chinese citizens only. They are listed on one or the other of the two mainland Chinese exchanges, namely the Shanghai Stock Exchange (SSE) and the Shenzhen Stock Exchange (SZSE), are quoted in RMB, and were completely unavailable for foreign purchase until 2002. Given their lack of investability from foreign institutional investors' perspective, they were initially not included in the EM Index. Following a set of market reforms instituted by the Chinese government (e.g., the Stock Connect Program), however, MSCI decided to include some of these A shares in the EM Index in May 2018. In five steps that took place between May 2018 and November 2019, large- and mid-cap Chinese A shares were gradually assigned larger weights within the EM Index, with their combined weight in the index rising from 0.0% to 5.1% by August 2020.

3.2. *GHG Emissions*

Our data on GHG emissions are taken from S&P Global Trucost Environmental. The dataset measures the environmental impact of more than 15,000 firms globally, beginning in 2002. Trucost provides raw values of emissions or resources at the company level, using various definitions of firm-level impact. This has in recent years become a widely accepted source of a firm's GHG emissions, with both MSCI and S&P using these emissions data as inputs in their ESG score calculations.

The main variable used in this study is GHG emissions in metric tons of CO_2 equivalents, which is divided into three "scopes." Scope 1 measures GHG emissions from resources owned directly by emitting companies. Scope 2 measures emissions from resources that are owned by other companies but produced specifically for a focal company, mostly emissions released by energy providers to create electricity consumed by the company in its production process. Scope 3 includes all indirect activities to create products along the supply chain, including business travel by suppliers and product disposals. Using these three scopes, Trucost also calculates a firm's "direct" and "indirect" GHG emissions, in terms of both CO_2 emissions and in dollar terms representing the externality costs associated with the emissions. Thus, one major advantage of this dataset is that we can measure the full extent of the environmental impact of a firm's production process, not only of its own output but of outputs along the entire supply chain, allowing us to better discern the firm's role in the global effort to achieve net-zero carbon emissions.

3.3. *Fund characteristics and holdings*

We obtain data on holdings of open-end mutual funds and ETFs across the world from Morningstar. The dataset includes holdings information for over 93,000 funds domiciled in 73 countries between 2002 and 2020. In the dominant majority of cases, the number of shares of each security held by a fund is reported at either quarterly or monthly frequency, and we use the latest available (i.e., of the highest frequency) holdings information for each fund at every month's-end, following Elton, Gruber, and Blake (2011).

We then supplement this information with information indicating fund characteristics from Morningstar Direct, including data on monthly returns and flows, assets under management, expenses, Morningstar category and ratings (in terms of both financial and sustainability performance), and the sustainability characteristics of funds' portfolios. The data also include information indicating whether a fund is a passive or active fund. We convert assets under management, expressed in local currencies, into U.S. dollars using month's-end exchange rates that are available in Datastream Worldscope to make fund sizes comparable across countries. Because international securities are identified either through the CINS (the CUSIP International Numbering System) or by International Securities Identification Numbers (ISINs), we first convert all CINS data to ISINs by obtaining CINS–ISIN matching data from Thomson Eikon.

By summing the number of shares held at each month's-end and by dividing this figure with the total number of shares outstanding of each security as reported in Datastream, we calculate the percentage of a firm's shares held by all mutual funds as well as shares held by funds that satisfy particular fund-characteristic criteria. For example, we separately calculate the percentage holdings of passive and active funds as well as those of foreign and domestic funds. We calculate the percentage holdings of a firm's common shares only, using security-type information in Morningstar as well as Datastream Worldscope to exclude preferred and other non-common shares. For the purpose of classifying mutual funds into "foreign" and "domestic," we consider a fund's sales region as reported in Morningstar Direct. This is important, as many of the funds held in the European Union, for example, tend to be domiciled in Luxembourg to take advantage of "passporting" rights and are marketed across other countries in the European Union. Thus, we define a fund as "foreign" if local investors in a given market do not have access to the said fund when making investment decisions.

3.4. *Financial accounting information*

Data on financial accounting and stock security information are collected from Datastream Worldscope. Following standard definitions in the literature, we use these data to compute financial variables such as market-to-book ratios. We collect data expressed in local currencies first and calculate percentage and percentage-growth variables to exclude any changes induced by changes in exchange rates. We then convert assets and sales figure into U.S. dollars to ensure full comparability between countries. We match this financial and stock information with S&P Trucost data, enabling us to examine the effects of foreign investor holdings on GHG emissions while controlling for an array of firm-level financial characteristics.

3.5. *Information on negative ESG events*

We obtain data on ESG risk incidents from RepRisk. The RepRisk dataset covers more than 210,000 firms beginning in January 2007. Every day, RepRisk screens more than 100,000 public sources in 23 languages for incidents that can involve reputational, compliance, or financial risk, using artificial intelligence (AI) and machine-learning techniques. This dataset allows us to examine the number of negative ESG incidents. We select firms that were included in the MSCI ACWI and control firms based on our matching process and map the risk-incident data with our main dataset.

3.6. *Summary statistics*

TABLE 1 HERE

In Table 1, we report summary statistics for our sample, separately for DMs and EMs. While most of the firm-level financial variables are similar across developed and emerging markets, we note a large discrepancy in the average level of GHG emissions between DM and EM firms.[8] For example, the mean value of direct GHG emissions among EM firms is 2.3 million tons of CO_2 equivalents, while the comparable figure for DM firms stands at 0.9 million tons, which is only approximately 40% of EM firms' emissions. A similar picture emerges for indirect GHG emissions, with EM and DM firms' average indirect emissions at 0.4 and 0.8 million tons of CO_2 equivalents, respectively. Given that average corporate GHG emissions are substantially higher among EM firms, understanding the factors that drive overall GHG emissions in these firms is integral to global efforts to reduce climate risk.

FIGURE 3 HERE

Prior to examining the relationship between foreign institutional ownership and corporate GHG emissions in greater detail, we graphically illustrate their *prima facie* association in Figure 3. Specifically, we average firm-level foreign institutional ownership (using holdings information from the FactSet/Lionshare database) and direct GHG emissions for each country over our sample period. Panel A presents results that reveal the relationship in EMs, while Panel B results do so for DMs. Whereas there is little association between the two in DMs, with the fitted slope trending marginally downward, as illustrated in Panel B, we observe a more noticeable positive relationship between the two variables in EM countries in the results reported in Panel A. The graphical evidence presented in Figure 3 suggests that more robust foreign ownership may not have a homogeneous impact on the environmental profiles of foreign owners' portfolio firms depending on the level of financial development where the firm operates.

4. Foreign Capital and GHG Emissions

[8] To capture the meaningful effects of index inclusion on GHG emissions, we take the contemporaneous datapoint if a firm was included in the index on or before June of a given year and the one-year-ahead datapoint if a firm was included on or after July of a given year.

In this section, we first outline our empirical strategy for MSCI Index inclusion as a plausibly exogenous driver of foreign investor capital. This influx of capital leads to sizable corporate expansion as well as corresponding increases in GHG emissions levels. We then pose the central research question of this paper, namely whether the emissions intensities of EM firms across regions and sectors rise following index inclusion. We also provide results suggesting that such increases in emissions intensities are consistent with weaker abatement efforts on the part of EM firms.

4.1. *Empirical strategy*

Our key empirical analysis requires instances whereby an exogenous influx of foreign investors provides expansion opportunities for firms in EMs. We employ two types of MSCI index inclusions as such instances: inclusions of individual firms in the MSCI EM Index and market-wide inclusions of China-A shares in the Index.

Our first setting enables us to exploit inclusions of individual firms in the MSCI Index as a shock to foreign investor capital as in, for example, Aggarwal, Erel, Ferreira, and Matos (2011), Bena, Ferreira, Matos, and Pires (2017), and Dyck, Lins, Roth, and Wagner (2019). The Index is tracked by mutual funds around the world with total capital of approximately $170 billion dollars, and thus inclusion in this index will increase the presence of foreign investors that follow MSCI indices as their benchmark, thus enabling us to use these inclusions as exogenous shocks to influxes of foreign investor capital.

We corroborate our first identification setting with the second setting, which focuses on market-level inclusion, specifically inclusion of China A shares in the EM Index between May 2018 and November 2019, to further sharpen our identification strategy. The advantage of using market-level inclusions is that they are not likely to be driven by any unobservable firm-level characteristics.

While firm-level stock inclusions have been widely used in the existing literature, these inclusions can be associated with time-varying firm-level omitted variables that might also drive firms' emissions choices.

China A-Share inclusions provide a nice laboratory in which to avoid this omitted-variable issue. MSCI first included 222 large-cap China A shares in the EM Index in May 2018 after concluding that China A-shares, which had been designed originally for domestic investors, had become sufficiently accessible to global investors (most notably with the launch of the Stock Connect program in 2014). In particular, these stocks were included in the EM Index over multiple stages, from May 2018 to November 2019, was based on market-wide considerations, not on firm-by-firm characteristics. When China A Shares were initially included in May 2018, the MSCI essentially used almost all the large-cap A-Share stocks that were accessible through Stock Connect and had already been included in the MSCI China Index (but not necessarily in the EM Index) at least a year earlier.[9] Thus, China A share inclusions offer distinct advantages for identification because they are not driven by factors associated with unobservable time-varying firm-level variables. We further rule out the effects of any industry-specific factors that may have changed around the time of A-share index inclusion at the industry level by including industry-by-time fixed effects, which enables us to compare environmental performance in firms operating within the same industry in China at a given point in time.

Once we identify our treated firms based on either firm-level inclusions or China A-Share inclusions, we construct a set of control firms after matching to address any concerns that the treated firms may differ systematically from control firms. Specifically, we match the treated firms with control

---

[9] On June 20 of 2017, MSCI announced that it would include 222 China A Large Cap stocks in the EM Index, after excluding 195 mid-cap stocks and 42 large cap stocks in the MSCI China A Share Index that are not accessible or suspended through the Stock Connect Program (See, "*Adding A Shares into Emerging Markets—Are You Ready*," *MSCI, June 2017*.)

firms in the same year and market, based on log total assets, log sales, log market capitalization, log physical assets (property, plant, and equipment), log capital expenditures, market-to-book ratios, and profitability using one-to-three nearest-neighbor matching. We check matching quality by examining differences in firm characteristics between treated and matched control firms. The difference statistics reported in Table A.1 in the Appendix show that our matching is quite successful and there are no meaningful differences in firm characteristics between the two groups of firms.[10] Our main empirical specifications are based on difference-in-differences (DiD) regressions, using these treated and matched control firms. We use this DiD setup to examine the effects of MSCI index inclusion on firms' expansion and carbon emissions and foreign mutual fund holdings in the firms.

MSCI inclusion and foreign mutual fund ownership. Using DiD regressions, we document that foreign mutual funds increase holdings in stocks that are newly included in the MSCI Index. The results are reported in Table A.2 for inclusions in both the EM and DM indexes. In summary, we observe an immediate increase in foreign fund shareholdings in EM-included firms relative to shareholdings in matched control firms by 2.3 percentage points (column (2)), which remains highly significant for the months following inclusion. An increase in foreign mutual fund holdings is accompanied by an immediate increase in total mutual fund holdings of 2.8 percentage points (column (1)). We also find that increases in fund holdings following DM Index inclusion are also sizable but more gradual, with total fund shareholdings increasing significantly, by almost 1.3 percentage points (column (3)) over shareholdings in matched control firms from the second month following index inclusion. In Figure 4, we graphically illustrate these increases in foreign mutual fund shareholdings between MSCI EM-included and matched control firms. As is evident from Figure 4, we observe a noticeable upward spike in shareholdings in inclusion months in both total (Panel A) and foreign

[10] The results in Table A.1 show that, prior to matching, the treated firms, on average, differ significantly from their peers particularly in terms of sales, profitability, and Scope 1 GHG emissions. After matching, these differences become statistically insignificant.

(Panel B) mutual fund holdings, with mutual fund shareholdings remaining higher in the ensuing months.

FIGURE 4 HERE

4.2. Expansion and GHG emissions

Within our conceptual framework, lower capital costs associated with an influx of foreign capital should result in higher output and, depending on the shape of the pollution-production isoquant, the *level* of GHG emissions may also increase with higher output. We thus examine the extent to which MSCI index inclusions lead EM firms to expand, raising GHG emissions. Specifically, we run DiD regressions of our treated and matched control firms in EMs for a window of [-3, 2] years around inclusion years. The treated firms include those based on both firm-level index inclusion and China A Share inclusion. In the first set of regressions, in which we examine firm expansion, the dependent variables are log sales, log total assets, log total number of employees, and profitability. In the second set of regressions, in which we examine GHG emissions, the dependent variables are log GHG Scope 1, Scope 2, and Scope 3 emissions. The regressions include firm, country-by-year, and industry-by-year fixed effects and standard errors are two-way clustered by firm and year. To avoid problems with bad controls, we omit other control variables.[11] Table 2 presents the results.

TABLE 2 HERE

In Table 2 Panel A we report DiD regression results showing that EM firms grow more substantially than matched control peers after MSCI inclusion. As is evident in columns (1) and (2), for example, the coefficient estimates on interactions between the indicator variable for treated firms ("*Included*") and the post-inclusion indicator ("*Post*") are positive and highly statistically significant. Inclusion in the MSCI EM index of a sample firm with average log total sales of 14.424 results in an

---

[11] In a robustness check, we also report the regression results with control variables in Appendix Tables A.4, A.6, A.8, and A.9. The results are qualitatively similar.

increase in sales of (exp(0.137+14.424) – exp(14.424))/exp(14.424)=14.7%. Using a similar calculation, we document a 14.9% increase in total assets. The results reported in columns (3) and (4) further show that our treated firms hire more employees and are more profitable following inclusion in the MSCI EM Index. These results are consistent with our conceptual framework, whereby a lower cost of capital results unambiguously in expansion and higher output.

Do GHG emissions also increase with MSCI inclusion? The results reported in Table 2 Panel B show that they do. Across all the emissions-scope measures as well as direct and indirect measures, the coefficient estimates on the interaction terms are all positive and highly statistically significant. The economic magnitudes of the coefficient estimates are also sizable. In column (1), for example, the coefficient estimate of 0.153 indicates that a treated firm with average log Scope 1 GHG emissions of 10.982 increases its emissions by (exp(0.153+10.982) – exp(10.982))/exp(10.982) = 16.5% more than their matched control firms. GHG emissions from energy use, as measured in Scope 2, as well as those from supply chain carbon footprints measured in Scope 3, increase significantly, with t-statistics above 3. Therefore, corporate expansion after an influx of foreign capital is accompanied by corresponding increases in GHG emissions.

Figure 5 Panel A graphically illustrates increases in GHG emissions, using the log Scope 1 emissions measure. Although there is no noticeable trend in GHG emissions between treated and matched control firms prior to inclusion, we observe an immediate increase in GHG emissions beginning in the year of MSCI inclusion, with the difference remaining elevated for the following two years. We observe a similar pattern when we focus on market-wide inclusion of China A share firms in the MSCI EM Index, as illustrated in Figure 5 Panel B.

FIGURE 5 HERE

4.3. MSCI inclusion and GHG emissions intensity

Our conceptual framework predicts that, while emissions levels can rise when the cost of capital falls, emissions intensities—GHG emissions per unit of output produced—should fall unless the (implicit) cost of pollution also falls with the lower cost of capital. If the cost of pollution also falls, however, firms will optimally adjust their abatement efforts downward, resulting in higher emissions intensity. On the one hand, the implicit cost of pollution will increase when foreign investors are involved if those investors export higher pollution standards from more developed countries to EM firms. On the other hand, the cost of pollution can fall with more foreign investors if they are less concerned about environmental issues in host countries than host-country investors are. Even if foreign investors originate from countries that maintain high environmental standards, they might care less about the environment in host countries than host-country investors who would bear the environmental consequences. Moreover, these foreign investors can be incentivized to care less about polluting in countries that are subject to less strict environmental regulations, thus using EM countries as pollution havens.

For Table 3, we repeat the DiD regressions as in the previous subsection, but with log emissions intensity (i.e., GHG emissions divided by sales) as the dependent variable. All fixed-effect and standard-error specifications remain unchanged.

TABLE 3 HERE

The results we report in Table 3 show that emissions intensities in treated EM firms are higher than those in matched control peers following inclusion in the MSCI EM Index. As seen in column (1), for example, the coefficient estimate on the interaction term ("*Included times Post")* is 0.076, indicating that emissions intensity (i.e., from direct operations) increases, with statistical significance at the 10% level, a finding echoed in our results reported in column (4) for direct emissions intensity. Regarding results obtained with Scopes 2 and 3 emissions intensity and reported in columns (2) and (3), we also find all the coefficient estimates to be positive (0.108 and 0.078, respectively) with statistical significance at the 1% level. The economic magnitudes of the coefficients are also sizable. For example, a treated firm's Scope 2 emissions intensity with log average intensity of -3.78 increases by (exp(-3.78+0.108)-exp(-3.78))/exp(-3.78) = 11.4%. Therefore, in terms of both direct operations and through energy use and supply chains, we observe sizable drops in emissions intensities.

Figure 6 plots log Scope 1 GHG emissions intensities for treated firms and matched control firms around MSCI Index inclusion. The graph in Panel A shows that emissions intensities jump immediately after index inclusion and remain high for the following two years.

The results suggest overall that an influx of foreign capital leads to a fall in the cost of pollution, disincentivizing firms from engaging in robust abatement efforts. Given that emissions intensity falls with firms' abatement efforts according to our conceptual framework, our results based on emissions intensity strongly indicate that firms exert less effort to manage GHG emissions in response to the increased presence of foreign investors.

FIGURE 6 HERE

4.4. China A Share inclusion and emissions intensity

Our earlier set of regressions reveal substantial increases in GHG emissions intensity following inclusion in the MSCI EM Index, indicating reduction in abatement efforts. To address a concern that firm-level factors not reflected in the matching process may be driving index inclusion and GHG emissions simultaneously, we focus our attention on the market-wide inclusion of China A Shares in the MSCI EM Index to further sharpen our identification. To examine how emissions intensities change after China A Share inclusions, we run DiD regressions as in the previous subsection, but with a sample of treated and matched control firms around China A share inclusion in 2018 and 2019.

TABLE 4 HERE

In Table 4 column (1) we report the results using log Scope 1 emissions intensity as the dependent variable. While the point estimate of the interaction term ("*Included times Post*") is positive

(0.113) and sizable, its statistical significance is only marginal, with a *t*-statistic of 1.67. We find a similar result for direct emissions intensity, as reported in column (4). For emissions from energy use (Scope 2) as reported in column (2) or from the supply chain (Scope 3) as reported in column (3), however, we find that the coefficient estimates of the interaction term are both positive and statistically significant at conventional levels, consistent with our earlier results obtained while utilizing the entire sample of firm-level MSCI Index inclusions. It is also interesting to find a particularly strong rise in Scope 3 emissions intensity, suggesting that weaker abatement effort is evident along the supply chain, which suggests that these large-cap, newly included firms may be "outsourcing pollution" down to their suppliers. We confirm a similar result in a graphical illustration shown in Figure 6 Panel B. Prior to MSCI EM inclusions, the treated China A share firms exhibit almost no discernable differences from matched controls in emissions intensity, but after inclusion emissions intensity immediately rises and remains elevated thereafter.[12]

4.5. *Emissions intensity across regions and sectors*

We now explore changes in GHG emissions intensity in response to MSCI EM Index inclusion across regions and sectors, using DiD regressions. First, we divide our EM firms into the following five geographic regions: South and Southeast Asia, China, East Asia, EMEA (Europe, Middle East, and Africa), and Latin America. Second, we divide our EM firms on the basis of industry segments: power generation, manufacturing, wholesale/retail, financial/services, and others. Table 5 presents our results.

TABLE 5 HERE

Table 5 Panel A presents the results for each of the geographic regions using log Scope 1 GHG emissions intensity as the dependent variable. We find that the coefficients on the DiD

[12] In Table A.5 in the Appendix, we report strong evidence of corporate expansion and higher GHG emissions levels following these China A share firms' inclusion in the EM index.

interaction term are positive and statistically significant at the 5% level in South and Southeast Asia as well as in China.[13] For the other three regions, the coefficient estimates are either close to zero or even negative, with no statistical significance. These results suggest that GHG emissions tend to be concentrated in manufacturing- and export-oriented countries, such as China, India, Malaysia, and Indonesia.

Panel B provides subsample estimation results across sectors, and we find that higher GHG emissions intensity is most evident in the power generation and manufacturing sectors, while in the other sectors, including finance and education, emissions intensities tend to fall or are statistically indistinguishable from zero. Our regional and sectoral analysis thus reveals that the higher GHG emissions intensity we observe is driven primarily by the manufacturing and energy sectors, with the observed relationship most prominent in South and Southeast Asia and China.

4.6. Emissions intensity in DM firms after MSCI Index inclusion

Our results reported thus far indicate that, following an influx of foreign capital, treated firms that are newly included in the EM Index increase emissions intensities substantially more than their matched control peers. Would foreign capital also lead to higher emissions intensities in DM firms? If foreign capital also tends to reduce the cost of pollution for DM firms, we expect to find higher emissions intensities, as in EM firms. This is likely the case if foreign investors in general care less about the environment in host countries than host-country investors themselves do. If, in contrast, foreign capital does not reduce the cost of pollution for DM firms, emissions intensities will not increase. We thus examine how emissions intensities change after DM firms are included in the index.

Table 6 column (1) presents the DiD regression results using log Scope 1 GHG emissions intensity as the dependent variable. In contrast with the results obtained based on MSCI inclusion of

[13] These Chinese treated firms include both firm-level and market-level MSCI inclusion cases.

EM firms, our results for DM firms do not reveal any statistically significant increases in emissions intensity.[14] If anything, point estimates of the interaction terms in the DiD regressions are negative. Results reported in column (2) similarly indicate that Scope 2 intensities in DM firms do not tend to rise significantly after index inclusion. Interestingly, however, we find that the coefficient estimates of the interaction terms for Scope 3 and indirect emissions intensities, reported in columns (3) and (5), respectively, are positive and statistically significant at the 5% level. These results for indirect emissions indicate that DM firms tend to outsource GHG emissions along their supply chains. Given that some of these firms' suppliers may reside in EM countries, the statistically significant increase in Scope 3 GHG emissions intensity may in part reflect some of our earlier findings for EM firms.

TABLE 6 HERE

4.7. MSCI inclusion and abatement efforts

The key prediction of our conceptual framework is that emissions intensity is a decreasing function of firms' unobserved abatement efforts. A natural question then arises: Do EM firms' abatement targets and activities actually weaken following inclusion in the MSCI Index? To answer this question, we employ stated emissions-reduction targets as reported in the ASSET4 database and examine how they change in DiD regressions. We emphasize that the results should be treated with caution given that abatement targets are self-reported, i.e., "espoused," measures and may not fully reflect actual abatement efforts. Coverage of this data item in the database is rather sparse, leading to a substantially smaller sample, particularly after including an extensive set of fixed effects, as in the previous specifications. As an alternative, we also consider a smaller set of fixed effects, namely firm and year fixed effects.

[14] The fact that emissions intensity does not rise does not reflect a lack of growth in DM firms. We confirm that, as in EM markets, inclusion in the MSCI DM Index leads firm to expand, thereby increasing total GHG emissions, as shown in Table A.7 in the Appendix.

TABLE 7 HERE

Panel A of Table 7 columns (1) and (2) present the results showing that EM firms tend to reduce emissions-reduction targets following MSCI Index inclusion. As can be seen in column (1), for which we include firm and year fixed effects, we find that treated firms reduce their percentage emissions-reduction targets 2.48 percentage points lower than matched control peers following index inclusion. As can be seen in column (2), we find that the coefficient estimate of the interaction term (*Included times Post*) is positive but lacks statistical significance once we replace year fixed effects with a strict set of country-by-year and industry-by-year fixed effects. Given that the sample for this regression is less than half the size of that used in the emissions intensity analysis, however, the inclusion of so many fixed effects for column (2) may have resulted in insufficient variation in the dependent variable. For columns (3) and (4) we repeat the analysis for DM firms. As shown by the coefficient estimates, we find that treated DM firms raise their emissions-reduction targets around 2 percentage points higher than their control peers, in stark contrast to the behavior observed among EM firms, further highlighting the differential effects of an influx of foreign capital on EM and DM firms.

As an additional measure of abatement efforts, we also collect environmental expenditures reported in the same database. In Table 7 Panel B, the results reported in first two columns reveal, with or without controlling for country-by-year and industry-by-year fixed effects, that EM firms tend to reduce environmental expenditures after MSCI Index inclusion. On the other hand, as seen in columns (3) and (4), we find that treated DM firms increase environmental expenditures to a greater extent than their control peers. These results should be interpreted with caution, though, given the small number of available observations of environmental expenditures.

5. Evidence of Pollution Migration and Greenwashing

In the previous section our reported results suggest that, following an index-inclusion-driven influx of foreign capital, EM firms' abatement efforts weaken significantly, as evidenced by sizable increases in emissions intensity across all emissions-measure scopes. Weaker abatement efforts may materialize through one of the following two channels. First, foreign investors are unlikely to fully bear the environmental consequences that host countries (i.e., EM countries) experience,[15] suggesting that a change in the composition of a firm's shareholder base with a greater presence of foreign investors would, by itself, weaken abatement efforts in EM firms. Second, foreign investors may *actively* reallocate GHG emissions within their portfolio firms, for example from a firm that operates in a country that features stringent environmental regulations to a firm that operates in a country that features lax regulations, known as the pollution-haven hypothesis. Such migration to pollution havens can also amount to "greenwashing" on the part of foreign investors if they appear to be green investors in their home countries while investing in "brown" companies in EM countries. In this section, we provide empirical evidence consistent with the second channel.

5.1. Fund-level characteristics: Active vs. passive, green vs. non-green, and strong vs. weak environment policies

Active vs. passive funds. We first examine how EM firms' emissions intensities respond to index inclusions depending on the relative shareholdings of passive and active foreign mutual funds. Active funds tend to engage more actively than passive funds with their portfolio firms and, as such, larger holdings of active funds can also affect GHG emissions. On the one hand, active funds might help reduce emissions intensity if they exert pressure on firms to be greener. On the other hand, such funds could instead focus on short-term profits and expansion by cutting expensive greener capital expenditures, thus increasing emissions intensities. To shed light on this issue, we estimate DiD regressions using an indicator variable that takes the value of one if and only if active fund holdings

[15] Groen-Xu and Zeume (2021), for example, document that local investors respond less to foreign ESG violation events, suggesting home bias in investors' ESG concerns.

in treated firms increase more than passive fund holdings from one month before to one month after MSCI index inclusion. We interact this variable with the post-event indicator variable, enabling us to isolate firms that active funds "overweight" relative to passive funds around MSCI inclusion events.

TABLE 8 HERE

In column (1) of Table 8 we present results showing that Scope 1 GHG emissions intensities increase to a greater extent for treated firms that experience more pronounced changes in active fund shareholding relative to passive fund shareholding. That is, when foreign mutual funds actively overweight our sample of EM firms around MSCI inclusion relative to the benchmark-following passive funds, we obtain a more pronounced increase in GHG emissions intensity. Although this result does not directly show active funds' engagement with their portfolio firms to deliberately relax their abatement efforts, given that holdings and engagements are separate activities, the stronger response of emissions intensity suggests that firms in which active foreign funds are larger shareholders tend to make dirtier investments.

Green versus non-green funds. We then examine how emissions intensity responds to foreign funds' ESG portfolio scores in a similar DiD specification. The results of this analysis indicate the extent of greenwashing by foreign mutual funds that hold shares in emerging market firms. The DiD regression employs an indicator variable that takes the value of one if green funds' holdings in treated firms increase to a greater extent than non-green funds' holdings between one month before and one month after MSCI inclusion. We designate funds as green if their carbon-risk scores from Morningstar are higher than the latest quarterly sample median carbon-risk scores. Similarly, the DiD regression employs another indicator variable based on Sustainalytics' portfolio environmental scores as an alternative designation of green funds.

We report the results in columns (2) and (3) of Table 8, indicating greenwashing on the part of foreign mutual funds. The coefficient estimates reported in columns (2) and (3) are both positive and statistically significant at the 10% level. Thus, the increased presence of "green" funds around MSCI inclusion is associated with a significantly higher increase in emissions intensity in their portfolio firms. Ironically, it appears that funds with strong ESG portfolio performance drive the increase in GHG emissions intensity in EM firms, which strongly suggests the possibility of greenwashing. These funds might sacrifice environmental performance in their EM portfolio firms, perhaps because financial performance can be much higher with these stocks. We investigate this issue further in Section 5.3.

Environmental policy stringency. Finally, we examine how the GHG emissions intensity response depends on environmental policy stringency (EPS) in the home countries of foreign mutual funds. The EPS measure is obtained from the OECD database, and we create an analogous indicator variable that takes the value of one if and only if funds originating in high-EPS countries increase shareholdings to a greater extent than funds originating in low-EPS countries. We then interact this indicator variable with the post-MSCI inclusion indicator in the DiD regression.

The results reported in Table 8 column (4) reveal that, following MSCI Index inclusion, EM firms' emissions intensities increase to a greater extent in firms where shareholding by funds arriving from countries with strong EPS standards is higher. The coefficient estimate reported in column (4) is positive, with a *t*-statistic of 2.92, which is consistent with the idea of pollution migration. The results reported in Table 8 suggest overall that increases in emissions intensity that we document for EM firms are driven by pollution migration and greenwashing incentives.

5.2. Environment policy stringency in EM countries

To examine pollution migration further, we now focus on environmental stringency in EM countries. In particular, we examine whether emissions intensities increase to a greater extent in EM countries that feature less stringent environmental policies, which is likely to occur if foreign investors are more profit-driven than environmentally conscious. We create subsamples of our EM firms based on the underlying components of EPS as categorized by the OECD, namely (i) economic policy stringency, (ii) market-based policy stringency, and (iii) R&D subsidies for environmental projects, with the latest annual sample median as the cutoff for low- and high-EPS countries. In addition to these measures of EPS components, we consider (iv) carbon emissions per capita in EM countries and (v) the capital intensity of industries in which EM firms operate. These two latter measures will be informative about whether emissions intensities increase to a greater extent in countries and industries where pollution is worse. We then run our earlier DiD regressions with log Scope 1 GHG emissions intensity as the dependent variable for each of the subsamples. We report the results in Table 9.

TABLE 9 HERE

As the results reported in rows (1) through (3) of Table 9 indicate, we find that increases in emissions intensity in treated firms are more pronounced in EM countries where EPS is relatively weak. For market-based EPS and R&D subsidies (rows 2 and 3), the coefficient estimates are both positive and statistically significant at conventional levels. For economic policy stringency, as seen in row 1, we find similar magnitudes of positive coefficients for both the low and high subsamples, but the coefficient is estimated much more reliably with the low subsample.

The results reported in rows 4 and 5 for per capita emissions and capital intensity, respectively, show that EM emissions intensities are higher in countries where pollution is relatively worse and for firms that operate in capital-intensive industries. Overall, the results we report in Table 9, along with our earlier results reported in Table 8, support the pollution-haven hypothesis, whereby increases in emissions intensity are most evident among EM firms that operate in weaker regulatory environments but with more foreign capital flows coming from stricter regulatory environments.

5.3. MSCI inclusion and stock returns: EM vs. DM firms

The results reported thus far indicate that green funds whose portfolios achieve strong environmental performance tend to sacrifice environmental performance in their EM portfolio firms. At first sight, these results can look puzzling. If these funds are conscious of their portfolio environmental scores, as shown by Atta-Darkua, Glossner, Krueger, and Matos (2023), why do they allow these EM firms to weaken their abatement efforts and correspondingly increase emissions intensity? Perhaps, in addition to maintaining the environmental performance of their portfolios, these funds also need to generate financial performance for their investors. Thus, funds face a tradeoff between environmental and financial performance. Some sacrifice in environmental performance is acceptable if those EM stocks can generate higher returns. To investigate this possibility, we compare stock returns on our EM and DM firms that are included in the MSCI indices for each of the three years following MSCI inclusion. We also run regressions of stock returns over the one- through three-year horizons following MSCI inclusion on the EM indicator as the main independent variable, with log market capitalization, market-to-book ratios, profitability, investment, and year fixed effects as controls. We report the estimation results in Table 10.

TABLE 10 HERE

In Table 10, we report the estimation results of the regressions of MSCI-included firms' stock returns on the EM indicator and control variables. In these regression results, reported in columns 1 through 3, we also find that EM treated firms' stock returns are significantly higher than those of their DM counterparts across all three time horizons; when we add the first three years' returns, for example, EM firms' returns are higher than DM firms' returns by around 0.8%. These results suggest that funds that invest in EM stocks are compensated with stronger financial performance while experiencing worse environmental performance. Funds that build strong records of ESG performance may optimally decide to allow their EM portfolio firms to cut back on their abatement efforts if they are rewarded with higher stock returns, strengthening the incentive for greenwashing.

5.4. MSCI inclusion and negative ESG incidents

In our final set of analyses, we examine the extent to which firms in our EM sample are more likely to be embroiled in negative ESG incidents following index inclusion. After all, if the implicit cost of pollution falls following MSCI Index inclusion, incentivizing firms to cut back on their abatement efforts and increase their emissions intensity—while assigning lower priority to environmentally friendly activities—we would expect to observe an increase in the number of environmental ESG violations for these firms. To this end, we count the number of negative ESG incidents reported in RepRisk, which collects information on ESG violations reported by various sources, including regulators, print media, newsletters, non-profits, and social media. In particular, we focus on issues pertaining to the environment, climate-related pollution, local pollution, and waste. We present the results for the EM sample in Table 11 Panel A, and we consider each EM region separately for Panel B. For comparison purposes, DM results are presented in Panel C.

TABLE 11 HERE

As can be seen in Panel A of Table 11, we find, across all issue categories, a significantly greater increase in the number of environmental-related negative ESG incidents in MSCI-included firms than in their matched control peers, with the DiD term significant at the 5% level in all instances and at the 1% level when we consider all environmental issues for column (1). When we break down our EM sample firms across geographic regions for Panel B, we find that treated firms' ESG violations increase substantially in South and Southeast Asia as well as in China, in line with our earlier findings. In contrast, we do not observe a similar increase in the number of negative ESG incidents in DMs around MSCI Index inclusion, as shown in Panel C. The evidence reported in Table 11 further indicates that an influx of foreign investor capital in response to MSCI index inclusion offers a growth opportunity but at the expense of environmental performance, with a greater incidence of environmental violations and adverse events.

5. Conclusion

Whether EM countries can achieve growth without compromising the planet's environmental sustainability in light of the role the financial sector plays on this road to economic growth is a question of crucial importance in global efforts to achieve net-zero carbon emissions by 2050. In this paper, we examine whether an influx of foreign mutual funds into EM countries following MSCI Index inclusion can promote growth and enhance abatement efforts at the same time. We find evidence to the contrary. Whereas MSCI-included firms utilize the greater availability of foreign external financing to engage in significant asset and sales growth, we document that such expansion increases not only GHG emissions but also *per-revenue* GHG emissions intensity, in terms of direct emissions as well as indirectly through energy use and along the supply chain. We confirm the causal direction of foreign investor entry and GHG emissions through an arguably cleaner setting featuring country-level inclusion of Chinese A shares in the MSCI EM Index. This finding contrasts with what occurs in DMs, where we do not observe any significant deterioration in the direct intensity of GHG emissions. We find supporting evidence of less aggressive emissions-reduction targets in newly included EM firms than in their peers.

We further document evidence consistent with greenwashing, with higher GHG emissions particularly noticeable in portfolio firms of mutual funds that tout their environmentally friendly reputations. We also document a "migration of pollution standards," whereby higher GHG emissions are evident among mutual fund investors from countries where environmental regulatory standards are stringent that invest in countries with relatively lax regulatory standards. These ESG-friendly funds seem willing to partially sacrifice environmental performance in their portfolios to generate higher returns for investors, with our EM treated firms' post-inclusion stock returns substantially higher than those of their DM counterparts. These foreign mutual funds thus appear to assign lower priority to their EM portfolio firms' environmental performance. Consequently, we document that our sample MSCI-included EM firms are more likely to be embroiled in environmental ESG violations. We thus document the sheer difficulty involved in overcoming the challenges faced by the financial sector in its role in global efforts to address climate change and provide meaningful economic growth opportunities for EM countries at the same time.

Reference

Atta-Darkua, Vaska, 2020, Corporate ethical behaviours and firm equity value and ownership: Evidence from the GPF"s ethical exclusions. Unpublished working paper.

Atta-Darkua, Vaska, Simon Glossner, Philipp Krueger, and Pedro Matos, 2023, Decarbonizing Institutional Investor Portfolios. Unpublished working paper.

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.

Amihud, Yakov, Allaudeen Hameed, Wenjin Kang, and Huiping Zhang, 2015, The illiquidity premium: International evidence. Journal of Financial Economics 117, 350-368.

Andersson, Mats, Patrick Bolton, and Frédéric Samama, 2016, Hedging climate risk. Financial Analyst Journal 72, 13-32.

Avramov, Doron, Si Cheng, Abraham Lioui, and Andrea Tarelli, 2022, Sustainable investing with ESG rating uncertainty. Journal of Financial Economics 145, 642-664.

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.

Bansal, Ravi, Marcelo Ochoa, and Dana Kiku, 2021, Climate change and growth risks. NBER Working Paper No. w23009.

Barber, Brad M., Adair Morse, and Ayako Yasuda, 2021, Impact investing. Journal of Financial Economics 139, 162-185.

Beck, Thorsten, Asli Demirgüç-Kunt, and Vojislav Maksimovic, 2008, Financing patterns around the world: Are small firms different? Journal of Financial Economics 89, 467-487.

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.

Berg, Florian, Julian F. Kölbel, and Roberto Rigobon, 2022, Aggregate confusion: The divergence of ESG ratings. Review of Finance, forthcoming.

Berk, J. and Jules H. van Binsbergen, 2022, The impact of impact investing. Unpublished working paper.

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

Bolton, Patrick, and Marcin Kacperczyk, 2021b, Carbon disclosure and the cost of capital. Unpublished working paper.

Bolton, Patrick, and Marcin Kacperczyk, 2022a, Global pricing of carbon-transition risk. The Journal of Finance (forthcoming).

Bolton, Patrick, and Marcin Kacperczyk, 2022b, Firm commitments. Unpublished working paper.

Bolton, P., Marcin Kacperczyk, and Frédéric Samama, 2022, Net-zero carbon portfolio alignment. Financial Analyst Journal, 78(2), 19-33.

Booth, Laurence, Varouj Aivazian, Asli Demirgüç-Kunt, and Vojislav Maksimovic, 2001, Capital structures in developing countries. Journal of Finance 56, 87-130.

Brunnermeier, S. and Levinson, A. 2004. Examining the evidence on environmental regulations and industry location. Journal of Environment & Development 13, 6–41

Chava, Sudheer, 2014, Environmental externalities and cost of capital. Management Science 60, 2223-2247.

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

Choi, Darwin, Zhenyu Gao, Wenxi Jiang, and Hulai Zhang, 2022, Carbon stock devaluation. Unpublished working paper.

Cohen, Shira, Igor Kadach, and Gaizka Ormazabal, 2022, Why do institutional investors request climate related disclosures?, Unpublished working paper.

Copeland, B. and Taylor, M. 2004. Trade, growth, and the environment. Journal of Economic Literature 42, 7–71.

Dai, R., Duan, R., Liang, H. and Ng, L., 2022. Outsourcing climate change. Unpublished working paper, European Corporate Governance Institute.

Davies, Shaun William, Edward Dickersin Van Wesep, 2018. The unintended consequences of divestment. Journal of Financial Economics, 128(3), 558-575.

DellaVigna, Stefano, John A. List, and Ulrike Malmendier, 2012, Testing for altruism and social pressure in charitable giving. Quarterly Journal of Economics 127, 1-56.

Demirgüç-Kunt, Asli, and Vojislav Maksimovic, 1998, Law, finance, and firm growth. Journal of Finance 53, 2107-2137.

Demirgüç-Kunt, Asli, and Vojislav Maksimovic, 1999, Institutions, financial markets, and firm debt maturity. Journal of Financial Economics 54, 295-336.

Dimson, Elroy, Oğuzhan Karakaş, and Xi Li, 2015, Active ownership. Review of Financial Studies 28, 3225-3268.

Dimson, Elroy, Oğuzhan Karakaş, and Xi Li, 2021, Coordinated engagements. Unpublished working paper, European Corporate Governance Institute.

Doidge, Craig, G. Andrew Karolyi, and René M. Stulz, 2007, Why do countries matter so much for corporate governance? Journal of Financial Economics 86, 1-39.

Dyck, Alexander, Karl V. Lins, Lukas Roth, and Hannes F. Wagner, 2019, Do institutional investors drive corporate social responsibility? International evidence. Journal of Financial Economics 131, 693-714.

Edmans, Alex, Doron Levit, and Jan Schneemeier, 2022, Socially responsible divestment, Unpublished working paper.

Elton, Edwin, Martin Gruber, and Christopher Blake, 2011. Holdings data, security returns, and the selection of superior mutual funds. Journal of Financial and Quantitative Analysis 46, 341-367.

Flammer, Caroline, 2013. Corporate social responsibility and shareholder reaction: The environmental awareness of investors. Academy of Management journal, 56(3), pp.758-781.

Flammer, Caroline, Michael W. Toffel, and Kala Viswanathan, 2021. Shareholder activism and firms' voluntary disclosure of climate change risks. Strategic Management Journal, 42(10), 1850-1879.

Gibson, Matthew, 2019, Regulation-induced pollution substitution, Review of Economics and Statistics 101, 827-840.

Gibson, Rajna, Philipp Krueger, and Peter Steffen Schmidt, 2021, ESG rating disagreement and stock returns. Financial Analyst Journal, forthcoming.

Gibson, Rajna, Simon Glossner, Philipp Krueger, Pedro Matos, and Tom Steffen, 2022, Do responsible investors invest responsibly? Review of Finance, forthcoming.

Goldstein, Itay, Alexandr Kopytov, Lin Shen, and Haotian Shang, 2022, On ESG investing: Heterogeneous preferences, information, and asset prices. NBER Working Paper No. w29839.

Griffin, John M., Patrick J. Kelly, and Federico Nardari, 2010, Do market efficiency measures yield correct inferences? A comparison of developed and emerging markets. Review of Financial Studies 23, 3225-3277.

Groen-Xu, Moqi and Stefan Zeume, 2021, The ESG home bias, Unpublished working paper, University of Illinois.

He, Yazhou, Bige Kahraman, and Michelle Lowry, 2022, ES risks and shareholder voice. Unpublished working paper, European Corporate Governance.

Heinkel, R.obin, Alan Kraus and Josef Zechner, 2001, The effect of green investment on corporate behavior. Journal of Financial and Quantitative Analysis, 36(4), 431-449.

Hong, Harrison, and Marcin Kacperczyk, 2009, The price of sin: The effects of social norms on markets. Journal of Financial Economics 93, 15-36.

Hsu, Po-Hsuan, Kai Li, and Chi-Yang Tsou, 2022, The pollution premium. Journal of Finance, forthcoming.

Ilhan, Emirhan, Philipp Krueger, Zacharias Sautner, and Laura T. Starks, 2021. Climate risk disclosure and institutional investors. Unpublished working paper, Swiss Finance Institute.

Iliev, Peter, and Michelle Lowry, 2015, Are mutual funds active voters? Review of Financial Studies 28, 446-485.

Jayaratne, Jith, and Philip E. Strahan, 1996, The finance-growth nexus: Evidence from bank branch deregulation. Quarterly Journal of Economics 111, 639-670.

Kacperczyk, Marcin, Savitar Sundaresan, and Tianyu Wang, 2021, Do Foreign Institutional Investors Improve Price Efficiency?, The Review of Financial Studies 34, 1317–1367

Kim, Incheol, Hong Wan, Bin Wang, and Tina Yang, 2019, Institutional investors and corporate environmental, social, and governance policies: Evidence from toxic release data. Management Science 65, 4901-4926.

Kim, Soohun, and Aaron Yoon, 2022, Analyzing active fund managers' commitment to ESG: Evidence from the United Nations Principles for Responsible Investment. Management Science, forthcoming.

King, Robert G., and Ross Levine, 1993. Finance and growth: Schumpeter may be right. Quarterly Journal of Economics 108, 717-737.

Krueger, Philipp, Zacharias Sautner, and Laura Starks, 2020, The importance of climate risks for institutional investors. Review of Financial Studies 33, 1067-1111.

Lesmond, David A., 2005, Liquidity of emerging markets. Journal of Financial Economics 77, 411-452.

Liang, Hao, Lin Sun, and Melvyn Teo. "Responsible hedge funds." Review of Finance 26, no. 6 (2022): 1585-1633.

Matos, Pedro, 2020, ESG and responsible institutional investing around the world: A critical review. CFA Institute Research Foundation Literature Reviews.

McCahery, Joseph, Zacharias Sautner, and Laura Starks, 2016, Behind the scenes: The corporate governance preferences of institutional investors. Journal of Finance 71, 2905-2932.

Morck, Randall, Bernard Yeung, and Wayne Yu, 2000, The information content of stock markets: why do emerging markets have synchronous stock price movements? Journal of Financial Economics 58, 215-260.

Pástor, Ľuboš, Robert F. Stambaugh, and Lucian A. Taylor, 2021, Sustainable investing in equilibrium. Journal of Financial Economics 142, 550-571.

Pedersen, Lasse Heje, Shaun Fitzgibbons, and Lukasz Pomorski, 2021, Responsible investing: The ESG-efficient frontier. Journal of Financial Economics 142, 572-597.

Rajan, Raghuram G., and Luigi Zingales, 1998, Financial dependence and growth. American Economic Review 88, 559-586.

Ramelli, Stefano, Alexander F. Wagner, Richard J. Zeckhauser, and Alexandre Ziegler, 2021, Investor rewards to climate responsibility: Stock-price responses to the opposite shocks of the 2016 and 2020 U.S. elections, Review of Corporate Finance Studies 10, 748-787.

Shapira, Roy, and Luigi Zingales, 2017, Is pollution value-maximizing? The DuPont case. NBER Working Paper w23866.

Starks, Laura T., Parth Venkat, and Qifei Zhu, 2020, Corporate ESG profiles and investor horizons. Unpublished working paper, University of Texas at Austin.

Stroebel, Johannes, and Jeffrey Wurgler, 2021, What do you think about climate finance? Journal of Financial Economics 142, 487-498.

Vuillemey, Guillaume, 2020, Evading corporate responsibilities: Evidence from the shipping industry. Unpublished working paper.

Xu, Simon, 2022, Environmental regulatory risks, firm pollution, and mutual funds' portfolio choices. Unpublished working paper.

Appendix A.1. Proofs

Proof of Proposition 1. We want to show $e'(\theta) < 0$ for all $\theta \in [0,1]$. Since:

$$e'(\theta) = \frac{(1-\theta)\phi'(\theta) \cdot + \phi}{(1-\theta)^2} \equiv \frac{h(\theta)}{(1-\theta)^2}. \tag{A.1}$$

We know that $h(1) = \phi(1) = 0$, so it suffices to show that $h'(\theta) > 0$ for all $\theta \in [0,1]$. Given that this becomes:

$$h'(\theta) = (1-\theta)\phi''(\theta) - \phi'(\theta) + \phi'(\theta) = (1-\theta)\phi''(\theta) > 0, \tag{A.2}$$

this completes the proof. □

Proof of Proposition 2. We prove the proposition in steps. First, given that:

$$\frac{\partial X}{\partial K} = \frac{\partial X}{\partial F}\frac{\partial F}{\partial K}, \tag{A.3}$$

and that the production function is always increasing in K, it suffices to show that $\frac{\partial X}{\partial F} > 0$ to guarantee $\frac{\partial X}{\partial K} > 0$.

Taking the derivative of X with respect to F gives:

$$\frac{\partial X}{\partial F} = \left(1 - \phi^{-1}\left(\frac{z}{F}\right)\right) + F\left([\phi^{-1}]'\left(\frac{z}{F}\right) \cdot \left(-\frac{z}{F^2}\right)\right) = 1 - \phi^{-1}\left(\frac{z}{F}\right) - \frac{z}{F}[\phi^{-1}]'\left(\frac{z}{F}\right). \tag{A.4}$$

Using the inverse function's derivative rule, this becomes:

$$\frac{\partial X}{\partial F} = 1 - \phi^{-1}\left(\frac{z}{F}\right) - \frac{z}{F}\frac{1}{\phi'\left(\phi^{-1}\left(\frac{z}{F}\right)\right)}. \tag{A.5}$$

But knowing that $\frac{z}{F} = \phi(\theta)$, this becomes:

$$\frac{\partial X}{\partial F} = (1-\theta) - \frac{\phi(\theta)}{\phi'(\theta)} \tag{A.6}$$

For our interval of interest, as long as $\phi(\theta) > 0$, i.e., $\theta < 1$, the entire term is positive, knowing that $\phi'(\theta) < 0$, which in turn guarantees that $\frac{\partial X}{\partial K} > 0$.

As for $\frac{\partial X}{\partial z}$, we obtain:

$$\frac{\partial X}{\partial z} = -[\phi^{-1}]'\left(\frac{z}{F}\right) \cdot \frac{1}{F} = -\frac{1}{F}\frac{1}{\phi'\left(\phi^{-1}\left(\frac{z}{F}\right)\right)} = -\frac{1}{F\phi'(\theta)} > 0. \tag{A.7}$$

Excluding the uninteresting case of zero intensity, which can only occur in the case of zero final output, each factor's marginal product is positive, guaranteeing that their marginal rate of substitution, in turn, will also be positive. Specifically, the marginal rate of technical substitution is given by:

$$\frac{\partial X}{\partial K}\Big/\frac{\partial X}{\partial z} = \frac{\phi(\theta)-(1-\theta)\phi'(\theta)}{F}\frac{dF}{dK}, \tag{A.8}$$

which is positive as long as $\theta < 1$. □

Appendix A.2. Variable Definition

In this section, we provide definitions of the variables used in our empirical analyses. We cite the data source in parentheses.

Capital investment (Worldscope): Capital expenditure scaled by total assets

Profitability (Worldscope): Earnings before interest, tax, depreciation, and amortization, divided by total assets on the firm's balance sheet.

Profit margin (Worldscope): Net income scaled by total sales

Tangibility (Worldscope): Property, plant, and equipment, divided by total assets on the firm's balance sheet.

Log total assets (Worldscope): the natural logarithm of total assets on the firm's balance sheet. Total assets are converted to U.S. dollars and presented in million U.S. dollar unit.

Leverage (Worldscope): Total debt divided by total assets on the firm's balance sheet.

Market-to-book (Worldscope): Market capitalization plus total debt divided by total assets on the firm's balance sheet.

Greenhouse Gases (Scope 1) (Trucost): Greenhouse gas emissions from sources that are owned or controlled by the company (categorized by the Greenhouse Gas Protocol) in million tCO_2e unit.

Greenhouse Gases (Scope 2) (Trucost): Greenhouse gas emissions from consumption of purchased electricity, heat or steam by the company (categorized by the Greenhouse Gas Protocol) in million tCO_2e unit.

Greenhouse Gases Scope 3 (Trucost): Greenhouse gas emissions from other upstream activities not covered in Scope 2 (categorized by the Greenhouse Gas Protocol) in million tCO_2e unit.

Direct greenhouse gas (Trucost): Greenhouse gas emissions generated from burning fossil fuels and production processes which are owned or controlled by the company in million tCO_2e unit.

Indirect greenhouse gas (Trucost): Greenhouse gas emissions generated from direct suppliers in million tCO_2e unit. The most significant sources are typically purchased electricity (Scope 2 of the GHG Protocol) and employee's business air travel.

Greenhouse Gases Scope 1 Cost (Trucost): External cost of greenhouse gas emissions from sources that are owned or controlled by the company in millions of U.S. dollars.

Direct greenhouse gas Cost (Trucost): External cost of greenhouse gas emissions generated from burning fossil fuels and production processes which are owned or controlled by the company in millions of U.S. dollars.

Total fund shareholdings (Morningstar): Proportion of mutual fund holdings divided by the latest number of shares outstanding. Mutual fund holdings are aggregated across all funds with the holdings data available in Morningstar.

Total passive fund shareholdings (Morningstar): Proportion of passive mutual fund holdings divided by the latest number of shares outstanding. Passive funds are defined as those are flagged by Morningstar as index funds or ETFs.

Total active fund shareholdings (Morningstar): Proportion of active mutual fund holdings divided by the latest number of shares outstanding. Active funds are funds that do not satisfy the criteria for passive funds as outlined above.

Foreign fund shareholdings (Morningstar): Proportion of foreign mutual fund holdings divided by the latest number of shares outstanding. We define a fund to be "foreign" if the sales region (as reported in Morningstar) of the fund's largest share class does not cover the firm's domicile country. When a fund's sales region is specified as "Nordic cross-border," we classify it as domestic in Scandinavian countries, while if it is specified as "European cross-border," it is treated as domestic in all countries that are part of the European union at the month-end in question.

Foreign passive fund shareholdings (Morningstar): Proportion of mutual fund holdings that satisfy the criteria above for passive and foreign funds, divided by the latest number of shares outstanding.

Low carbon designation (*Morningstar*): Designation assigned if portfolios that have low carbon-risk scores (Morningstar Portfolio Carbon Risk Score) and low levels of fossil-fuel exposure (Morningstar Portfolio Fossil Fuel Involvement).

Appendix A.3. A Primer on the MSCI Index Inclusion Criteria

Panel A. Firm-level criteria

For a security to be included in the index, it has to meet the following investability requirements.

- Equity Universe Minimum Size Requirement.
- Equity Universe Minimum Free Float-Adjusted Market Capitalization Requirement.
- DM and EM Minimum Liquidity Requirement.
- Global Minimum Foreign Inclusion Factor Requirement.
- Minimum Length of Trading Requirement.
- Minimum Foreign Room Requirement.
- Financial Reporting Requirement.

Panel B. Country-level criteria

In order to be classified in a given investment universe, a country must meet the requirements of all three criteria as described in the table below.

Criteria	Frontier	Emerging	Developed
A Economic Development			
A.1 Sustainability of economic development	No requirement	No requirement	Country GNI per capita 25% above the World Bank high income threshold* for 3 consecutive years
B Size and Liquidity Requirements			
B.1 Number of companies meeting the following Standard Index criteria	2	3	5
Company size (full market cap) **	USD 1,189 mm	USD 2,378 mm	USD 4,755 mm
Security size (float market cap) **	USD 101 mm	USD 1,189 mm	USD 2,378 mm
Security liquidity	2.5% ATVR	15% ATVR	20% ATVR
C Market Accessibility Criteria			
C.1 Openness to foreign ownership	At least some	Significant	Very high
C.2 Ease of capital inflows / outflows	At least partial	Significant	Very high
C.3 Efficiency of operational framework	Modest	Good and tested	Very high
C.4 Availability of Investment Instrument	High	High	Unrestricted
C.5 Stability of the institutional framework	Modest	Modest	Very high

* High income threshold: 2019 GNI per capita of USD 12,536 (World Bank, Atlas method)

** Minimum in use for the November 2021 Semi-Annual Index Review, updated on a semi-annual basis

Market Accessibility Criteria

	Definition
Openness to foreign ownership	
Investor qualification requirement	Existence of qualifying conditions for international investors. Existence of a level playing field for all international investors.
Foreign ownership limit (FOL) level	Proportion of the market being accessible to non-domestic investors.
Foreign room level	Proportion of shares still available for non-domestic investors. Existence of a foreign board where non-domestic investors could trade with each other.
Equal rights to foreign investors	Equal economic and voting rights as well as availability of information in English. Equal rights for minority shareholders.
Ease of capital inflows / outflows	
Capital flow restriction level	Existence of restriction on inflows and outflows of foreign capital to/from the local stock market (excluding foreign currency exchange restrictions).
Foreign exchange market liberalization level	Existence of a developed onshore and offshore foreign exchange market.
Efficiency of the operational framework	
Market entry	
Investor registration & account set up	Existence/level of complexity of registration requirements for international investors such as Tax IDs as well as ease/complexity for setting up local accounts (e.g., documents to be provided, approvals required). The time to complete the process includes the preparation of the documents.
Market organization	
Market regulations	Level of advancement of he legal and regulatory framework governing the financial market, the stock exchange and the various other entities involved in the financial markets, an important weight is assigned to: ease of access (including in English), lack of ambiguity and prompt enforcement of laws and regulations, as well as consistency over time.
Information flow	Timely disclosure of complete stock market information items (e.g., stock exchange alerts, corporate news, float information, dividend information) in English and under reasonable commercial terms, as well as the robustness and enforcement of accounting standards.
Market infrastructure	
Clearing and Settlement	Well functioning clearing and settlement system based on the broad framework published by the Bank for International Settlements including delivery versus payment (DVP), the absence of pre-funding requirements/practices and the possibility to use overdrafts. Availability of real omnibus structures.
Custody	Level of competition amongst local custodian banks as well as the presence of global custodian banks. Existence of an efficient mechanism that prevents brokers to have unlimited access to the investor's accounts and guarantees the safekeeping of its assets.
Registry / Depository	A well functioning central registry or independent registrars and a central depository.
Trading	Level of competition amongst brokers ensuring high quality services (e.g., cost efficient trading, ability to execute grouped trades at the same price for the various accounts of a fund manager).
Transferability	Possibility of off-exchange transactions and "in-kind" transfers.
Stock lending	Existence of a regulatory framework as well as an efficient mechanism allowing extensive use of stock lending.
Short selling	Existence of a regulatory and practical framework allowing short selling.
Availability of Investment Instruments	Existence of restrictions on access to derived stock exchange information, data and products that prevents the creation of investment instruments.
Stability of institutional framework	Basic institutional principles such as the rule of law and its enforcement as well as the stability of the "free-market" economic system. Track record of government intervention with regards to foreign investors.

Figure 1. The effect of a fall in the cost of capital ($r_1 \rightarrow r_2$)

This figure plots how a firm adjusts its optimal input mix in the emission-potential output (z-F) space following a decrease in the cost of capital from r_1 to r_2.

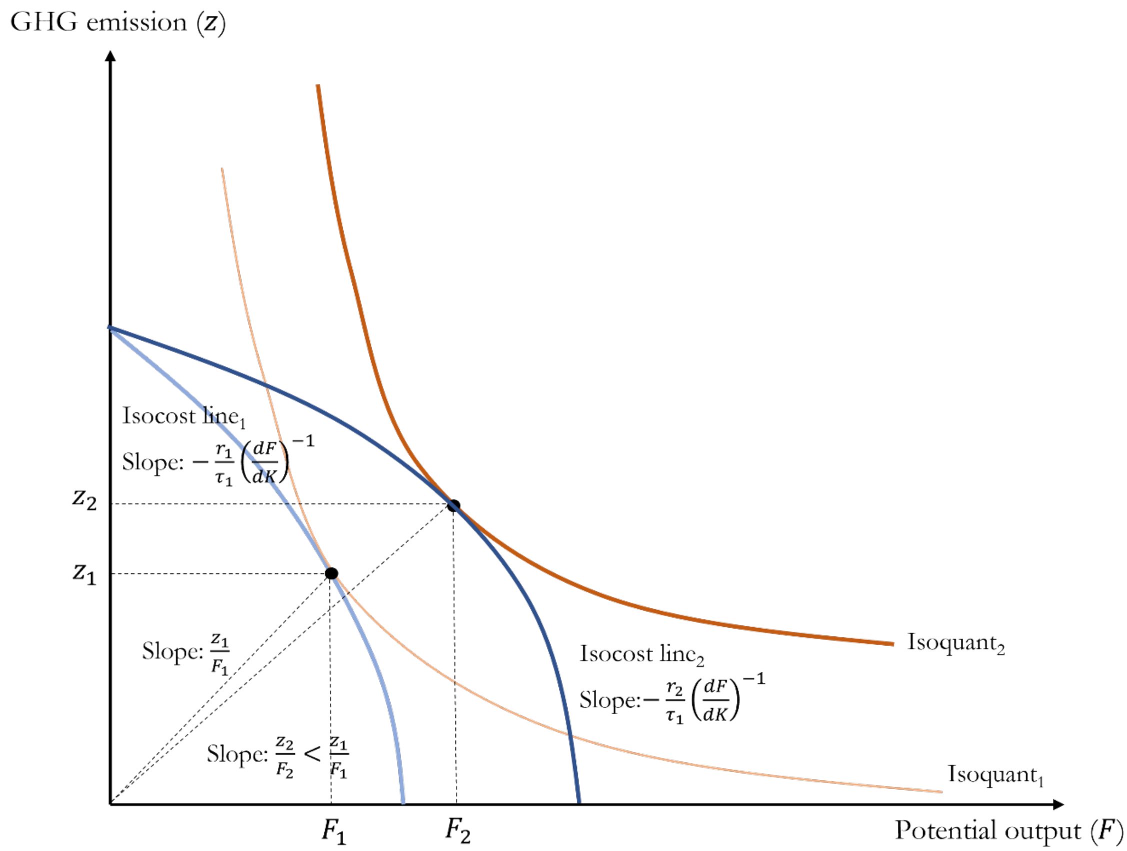


Figure 2. The effect of falls in the costs of capital ($r_1 \rightarrow r_2$) and pollution ($\tau_1 \rightarrow \tau_2$)

This figure plots how a firm adjusts its optimal input mix in the emission-potential output (z-F) space following decreases in the costs of capital from r_1 to r_2 and pollution from τ_1 to τ_2.

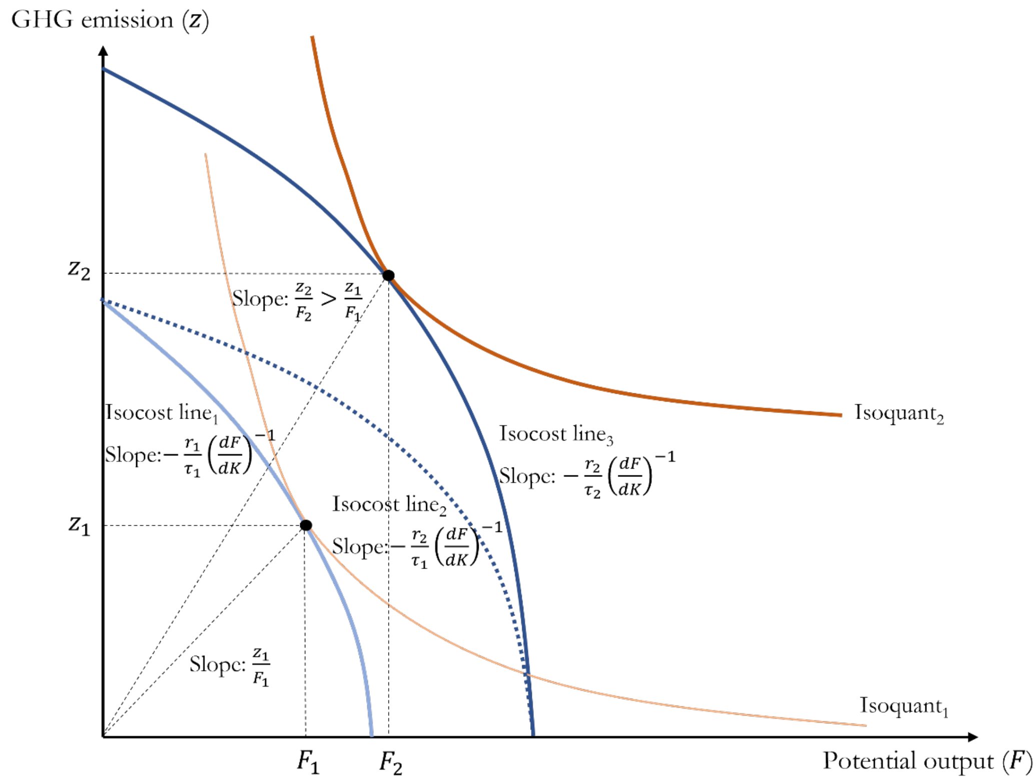
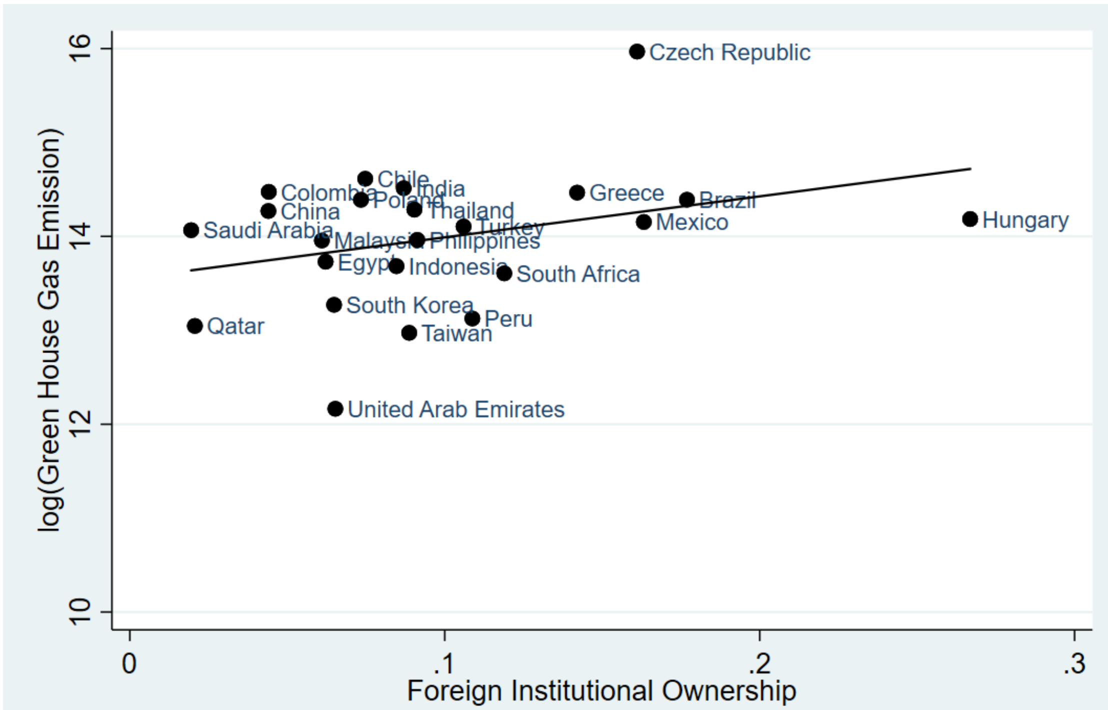


Figure 3. Foreign Institutional Ownership and Greenhouse Gas (GHG) Emission

In this figure, we present the relationship between foreign institutional ownership and GHG emission. We first aggregate the holdings of foreign institutions as reported in FactSet/Lionshare as well as the average GHG emission generated from burning fossil fuels and production processes owned or controlled by the company in million tons of CO_2 equivalent for each firm-year. We then take the country-level average of our sample firm-year observations, for a period from 2003 to 2020. Panel A presents the relationship in the emerging market, and Panel B presents the relationship in the developed market.

Panel A. Emerging market



Panel B. Developed market

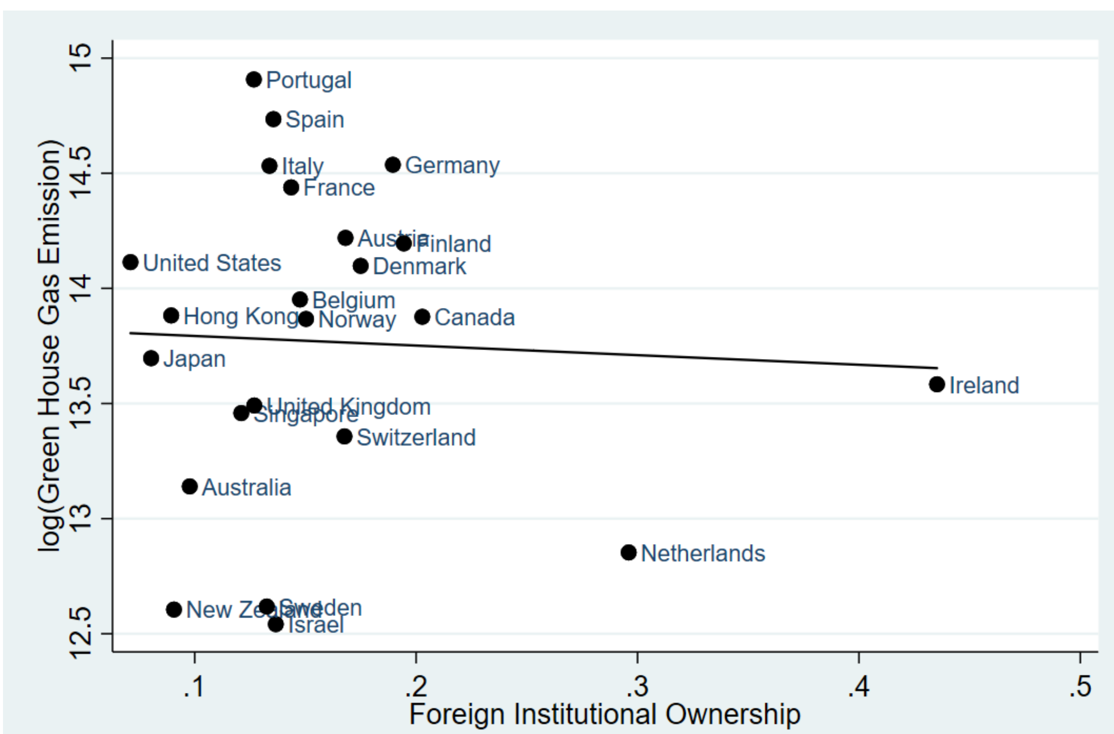
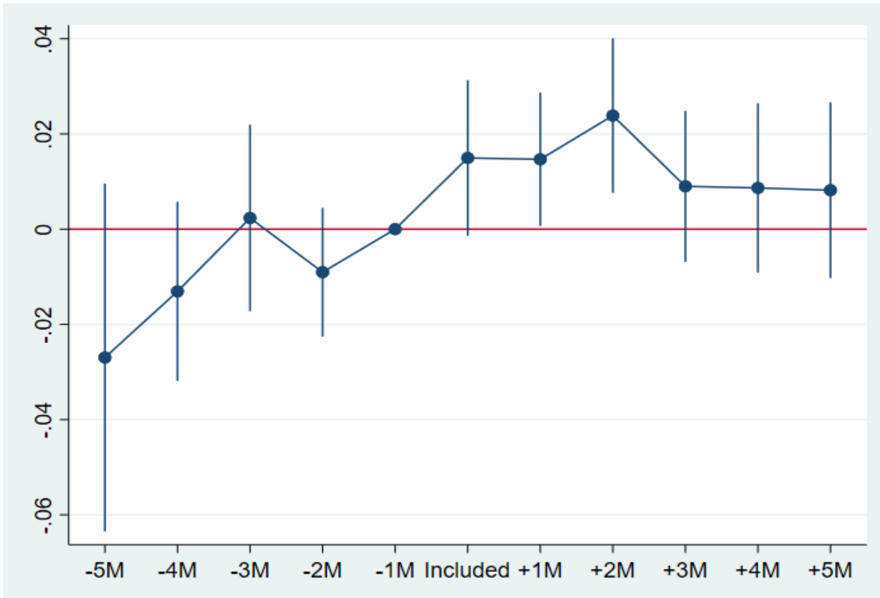


Figure 4. Changes in Mutual Fund Ownerships around MSCI Emerging Market Index Inclusion

These figures present the difference in monthly change in total (Panel A) and foreign (Panel B) mutual fund holdings between treated and matched control firms before around the MSCI index inclusion events. For each firm included in the MSCI index in a given year, we find three closest control firms within the same country at the same point in time, matched on the previous year values of log total assets, log sales, log market capitalization, log physical assets (property, plant, and equipment), log capital expenditure, market-to-book, and profitability, using the nearest neighbor propensity score matching.

Panel A. Total mutual fund holdings



Panel B. Foreign mutual fund holdings

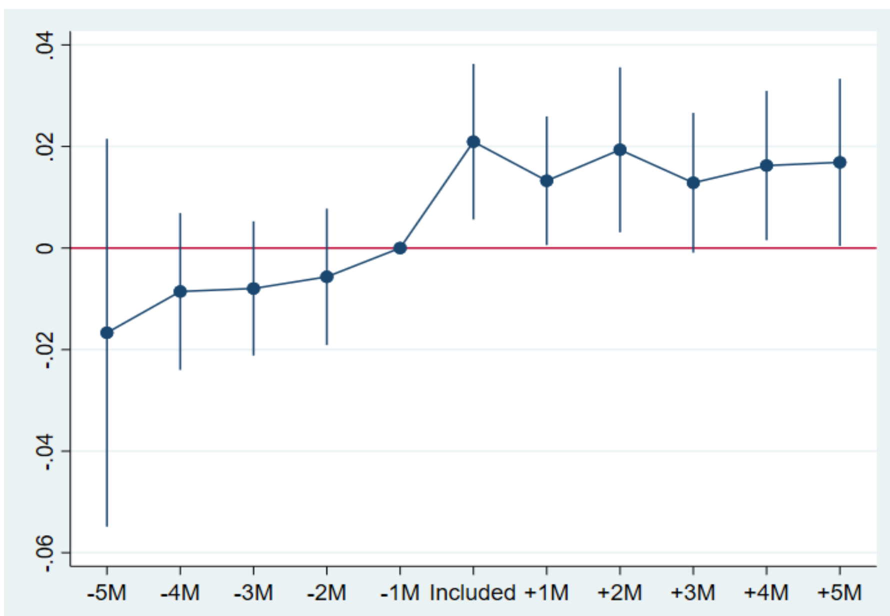
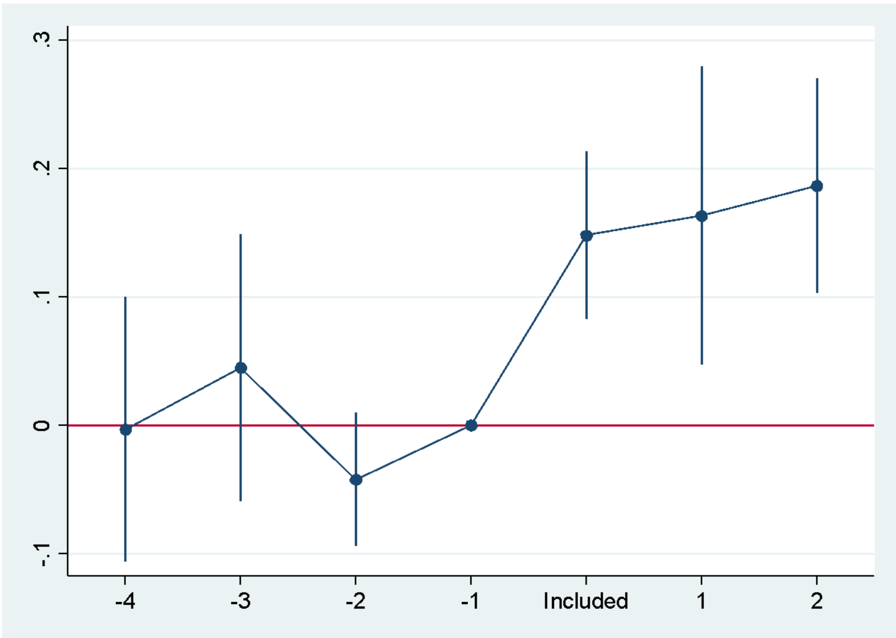


Figure 5. Changes in GHG Emission Levels around the MSCI Index Inclusion

These figures present the difference in GHG emission level between treated and matched control firms before and after all firm-level inclusion into the MSCI Emerging Market (EM) index (Panel A) and market-wide Chinese A-share inclusion into the MSCI EM index (Panel B). Plots show regression coefficients on the interaction terms between included (i.e., "treated") and years relative the inclusion year indicator variables, obtained from the regressions of log Scope 1 GHG emission on the aforementioned interaction as well as year-by-country and year-by-industry fixed effects, for a window of [-4, 2] years around the index inclusion. 90% confidence intervals obtained from robust standard errors clustered by firm and year are plotted. For more details on the matching procedure, refer to the explanation provided in Figure 4.

Panel A. All MSCI EM index inclusions



Panel B. Chinese A-share inclusion in the MSCI EM index

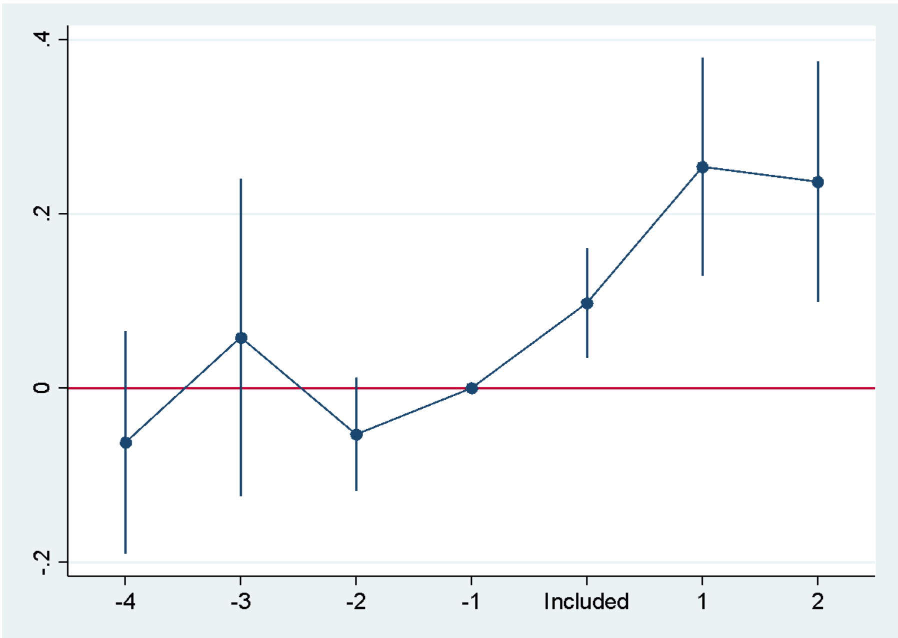
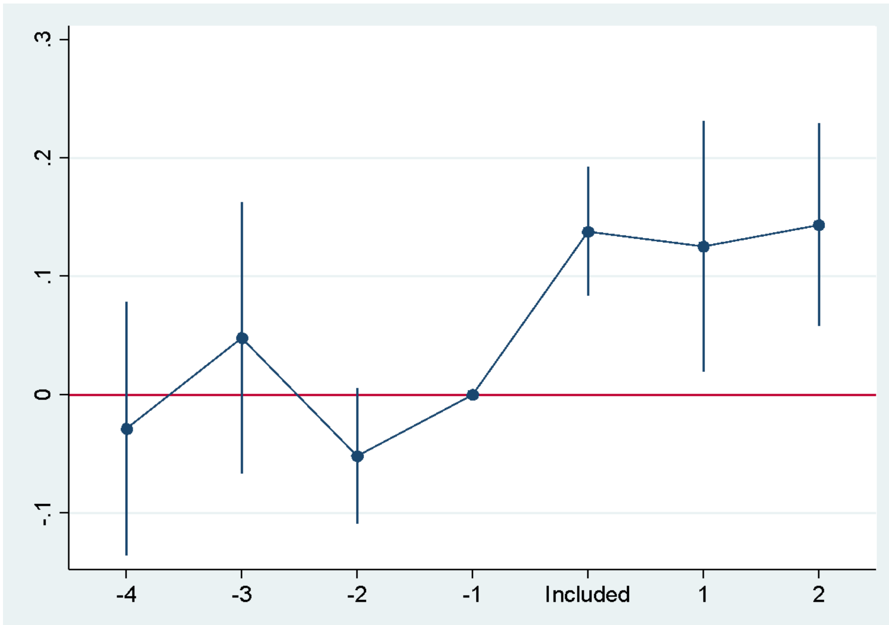


Figure 6. Changes in GHG Emissions intensities around MSCI Index Inclusion

These figures present the difference in GHG emissions intensity between treated and matched control firms before and after all firm-level inclusion into the MSCI EM (Panel A) and market-wide Chinese A-share inclusion into the MSCI EM index (Panel B). Plots show regression coefficients on the interaction terms between included (i.e., "treated") and years relative the inclusion year indicator variables, obtained from the regressions of log Scope 1 GHG emissions intensity per sale on the aforementioned interaction as well as year-by-country and year-by-industry fixed effects, for a window of [-4, 2] years around the index inclusion. 90% confidence intervals obtained from robust standard errors clustered by firm and year are plotted. For more details on the matching procedure, refer to the explanation provided in Figure 4.

Panel A. All MSCI EM index inclusions



Panel B. Chinese A-share inclusion in the MSCI EM index

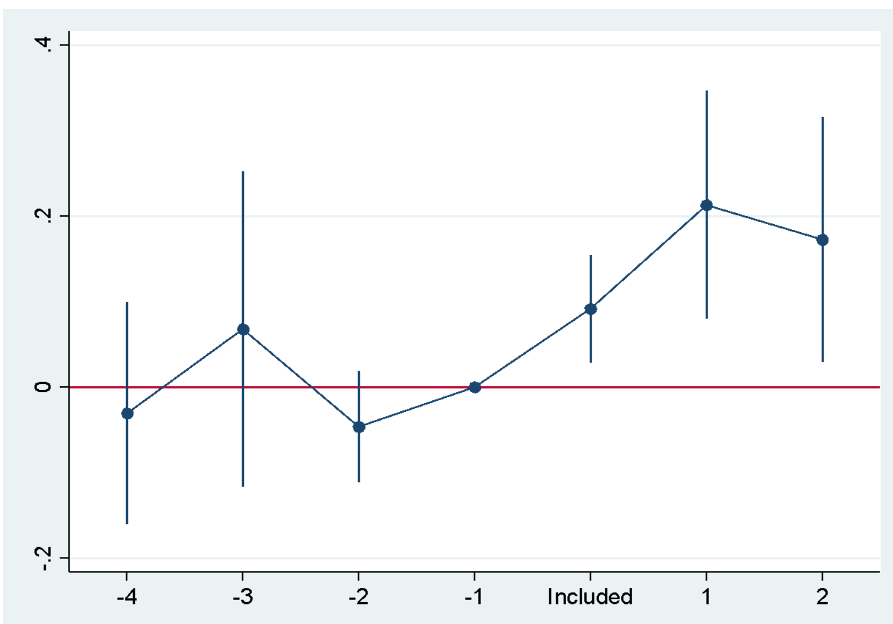


Table 1. Descriptive Statistics

This table reports the summary statistics of sample firms used in our empirical analysis from 2003 to 2020. Characteristics for emerging market firms are presented in Panel A, and characteristics by industry sectors for emerging market and developed market firms are in Panels B and C, respectively. Detailed description of the variables is presented in Appendix A.1. Continuous variables are winsorized at the 1% and 99% levels.

Panel A. Summary statistics

	Obs.	Mean	St. Dev.	P1	P25	Median	P75	P99
Total assets ($ millions)	11,061	22.266	72.503	0.171	1.382	3.476	10.762	537.128
Log total assets	11,061	15.272	1.611	12.048	14.139	15.061	16.192	20.102
Log sales	10,906	14.424	1.492	11.143	13.413	14.309	15.340	18.364
Log market capitalization	11,039	16.684	1.972	12.992	15.424	16.352	17.569	22.587
Log physical assets	10,748	18.329	3.866	11.100	15.993	17.524	19.671	31.377
Log capital expenditure	10,726	16.487	3.803	9.731	14.182	15.704	17.851	29.329
Market-to-book	11,061	0.434	0.220	0.048	0.266	0.429	0.596	0.889
Profitability	11,001	0.109	0.093	-0.146	0.055	0.099	0.155	0.400
GHG emission (million tCO_2e)								
Scope 1	11,061	2.341	7.685	0.000	0.009	0.042	0.359	46.300
Scope 2	11,061	0.236	0.644	0.000	0.010	0.039	0.146	4.451
Scope 3 (Upstream)	11,061	1.111	2.906	0.003	0.063	0.220	0.783	19.400
Direct	11,061	2.372	7.723	0.000	0.009	0.042	0.363	46.500
Indirect	11,061	0.751	1.993	0.001	0.033	0.131	0.456	14.500
GHG emissions intensity (emission/sales)								
Scope 1	10,908	0.778	6.255	0.000	0.008	0.028	0.176	12.567
Scope 2	10,908	0.077	0.322	0.000	0.010	0.026	0.061	0.894
Scope 3 (Upstream)	10,908	0.263	0.524	0.009	0.058	0.146	0.321	1.546
Direct	10,908	0.789	6.263	0.000	0.009	0.028	0.177	12.637
Indirect	10,908	0.195	0.496	0.002	0.034	0.078	0.205	1.456

Panel B. Carbon emission by industry sectors: Emerging market

		GHG emission level (million tCO2e)			GHG emissions intensity		
		Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3
	Obs.						
Low climate impact	2,541	0.103	0.076	0.189	0.054	0.043	0.096
Agriculture	83	1.361	0.099	1.268	1.310	0.080	0.721
Power generation	588	7.589	0.411	1.378	3.198	0.243	0.343
Manufacturing	4,118	1.908	0.245	1.382	0.778	0.113	0.539
Trade/transportation	964	1.949	0.202	0.789	0.553	0.040	0.142
Construction	387	0.287	0.107	1.004	0.088	0.024	0.251
Water/sewage/waste	74	0.688	0.049	0.071	0.795	0.084	0.092
Total	8,755	1.824	0.197	0.938	0.739	0.092	0.331

Panel C. Carbon emission by industry sectors: Developed market

		GHG emission level (million tCO2e)			GHG emissions intensity		
	Obs.	Scope 1	Scope 2	Scope 3	Scope 1	Scope 2	Scope 3
Low climate impact	5,578	0.149	0.094	0.344	0.042	0.034	0.075
Agriculture	67	1.235	0.203	1.966	0.708	0.046	0.419
Power generation	942	6.954	0.369	1.748	1.612	0.158	0.277
Manufacturing	4,156	1.455	0.365	2.575	0.817	0.497	0.595
Trade/transportation	1,601	1.535	0.269	1.008	0.199	0.042	0.124
Construction	455	0.327	0.080	0.940	0.102	0.140	0.424
Water/sewage/waste	82	3.327	0.330	0.402	0.562	0.063	0.097
Total	12,881	1.365	0.234	1.346	0.474	0.212	0.294

Table 2. Firm Expansion and GHG Emission Levels around MSCI EM Index Inclusion

In this table, we present the difference-in-differences regression results of firm financials and GHG emission levels with various scope definitions around the MSCI EM index inclusion. The sample consists of treated and matched control firms for a window of [-3, 2] years around the index inclusion. In Panel A, we consider firm financial variables with the log sales, log total assets, log number of employees, or profitability as the dependent variable. In Panel B, we consider Scope 1, Scope 2 Scope 3, direct, or indirect GHG emission as the dependent variable, all in log terms. Included is an indicator variable that takes the value of 1 if the firm is newly included to MSCI EM index and 0 for the matched control firms. Post is an indicator variable which is 1 if a given year is on or after a firm or its matched control firms are newly included into the index and zero otherwise. We include firm, country-by-year, and industry-by-year fixed effects. All continuous variables are winsorized at the 1% and 99% levels. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by firm and year are presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Firm financials

	Dependent variables:			
	(1)	(2)	(3)	(4)
	Log sales	Log total assets	Log employees	Profitability
Post	-0.050***	-0.040***	-0.042***	-0.007**
	(-5.473)	(-4.132)	(-3.920)	(-2.344)
Included × Post	0.137***	0.139***	0.105***	0.007**
	(7.078)	(9.695)	(4.756)	(2.458)
Observations	11,427	11,429	9,692	11,348
Adjusted R-squared	0.991	0.988	0.975	0.753
Firm FE	YES	YES	YES	YES
Country ×Year FE	YES	YES	YES	YES
Industry ×Year FE	YES	YES	YES	YES

Panel B. GHG emission levels

	Dependent variables: Log GHG emission				
	(1)	(2)	(3)	(4)	(5)
	Scope 1	Scope 2	Scope 3	Direct	Indirect
Post	-0.010	-0.050*	-0.028**	-0.008	-0.033**
	(-0.331)	(-1.869)	(-2.653)	(-0.272)	(-2.245)
Included × Post	0.153***	0.184***	0.149***	0.152***	0.172***
	(3.933)	(4.991)	(7.554)	(3.855)	(6.377)
Observations	11,061	11,061	11,061	11,061	11,061
Adjusted R-squared	0.968	0.942	0.980	0.968	0.971
Firm FE	YES	YES	YES	YES	YES
Country ×Year FE	YES	YES	YES	YES	YES
Industry ×Year FE	YES	YES	YES	YES	YES

Table 3. GHG Emissions Intensity Around the MSCI EM Index Inclusion

In this table, we present the difference-in-differences regression results of GHG emissions intensity with various scope definitions around the MSCI EM index inclusion. The sample consists of treated and matched control firms for a window of [-3, 2] years around the index inclusion. We consider Scope 1, Scope 2 Scope 3, direct, or indirect GHG emissions intensity as the dependent variable, all in log terms. Included is an indicator variable that takes the value of 1 if the firm is newly included to MSCI EM index and 0 for the matched control firms. Post is an indicator variable which is 1 if a given year is on or after a firm or its matched control firms are newly included into the index and zero otherwise. We include firm, country-by-year, and industry-by-year fixed effects. All continuous variables are winsorized at the 1% and 99% levels. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by firm and year are presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variables: Log GHG emissions intensity				
	(1)	(2)	(3)	(4)	(5)
	Scope 1	Scope 2	Scope 3	Direct	Indirect
Post	0.012	-0.027	-0.011	0.013	-0.013
	(0.363)	(-0.974)	(-0.801)	(0.375)	(-0.787)
Included × Post	0.076*	0.108***	0.078***	0.076*	0.098***
	(1.798)	(3.283)	(4.545)	(1.797)	(4.068)
Observations	10,889	10,889	10,889	10,889	10,889
Adjusted R-squared	0.955	0.902	0.934	0.955	0.934
Firm FE	YES	YES	YES	YES	YES
Country ×Year FE	YES	YES	YES	YES	YES
Industry ×Year FE	YES	YES	YES	YES	YES

Table 4. Chinese A-share MSCI EM Inclusion

In this table, we present the difference-in-differences regression results of GHG emissions intensity with various scope definitions as in Table 3, but with a specific focus on market-wide Chinese A-share inclusion into the MSCI EM index in 2018 and 2019. The sample consists of treated and matched control firms for a window of [-3, 2] years around the index inclusion. We consider Scope 1, Scope 2 Scope 3, direct, or indirect GHG emissions intensity as the dependent variable, all in log terms. Included is an indicator variable that takes the value of 1 if the firm is newly included to MSCI EM index and 0 for the matched control firms. Post is an indicator variable which is 1 if a given year is on or after a firm or its matched control firms are newly included into the index and zero otherwise. We include firm, country-by-year, and industry-by-year fixed effects. All continuous variables are winsorized at the 1% and 99% levels. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by firm and year are presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variables: Log GHG emissions intensity				
	(1)	(2)	(3)	(4)	(5)
	Scope 1	Scope 2	Scope 3	Direct	Indirect
Post	-0.041	-0.057*	-0.061***	-0.043	-0.050*
	(-0.693)	(-1.792)	(-3.152)	(-0.735)	(-2.013)
Included × Post	0.113	0.092*	0.087***	0.113	0.102**
	(1.667)	(2.083)	(3.741)	(1.671)	(2.807)
Observations	4,087	4,087	4,087	4,087	4,087
Adjusted R-squared	0.947	0.897	0.935	0.947	0.934
Firm FE	YES	YES	YES	YES	YES
Industry ×Year FE	YES	YES	YES	YES	YES

Table 5. Cross-Sectional Variations in GHG Emissions Intensity Around the MSCI EM Index Inclusion
In this table, we present the difference-in-differences regression results of GHG emissions intensity as in Table 3, but for various subsamples based on geographic regions (Panel A) or industry sectors (Panel B). In all specifications, we consider the log Scope 1 GHG emissions intensity as the dependent variable. In Panel A, we divide our sample into (1) South and Southeast Asia, (2) China, (3) East Asia, (4) Europe, Middle East, and Africa, and (5) Latin America. South and Southeast Asia consists of Philippines, India, Pakistan, Indonesia, Thailand, and Malaysia, while East Asia consists of South Korea, Hong Kong, Taiwan, and Singapore. In Panel B, we divide our sample firms' industry sectors into (1) power generation, (2) manufacturing, (3) wholesale/retail, and (4) information and financial and services. All other specifications are identical to Table 3. All continuous variables are winsorized at the 1% and 99% levels. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by firm and year are presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Geographic regions

	Dependent variable: Log Scope 1 GHG emissions intensity				
	(1)	(2)	(3)	(4)	(5)
	South/SE Asia	China	East Asia	Europe, Middle East & Africa	Latin America
Post	0.046	-0.020	0.016	0.158	0.025
	(1.185)	(-0.390)	(0.240)	(1.024)	(0.129)
Included × Post	0.156**	0.109*	-0.071	-0.008	-0.136
	(2.645)	(2.068)	(-0.888)	(-0.046)	(-0.979)
Observations	1,508	4,674	1,311	651	745
Adjusted R-squared	0.980	0.948	0.929	0.945	0.961
Firm FE	YES	YES	YES	YES	YES
Country ×Year FE	YES	NO	YES	YES	YES
Industry ×Year FE	YES	YES	YES	YES	YES

Panel B. Industry sectors

	Dependent variable: Log Scope 1 GHG emissions intensity			
	(1)	(2)	(3)	(4)
	Power Generation	Manufacturing	Wholesalers/ Retailers	Information/ Financial Services
Post	-0.139	-0.058	-0.016	0.029
	(-1.462)	(-1.028)	(-0.254)	(0.502)
Included × Post	0.206*	0.109*	0.136	0.081
	(1.940)	(2.075)	(1.533)	(1.277)
Observations	1,637	4,805	1,532	3,192
Adjusted R-squared	0.935	0.912	0.922	0.891
Firm FE	YES	YES	YES	YES
Country ×Year FE	YES	YES	YES	YES

Table 6. GHG Emissions Intensity Around the MSCI DM Index Inclusion

In this table, we present the difference-in-differences regression results of GHG emissions intensity with various scope definitions as in Table 3, but for a sample of treated and matched control firms for a window of [-3, 2] years around the MSCI DM index inclusion. Matching for DM firms is performed in the identical manner to EM index inclusion events. We consider Scope 1, Scope 2 Scope 3, direct, or indirect GHG emissions intensity as the dependent variable, all in log terms. Included is an indicator variable that takes the value of 1 if the firm is newly included to MSCI DM index and 0 for the matched control firms. Post is an indicator variable which is 1 if a given year is on or after a firm or its matched control firms are newly included into the index and zero otherwise. We include firm, country-by-year, and industry-by-year fixed effects. All continuous variables are winsorized at the 1% and 99% levels. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by firm and year are presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variables: Log GHG emissions intensity				
	(1)	(2)	(3)	(4)	(5)
	Scope 1	Scope 2	Scope 3	Direct	Indirect
Post	0.036	0.015	0.016	0.033	0.012
	(1.470)	(0.534)	(1.040)	(1.319)	(0.778)
Included × Post	-0.044	0.038	0.039**	-0.041	0.056**
	(-1.500)	(1.185)	(2.256)	(-1.434)	(2.784)
Observations	11,911	11,911	11,911	11,911	11,911
Adjusted R-squared	0.960	0.882	0.935	0.960	0.941
Firm FE	YES	YES	YES	YES	YES
Country ×Year FE	YES	YES	YES	YES	YES
Industry ×Year FE	YES	YES	YES	YES	YES

Table 7. Evidence on GHG Emission Abatement Activities Around the MSCI Index Inclusion

In this table, we present the difference-in-differences regression results of corporate GHG emission reduction targets (Panel A) and environmental expenditure (Panel B) around the MSCI EM or DM index inclusion. The sample consists of treated and matched control firms for a window of [-3, 2] years around the index inclusion. In Panel A, we consider the firm's stated emission reduction target percentage as the dependent variable. In Panel B, we consider the firm's log environmental expenditure as the dependent variable. The data on emission reduction target and environmental expenditure are obtained from Refinitiv ESG (formerly Asset4). In columns (1) and (3) of both panels, we include firm and year fixed effects, while in columns (2) and (4), we include firm, country-by-year, and industry-by-year fixed effects. Columns (1) and (2) of both panels present the result for EM index inclusions, while columns (3) and (4) present the results for DM index inclusions. All continuous variables are winsorized at the 1% and 99% levels. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by firm and year are presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Percentage emission reduction target

	Dependent variable: Percentage emission reduction target			
	Emerging Market		Developed Market	
	(1)	(2)	(3)	(4)
Post	1.047	-1.345	-1.462**	-2.387***
	(1.205)	(-1.181)	(-2.394)	(-3.041)
Included × Post	-2.478**	-0.173	1.804*	2.211**
	(-2.542)	(-0.143)	(2.029)	(2.745)
Observations	5,592	4,520	8,211	6,673
Adjusted R-squared	0.389	0.382	0.442	0.441
Firm FE	YES	YES	YES	YES
Year FE	YES	NO	YES	NO
Country ×Year FE	NO	YES	NO	YES
Industry ×Year FE	NO	YES	NO	YES

Panel B. Environmental Expenditure

	Dependent variable: Log environmental expenditure			
	Emerging Market		Developed Market	
	(1)	(2)	(3)	(4)
Post	0.661*	2.011***	-0.169	-0.107
	(2.014)	(3.51)	(-1.020)	(-0.365)
Included × Post	-0.924**	-3.513***	0.246	0.532
	(-2.398)	(-3.58)	(1.285)	(1.214)
Observations	404	67	582	88
Adjusted R-squared	0.929	0.954	0.900	0.956
Firm FE	YES	YES	YES	YES
Year FE	YES	NO	YES	NO
Country ×Year FE	NO	YES	NO	YES
Industry ×Year FE	NO	YES	NO	YES

Table 8. Fund Characteristics and GHG Emissions Intensity

In this table, we present the difference-in-differences regression results of GHG emissions intensity of our treated and matched controls around the MSCI EM index inclusions, but on the basis of whether the increased shareholdings are driven by funds with different characteristics. The dependent variable is log Scope 1 GHG emissions intensity. We create a number of indicator variables. First, D(Δ Active MF > Δ Passive MF) takes the value of one if the change in shareholdings of active mutual funds (MF) from one month before to the end of the inclusion month is higher than that of passive funds. Second, D(Δ Low > Δ High year-to-date return) takes the value of one if the change in shareholdings of mutual funds with below-median year-to-date fund return from one month before to the end of the inclusion month is higher than that of above-median peers. Third, D(Δ Low > Δ High Carbon Risk MF) takes the value of one if the change in shareholdings of mutual funds with low carbon risk from one month before to the end of the inclusion month is higher than that of funds with high carbon risk. We obtain funds' carbon risk score from Morningstar and use the latest quarterly median as the cut-off. Fourth, D(Δ High > Δ Low Env. Score MF) is computed in an analogous manner using the funds' Sustainalytics portfolio environmental score. Finally, D(Δ High > Δ Low Stringent EPS MF) takes the value of one if the change in shareholdings of mutual funds selling to investors in high environmental policy stringency (EPS) countries from one month before to the end of the inclusion month is higher than that of funds selling to investors in low EPS countries. Countries are defined as high (low) EPS if its latest yearly OECD Environment Policy Stringency is higher (lower) than the median value for the same year. Post is an indicator variable which is 1 if a given year is on or after a firm or its matched control firms are newly included into the index or zero otherwise. All other specifications are identical to Table 3. Continuous variables are winsorized at the 1% and 99% levels. We include firm, country-by-year, and industry-by-year fixed effects in all specifications. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by firm and year are presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Around the MSCI EM Index Inclusion

	Dependent variable: Log Scope 1 GHG emissions intensity				
	(1)	(2)	(3)	(4)	(5)
Post	-0.005	-0.024	-0.013	-0.026	0.026
	(-0.133)	(-0.934)	(-0.359)	(-0.849)	(0.997)
Post × D(Δ Active MF > Δ Passive MF)	0.114*				
	(1.859)				
Post × D(Δ Low > Δ High year-to-date return)		0.106*			
		(2.083)			
Post × D(Δ Low > Δ High Carbon Risk MF)			0.131*		
			(1.973)		
Post × D(Δ High > Δ Low Env. Score MF)				0.116*	
				(1.883)	
Post × D(Δ High > Δ Low Stringent EPS MF)					0.126***
					(2.920)
Observations	6,471	7,418	5,739	6,076	8,612
Adjusted R-squared	0.970	0.970	0.963	0.963	0.954
Firm FE	YES	YES	YES	YES	YES
Industry × Year FE	YES	YES	YES	YES	YES

Panel B. Around the Chinese A-share MSCI EM Inclusion

	Dependent variable: Log Scope 1 GHG emissions intensity				
	(1)	(2)	(3)	(4)	(5)
Post	-0.061	-0.054	-0.039	-0.076	-0.018
	()	()	()	()	()
Post × D(Δ Active MF > Δ Passive MF)	0.194				
	(1.571)				
Post × D(Δ Low > Δ High year-to-date return)		0.159**			
		(2.219)			
Post × D(Δ Low > Δ High Carbon Risk MF)			0.170*		
			(1.868)		
Post × D(Δ High > Δ Low Env. Score MF)				0.183**	
				(2.537)	
Post × D(Δ High > Δ Low Stringent EPS MF)					0.193**
					(2.276)
Observations	2,115	3,015	2,876	3,026	2,347
Adjusted R-squared	0.923	0.946	0.945	0.944	0.949
Firm FE	YES	YES	YES	YES	YES
Industry × Year FE	YES	YES	YES	YES	YES

Table 9. Cross-Sectional Variation in GHG Emissions Intensity: Firm-Level Environmental Policy Stringency, Emission Levels, and Capital Intensity

In this table, we present the difference-in-differences regression results of GHG emissions intensity of our treated and matched controls around the MSCI EM index inclusions, but on the basis of whether (i) the firm resides in countries with high or low EPS, (ii) countries with high or low GHG emission level per capita, and (iii) the firm operates in capital-intensive or non-capital-intensity industries. The dependent variable is log Scope 1 GHG emissions intensity. We divide our sample into subsamples on the basis of whether the countries' latest (1) Environmental Policy Stringency, (2) market-based (taxes, permits, and certificates) Environmental Policy Stringency, and (3) public R&D expenditure on clean technology scores are higher or lower than the sample median at the same point in time. Subsamples using carbon emission per capita are calculated analogously. The data on Environmental Policy Stringency score is from the OECD. Finally, we consider a firm to be in capital-intensive industry if its assets-to-sales ratio is higher than the sample median at the same point in time. Post is an indicator variable which is 1 if a given year is on or after a firm or its matched control firms are newly included into the index or zero otherwise. All other specifications are identical to Table 3. Continuous variables are winsorized at the 1% and 99% levels. We include firm, country-by-year, and industry-by-year fixed effects in all specifications. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by firm and year are presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variable: Log Scope 1 GHG emissions intensity	
	(1)	(2)
(1) Environmental Policy Stringency	Low	High
Included × Post	0.094*	0.109
	(1.896)	(0.491)
(2) Market-based Environmental Policy Stringency	Low	High
Included × Post	0.099*	-0.271
	(1.934)	(-0.920)
(3) R&D Subsidy for environmental projects	Low	High
Included × Post	0.101*	-0.016
	(2.050)	(-0.072)
(4) Carbon emission per capita	Low	High
Included × Post	-0.071	0.094*
	(-0.799)	(1.965)
(5) Industry-level capital intensity	Low	High
Included × Post	0.053	0.178***
	(0.853)	(4.300)
Firm FE	YES	YES
Country ×Year FE	YES	YES
Industry ×Year FE	YES	YES

Table 10. Post-Inclusion Stock Returns of MSCI-Included Firms

In this table, we run OLS regressions of the stock returns of firms that are included in the MSCI EM and DM indices. As the dependent variable, we consider stock returns summed over the following three time horizons relative to the inclusion year: 0, [1, 2], and [0, 2]. We create an EM inclusion indicator variable that takes the value of 1 for EM included firms and 0 for DM included firms. As controls, we include log market capitalization, log market-to-book, profitability, and investment, and we include year fixed effect. Continuous variables are winsorized at the 1% and 99% levels. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by firm and year are presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)
	Year 0	Year [1, 2]	Year [0, 2]
EM inclusion	0.004***	0.003*	0.008***
	(3.012)	(1.665)	(3.112)
Controls	YES	YES	YES
Observations	2,794	2,542	2,161
Adjusted R-squared	0.342	0.294	0.176
Year FE	YES	YES	YES

Table 11. Environment-Related ESG Violation Around the MSCI Index Inclusion

In Panel A of this table, we present the difference-in-differences regression results of the likelihood of environment-related ESG violation around the MSCI EM index inclusion. The sample consists of treated and matched control firms for a window of [-3, 2] years around the index inclusion. The dependent variables are indicator variables that take the value of one if a firm has violation linked to (1) all environmental-related, (2) climate and GHG pollution, (3) local pollution, or (4) waste issues in a given year. Included is an indicator variable that takes the value of 1 if the firm is newly included to MSCI EM index and 0 for the matched control firms. Post is an indicator variable which is 1 if a given year is on or after a firm or its matched control firms are newly included into the index and zero otherwise. Then, in Panel B, we run difference-in-difference regressions separately for each geographic region, with all environment-related violation indicator as the dependent variable. Finally, in Panel C, we present the results for our sample firms around the MSCI DM index inclusion instead. We include firm, country-by-year, and industry-by-year fixed effects in all specifications. All continuous variables are winsorized at the 1% and 99% levels. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by firm and year are presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Emerging Market

	Dependent variables: ESG violation indicator			
	(1)	(2)	(3)	(4)
	Incidents related to			
	All environment-related	Climate and GHG pollution	Local pollution	Waste
Post	-0.136	-0.054	-0.100*	-0.013
	(-1.437)	(-1.639)	(-1.775)	(-0.379)
Included × Post	0.224***	0.096***	0.104***	0.053***
	(3.939)	(3.046)	(2.953)	(3.022)
Observations	11,426	11,426	11,426	11,426
Adjusted R-squared	0.787	0.632	0.753	0.546
Firm FE	YES	YES	YES	YES
Country ×Year FE	YES	YES	YES	YES
Industry ×Year FE	YES	YES	YES	YES

Panel B. Geographic Regions

	Dependent variable: All environment-related ESG violation indicator				
	(1)	(2)	(3)	(4)	(5)
	South/SE Asia	China	East Asia	Europe, Middle East & Africa	Latin America
Post	-0.144	-0.181	0.010	-0.176	-0.020
	(-1.374)	(-1.466)	(0.124)	(-0.475)	(-0.088)
Included × Post	0.176**	0.183***	0.005	0.313	-0.062
	(2.246)	(3.091)	(0.078)	(1.095)	(-0.400)
Observations	1,689	5,297	1,208	919	703
Adjusted R-squared	0.819	0.866	0.915	0.923	0.935
Firm FE	YES	YES	YES	YES	YES
Country ×Year FE	YES	YES	YES	YES	YES
Industry ×Year FE	YES	YES	YES	YES	YES

Panel C. Developed Market

	Dependent variables: ESG violation indicator			
	(1)	(2)	(3)	(4)
	Incidents related to			
	All environment-related	Climate and GHG pollution	Local pollution	Waste
Post	-0.027	0.029	-0.005	-0.012
	(-0.356)	(0.743)	(-0.132)	(-0.478)
Included × Post	0.106	-0.022	0.069	0.047
	(1.042)	(-0.449)	(1.320)	(1.403)
Observations	13,737	13,737	13,737	13,737
Adjusted R-squared	0.842	0.774	0.801	0.667
Firm FE	YES	YES	YES	YES
Country ×Year FE	YES	YES	YES	YES
Industry ×Year FE	YES	YES	YES	YES

Internet Appendix to:

"Does Foreign Institutional Capital Promote Green Growth for Emerging Market Firms?"

This Version: March 15, 2023

Table A.1. Characteristics of MSCI Included and Matched Control Firms

This table reports the differences in firm characteristics of treated (MSCI-included), all non-MSCI, and matched control firms. For more information on the matching procedure, refer to the explanation provided in Figure 4. Differences between the subsamples are tested using regression with year fixed effect and *p*-values associated with standard errors clustered by year are reported. All continuous variables are winsorized at the 1% and 99% levels. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	Mean			Test of difference (*p*-value)	
	MSCI included	Non-MSCI	Matched control	MSCI – non-MSCI	MSCI – matched control
Total assets	21.198	13.375	12.794	0.244	0.391
Market capitalization	6.801	7.686	4.566	0.091*	0.168
Sales	5.401	6.797	4.171	0.040**	0.352
Profitability	0.122	0.100	0.112	< 0.001***	0.110
Physical assets	2.249	2.814	2.033	0.070*	0.798
Capital expenditure	0.442	0.799	0.788	< 0.001***	0.238
Market-to-book	0.438	0 .427	0.457	0.123	0.498
GHG (Scope 1)	2.055	1.395	1.702	< 0.001***	0.911
Observations	1,108	103,201	1,368		

Table A.2. Changes in Mutual Fund Ownership Around the MSCI Index Inclusion

This table presents the monthly change in (i) total and (ii) foreign mutual fund shareholdings before and after the firms' inclusion to the MSCI Index. Included is an indicator variable that takes the value of 1 if the firm is newly included to MSCI index and 0 for the matched control. t indicates the month of index inclusion. We consider all inclusions to the EM index in columns (1) and (2), DM index inclusions in columns (3) and (4), and Chinese A-share inclusions to the EM index in 2018 and 2019 in columns (5) and (6). The month before the inclusion is the base month for the analysis, and thus all coefficients present the differences relative to month $t-1$. Continuous variables are winsorized at the 1% and 99% levels. We include firm, country-by-month, and industry-by-month fixed effects in all specifications. All continuous variables are winsorized at the 1% and 99% levels. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by firm and month are presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variables					
	EM index inclusion		DM index inclusion		China A-share Inclusion	
Month	Total fund shareholdings	Foreign fund shareholdings	Total fund shareholdings	Foreign fund shareholdings	Total fund shareholdings	Foreign fund shareholdings
	(1)	(2)	(3)	(4)	(5)	(6)
$(t-5)$ × Included	-0.012	-0.022	-0.009	-0.004	-0.010	-0.001
	(-0.755)	(-1.570)	(-0.571)	(-0.483)	(-1.225)	(-0.851)
$(t-4)$ × Included	0.001	-0.008	-0.003	-0.003	-0.010	-0.001
	(0.164)	(-1.254)	(-0.348)	(-0.424)	(-1.185)	(-1.214)
$(t-3)$ × Included	-0.003	-0.010*	0.001	0.001	-0.007	-0.000
	(-0.519)	(-1.799)	(0.359)	(0.292)	(-0.852)	(-0.668)
$(t-2)$ × Included	-0.0043	-0.005	0.000	-0.002	-0.001	0.000
	(-0.635)	(-0.974)	(0.016)	(-0.774)	(-0.327)	(0.207)
t × Included	0.0282***	0.023***	0.014	0.005	0.002	0.001*
	(3.791)	(3.355)	(1.062)	(0.887)	(0.527)	(1.995)
$(t+1)$ × Included	0.0206**	0.016**	0.019	0.007	-0.007	0.001
	(2.492)	(2.184)	(1.238)	(1.063)	(-0.801)	(1.581)
$(t+2)$ × Included	0.0079	0.006	0.036**	0.013**	-0.003	0.000
	(0.809)	(0.650)	(2.411)	(2.113)	(-0.421)	(0.377)
$(t+3)$ × Included	0.0133	0.007	0.033**	0.010	-0.004	0.001
	(1.388)	(0.871)	(2.102)	(1.550)	(-0.791)	(1.213)
Controls	NO	NO	NO	NO	NO	NO
Observations	12,654	12,654	8,850	8,928	1,210	1,210
Adjusted R-squared	0.798	0.798	0.910	0.873	0.658	0.971
Firm FE	YES	YES	YES	YES	YES	YES
Country × Month FE	YES	YES	YES	YES	YES	YES
Industry × Month FE	YES	YES	YES	YES	YES	YES

Table A.3. Mutual fund shareholdings and GHG Emissions intensity

In this table, we present the regression results of next-year log Scope 1 GHG emissions intensity on various measures mutual fund shareholdings for all EM firms, regardless of whether they are included in the MSCI EM index. As the dependent variable, we focus on one-year-ahead GHG emissions intensity with various scope definitions. We control for log total assets, leverage, market-to-book, profitability, and tangibility, all in lagged values, as well as firm and country-by-industry-by-year fixed effects. All continuous variables are winsorized at the 1% and 99% levels. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by firm and year are presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variable: Log Scope 1 GHG emissions intensity					
	(1)	(2)	(3)	(4)	(5)	(6)
Domestic fund shareholdings	-0.061					
	(-0.585)					
Domestic passive shareholdings		-0.455				
		(-1.240)				
Domestic active shareholdings			-0.019			
			(-0.169)			
Foreign fund shareholdings				0.128**		
				(1.975)		
Foreign passive fund shareholdings					0.139	
					(0.585)	
Foreign active fund shareholdings						0.122*
						(1.838)
Controls	YES	YES	YES	YES	YES	YES
Observations	67,757	67,757	67,757	67,757	67,757	67,757
Adjusted R-squared	0.987	0.988	0.988	0.988	0.988	0.988
Firm FE	YES	YES	YES	YES	YES	YES
Country × Industry × Year FE	YES	YES	YES	YES	YES	YES

Table A.4. Firm Expansion, GHG Emission, and Emissions intensity Around the MSCI EM Index Inclusion: Additional Controls

In this table, we present the difference-in-differences regression results of firm financials, GHG emission levels, and GHG emissions intensities with various scope definitions around the MSCI EM index inclusion as in Tables 2 and 3, albeit with variables used for matching as additional controls. The sample consists of treated and matched control firms for a window of [-3, 2] years around the index inclusion. In Panel A, we consider firm financial variables with the log sales, log total assets, log number of employees, or profitability as the dependent variable. In Panel B, we consider Scope 1, Scope 2 Scope 3, direct, or indirect GHG emission as the dependent variable, all in log terms. Finally, in Panel C, we consider log GHG emissions intensities with various scope definitions as the dependent variables. All other specifications are identical to Tables 2 and 3. All continuous variables are winsorized at the 1% and 99% levels. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by firm and year are presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Firm financials

	Dependent variables:			
	(1)	(2)	(3)	(4)
	Log sales	Log total assets	Log employees	Profitability
Post	-0.034***	-0.025**	-0.030***	-0.007**
	(-5.257)	(-2.794)	(-3.368)	(-2.433)
Included × Post	0.082***	0.084***	0.061***	0.009**
	(6.746)	(9.287)	(3.756)	(2.723)
Controls	YES	YES	YES	YES
Observations	11,427	11,429	9,692	11,348
Adjusted R-squared	0.991	0.991	0.975	0.753
Firm FE	YES	YES	YES	YES
Country ×Year FE	YES	YES	YES	YES
Industry ×Year FE	YES	YES	YES	YES

Panel B. GHG emission levels

	Dependent variables: Log GHG emission				
	(1)	(2)	(3)	(4)	(5)
	Scope 1	Scope 2	Scope 3	Direct	Indirect
Post	0.000	-0.039	-0.016	0.002	-0.021
	(0.011)	(-1.427)	(-1.675)	(0.056)	(-1.510)
Included × Post	0.114**	0.142***	0.100***	0.113**	0.128***
	(2.875)	(4.067)	(6.730)	(2.837)	(5.265)
Controls	YES	YES	YES	YES	YES
Observations	11,061	11,061	11,061	11,061	11,061
Adjusted R-squared	0.969	0.944	0.982	0.969	0.974
Firm FE	YES	YES	YES	YES	YES
Country ×Year FE	YES	YES	YES	YES	YES
Industry ×Year FE	YES	YES	YES	YES	YES

Panel C. GHG emissions intensities

	Dependent variables: Log GHG emissions intensity				
	(1)	(2)	(3)	(4)	(5)
	Scope 1	Scope 2	Scope 3	Direct	Indirect
Post	0.000	-0.040	-0.016	0.001	-0.022
	(-0.013)	(-1.452)	(-1.675)	(0.032)	(-1.552)
Included × Post	0.112**	0.140***	0.100***	0.112**	0.127***
	(2.822)	(3.980)	(6.730)	(2.790)	(5.163)
Controls	YES	YES	YES	YES	YES
Observations	11,061	11,061	11,061	11,061	11,061
Adjusted R-squared	0.972	0.962	0.987	0.972	0.981
Firm FE	YES	YES	YES	YES	YES
Country ×Year FE	YES	YES	YES	YES	YES
Industry ×Year FE	YES	YES	YES	YES	YES

Table A.5. Firm Expansion and GHG Emission Levels around Chinese A-share MSCI EM Inclusion

In this table, we present the difference-in-differences regression results of firm financials and GHG emission levels with various scope definitions as in Table 2, but with a specific focus on Chinese A-share inclusions into the EM index in 2018 and 2019 as in Table 4. The sample consists of treated and matched control firms for a window of [-3, 2] years around the index inclusion. In Panel A, we consider firm financial variables with the log sales, log total assets, log number of employees, or profitability as the dependent variable. In Panel B, we consider Scope 1, Scope 2 Scope 3, direct, or indirect GHG emission as the dependent variable, all in log terms. Included is an indicator variable that takes the value of 1 if the firm is newly included to MSCI EM index and 0 for the matched control firms. Post is an indicator variable which is 1 if a given year is on or after a firm or its matched control firms are newly included into the index and zero otherwise. We include firm, country-by-year, and industry-by-year fixed effects. All continuous variables are winsorized at the 1% and 99% levels. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by firm and year are presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Firm financials

	Dependent variables:			
	(1)	(2)	(3)	(4)
	Log sales	Log total assets	Log employees	Profitability
Post	-0.030***	-0.030**	-0.02	-0.011**
	(-3.065)	(-2.366)	(-1.235)	(-2.214)
Included × Post	0.089***	0.108***	0.079***	0.015***
	(3.973)	(5.366)	(3.264)	(3.733)
Controls	NO	NO	NO	NO
Observations	4,087	4,087	4,057	4,050
Adjusted R-squared	0.975	0.989	0.979	0.621
Firm FE	YES	YES	YES	YES
Country ×Year FE	YES	YES	YES	YES
Industry ×Year FE	YES	YES	YES	YES

Panel B. GHG emission levels

	Dependent variables: Log GHG emission				
	(1)	(2)	(3)	(4)	(5)
	Scope 1	Scope 2	Scope 3	Direct	Indirect
Post	-0.010	-0.026	-0.030***	-0.013	-0.019
	(-0.186)	(-0.978)	(-3.055)	(-0.237)	(-1.078)
Included × Post	0.133**	0.113**	0.108***	0.133**	0.123***
	(2.356)	(2.543)	(4.678)	(2.360)	(3.816)
Controls	NO	NO	NO	NO	NO
Observations	4,087	4,087	4,087	4,087	4,087
Adjusted R-squared	0.963	0.943	0.980	0.963	0.972
Firm FE	YES	YES	YES	YES	YES
Country ×Year FE	YES	YES	YES	YES	YES
Industry ×Year FE	YES	YES	YES	YES	YES

Table A.6. Cross-Sectional Variations in GHG Emissions intensity around the MSCI EM Index Inclusion: Additional Controls

In this table, we present the difference-in-differences regression results of GHG emissions intensity for various geographic region or industry sector subsamples as in Table 5, but with matching variables as additional controls. In all specifications, we consider the log Scope 1 GHG emissions intensity as the dependent variable. In Panel A, we divide our sample into (1) South and Southeast Asia, (2) China, (3) East Asia, (4) Europe, Middle East, and Africa, and (5) Latin America. South and Southeast Asia consists of Philippines, India, Pakistan, Indonesia, Thailand, and Malaysia, while East Asia consists of South Korea, Hong Kong, Taiwan, and Singapore. In Panel B, we divide our sample firms' industry sectors into (1) power generation, (2) manufacturing, (3) wholesale/retail, and (4) information and financial and services. All other specifications are identical to Table 5. All continuous variables are winsorized at the 1% and 99% levels. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by firm and year are presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Geographic regions

	Dependent variable: Log Scope 1 GHG emissions intensity				
	(1)	(2)	(3)	(4)	(5)
	South/SE Asia	China	East Asia	Europe, Middle East & Africa	Latin America
Post	-0.001	-0.002	-0.027	0.158	0.062
	(-0.020)	(-0.043)	(-0.441)	(1.024)	(0.384)
Included × Post	0.136**	0.106*	0.060	-0.008	-0.060
	(2.574)	(1.721)	(0.591)	(-0.046)	(-0.413)
Controls	YES	YES	YES	YES	YES
Observations	1,478	4,584	1,280	779	718
Adjusted R-squared	0.988	0.954	0.975	0.966	0.977
Firm FE	YES	YES	YES	YES	YES
Country ×Year FE	YES	YES	YES	YES	YES
Industry ×Year FE	YES	YES	YES	YES	YES

Panel B. Industry sectors

	Dependent variable: Log Scope 1 GHG emissions intensity			
	(1)	(2)	(3)	(4)
	Power Generation	Manufacturing	Wholesalers/ Retailers	Information/ Financial Services
Post	-0.151	-0.068	-0.038	0.041
	(-1.662)	(-1.156)	(-0.609)	(0.794)
Included × Post	0.234**	0.176***	0.183*	0.075
	(2.381)	(3.268)	(2.030)	(1.141)
Controls	YES	YES	YES	YES
Observations	1,637	4,805	1,532	3,192
Adjusted R-squared	0.941	0.920	0.931	0.915
Firm FE	YES	YES	YES	YES
Country ×Year FE	YES	YES	YES	YES
Industry ×Year FE	YES	YES	YES	YES

Table A.7. Firm Expansion and GHG Emission Levels around the MSCI DM Index Inclusion

In this table, we present the difference-in-differences regression results of firm financials and GHG emission levels with various scope definitions as in Table 2, but for the sample of treated and matched control firms for the MSCI DM index inclusion events. The sample consists of treated and matched control firms for a window of [-3, 2] years around the index inclusion. We first report the summary statistics in Panel A. In Panel B, we consider firm financial variables with the log sales, log total assets, log number of employees, or profitability as the dependent variable. In Panel C, we consider Scope 1, Scope 2 Scope 3, direct, or indirect GHG emission as the dependent variable, all in log terms. All other specifications are identical to Table 2. All continuous variables are winsorized at the 1% and 99% levels. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by firm and year are presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Descriptive statistics

	Obs.	Mean	St. Dev.	P1	P25	Median	P75	P99
Total assets ($ millions)	11,952	24.520	71.020	0.201	1.998	4.796	13.615	537.128
Log total assets	11,952	15.552	1.566	12.212	14.508	15.383	16.427	20.102
Log sales	11,900	15.318	1.921	11.085	14.022	15.061	16.390	20.535
Log market capitalization	11,883	14.968	1.835	11.242	13.796	14.647	15.857	19.800
Log physical assets	11,912	14.617	3.254	8.711	12.585	14.095	15.814	24.475
Log capital expenditure	11,905	12.831	3.093	7.253	10.923	12.253	13.851	22.243
Market-to-book	11,952	0.408	0.216	0.022	0.254	0.402	0.556	0.893
Profitability	11,908	0.110	0.105	-0.238	0.059	0.105	0.157	0.416
				GHG emission (million tCO_2e)				
Scope 1	11,952	1.669	6.410	0.000	0.008	0.043	0.249	46.300
Scope 2	11,952	0.260	0.660	0.000	0.014	0.048	0.177	4.451
Scope 3 (Upstream)	11,952	1.447	3.535	0.004	0.080	0.285	1.037	23.100
Direct	11,952	1.695	6.439	0.000	0.008	0.044	0.253	46.500
Indirect	11,952	0.855	2.177	0.002	0.039	0.156	0.590	14.500
				GHG emissions intensity (emission/sales)				
Scope 1	11,920	0.293	1.248	0.000	0.005	0.018	0.066	5.709
Scope 2	11,920	0.051	0.169	0.000	0.009	0.020	0.049	0.530
Scope 3 (Upstream)	11,920	0.197	0.287	0.012	0.052	0.112	0.251	1.325
Direct	11,920	0.297	1.255	0.000	0.005	0.018	0.067	5.756
Indirect	11,920	0.133	0.286	0.003	0.026	0.063	0.146	1.116

Panel B. Firm financials

	Dependent variables:			
	(1) Log sales	(2) Log total assets	(3) Log employees	(4) Profitability
Post	-0.056***	-0.040***	-0.027*	-0.009**
	(-4.504)	(-3.786)	(-1.846)	(-2.861)
Included × Post	0.151***	0.184***	0.118***	0.011***
	(9.371)	(9.768)	(7.068)	(3.757)
Controls	NO	NO	NO	NO
Observations	12,053	12,074	11,297	12,024
Adjusted R-squared	0.987	0.978	0.983	0.723
Firm FE	YES	YES	YES	YES
Country ×Year FE	YES	YES	YES	YES
Industry ×Year FE	YES	YES	YES	YES

Panel C. GHG emission levels

	Dependent variables: Log GHG emission				
	(1)	(2)	(3)	(4)	(5)
	Scope 1	Scope 2	Scope 3	Direct	Indirect
Post	-0.017	-0.035	-0.036**	-0.020	-0.040**
	(-0.720)	(-1.298)	(-2.414)	(-0.858)	(-2.797)
Included × Post	0.081**	0.157***	0.162***	0.083**	0.178***
	(2.700)	(4.488)	(8.230)	(2.767)	(8.035)
Controls	NO	NO	NO	NO	NO
Observations	11,952	11,952	11,952	11,952	11,952
Adjusted R-squared	0.972	0.937	0.980	0.972	0.975
Firm FE	YES	YES	YES	YES	YES
Country ×Year FE	YES	YES	YES	YES	YES
Industry ×Year FE	YES	YES	YES	YES	YES

Table A.8. Fund Characteristics and GHG Emissions intensity around the MSCI EM Index Inclusion: Additional Controls

In this table, we present the difference-in-differences regression results of GHG emissions intensity of our treated and matched controls around the MSCI EM index inclusions on the basis of whether the increased shareholdings are driven by funds with different characteristics as in Table 8, but with matching variables as additional controls. The dependent variable is log Scope 1 GHG emissions intensity. We create a number of indicator variables. All other specifications are identical to Table 8. All continuous variables are winsorized at the 1% and 99% levels. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by firm and year are presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variable: Log Scope 1 GHG emissions intensity			
	(1)	(2)	(3)	(4)
Post	-0.012	0.003	-0.006	0.042*
	(-0.345)	(0.110)	(-0.212)	(1.786)
Post × D(Δ Active MF > Δ Passive MF)	0.183***			
	(3.376)			
Post × D(Δ Low > Δ High Carbon Risk MF)		0.150**		
		(2.411)		
Post × D(Δ High > Δ Low Env. Score MF)			0.131*	
			(2.078)	
Post × D(Δ High > Δ Low Stringent EPS MF)				0.135***
				(3.258)
Controls	YES	YES	YES	YES
Observations	6,471	5,739	6,076	8,612
Adjusted R-squared	0.973	0.966	0.966	0.958
Firm FE	YES	YES	YES	YES
Country ×Year FE	YES	YES	YES	YES
Industry × Year FE	YES	YES	YES	YES

Table A.9. Firm-Level Environmental Policy Stringency, Emission Levels, and Capital Intensity: Additional Controls

In this table, we present the difference-in-differences regression results of GHG emissions intensity of our treated and matched controls around the MSCI EM index inclusions as in Table 9, on the basis of whether (i) the firm resides in countries with high or low EPS, (ii) countries with high or low GHG emission level per capita, and (iii) the firm operates in capital-intensive or non-capital-intensity industries, but with matching variables as additional controls. The dependent variable is log Scope 1 GHG emissions intensity. All other specifications are identical to Table 9. All continuous variables are winsorized at the 1% and 99% levels. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by firm and year are presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variable: Log Scope 1 GHG emissions intensity	
	(1)	(2)
(1) Environmental Policy Stringency	Low	High
Included × Post	0.195*	0.080
	(2.068)	(1.172)
(2) Market-based Environmental Policy Stringency	Low	High
Included × Post	0.137**	-0.012
	(2.785)	(-0.156)
(3) R&D Subsidy for environmental projects	Low	High
Included × Post	0.106**	0.120
	(2.178)	(1.070)
(4) Carbon emission per capita	Low	High
Included × Post	0.100	0.144**
	(1.451)	(2.696)
(5) Industry-level capital intensity	Low	High
Included × Post	0.058	0.134**
	(0.851)	(2.767)
Controls	YES	YES
Firm FE	YES	YES
Country ×Year FE	YES	YES
Industry ×Year FE	YES	YES

Table A.10. Industrial Variation in GHG Emissions Intensity: Chinese A-share MSCI EM Inclusion

In this table, we present the difference-in-differences regression results of GHG emissions intensity of our treated and matched controls around the Chinese A-share MSCI EM Inclusions, but on the basis of whether (i) the firms operate in high or low climate impact sectors and (ii) the firm operates in capital-intensive or non-capital-intensity industries. Dependent variable is log Scope 1 GHG emissions intensity. We consider a firm to be in (i) high climate impact sectors if its Trucost sector is one of key sectors to the low-carbon transition according to EU Low Carbon Benchmarks Regulation (EU BMR) and (ii) capital-intensive industry if its assets-to-sales ratio is higher than the sample median at the same point in time. Post is an indicator variable which is 1 if a given year is on or after a firm or its matched control firms are newly included into the index or zero otherwise. All other specifications are identical to Table 3. Continuous variables are winsorized at the 1% and 99% levels. We include firm, country-by-year, and industry-by-year fixed effects in all specifications. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by firm and year are presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variable: Log Scope 1 GHG emissions intensity			
	(1)	(2)	(3)	(4)
	High Climate Impact Sectors	Low Climate Impact Sectors	High Capital Intensity	Low Capital Intensity
Post	-0.055	-0.029	0.080	-0.017
	(-1.159)	(-0.383)	(0.978)	(-0.319)
Included × Post	0.101*	0.019	0.165**	-0.100
	(1.827)	(0.183)	(2.466)	(-1.510)
Observations	3,331	1,305	872	3,446
Adjusted R-squared	0.917	0.892	0.957	0.966
Firm FE	YES	YES	YES	YES
Industry × Year FE	NO	NO	YES	YES
Sector ×Year FE	YES	YES	NO	NO