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

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Abstract

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JEL Classification: G15, G23, Q54, Q56

Keywords: Carbon Emissions, Climate Risk, International Institutional Investors, Emerging Markets, MSCI, ESG, CSR

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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 significant reductions in greenhouse gas (GHG) emissions from emerging economies, which have now surpassed those of developed nations.[1] Nevertheless, many perceive reliance on fossil fuels as a necessary trade-off for economic growth in emerging markets (EMs). In this paper, we examine whether global asset managers, predominantly based in developed markets (DMs), help reduce GHG emissions while facilitating their growth—that is, green growth—for these EM companies.

We find that foreign institutional capital does not promote green growth in EM firms. With increased foreign ownership, these firms grow—their sales, assets, and employment all grow—but at the cost of higher emissions, an outcome suggesting that carbon emissions can be a by-product of output growth. More surprisingly, however, this emissions growth in EM firms outpaces output growth, such that their per-output emissions, or emissions intensities, increase as well. In contrast, DM firms do not exhibit a similar rise in emissions intensities with increased foreign ownership.

These results seem to run counter to the argument that foreign investors extend effective environmental, social, and governance (ESG) practices to international firms.[2] Nevertheless, foreign investors might not necessarily stimulate carbon emissions reduction in EM firms for several reasons. First, foreign investors may not fully bear local environmental externalities and thus are not incentivized to push for green corporate policies. Second, environmental regulations and social pressure are often weaker in EMs, leading to divergent incentives for improving environmental

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

[2] Several studies document that foreign institutional investors enhance the ESG performance of their portfolio companies around the world, but without distinguishing EM and DM firms (e.g., Aggarwal et al., 2011; Bena et al., 2017; Dyck et al., 2019).

performance across EMs and DMs.[3] Third, foreign investors may prioritize financial over environmental performance, given that brown stocks often offer higher returns than green stocks, particularly in EMs (Bolton and Kacperczyk, 2023; Karolyi, Wu, and Xiong, 2023; Zhang, 2023). Thus, to the extent that foreign investors have diverging incentives between investing 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 the effect of foreign investors on green growth (or the lack thereof), we focus on index inclusions in the Morgan Stanley Capital International (MSCI) EM Index as an exogenous driver of foreign capital. The MSCI index inclusions offer a nice laboratory in which to study green growth. With approximately $13.9 trillion of investor funds following the Index as of 2017,[4] the cost of capital can become substantially lower for newly indexed firms, facilitating their growth. At the same time, the influx of foreign capital can also provide opportunities to reshape the ESG practices of these firms, since asset managers, under investor scrutiny, are supposed to assess climate risks in their portfolios (e.g., Krueger, Sautner, and Starks, 2020).

We employ two identification strategies that are complementary to each other. Our first setting uses firm-level inclusions that are predominantly rule-based, 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). While the prior studies tend to examine the overall effect of foreign investors on EM and DM countries collectively, our focus is on EMs as emission reductions in these markets are pivotal in achieving net-zero carbon. The second strategy exploits market-level inclusions of China A-shares in the MSCI EM Index. In

[3] 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.
[4] Source: "MSCI—A Leader in Equity Indexes," MSCI, March 2018. (https://www.msci.com/documents/1296102/1362201/MSCI-Global-Indexes-cheatsheet-May-2018.pdf/22891d21-faba-db34-bc61-195131e296ab)

2018 and 2019, Chinese large- and mid-cap A-shares were added *en masse* to the index. This approach has a unique advantage in addressing firm-level omitted variable biases present in the first approach. Firm-level index inclusion is associated mainly with increased market capitalization, which itself can be influenced by other unobservable firm-specific factors. Although our analysis employs a difference-in-differences (DiD) approach, matching firms on multiple observable traits including market capitalization, ruling out the possibility that firm-level unobservables drive both index inclusion and carbon emissions remains challenging. The market-level inclusion of China A-shares, however, is not contingent upon the characteristics of any single firm, thereby mitigating the concern of omitted variables inherent in firm-level index inclusions.

Using GHG emission data from Trucost and global institutional holdings data from Factset and Morningstar covering the period from 2003 to 2020, we first examine the extent to which foreign capital entry increases output and emissions in EM firms. We confirm that inclusion in the MSCI Index leads to an immediate increase in foreign mutual fund shareholdings, offering these firms with growth opportunities, as evidenced by significant increases in firms' assets and sales. We further observe increases in GHG emissions, across both direct (Scope 1) and indirect (Scopes 2 and 3) emissions, in line with the growth of these firms.

As emissions can be viewed as a by-product of output, it might not be particularly surprising that emissions increase with output growth. But then, how much of emissions growth is consistent with green growth? Using our conceptual framework, we posit that emissions intensity—emissions per output—should fall as firms' outputs grow with foreign capital as long as firms do not weaken their emissions abatement effort. The intuition is that an influx of foreign investors reduces the cost of capital, which in turn should make production expansion relatively cheaper. Firms can then optimally allocate more resources to reducing emissions, leading to a reduction in per-output emissions. Thus, an increase in emissions intensity following foreign capital, as we find in our empirical analysis, suggests that firms have likely scaled back abatement efforts, perhaps as a result of weaker pressure from shareholders to adopt greener business practices.[5]

We find significant increases in emissions intensity among EM firms following their inclusion in the MSCI Index, with direct emissions intensity measures showing particularly strong statistical significance. The economic magnitude of intensity increases is large: for an index-included firm with an average Scope 1 intensity, we observe an increase in the intensity by approximately 5.8%. In contrast to these results, we find little evidence of increases in emissions intensity in DM firms following inclusion in the MSCI DM Index; if anything, Scope 1 intensity actually decreases following inclusion.[6] As further corroborating evidence for weaker abatement efforts in EM firms, we find that these firms set less aggressive emissions reduction targets and cut back on environmental expenditures. Such weaker abatement efforts may also result in more frequent environmental violations, which we confirm using news events data from RepRisk.

The increase in emission intensity following the influx of foreign institutional capital may initially seem puzzling. It is unclear why it would be in these funds' best interests to worsen the emissions profile of their EM portfolio firms. After all, the fact that these firms generate revenue with a greater carbon footprint could adversely impact the overall weighted-average portfolio GHG emissions, which investors may view unfavorably. However, at the portfolio level, we find that an increase in the GHG emissions of foreign EM portfolio firms is offset by a corresponding decrease in those of foreign DM portfolio firms, resulting in little change to the overall emission profile when these firms are aggregated. Consequently, a fund may be able to improve its financial performance

[5] In this sense, the level of emissions can be a more informative measure of firms' active decarbonization, as noted by Bolton and Kacperczyk (2021a). In comparison, emissions intensity can decrease even without active abatement effort, as long as other production factors (e.g., capital) become cheaper.
[6] Throughout this paper, we refer to the MSCI World Index as the DM 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.

while maintaining its environmental profile by not encouraging EM portfolio firms to pollute less while simultaneously keeping DM portfolio firms' emissions in check.

We identify two non-mutually exclusive channels to account for this glaring difference in the emissions characteristics of EM and DM portfolio firms. The first is the limited channels for foreign investors to engage in environmental performances of firms. Foreign investors may be difficult to govern firms to reduce carbon emission when there are weaker environmental regulations in EMs. Foreign investors with high environmental performances in their portfolio would have more room to be able to accompany a weak governance institutional background in EMs. We find evidence supporting this channel as well. Increases in emissions intensity are pronounced among firms that are owned mostly by environmentally friendly foreign funds with low carbon-risk scores or high portfolio environmental scores and by funds based in countries with stringent environmental policy standards.

Cost of engaging in EM firms would be even more expensive given that sacrificing environmental performance often comes with higher financial performances. As shown by Zhang (2023), brown EM stocks tend to earn higher returns than green counterparts, further diminishing foreign investors' incentives to engage in green corporate policies in EMs in pursuit of higher returns. Consistently, we find that firms EM firms have higher return compared to DM firms especially when they increase carbon emission intensities. Also, the results are concentrated on firms that are predominantly held by funds with poor past returns and a short-term focus show bigger increases in emissions, further highlighting the importance of financial incentives.

Moreover, foreign investors, who are predominantly from the DM market, may exhibit "not-in-my-backyard" behavior. These foreign investors do not fully bear the local environmental consequences of pollution and thus are not incentivized to push for green corporate policies. This effect can also arise from an environmental home bias, occurring even when foreign investors might share the environmental consequences of EM countries, such as in the case of global climate change.

We find evidence supporting this effect. First, we document that funds acquire significantly more position in foreign portfolio firms pushing for higher GHG emissions intensity, whereas they do not exhibit similar trading behavior for domestic portfolio firms that increase their emissions intensity, a trading pattern consistent with "environmental home bias." Second, in our analysis of emissions changes following the inclusions of Chinese stocks to the CSI 300 Index—acting as shocks to domestic investor capital—the emissions intensity of CSI-included firms does not increase, suggesting that domestic investor capital does not tend to deteriorate environmental performance. Third, the externality argument of the not-in-my-backyard hypothesis is likely to present for other forms of pollution that are more local in nature. Consistent with the hypothesis, we find that other forms of pollution, proxied by landfill and incinerated waste pollution, increase with foreign institutional capital.

We present several additional results. Furthermore, emissions intensities of EM firms increase more substantially when these firms are owned by foreign passive funds, suggesting that these funds might not prioritize environmental policies in EM firms. Despite occasional activism and demonstrated environmental commitment in sizable DM companies (e.g., Azar et al., 2021),[7] these funds seem less engaged in EM firms. Finally, we perform robustness checks. For example, we re-run our main analysis after excluding estimated emissions data from Trucost, confirming that our results are not driven by those estimated data points.

Related literature. We contribute to the growing literature that studies the impact of institutional investor engagement on portfolio firms, with a focus on ESG issues (e.g., Dimson et al., 2015; McCahery et al., 2016; Dyck et al., 2019; Kim et al., 2019; Chen et al., 2020; Krueger et al., 2020; Azar et al., 2021; Dimson et al., 2021; He et al., 2023; Atta-Darkua et al., 2023). Our contribution to this line of literature lies in revealing that institutional investors' presence may have a differential impact on the environmental performance of their portfolio firms across EMs and DMs. By

[7] For a review of the debate on corporate engagement by passive and active funds, see, for example, Brav et al. (2022).

employing a plausibly exogenous shock to foreign investor holdings, we establish a causal link between increased ownership by foreign institutional investors and higher carbon emissions in EM firms. In so doing, we also contribute to the broader, blossoming literature on climate change and pollution risk (e.g., Bansal et al., 2021; Bolton and Kacperczyk, 2021a; 2021b; Stroebel and Wurgler, 2021; Hsu et al., 2022). Our findings suggest that the effectiveness of institutional investors in mitigating climate risk is not uniform globally. In EMs, their presence may even amplify climate risk.

Our paper also contributes to the literature on investors' ESG preferences. While several studies find that investors consider sustainability profiles in mutual fund selections (e.g., Hartzmark and Sussman, 2019), other studies highlight noticeable differences in the extent of investors' preference for strong ESG characteristics (e.g., Gantchev, Giannetti, and Li, 2023). 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; Hartzmark and Shue, 2023). Several empirical papers also document the performance of green stock versus brown stocks for the U.S. market (e.g., Bolton and Kacperczyk, 2021; Hsu et al., 2022; Pástor, Stambaugh, and Taylor, 2022) and for the international markets (Bolton and Kacperczyk, 2023; Karolyi et al., 2023; Zhang, 2023; Eskildsen et al., 2024). Our empirical results also suggest the possibility of greenwashing (e.g., Gibson et al., 2022; Kim and Yoon, 2022; Liang et al., 2022), where the presence of investors with pronounced ESG preferences paradoxically exacerbates GHG emissions in firms within countries with lax environmental regulations. 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, 2024). Thus, our research indicates that investors' ESG preferences may not yield uniform corporate GHG emissions outcomes across firms operating in dissimilar regulatory environments.

Our research is also related 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 literature lies in documenting whether access to financing from foreign investors serves not only as a catalyst for growth but also enhances corporate environmental performance. Our findings indicate that, despite significant growth in sales and profit margins, such growth is accompanied by substantially higher direct and indirect GHG emissions intensity, suggesting that the influx of foreign institutional capital does not necessarily foster sustainable, or green, growth in EM firms.

2. Conceptual Framework: How Would Emissions Change as Firms Grow?

In this section, we provide a simple conceptual framework to better understand the relationship between a firm's output growth and its emissions. This framework formalizes the following points:

a. With a reduction in the cost of capital, output will grow. At the same time, emissions intensity, calculated as emissions per output, should fall with the reduced cost of capital, assuming that environmental awareness (or the cost of pollution) remains constant.

b. Emissions intensity is a decreasing function of emission abatement efforts. Thus, an increase in emissions intensity suggests that firms may have reduced their abatement efforts.

c. In contrast, there is no clear prediction regarding the volume of emissions: Emissions can either increase or decrease following a reduction in the cost of capital.

Emissions represent a joint output of production. The first step in our analysis is to illustrate how emissions can be reinterpreted as a factor input rather than an output. Imagine a firm that produces output using capital as the sole factor: The production function is given as $F(K)$, which exhibits decreasing returns to scale and increases with capital K. We treat capital as the only factor, but this setting could be readily extended to a multifactor case. For a succinct demonstration using a simple example, we assume $F(K) = \gamma K^{\alpha}$, with $\alpha \in (0, 1)$, which in turn satisfies $F'(K) > 0$ and $F''(K) < 0$.[8]

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

$$X = (1 - \theta)F(K). \tag{1}$$

Emissions depend on the firm's output and abatement efforts. Specifically, the volume of emissions, z, is determined as follows:

$$z = \phi(\theta)F(K), \tag{2}$$

where ϕ is the abatement technology function that transforms the firm's abatement efforts into emission reductions. We assume that $\phi(\theta)$ is decreasing in θ, with $\phi(0) = 1$, $\phi(1) = 0$, and $\phi''(\theta) > 0$ for all $\theta \in [0, 1]$. This production process can be understood as follows: The firm chooses "intermediate" output $F(K)$, a θ portion of which is allocated to abatement activities, with the remaining $1 - \theta$ portion becoming the final output, X.

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

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

Proof. See the Appendix A.1.

[8] It is straightforward to show that the same qualitative results hold when we employ $F(K) = \gamma \log(1 + K)$ instead.

Now, let us illustrate how emissions can be interpreted as a production factor rather than a by-product of output. From Eqs. (1) and (2), we derive the following relationship:

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

Eq (3) shows that the firm's problem is transformed into a conventional two-factor production problem with a constant return-to-scale production function. Thus, 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, $\frac{z}{X}$, rise when the cost of capital decreases, which occurs with an influx of foreign capital. To consider the firm's optimization problem, let us introduce the costs associated with both the production factors: r represents the cost of capital (K) and τ is the dollar cost per unit volume of emissions (z). The latter may include both explicit costs, such as pollution taxes, and implicit costs associated with shareholder or social pressure (Shapira and Zingales, 2017; Ramelli et al., 2021; Xu, 2022). The firm's optimization problem then becomes:

$$\max_{K,z} X - (\tau z + rK)$$

subject to:

$$\tau z + rK = E, \tag{4}$$

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

Proposition 2. For $\theta < 1$, 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 ratio of factor prices:

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

Applying the production function, $F(K) = \gamma K^{\alpha}$, we can rearrange the budget constraint in Eq. (4) as follows (see the Appendix for derivation):

$$\left(\frac{\tau^{\frac{1}{1-\alpha}}}{r^{\frac{\alpha}{1-\alpha}}}\right)\left[\left\{\alpha\gamma\big(\phi(\theta) - (1-\theta)\phi'(\theta)\big)\right\}^{\frac{1}{1-\alpha}} + \phi(\theta)\left\{\alpha\gamma\big(\phi(\theta) - (1-\theta)\phi'(\theta)\big)\right\}^{\frac{\alpha}{1-\alpha}}\right] = E. \tag{6}$$

Crucially, given that $\phi(\theta)$ decreases in θ and $\theta \in (0,1)$, $\phi''(\theta) > 0$ is sufficient to guarantee that both $\phi(\theta) - (1-\theta)\phi'(\theta)$ and the entire left-hand side of Eq. (6) decrease with θ.

Now, suppose that the influx of foreign capital reduces the cost of capital (r), thereby increasing the left-hand side of Eq. (6). Given that the left-hand of Eq. (6) decreases in θ, this budget constraint can only be met if θ rises in response to the decrease in r. In other words, when the firm's access to capital becomes cheaper, the firm will increase abatement efforts 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 (Proposition 1). The intuition behind this point is also illustrated using a standard isoquant graph in Figure 1 Panel A: As the cost of capital falls, firms use disproportionately more capital than emissions in producing output X, leading to lower emissions intensities. Note, however, that the actual volume of emissions, z, can either rise or fall, depending on the shape of the isoquant.

FIGURE 1 HERE

This analysis suggests that emissions intensity should decline following an influx of foreign capital. Our later empirical results, however, show otherwise: Emissions intensities in EM companies actually rise with an increase in foreign capital. In our theoretical framework, such a rise in emissions intensity can only occur if the cost of emissions (τ) falls along with the cost of capital. We illustrate this scenario in our isoquant analysis, presented in Figure 1 Panel B. If the influx of foreign institutional capital reduces both the cost of emission and the cost of capital, it is then possible for emissions intensity, e, to subsequently rise. This circumstance arises when the firm optimally cuts back on its abatement effort, θ, according to Proposition 1.

In our later empirical analysis, we present evidence showing increases in the emissions intensity of EM firms following their inclusion in the MSCI Index. This rise in intensity is consistent with reduced abatement efforts of these firms.

3. Data

This section describes the data used in our empirical analysis. We draw GHG emissions data from S&P Global Trucost Environmental, international financial statement data from Datastream Worldscope, global institutional holdings data from Factset and Morningstar, and MSCI index constituents data from Morgan Stanley Capital International. In addition, we collect data on adverse ESG-related events from RepRisk. All variable definitions used in this study are summarized in Appendix A.2.

3.1. GHG Emissions

The GHG emissions data S&P Trucost provide environmental impact measures of more than 15,000 firms globally, beginning in 2002. This dataset 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.[9]

[9] By focusing on an objective and output-based measure of carbon emissions rather than ESG scores, we abstract from the ongoing debate over whether conventional ESG scores truly capture a firm's environmental performance in light of huge discrepancies in the scores computed by different rating agencies (e.g., Gibson, Krueger, and Schmidt, 2021; Avramov et al., 2022; Berg, Kölbel, and Rigobon, 2022).

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 focal company in its production process. Scope 3 includes all indirect activities to create products along the supply chain, including, for example, 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 equivalents and in dollar terms representing externality costs associated with 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.

3.2. Firm-level information

Data on financial accounting and stock price information are collected from Datastream Worldscope. Following standard definitions in the literature, we use these data to compute variables such as total assets, sales, market capitalization, physical assets (property, plant, and equipment), capital expenditures, market-to-book ratios, profitability, and total shares outstanding. We collect data expressed in local currencies first and convert these figures into U.S. dollars to ensure comparability between countries.

3.3. Institutional holdings and characteristics

We obtain data on quarterly institutional holdings from the Factset Ownership database (LionShares), which cover institutional investors across 120 countries since 1999, including 6,920 institutions and 103,000 mutual funds. This data, detailing investor-firm level equity ownership, is reported quarterly. We categorize investor shareholdings into domestic and foreign, following Ferreira and Matos (2008).

We also employ data on 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. The advantage of these Morningstar data is the availability of rich fund-level characteristics and information from Morningstar Direct, including monthly returns and flows, assets under management, Morningstar category and ratings (in terms of both financial and sustainability performance), funds' sales region, passive fund indicator, and the sustainability characteristics of funds' portfolios. We classify mutual funds into foreign and domestic based on a fund's domicile as reported in Morningstar Direct to capture the legal jurisdiction of the funds. We treat European Monetary Union countries as a single block, since most of them are either domiciled in Luxembourg or Ireland (Maggiori et al., 2020; Coppola et al., 2021).[10]

3.4 MSCI international equity indices

MSCI's international indices are widely used by institutional investors, with assets following MSCI equity indices exceeding $13.9 trillion 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. Index inclusion is rule-based (as opposed to discretion-based),[11] with investability requirements on size, free float-adjusted market capitalization, liquidity, foreign inclusion factor, length of trading, foreign room, and financial reporting.

3.5. Negative ESG events

[10] EU passporting system allows the most of EMU mutual funds to domicile in Ireland, Luxembourg, or Netherlands. For example, according to Maggiori et al. (2020), 72 percent of Luxembourg fund investments come from other EMU countries.

[11] According to MSCI's Equity Benchmark Statement, discretion is exercised in the production of indexes only in exceptional circumstances including, e.g., complex corporate events not previously encountered, operational issues at exchanges, and geo-political events, among others.

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 machine-learning techniques. This dataset allows us to examine the number of negative ESG incidents.

3.6. Summary statistics

TABLE 1 HERE

We report descriptive statistics for EM firms in Panel A of Table 1, including total assets, sales, market capitalizations, and emissions volume and intensity across Scopes 1 through 3. In Panel B, we compare emissions volume and intensity between EM and DM firms. Several interesting observations are in order. For example, direct emissions (i.e., Scope 1) are greater in EM firms, whereas indirect emissions (Scope 3) are more substantial in DM firms. EM firms generate 0.975 million tons of CO_2 equivalent (tCO_2e) more Scope 1 emissions than DM firms. In comparison, the average Scope 3 emissions of DM firms is greater than that of EM firms by 0.302 million tCO_2e, suggesting pollution outsourcing by DM firms. Regarding emissions intensity, however, EM firms consistently show higher averages than DM firms across all Scopes, with the differences being statistically significant at conventional levels. These patterns in EM and DM firms underscore the importance of understanding the factors that drive differential emissions between these firms.

FIGURE 2 HERE

Before delving into a formal analysis of the relationship between foreign ownership and GHG emissions intensity, we graphically illustrate their *prima facie* association in Figure 2. Specifically, we examine the proportion of foreign ownership relative to market capitalization for each country, as reported in OECD Capital Market Series at the end of 2017. We then compute GHG emissions intensity, defined as the ratio of production-based greenhouse gas emission to total primary energy consumption in each country for the year 2017. In EMs, Panel A demonstrates a pronounced positive correlation between foreign ownership and GHG emissions intensity. Conversely, for DMs, Panel B reveals a negligible correlation, with the trend line slightly declining. These graphical findings indicate that the relationship between foreign ownership and the environmental performance of portfolio companies varies significantly depending on the level of financial market development.

4. Foreign Capital and GHG Emissions

In this section, we first outline our empirical strategy for MSCI index inclusion as a plausibly exogenous driver of foreign investor capital influx. 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: Do emissions intensities of EM firms 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 where an exogenous influx of foreign investors creates expansion opportunities for EM firms. We employ two complementary types of MSCI index inclusions as such instances: individual firm inclusions 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), Dyck, Lins, Roth, and Wagner (2019), and Kacperczyk, Sundaresan, and Wang (2021). The index is tracked by mutual funds around the world with total capital of approximately $13.9 trillion dollars, and thus inclusion in this index will increase the presence of foreign investors that follow MSCI indices as their benchmark, enabling us to use these inclusions as exogenous shocks to influxes of foreign investor capital.

While these firm-level stock inclusions have been widely accepted in the existing literature as a shock to foreign capital,[12] they can be associated with firm-level omitted variables that might also drive firms' emission choices. We thus complement our first identification setting with the second setting, focusing on market-level inclusion, specifically the inclusion of China A-shares in the EM Index. The primary advantage of examining such market-level inclusions is that they are not likely to be driven by unobservable firm-level factors.

Accordingly, China A-share inclusions provide a nice laboratory in which to circumvent this omitted-variable issue. This inclusion process was driven mainly by market-wide considerations: MSCI included virtually all the large-cap A-Share stocks that were accessible through Stock Connect and had already been included in the MSCI China Index.[13] MSCI first included China A-shares in the EM Index in May 2018 after concluding that China A-shares, which had primarily catered to domestic investors,[14] had become adequately accessible to global investors, most notably with the launch of the Stock Connect program in 2014. Starting with inclusion of 222 large-cap shares, inclusions took place over five stages, from May 2018 to November 2019. Large- and mid-cap China A-shares were gradually assigned larger weights, rising from 0.0% to 5.1% by August 2020. We further rule out the

[12] For example, prior research has examined relationships between foreign capital and other outcome variables, such as governance (Aggarwal, Erel, Ferreira, and Matos 2011), investment horizon (Bena, Ferreira, Matos, and Pires 2017), corporate social responsibility (Dyck, Lins, Roth, and Wagner 2019), or price efficiency (Kacperczyk, Sundaresan, and Wang 2021).

[13] 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 were not accessible or suspended through the Stock Connect Program (source: MSCI, June 2017, "Adding A Shares into Emerging Markets—Are You Ready". https://www.msci.com/documents/1296102/1330218/China_A-shares_Inclusion_Jun17.pdf/eccaf799-3c2b-465b-abc8-131b2678c4a8)

[14] Stocks 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. These were completely unavailable for foreign purchase until 2002.

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.

Matching. Our treated firms are those newly included in the MSCI index during our sample period from 2003 to 2020, based on either firm-level or market-wide China A-share inclusions. To address concerns of selection bias—that treated firms may systematically differ from control firms—we construct a matched set of control firms. Our matching criteria incorporate several size metrics, such as log market capitalization, log total assets, and log sales, reflecting MSCI's primary index inclusion criteria based on market valuation. We include additional matching criteria variables such as market-to-book ratio, log physical assets (property, plant, and equipment), log capital expenditures, and profitability, aiming to control for variations in firms' production and valuation. We employ one-to-three nearest-neighbor propensity score matching with replacement (Abadie et al. 2004), based on these metrics from the year prior to index inclusion, to match treated firms with public firms from the same year and market. Control firms are specifically selected to have never been part of the MSCI index, mitigating the risk of heterogeneous treatment effects among not-yet-treated firms. This precaution helps to prevent bias in our coefficients within a staggered difference-in-differences (DiD) framework employing two-way fixed effects, as discussed in recent literature (De Chaisemartin and d'Haultfoeuille 2020; Callaway and Sant'Anna 2021; Goodman-Bacon 2021; Sun and Abraham 2021).

We begin with an initial sample of 2,231 unique firms newly added to the MSCI EM index between 2003 and 2020. The application of Trucost database coverage reduces our sample to 1,747, and after matching, our final dataset comprises 1,219 unique treated firms and 1,164 unique matched control firms.[15] To evaluate matching quality, we examine differences in firm characteristics between

[15] For China A-share inclusions to the MSCI EM index, we have 473 treated firms with Trucost coverage, and after matching, we are left with 465 unique treated firms and 435 unique matched control firms. For MSCI DM index inclusions, out of 1,679 treated firms with Trucost coverage, we have 1,175 unique treated firms and 1,174 unique matched control firms following the matching procedure. We note that repeated matched control firms are excluded from the sample.

treated and matched control firms. The differences-in-mean results reported in Internet Appendix Table A.1 show no meaningful differences in firm characteristics between the two groups of firms except for profitability. A high degree of matching quality for our study ensures that any observed differences in outcomes can be confidently attributed to the treatment effect of MSCI EM index inclusion.

MSCI inclusion and foreign institutional ownership. We document an increase in foreign institutional holdings in stocks newly included in the MSCI Index, reported in Internet Appendix Table A.2. In column (1), we observe an increase of 0.53 percentage points in foreign institutional ownership in EM-included firms immediately after inclusion, which gradually increases to 1.05 percentage points over the next three quarters. Similar trends are observed for market-wide China A-share inclusions in columns (3). These results indicate that MSCI index inclusions provide a useful setting to understand the impact of foreign institutional owners on green growth.

Such an increase in foreign mutual fund ownership is not necessarily limited to passive funds. The MSCI index universe forms a key component of many international equity funds' investment mandates, prompting even active funds to increase ownership in included stocks. In Internet Appendix Table A.3, we report that around 30% of U.S. active international equity funds use the MSCI index as part of their investment mandate as declared in their fund prospectus, with over $400 billion in AUM by the end of 2020.

FIGURE 3 HERE

Figure 3 graphically illustrates changes in foreign institutional ownership for MSCI EM-included compared with matched control firms. We observe a noticeable upward spike in foreign institutional ownership after inclusion to both firm-level EM index inclusion (Panel A) and China-A shares EM index inclusion (Panel B) remaining high in subsequent quarters.

4.2. Expansion and GHG emissions after MSCI inclusion

Our conceptual framework posits that an influx of foreign capital, by lowering capital costs, is expected to drive higher output and the *level* of GHG emissions may also increase with higher output. In Table 2, we examine the extent to which MSCI index inclusions lead EM firms to expand, raising GHG emissions. Specifically, we run DiD regressions for a window of [-4, 3] years around inclusion years. The regression sample consists of all EM treated and matched control firms. The dependent variables are log sales, log total assets, log total number of employees, and profitability (Panel A) and log GHG Scope 1, Scope 2, and Scope 3 emissions (Panel B). To mitigate potential confounding effects at the country or industry level—such as those stemming from carbon tax regulations—the regressions include firm-specific, country-by-year, and industry-by-year fixed effects. Standard errors are two-way clustered by firm and year. These regressions deliberately refrain from controlling for additional variables to circumvent the "bad control" problem (Angrist and Pischke 2009).[16]

TABLE 2 HERE

The results reported in Table 2 Panel A show that EM firms grow substantially after MSCI inclusion, compared with matched control peers. As is evident in columns (1) and (2), for example, the coefficient estimates on the interaction term ("*Included X Post*") are positive and highly statistically significant. The magnitude of the coefficients suggests that, for a sample firm with average log total sales of 14.50, index inclusion leads to a total sales increase of $\exp(0.158+14.50)/\exp(14.50) - 1 =$ 17.1%. A similar calculation yields a 14.9% increase in total assets. The results reported in columns (3) and (4) further show that treated firms hire more employees and become more profitable subsequent to MSCI EM inclusion. Such firm expansion is accompanied by increases in equity and debt issuances, as reported in Internet Appendix Table A.4, consistent with a reduction in the cost of capital that typically occurs with an influx of foreign capital.

[16] We obtain consistent results from incorporating additional controls into these regressions.

Do GHG emission levels also increase with MSCI inclusion? The results reported in Table 2 Panel B reveal that they do. Across all the emissions-scope measures, as well as direct and indirect measures, the coefficient estimates on the interaction term 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 0.205 indicates that a treated firm with average Scope 1 GHG emissions of 2.543 million tons increases its emissions by exp(0.205+log(2.543))/2.543 – 1 = 22.8%, compared with 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.

4.3. MSCI inclusion and GHG emissions intensity

Our conceptual framework suggests that, while emission levels can rise when the cost of capital falls, emissions *intensities*—GHG emissions per unit of output produced—should not necessarily rise, with the assumption that the cost of pollution remains constant. If the cost of pollution also falls, however, firms will optimally reduce their abatement efforts, in which case it is possible for emissions intensity to rise. On the one hand, the cost of pollution will increase with greater presence of foreign investors if they bring higher pollution standards to EM firms. On the other hand, the cost of pollution can fall if foreign investors are concerned less about environmental issues in their country of investment than the domestic counterparts because they do not fully internalize the negative externalities of pollution or migrate to a "pollution haven." Our analysis in this section is thus also informative of how the cost of pollution changes with an influx of foreign investors.

TABLE 3 HERE

In 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.[17] All fixed-effect and standard-error specifications remain unchanged. These results show that emissions intensities of treated EM firms are higher than those of matched control peers following inclusion into the MSCI EM Index. As shown in column (1), for example, the coefficient estimate on the interaction term ("*Included X Post")* is 0.056, indicating that Scope 1 emissions intensity increases, with statistical significance at the 1% level, a finding echoed in our results reported in column (4) for direct emissions intensity. The economic magnitudes of the coefficients are also sizable. A treated firm's Scope 1 emissions intensity with average intensity of 0.869 increases by (exp(0.056+log(0.869))/0.869 – 1 =5.8%. As for the Scopes 2 and 3 in columns (2) and (3), we also find all the coefficient estimates to be positive (0.058 and 0.006, respectively) with statistical significance at the 5% level for the case of Scope 2. Overall, these results indicate that an influx of foreign capital leads to an increase in emissions intensity, suggesting a reduction in the cost of pollution and a corresponding decrease in abatement efforts.

Figure 4 Panel A graphically illustrates the increases in log Scope 1 GHG emissions intensity after index inclusions. While there is no noticeable trend in GHG emissions intensity between treated and matched control firms prior to inclusion, we observe an increase in GHG emissions intensity beginning in the year of MSCI inclusion, with the difference remaining elevated for the following years.

FIGURE 4 HERE

We further examine if foreign capital outflow has analogous impact on GHG emissions intensities by studying the firms excluded from MSCI EM index. In Internet Appendix Table A.6, we

[17] As an alternative specification, we run full-sample pooled OLS regressions of EM firms' emissions intensity on fund shareholdings. Internet Appendix Table A.5 report the results that are qualitatively identical to our main results. For example, we find a similar positive relationship between log Scope 1 emissions intensity and foreign fund shareholding and also find a negative relationship between log Scope 1 emissions intensity and domestic fund shareholdings.

compare excluded firms and their matched control firms. Despite a significant foreign capital outflow after index exclusions (Panel A column 2), this outflow does not have a significant impact on firm financials (Panel B). However, we observe a significant fall in direct and indirect GHG emission level after exclusions (Panel C). The point estimate for log Scope 1 intensity is also negative with statistical significance at the 5% level (Panel D).

4.4. China A-share inclusions and emissions intensity

Our earlier set of regressions reveals substantial increases in GHG emissions intensity following inclusion to the MSCI EM Index. To mitigate a concern that unobservable firm-level factors not reflected in the matching process may be driving index inclusion and GHG emissions simultaneously, we further sharpen our identification strategy by focusing on the market-wide inclusion of China A-shares in the MSCI EM Index. Specifically, we examine changes in emissions intensities following the inclusion of China A-shares in 2018 and 2019 by employing DiD regressions, similar to those employed in the previous subsection.[18]

TABLE 4 HERE

In Table 4 column (1), we report the results using log Scope 1 emissions intensity as the dependent variable. The point estimate of the interaction term ("*Included X Post*") is positive (0.198) and sizable, with a *t*-statistic of over 2.5. We find the similar result for log direct emission intensity in column (4). For indirect emission intensities in columns (2), (3), and (5), we also find that the interaction term turns out to be positive, albeit with weak statistical significance potentially due to a lack of observations. In Figure 4 Panel B, we observe a gradual increase in emissions intensity for China A-share firms compared with the matched control firms, after inclusion to the MSCI EM Index.

FIGURE 5 HERE

[18] In Table A.7, we observe firm expansion and the increase in GHG emission levels around China A-share MSCI EM index inclusions consistent with the results in Table 2.

We investigate changes in GHG emissions intensity across geographic regions using DiD regressions. Figure 5 presents the coefficient estimates of the interaction terms in the regressions for the following subsamples: South and Southeast Asia, China, East Asia excluding China, EMEA (Europe, Middle East, and Africa), and Latin America. Although the coefficient estimates are statistically indistinguishable from zero, largely because of the lack of statistical power in these subsample analyses, the point estimates are mostly positive, suggesting that increases in emissions intensity are widespread across the regions. An exception is East Asia excluding China, where a negative coefficient is observed.

4.5. Emissions intensity in DM firms after MSCI Index inclusion

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, because of strict environmental regulation or awareness in those DM countries, emissions intensities will not increase. We thus examine how emissions intensities change after DM firms are included in the MSCI index.

TABLE 5 HERE

Table 5 column (1) presents the DiD regression results using log Scope 1 GHG emissions intensity as the dependent variable. In contrast with the results based on EM firms, our results for DM firms reveal that Scope 1 emissions intensity actually *decreases* following the index inclusion, with statistical significance at the 5% level, despite growth in their sales and total assets as shown in Panel

B of Internet Appendix Table A.8.[19] The coefficient estimates of the interaction terms for the other two Scopes lack statistical significance. Thus, the increase in emissions intensity following inclusion in the MSCI index appears to be a phenomenon *solely* among EM firms.

4.6. Abatement efforts

The key prediction of our conceptual framework is that emissions intensity is inversely related to firms' abatement efforts. A natural question then arises: Do the abatement targets and practices of EM firms diminish following their inclusion in the MSCI Index? To answer this question, we examine stated emission reduction targets, as reported in the ASSET4 database, around index inclusions. An emission reduction target indicates the percentage by which a firm intends to lower its GHG emissions. We emphasize that the results should be treated with caution, recognizing that abatement targets, being self-reported measures, may not accurately represent tangible abatement actions. The coverage of this data item in the database is relatively sparse, resulting in a notably smaller sample, particularly after including an extensive set of fixed effects. As an alternative, we also consider a smaller set of fixed effects, namely firm and year fixed effects.

TABLE 6 HERE

Panel A of Table 6 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), where we include firm and year fixed effects, we find that treated firms reduce their percentage emissions-reduction targets by 2.84 percentage points compared with matched control peers following index inclusion. In column (2), the coefficient estimate of the interaction term is positive but lacks statistical significance with a more stringent set of country-by-year and industry-by-year fixed effects,

[19] 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 firms to expand, thereby increasing total GHG emissions, as shown in Internet Appendix Table A.8.

possibly because of insufficient within-fixed-effect sample variation. In columns (3) and (4), we repeat the analysis for DM firms. We find that treated DM firms raise their emissions-reduction targets around 0.86 percentage points compared with their control peers, in 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 collect data on environmental expenditures from the same database for a small sample of firms with data availability. In Table 6 Panel B, the results reported in first two columns reveal that, irrespective of whether country-by-year and industry-by-year fixed effects are controlled for, EM firms tend to reduce environmental expenditures after index inclusion. In comparison, as seen in columns (3) and (4), we find that treated DM firms increase environmental expenditures to a greater extent than their control peers.

4.7. *ESG violations*

Should the increased foreign institutional ownership lead EM firms to reduce their abatement efforts, we would expect a rise in environmental violations for these companies as a result. In this subsection, we count the number of negative environmental incidents as reported in RepRisk, which collects ESG violations data from regulators, print media, newsletters, non-profits, and social media. We focus particularly on environmental concerns, including climate-related pollution, local pollution, and waste.

In Internet Appendix Table A.9 Panel A, we observe a significantly higher increase in the count of environmental-related negative ESG incidents for MSCI-included EM firms compared with their matched controls across all issue categories. The DiD term is statistically significant at the 5% level for all categories, and even more so at the 1% level for comprehensive environmental issues in column (1). In contrast, Panel B shows no corresponding rise in negative ESG incidents among DM countries in relation to MSCI Index inclusion, consistent with our main findings showing environmental performance deterioration in EM firms after their inclusion to the MSCI Index.

4.8. *Robustness Checks*

We further check whether the increases in emissions intensity of EM firms are merely a by-product of improved disclosure quality following an influx of foreign institutional investors (Flammer et al., 2021; Cohen et al., 2022; Ilhan et al., 2023;). We first verify whether disclosure quality improves after the MSCI Index inclusions. In column (1) of Internet Appendix Table A.10, we find that there is no significant change in EM firms' carbon disclosure quality after the MSCI index inclusions. Should the rise in emissions intensity be attributable solely to firms with enhanced disclosure, such an increase in intensity would not be observed among firms whose disclosure quality remains unchanged. In column (2) of Internet Appendix Table A.10, we confine our sample to firms exhibiting no improvement in disclosure quality before and after MSCI index inclusion. We continue to observe a strong increase in Scope 1 GHG emissions intensity among index-included firms.

In another robustness check, we examine whether our main results provided in Table 3 are driven mostly by estimated emissions data in Trucost (e.g., Aswani et al. 2023). We divide the full sample of treated and control firms depending on whether the Scope 1 GHG emissions intensity metrics are estimated or self-disclosed. As shown in columns (3) and (4), both the estimated and disclosed carbon emissions increase significantly. The results suggest that our main results in Table 3 are not driven by the increased disclosure quality.[20] Lastly, we examine whether our results are sensitive to the coverage expansion of the Trucost data that occurred in 2016. In untabulated results, we find out main results in Table 3 are qualitatively consistent using the sample after 2016.

[20] Trucost expands its data coverage exceptionally in 2016. In untabulated results, we find out main results in Table 3 are qualitatively consistent using the sample after 2016.

5. Economic Channels

Our results so far indicate that the emissions intensities of EM firms increase subsequent to the influx of foreign capital. This may appear puzzling at first glance. This deterioration in the emissions intensities may have an adverse impact on the funds' overall environmental profile, which may be viewed unfavorably by their investors. These funds thus need to be mindful of their overall portfolio carbon score. In this section, we further examine the incentives of these funds to let their EM portfolio firms pollute. First, we establish that, compared to DM firms, EM firms' stock returns are more favorable following their inclusion in the MSCI EM index. Second, we find that, while the inclusion of EM firms in the MSCI index does lead to an increase in the overall GHG emissions of the foreign EM component of a fund's portfolio, those of the DM component also decrease, resulting in little change to the overall GHG emissions when EM and DM foreign portfolio firms are added together. Thus, funds can improve their financial performance while maintaining its overall environmental profile by allowing the EM firms to pollute more while pushing for greener growth of DM firms.

Funds' incentives may manifest themselves through a number of additional channels. First, foreign investors may want to exploit lax environmental regulations in EMs to compensate for stringent environmental regulations faced by DM firms, known as the pollution-haven hypothesis. As shown in Zhang (2023), brown EM stocks tend to earn higher returns than green counterparts,[21] and thus foreign investors are less incentivized to engage in green corporate policies in EM firms, seeking higher financial performance. Such incentives will be stronger for foreign investors with subpar past performance or a focus on short-term gains.

[21] Bolton and Kacperczyk (2023) also show that stock returns on high emission Chinese firms are on average higher than low emission counterparts. Karolyi et al. (2023) also document that the green-minus-brown stock returns tend to become negative in EMs, particularly in the post-2016 period.

Second, foreign investors, especially those residing in the DM, are unlikely to fully internalize the negative environmental externalities of environmental consequences that domestic investors in EM host countries face. Moreover, this disconnection would persist even in the context of carbon emissions and global climate change where foreign investors are also affected by the externalities—those investors could still be indifferent to emissions in other countries because of environmental home bias (Groen-Xu and Zeume 2021; Li, Xu, and Zhu 2023). We refer to this channel as a not-in-my-backyard hypothesis.

Third, the influx of foreign capital arising from index inclusion is driven largely by passive investment strategies. Given the debate regarding the engagement of passive funds in corporate policies, (see Brav et al., 2023 for the review), it is an open empirical question whether passive funds contribute to the rise in carbon emissions intensities in EM firms. In this section, we conduct further empirical analysis to investigate these channels.

5.1. *Bang for the buck: What do funds gain from higher emissions intensities?*

As discussed earlier, it may be in foreign investors' incentives to allow EM firms to pollute more if doing so translates into superior financial gains (i.e., stock returns). The existing results in the literature provide insights into the performance of EM stocks. Bolton and Kacperczyk (2023), for example, document that stocks of firms with high carbon emissions generally yield higher returns globally, including in China. Karolyi et al. (2023) find that green-minus-brown returns tend to be negative, particularly in EMs. Furthermore, Zhang (2023) shows that EM brown stocks earn substantially higher raw and risk-adjusted returns, whereas DM brown stocks do not. While this issue is still under debate,[22] a balanced reading of the literature suggests that incentives to engage in green

[22] Several papers find the greenium in stock returns. For example, Aswani et al. (2023) questions the existence of carbon premium providing evidence that stock returns are not correlated with carbon intensities, unlike with carbon levels. Pástor et al. (2022) find that green stocks outperform brown stock as environmental concerns strengthen. Both papers are focusing on the developed economies, e.g., the United States and Germany.

corporate policies are not necessarily stronger in EM firms, as financial gains from brown investing can be high.

TABLE 7 HERE

We dig deeper into this issue by examining the extent to which the stock returns of EM index-included firms increase in comparison with their DM-included counterparts. We thus compare stock returns on our EM and DM firms included in the MSCI indices (i) during the inclusion year, (ii) over two subsequent years, and (iii) throughout the three-year period from the inclusion year. We conduct the regressions of stock returns using the EM indicator as the main independent variable, with included years' log market capitalization, market-to-book ratios, profitability, investment, and year fixed effects as controls.

Table 7 presents the estimation results. In columns (1) through (3), we find that stock returns for EM treated firms are significantly higher than those of their DM counterparts across all three-time horizons. On the inclusion year, for example, EM firms' returns are higher than DM firms' by around 1.1 percentage points, and the tendency persists for the following two years of returns, generating 1.3 percentage point higher cumulative returns over three years. A comparison of the results reported in Panels B and C of Table 7 also indicates that stock returns around index inclusions are even higher among firms that experience increases in emissions intensities. These results suggest that the funds that invest in EM stocks are compensated with stronger financial performance by engaging less in environmentally friendly policies in EM firms than in DM firms, as discussed in our earlier study in subsections 4.3 and 4.6.

This increased financial performance may, however, come at a cost of the deterioration in the funds' portfolio carbon score. To examine this, we examine the change in GHG emissions at the fund portfolio level. We focus on the level of emissions as this is often the headline measure that investors pay attention to. For funds holding at least one local, EM foreign, and DM foreign firms at every year-end, we separately calculate the year-on-year change in weighted-average log Scope 1 GHG emissions of (i) all, (ii) EM foreign, and (iii) DM foreign components of their portfolio. We demean each component of portfolio emissions by subtracting the overall weighted-average portfolio emissions, which enables us to examine how much EM foreign firms' GHG emissions change relative to those of all firms held by the fund, for example. As the main variable of interest, we compute the fund's previous-year net MSCI-inclusion EM holdings, specifically the difference between the combined portfolio weight of all EM portfolio firms that are newly added to the MSCI EM index and that of EM portfolio firms that are deleted. This enables us to examine how much the GHG emissions of different components of a fund's portfolio respond to when a fund holds more shares of EM firms that experience MSCI index inclusion. We include Morningstar-category-by-year fixed effect to control for any within-country-style heterogeneity and check the robustness of the results to the inclusion of fund fixed effect. Table 8 presents the results.

TABLE 8 HERE

Regardless of whether fund fixed effect is included or not, we find that the EM foreign component of the portfolio log GHG emissions increase substantially relative to the overall fund-level average when a fund holds more shares in newly-added MSCI EM firms, with statistical significance at the 5% level even with the inclusion of fund fixed effect. Interestingly, we find a corresponding fall in the DM foreign component of the portfolio log GHG emissions, with comparable economic magnitude and statistical significance at either the 5% or 10% level depending on the fixed effect specification. As a result, when the two components are aggregated, we find that the overall foreign component of the portfolio emissions do not respond significantly, as shown in columns (1) and (4). This suggests that, while funds are attracted to the potential financial performance of newly-included EM firms, they simultaneously manage their overall portfolio environmental profile to remain largely unchanged by pushing for more aggressive emission reductions in DM portfolio firms.

5.2. Pollution haven

The stark contrast in portfolio-level GHG emissions of EM and DM components of a fund's portfolio suggests that differing forces may be at work in these markets. Specifically, foreign investors may take advantage of relatively lax environmental regulations in EMs to make their trade-off between financial and environmental performances more favorable. Table 9 provides the results obtained from several subsample analyses that examine the pollution haven hypothesis. We utilize an array of variables, including country-level regulatory restrictions and fund-level sustainability scores, that help us better understand investors' incentives regarding green investing. We re-estimate the main DiD regressions for Scope-1 emissions intensities, as previously reported in Table 3, using subsamples formed based on these variables.

TABLE 9 HERE

Environmental Policy Stringency of funds' home country. We first perform subsample analysis based on the environmental policy stringency (EPS) scores of investors' home countries, available in the Morningstar fund data. Funds domiciled in high-EPS countries might have weaker incentives to pursue greener corporate policies in EM portfolio firms. We sort funds based on the EPS scores of their country of domicile and divide the sample by median. Firms are defined as with high "fund home country EPS score" if high-EPS funds hold more shares than low-EPS funds in a firm based on fund shareholdings a month before the index inclusions. The results reported in row (1) show that the rises in emissions intensities that we previously documented in Table 3 are concentrated in funds domiciled in countries with high EPS scores. The results show that foreign institutional capital that faces strict public pressure on environmental protection worsen the emissions intensities in EM firms, hinting at greenwashing.

Portfolio environment scores. Two measures of portfolio environmental scores are employed: Sustainalytics overall ESG score and Morningstar Portfolio Carbon Risk score. Using these two measures, we categorize firms into subsamples based on the portfolio environmental scores of funds holding these firms a month before inclusions. Firms are allocated to the high sustainability subsample if they are predominantly held by funds with high sustainability scores or low carbon risk scores, whereas those predominantly held by funds with low sustainability scores or high carbon risk scores are classified into the low sustainability subsample. In rows (2) and (3) of Table 9, we find that higher presence of high sustainability funds is associated with a significantly higher increase in emissions intensity in their portfolio firms. These results indicate that funds that are designated as sustainable tend to engage less in green policies in EM firms.

EPS scores of EM countries. The next analysis focus on subsamples based on the EPS scores of the EM countries (i.e., portfolio firms). Emissions intensities of EM country firms are more likely to increase in countries that feature less stringent environmental policies if foreign investors are more return-seeking than environmentally conscious. As the results reported in row (4) 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. The coefficient estimates for weak EPS countries are both positive and statistically significant at conventional levels, suggesting foreign investors exploit weak environmental regulations in EM investments.

Capital intensity of industry. In addition to these measures of EPS components, we consider the capital intensity of industries in which EM firms operate. This measure is informative about whether emissions intensities increase to a greater extent in industries where pollution is worse. We then run our earlier DiD regressions with log Scope 1 GHG emissions intensity as the dependent variable. We report the results in row (5) of Table 9.

The results reported in row (5) for capital intensity show that EM emissions intensities are higher for firms that operate in capital-intensive industries. Overall, the results we report in Table 9 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. Not-in-my-backyard hypothesis

In addition to the pollution haven hypothesis, foreign investors may exhibit environmental home bias, preferring to pollute other countries where they do not bear the full extent of negative externalities. To explore the relative plausibility of the not-in-my-backyard hypothesis, we examine (i) fund trading in response to the pollution intensities of local and foreign portfolio firms, (ii) the impact of local investors on carbon emissions intensities, and (iii) the impact of foreign investors on other forms of local pollution whose externalities are not faced by foreign investors.

We first explore whether local and foreign firms' emissions profile enter into the trading decisions of mutual funds. To examine this, we construct holdings data at the fund-firm-year level. Using the year-end portfolio holdings of equity mutual funds across the world, we create a variable indicating whether a fund has increased or newly acquired positions in a firm compared to the previous year. We then interact the contemporaneous change of a firm's Scope 1 GHG emissions intensity and an indicator variable for foreign firm (from the fund's perspective). We further control for firm size, book-to-market, momentum, profitability, and investment, and consider different combinations of fixed effects.[23]

TABLE 10 HERE

Across all four columns in Table 10, we find that the standalone change in Scope 1 GHG emissions intensity enters insignificantly. In contrast, however, the interaction between the change in emissions intensity and the foreign firm indicator is significantly positive across all four columns, with

[23] Due to the time-varying nature of the membership for the European Monetary Union (EMU), the standalone indicator for foreign firm survives the inclusion of firm fixed effect. For example, a German fund investing in Latvia may classify it as foreign prior to the latter's inclusion in the EMU in 2013 and domestic thereafter.

statistical significance at the 1% level in specifications without firm fixed effect and 5% level when it is included. The results indicate strong environmental home bias on the behavior of mutual funds, whose trading decisions react positively to increases in GHG emissions intensity *only* among foreign portfolio firms.

We next examine the extent to which an influx of local investors, who tend to care more about pollution within their own country than foreign investors, is also associated with an increase in carbon emissions intensity. We employ a setting where local investor shares are more likely to increase. Specifically, we use inclusions of Chinese stocks to the CSI 300 Index, consisting of the largest 300 stocks in the Shanghai and Shenzhen stock exchanges. Inclusion to the Index is mostly rule-based, rather than discretion-based, and it is widely followed by Chinese domestic mutual funds, thus providing an increase in local investor capital flows.

TABLE 11 HERE

In Table 11, we run the DiD regressions around Chinese firms' inclusion into the CSI 300 index. We define treated as firms that were included into the CSI 300 Index and examine their outputs compared to the matched control firms, following the same matching process used in Table 1. While we document a significant increase in log sales following the index inclusion, we do not find this expansion to be accompanied by a significant increase in emissions intensity across all three Scopes. The results suggest that the influx of foreign capital, who are less exposed to the consequences of local pollutions, is the key driver of deteriorated environmental performance among EM firms around index inclusions.

TABLE 12 HERE

Lastly, we study how the intensities of other forms of local pollution are affected following the influx of foreign capital. Since climate change is ultimately global in nature, foreign investors may have greater incentives to internalize the negative externalities associated with increased emissions intensity. Thus, the externality argument is likely to be even more intensified for other forms of pollution that are more local in nature. In Table 12, we check whether the emissions intensity of waste pollution increase following the influx of foreign capital, as this type of pollution tend to lead to a deterioration in environmental standards on a narrower, more local scale. We indeed find that landfill and incineration waste generation intensity of our treated firms increase substantially relative to their matched control peers around MSCI inclusion, regardless of whether we focus on all EM inclusion events or restrict our attention to China A-Share inclusions.

5.4. Fund incentives: Past performance and short-termism

Building on our previous findings, this section further examines how funds' incentives to generate financial performance is associated with emissions intensities of their portfolio firms. In particular, we explore whether funds with poor financial performance may put a lower priority on the emissions intensities of their portfolio companies. Poorly performing funds might be more inclined to accept environmental risks in pursuit of higher financial returns, thus potentially de-emphasizing their environmental performance. To investigate this channel, foreign mutual funds are categorized into low and high performance, based on their returns over past 12 months. We then perform a subsample analysis of our main DiD regressions by dividing EM sample firms into those held by high and low past performance funds. The findings presented in row (1) of Table 13 indicate a more substantial increase in emissions intensity in firms held by poorly performing foreign mutual funds, suggesting that these funds may exert less pressure on their EM portfolio companies to adopt greener corporate policies.

TABLE 13 HERE

In row (2) of Table 13, we then examine how the short-term focus of foreign mutual funds is associated with the carbon emissions of their portfolio companies. Starks, Venkat, and Zhu (2023) show that funds with a short-term orientation, as indicated by their portfolio turnover, tend to allow less environmentally friendly policies in their portfolio companies, as financial gains from such policies typically take longer time to materialize. We thus examine whether emissions intensity increases more after MSCI inclusions for companies held primarily by foreign funds with higher turnover. The results in row (2), based on the subsample analysis comparing companies held by high versus low turnover funds, confirm that emissions intensities indeed rise more substantially for companies held by funds with short-termism.

5.5. Passive vs. active funds and the "Big-Three" asset managers

The inclusion of EM firms in the MSCI Index can lead to increased ownership by both passive and active funds. Each of these institutions are influenced by different incentives regarding carbon emissions of their portfolio companies. Active funds, driven by performance motives, may overlook environmental issues if pollution correlates with higher stock returns. Passive funds, inherently less engaged, might not prioritize environmental policies (e.g., Heath et al., 2022). While previous studies suggest passive funds occasionally act as "closet" activists (e.g., Appel et al., 2016; Crane et al., 2016; Appel et al., 2019;) and major passive asset managers have shown environmental commitment in large DM companies (e.g., Azar et al., 2021),[24] the willingness of these managers to invest in environmental efforts for EM firms remains uncertain, especially as some asset management companies recently scaled back on environmental engagement.[25] Thus, it is an open empirical question how the influx of passive foreign investors impact carbon emissions in EM firms, and this analysis will be informative of the extent to which the rise of passive investors would help alleviate corporate sustainability concerns.

[24] For a review of the debate on corporate engagement by passive and active funds, see, for example, Brav et al. (2022).
[25] On February 15, 2023, JPMorgan Chase and State Street announced that they quit Climate Action 100+ (CA 100+), an investor-led coalition for environmental actions, and Blackrock limited its involvement by retracting its domestic arm from CA 100+.

In row (3) of Table 13, we report the results from subsample analysis based on passive fund ownership. For this analysis, firms are categorized into two groups based on shareholdings by passive or active mutual funds. The results reported in row (3) of the table shows that the emissions intensity of EM firms post-MSCI inclusions increase more when these firms are held primarily by passive foreign funds. Although the coefficient estimates for both the subsamples are statistically significant at the 5% level, the economic magnitude is larger by approximately two-thirds for the passive fund subsample. These results indicate that foreign ownership by passive funds is more strongly associated with greater carbon emissions for EM firms.

In row (4) of Table 13, we examine whether the presence of the "Big-Three" asset managers—BlackRock; State Street Global Advisors, and Vanguard—makes a difference. There is a growing concentration of ownership by these asset managers, and their presence at times is regarded as influential. Row (4) of Table 13 presents the results from the subsample analysis based on the presence of the Big-Three asset managers. The results show that EM firms held by these three asset managers exhibit a significant increase in emissions intensities, while those not held by them do not. These results complement those provided in Azar et al. (2021), who document that the Big-Three asset managers exert engagement effort in large DM companies.

6. Conclusion

Whether EM countries can achieve growth without compromising environmental sustainability is an important question for global efforts to achieve net-zero carbon emissions by 2050. In this paper, we examine the extent to which foreign institutional investors help achieve green growth in EM companies. We employ two identification approaches based on the MSCI inclusions: Firm-level and China A-shares' market-level inclusions to the MSCI Index. Our findings suggest that foreign institutional capital does not inherently support sustainable growth in EM firms. Post-MSCI inclusion, EM firms experience substantial growth, yet this expansion is paired with significantly increased emissions, leading to heightened emissions intensity. These findings contrast with what occurs in DMs, where we do not observe any significant increase in GHG emissions intensity. We also find evidence of less-aggressive abatement efforts in EM firms. This increase in EM portfolio firms' emissions intensity does not, however, appear to translate into a deterioration in the funds' overall portfolio emissions profile, with a corresponding decrease in DM portfolio firms' emissions that enable funds to dampen the effect of deterioration in EM firms' environmental performance.

We explore economic channels that underlie our results. First, our results support the pollution haven hypothesis. For example, the rises in emissions intensity are concentrated in EM countries with weaker environmental regulations and EM firms that are predominantly held by funds domiciled in stronger environmental regulations. Second, we find evidence supporting the not-in-my-backyard hypothesis. We document strong environmental home bias in fund trading behavior, and emissions intensities of these EM firms do not tend to increase after an influx of domestic institutional capital. Moreover, EM firms' local pollution, such as landfill and incinerated waste, tends to rise, aligning with the not-in-my-backyard story. Finally, we also find that financial incentives matter. For instance, the emissions intensities of EM firms held mainly by funds with poor past performance and a short-term focus increase more after MSCI inclusions. Given that brown EM stocks tend to outperform green EM stocks, the incentives of these funds to engage in green corporate policies in EM firms seem weak. We also find that ESG-oriented funds may compromise environmental performance in their portfolios for higher returns. In conclusion, our results highlight the challenges the financial sector faces in contributing to global climate change mitigation while providing capital to promote economic growth for EM countries.

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Appendix A.1. Proofs

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

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

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. □

Derivation of Eq. (6)

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

$$\frac{\partial X}{\partial K} \Big/ \frac{\partial X}{\partial z} = \{\phi(\theta) - (1-\theta)\phi'(\theta)\}F'(K) = \frac{r}{\tau}, \tag{A.3}$$

which, along with $F(K) = \gamma K^{\alpha}$, implies that:

$$K = \left(\frac{\alpha\gamma\tau}{r}\{\phi(\theta) - (1-\theta)\phi'(\theta)\}\right)^{\frac{1}{1-\alpha}}, \tag{A.4}$$

$$F(K) = \left(\frac{\alpha\gamma\tau}{r}\{\phi(\theta) - (1-\theta)\phi'(\theta)\}\right)^{\frac{\alpha}{1-\alpha}}, \tag{A.5}$$

Using $\tau z + rK = E$, and with $z = \phi(\theta)F(K)$, we are able to rearrange the budget constraint as follows:

$$\left(\frac{\tau^{\frac{1}{1-\alpha}}}{r^{\frac{\alpha}{1-\alpha}}}\right)\left[\{\alpha\gamma(\phi(\theta) - (1-\theta)\phi'(\theta))\}^{\frac{1}{1-\alpha}} + \phi(\theta)\{\alpha\gamma(\phi(\theta) - (1-\theta)\phi'(\theta))\}^{\frac{\alpha}{1-\alpha}}\right] = E. \tag{A.6}$$

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

$$\frac{\partial X}{\partial K} = \frac{\partial X}{\partial F} F'(K), \tag{A.7}$$

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:

$$\frac{\partial X}{\partial F} = \left(1 - \phi^{-1}\left(\frac{z}{F}\right)\right) + F\left([\phi^{-1}]'\left(\frac{z}{F}\right) \cdot \left(-\frac{z}{F^2}\right)\right) = 1 - \phi^{-1}\left(\frac{z}{F}\right) - \frac{z}{F}[\phi^{-1}]'\left(\frac{z}{F}\right). \tag{A.8}$$

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

$$\frac{\partial X}{\partial F} = 1 - \phi^{-1}\left(\frac{z}{F}\right) - \frac{z}{F}\frac{1}{\phi'\left(\phi^{-1}\left(\frac{z}{F}\right)\right)}. \tag{A.9}$$

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

$$\frac{\partial X}{\partial F} = (1 - \theta) - \frac{\phi(\theta)}{\phi'(\theta)} \tag{A.10}$$

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:

$$\frac{\partial X}{\partial z} = -[\phi^{-1}]'\left(\frac{z}{F}\right) \cdot \frac{1}{F} \cdot F = -\frac{1}{\phi'\left(\phi^{-1}\left(\frac{z}{F}\right)\right)} = -\frac{1}{\phi'(\theta)} > 0. \tag{A.11}$$

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:

$$\frac{\partial X}{\partial K} \bigg/ \frac{\partial X}{\partial z} = \{\phi(\theta) - (1-\theta)\phi'(\theta)\}F'(K), \tag{A.12}$$

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

Appendix A.2. Variable Definition

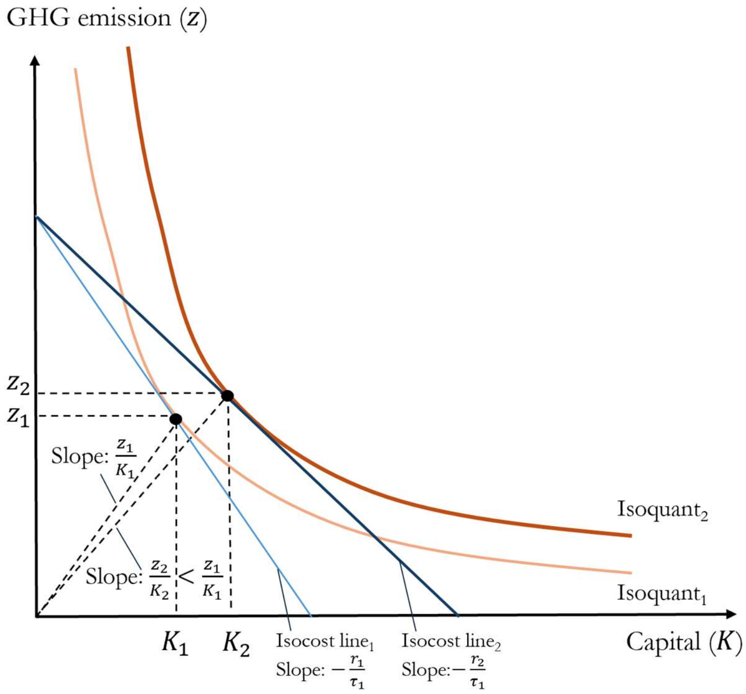
Variables	Definition	Source
Firm level data		
Log total assets	The natural logarithm of total assets at fiscal year-end in thousands of U.S. dollars.	Worldscope
Log sales	The natural logarithm of sales at fiscal year-end in thousands of U.S. dollars.	Worldscope
Log employees	The natural logarithm of the number of employees at fiscal year-end.	
Profitability	Earnings before interest, tax, depreciation, and amortization, divided by total assets at fiscal year-end.	Worldscope
Log market capitalization	The natural logarithm of market capitalization at fiscal year-end in thousands of U.S. dollars.	
Log physical assets	The natural logarithm of the property, plant, and equipment at fiscal year-end in thousands of U.S dollars.	Worldscope
Log capital expenditure	Capital expenditure at fiscal year-end in thousands of U.S. dollars.	Worldscope
Market-to-book	Market capitalization plus total debt divided by total assets at fiscal year-end.	Worldscope
Greenhouse gases (Scope 1)	Greenhouse gas emissions from sources that are owned or controlled by the company (categorized by the Greenhouse Gas Protocol) in million tCO_2e unit.	Trucost
Greenhouse gases (Scope 2)	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.	Trucost
Greenhouse gases (Scope 3)	Greenhouse gas emissions from other upstream activities not covered in Scope 2 (categorized by the Greenhouse Gas Protocol) in million tCO_2e unit.	Trucost
Direct greenhouse gas	Greenhouse gas emissions generated from burning fossil fuels and production processes which are owned or controlled by the company in million tCO_2e unit.	Trucost
Indirect greenhouse gas	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.	Trucost
Waste landfill	Sum of direct and indirect hazardous and nonhazardous landfill waste quantity.	Trucost
Waste incineration	Sum of direct and indirect hazardous and nonhazardous incinerated waste quantity.	Trucost
Emission reduction target	Percentage of emission reduction target set by the company. (Item number: ENERDP015)	Refinitive ESG

Log environmental expenditure	The natural logarithm of total amount of environmental expenditures. (Item number: ENERDP091)	Refinitive ESG
Investor level data		
Total institutional ownership	Total shareholdings by institutional ownership	Factset
Foreign institutional ownership	Shareholdings by foreign institutional ownership constructed by Ferreira and Matos (2008)	Factset
Total fund shareholdings	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.	Morningstar
Total passive fund shareholdings	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.	Morningstar
Total active fund shareholdings	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.	Morningstar
Foreign fund shareholdings	Proportion of foreign mutual fund holdings divided by the latest number of shares outstanding. We define a fund to be "foreign" if the domicile of the fund's largest share class does not cover the firm's domicile country. For the purpose of defining a foreign fund, European Monetary Union is treated as a single country.	Morningstar
Foreign passive fund shareholdings	Proportion of mutual fund holdings that satisfy the criteria above for passive and foreign funds, divided by the latest number of shares outstanding.	Morningstar
Foreign active fund shareholdings	Proportion of mutual fund holdings that satisfy the criteria above for active and foreign funds, divided by the latest number of shares outstanding. Active funds are funds that do not satisfy the criteria for passive funds as outlined above.	Morningstar
Portfolio Sustainability score	Portfolio-level Sustainalytics overall sustainability score.	Morningstar
Portfolio carbon risk	Portfolio-level carbon risk score.	Morningstar
12-month return		
Turnover		
Country and industry level data		
EPS score	Environmental Policy Stringency Index score matched to operating countries of firms or domicile countries of funds.	OECD
Industry level capital intensity	Average of capital intensity, asset-to-sales ratio, in each Trucost primary sector id.	Worldscope, Trucost

Figure 1. The Effects of Falls in the Costs of Capital (and) Pollution

Panel A of this figure plots how a firm adjusts its optimal input mix in the emission-capital (z-K) space following a decrease in the cost of capital from r_1 to r_2. Panel B of this figure then plots how a firm adjusts its optimal input mix following decreases in the costs of capital from r_1 to r_2 and pollution from τ_1 to τ_2.

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



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

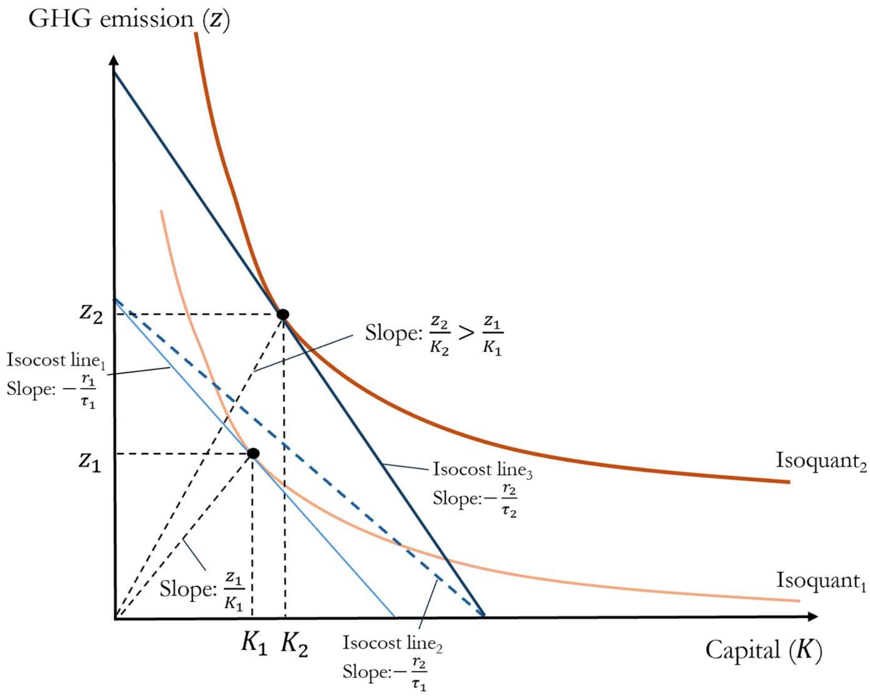
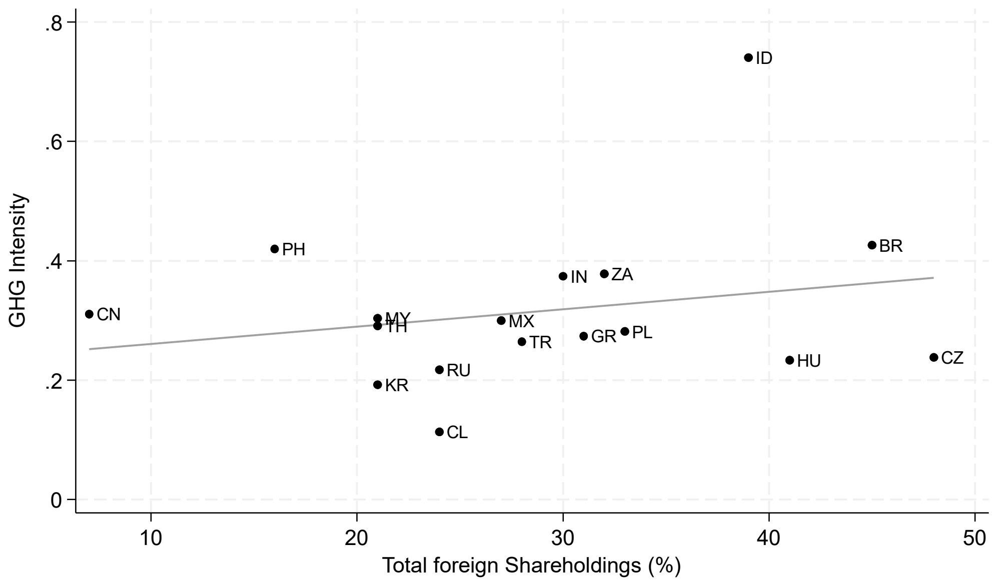


Figure 2. Foreign Institutional Ownership and Greenhouse Gas (GHG) Emissions Intensity

These figures plot the relationship between foreign institutional investor shareholdings and greenhouse gas (GHG) emissions intensities in countries belonging to the MSCI Emerging Market (EM) index (Panel A) and the MSCI Developed Market (DM) index (Panel B). Total foreign ownership is the weighted-average of foreign ownership as a percentage of market capitalization in private corporations, the public sector, strategic individuals, and institutional investors within each country as of end-2017, as reported in OECD Capital Market Series. GHG emissions intensity is defined as the ratio of production-based greenhouse gas emission to total primary energy consumption in each country for the year of 2017, as reported in Ritchie, Roser, and Rosado (2020).

Panel A. Emerging Market



Panel B. Developed Market

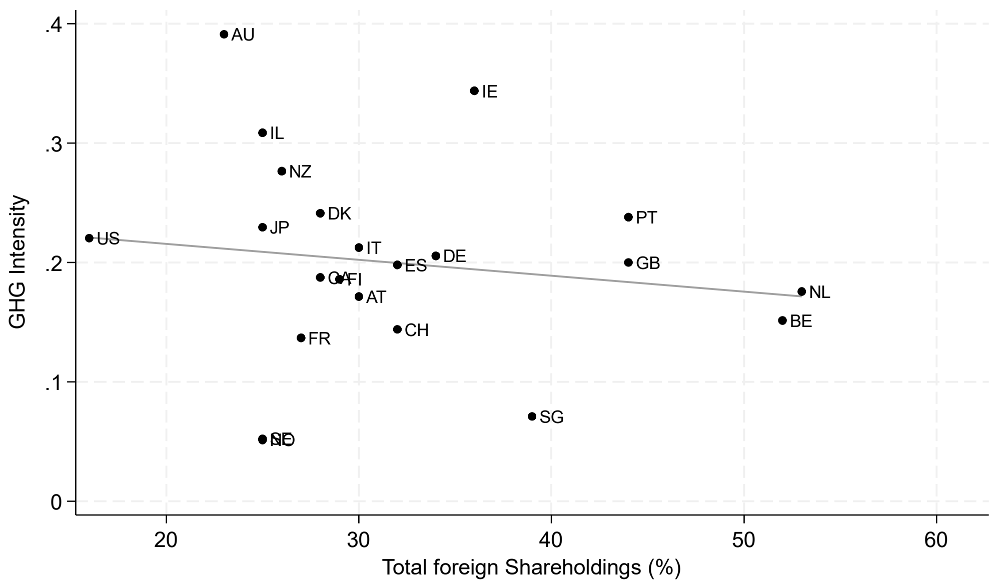
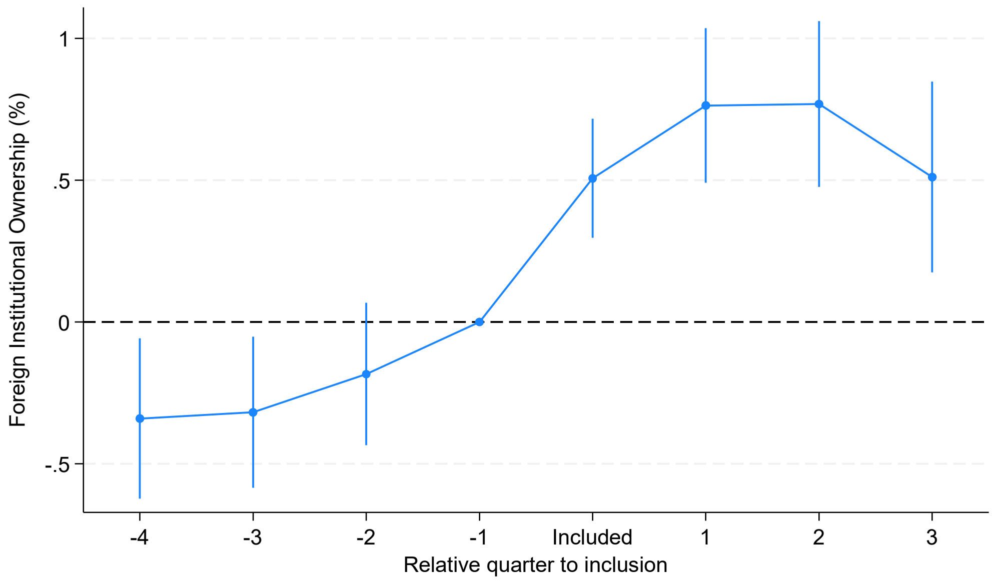


Figure 3. Changes in Institutional Ownerships Around MSCI Emerging Market Index Inclusions

These figures plot the regression results of foreign institutional ownership as reported in Factset on the interaction term of the indicator variable, *Included,* and years relative to the inclusion year indicator variables. *Included* is an indicator variable that takes a value of 1 for treated firms that are newly included to the index. The samples consist of treated and matched control firms before and after the firm-level inclusions into the MSCI Emerging Market (EM) index (Panel A) and the market-wide Chinese A-share inclusion into the MSCI EM index (Panel B). Each dot represents the point estimates of coefficients for interaction terms, while the bars plot the 90th percentile confidence interval. The regression includes firm, quarter-by-country, and quarter-by-industry fixed effects in Panel A, with firm and quarter-by-industry fixed effects in Panel B. Control variables are lagged 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. Plotted event windows are [-4, 3] quarters around the index inclusions. Standard errors are robust to heteroskedasticity and two-way clustered by firm and quarter. All continuous variables are winsorized at the 1% and 99% levels.

Panel A. All MSCI EM index inclusions



Panel B. China A-share MSCI EM index inclusions

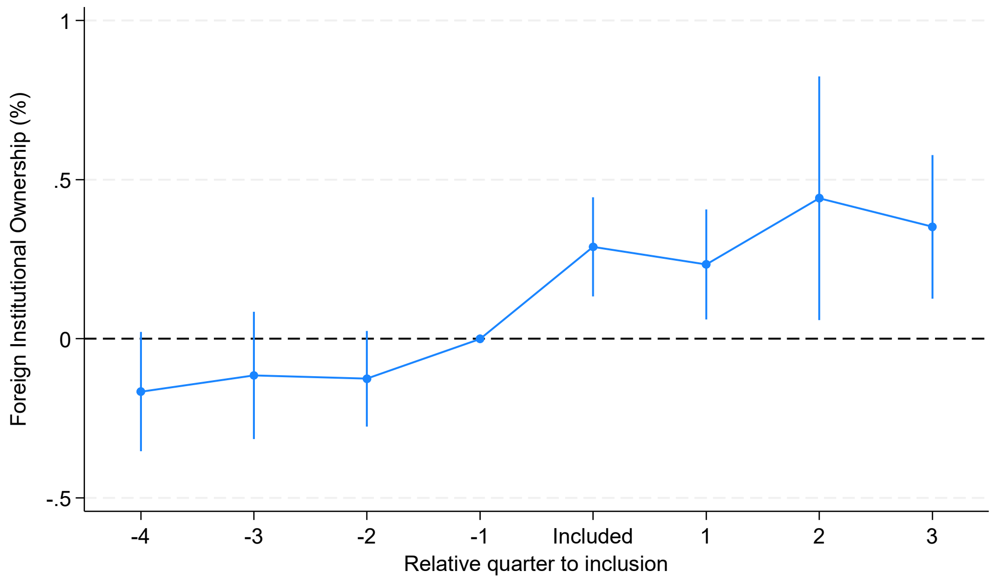
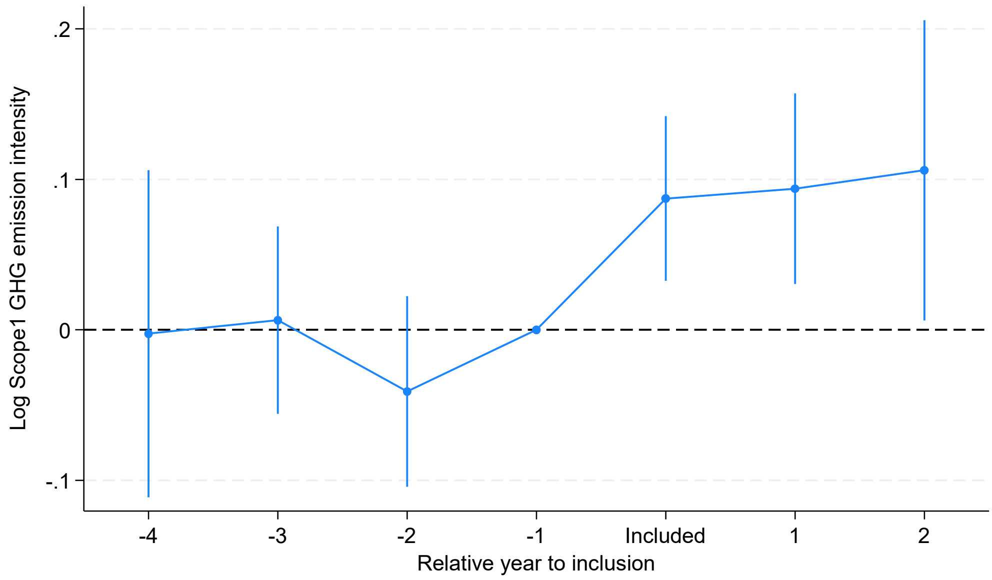


Figure 4. Changes in GHG Emissions Intensity Around the MSCI Index Inclusions

These figures plot the regression results of log Scope 1 GHG emission intensities on the interaction term of the indicator variable, *Included,* and years relative to the inclusion year indicator variables. *Included* is an indicator variable that takes a value of 1 for treated firms that are newly included to the index. The samples consist of treated and matched control firms before and after the firm-level inclusions into the MSCI Emerging Market (EM) index (Panel A) and the market-wide Chinese A-share inclusion into the MSCI EM index (Panel B). Each dot represents the point estimates of coefficients for interaction terms, while the bars plot the 90th percentile confidence interval. The regression includes firm, year-by-country, and year-by-industry fixed effects in Panel A, with firm and year-by-industry fixed effects in Panel B. Plotted event windows are [-4, 2] years around the index inclusions. Standard errors are robust to heteroskedasticity and two-way clustered by country and year in Panel A and firm and year in Panel B. All continuous variables are winsorized at the 1% and 99% levels.

Panel A. All MSCI EM index inclusions



Panel B. China A-share MSCI EM index inclusions

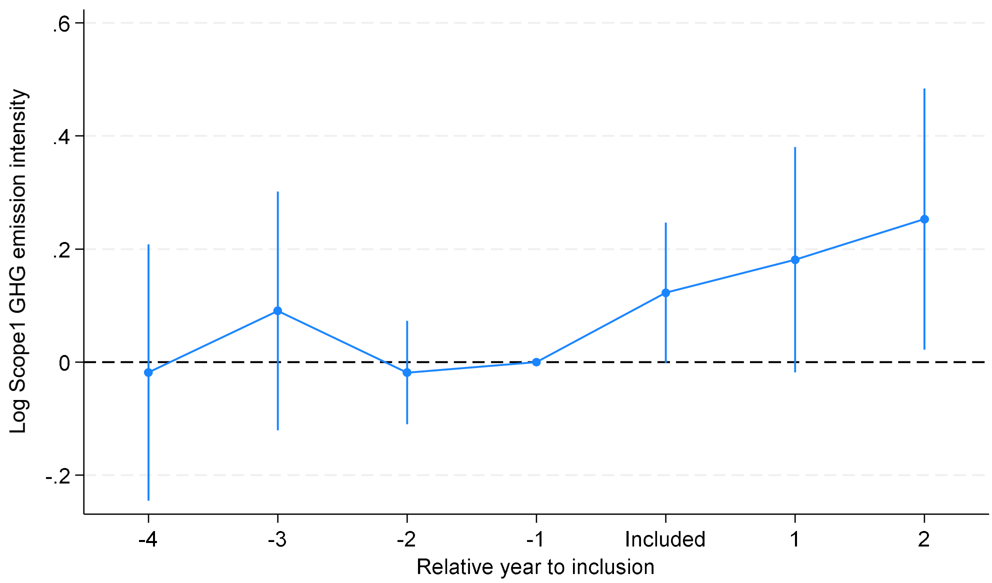


Figure 5. GHG Emissions Intensity Around the MSCI EM Index Inclusions by Geographic Regions

This figure plots the regression results of log Scope 1 GHG emission intensities on the interaction term of the indicator variable, Included, and years relative to the inclusion year indicator variables in subsamples of five geographic regions: (1) South and Southeast Asia, (2) China, (3) East Asia excluding China, (4) Europe, Middle East, and Africa, and (5) America based on the headquartered nations. Included is an indicator variable that takes a value of 1 for treated firms that are newly included to the MSCI Emerging Market (EM) Index and 0 for matched control firms. Each dot represents the point estimates of coefficients for interaction terms, while the bars plot the 90th percentile confidence interval. The sample consists of treated and matched control firms for a window of [-4, 3] years around index inclusions. The regressions include firm, country-by-year, and industry-by-year fixed effects all samples, and firm and industry-by-year for China sample. Matching is done in an identical manner to Table 1. All continuous variables are winsorized at the 1% and 99% levels. Standard errors are two-way clustered by country and year in all subsamples, except for the China subsample where the standard error is clustered by year.

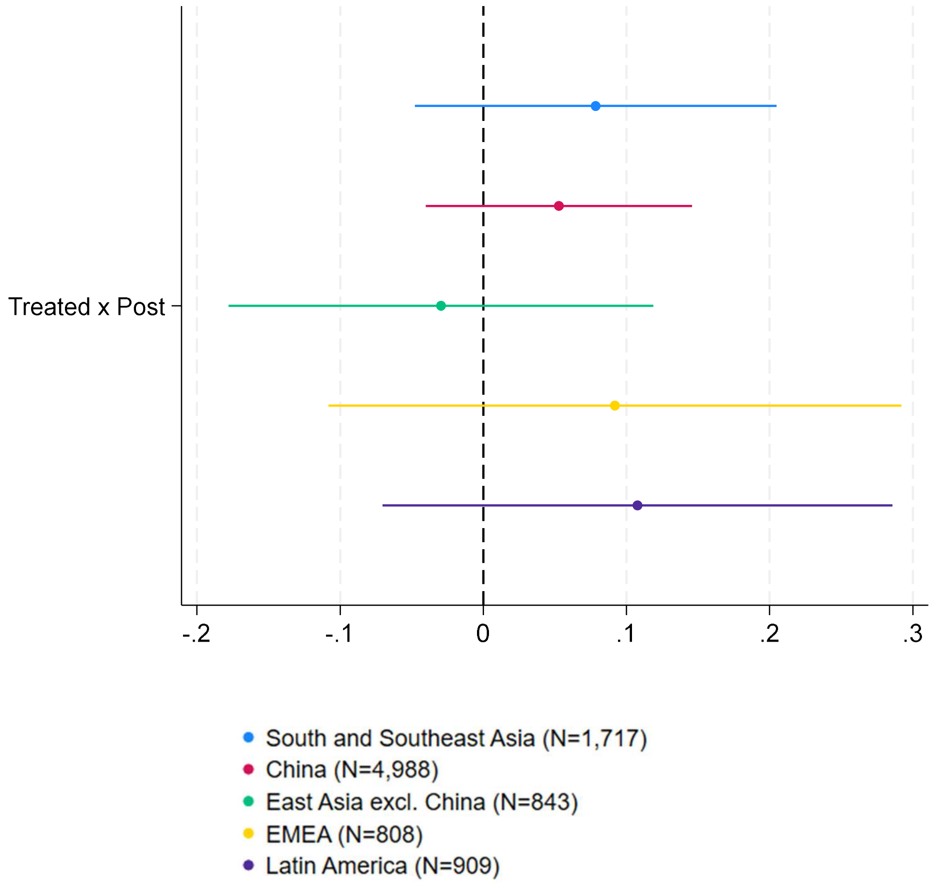


Table 1. Descriptive Statistics

This table reports the summary statistics of sample firms used in our empirical analysis. Financial and emissions characteristics for firms that are listed in constituent countries of MSCI Emerging Market (EM) index are presented in Panel A. In Panel B, differences in greenhouse gas (GHG) emissions and intensities between firms that are listed in constituent countries of MSCI EM Index and firms that are listed in constituent countries of MSCI Developed Market (DM) Index. In both panels, the sample includes treated and their matched control firms. For each firm newly included in the MSCI index, we identify three closest control firms within the same country at the same point in time, matched based 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 nearest neighbor propensity score matching. Detailed description of the variables is presented in Appendix A.2. All continuous variables are winsorized at the 1% and 99% levels.

Panel A. Summary statistics

	Obs.	Mean	SD	P1	P25	Median	P75	P99
Log total assets	12,003	15.347	1.620	12.070	14.219	15.163	16.305	20.102
Log sales	12,003	14.498	1.498	11.211	13.481	14.403	15.429	18.364
Log market capitalization	11,989	15.045	1.183	12.411	14.295	14.947	15.726	18.434
Log employees	10,444	8.996	1.517	4.990	8.091	9.033	9.994	12.502
Log physical assets	11,800	13.203	1.931	7.826	12.105	13.237	14.522	17.451
Log capital expenditure	11,762	11.352	1.901	6.055	10.285	11.407	12.609	15.523
Market-to-book	11,988	0.261	0.520	0.000	0.028	0.094	0.267	2.517
Profitability	11,879	0.109	0.092	-0.133	0.054	0.098	0.154	0.402
	GHG emissions (million tCO_2e)							
Scope 1	12,003	2.543	8.031	0.000	0.009	0.043	0.394	46.340
Scope 2	12,003	0.245	0.658	0.000	0.010	0.040	0.161	4.451
Scope 3 (Upstream)	12,003	1.206	3.075	0.004	0.063	0.224	0.834	19.625
Direct	12,003	2.582	8.075	0.000	0.009	0.044	0.398	46.456
Indirect	12,003	0.812	2.100	0.002	0.034	0.133	0.496	14.463
	GHG emissions intensity (emissions tCO_2e/sales)							
Scope 1	12,003	0.869	19.730	0.000	0.008	0.025	0.171	10.709
Scope 2	12,003	0.082	1.667	0.000	0.009	0.023	0.056	0.727
Scope 3 (Upstream)	12,003	0.390	13.009	0.009	0.053	0.132	0.279	1.235
Direct	12,003	0.880	19.731	0.000	0.008	0.025	0.172	10.721
Indirect	12,003	0.284	9.359	0.002	0.032	0.070	0.194	1.176

Panel B. GHG emissions: EM vs. DM

	EM		DM			
	Obs.	Emissions	Obs.	Emissions	Difference: EM – DM	(t-stat)
Scope 1	12,003	2.543	13,680	1.668	0.875	(9.661)
Scope 2	12,003	0.245	13,680	0.274	-0.029	(-3.549)
Scope 3 (Upstream)	12,003	1.206	13,680	1.567	-0.361	(-8.404)
Direct	12,003	2.582	13,680	1.680	0.902	(9.917)
Indirect	12,003	0.812	13,680	0.906	-0.094	(-3.474)
	Obs.	Intensity	Obs.	Intensity	Difference: EM – DM	(t-stat)
Scope 1	12,003	0.869	13,680	0.250	0.619	(3.663)
Scope 2	12,003	0.082	13,680	0.047	0.035	(2.454)
Scope 3 (Upstream)	12,003	0.390	13,680	0.198	0.192	(1.715)
Direct	12,003	0.880	13,680	0.253	0.627	(3.712)
Indirect	12,003	0.284	13,680	0.122	0.162	(2.018)

Table 2. Firms' Outputs and GHG Emissions Around MSCI EM Inclusion

This table presents the regression results of log sales, log total assets, log employees, and profitability (Panel A) and Scopes 1 through 3 as well as direct and indirect log GHG emissions levels (Panel B). The main regressor is the interaction of two indicator variables, *Included* and *Post*: *Included* is an indicator variable that takes a value of 1 for treated firms that are newly included to the MSCI Emerging Market (EM) Index and 0 for matched control firms; and *Post* is an indicator variable that takes a value of 1 for the index inclusion year and the following years and 0 for other years. Firm, country-by-year, and industry-by-year fixed effects are included. The sample consists of treated and matched control firms for a window of [-4, 3] years around index inclusions. Matching is done in an identical manner to Table 1. 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)
	Sales	Total assets	Employees	Profitability
Post	-0.048***	-0.038***	-0.053***	-0.003*
	(-5.159)	(-3.838)	(-4.728)	(-1.885)
Included × Post	0.158***	0.139***	0.097***	0.008***
	(8.235)	(11.416)	(5.141)	(3.661)
Observations	12,159	12,157	10,270	12,014
Adjusted R-squared	0.987	0.985	0.970	0.743
Firm FE	YES	YES	YES	YES
Country ×Year FE	YES	YES	YES	YES
Industry ×Year FE	YES	YES	YES	YES

Panel B. GHG emissions levels

	Dependent variables:				
	(1)	(2)	(3)	(4)	(5)
	Scope 1	Scope 2	Scope 3	Direct	Indirect
Post	-0.069**	-0.074**	-0.046**	-0.064**	-0.048***
	(-2.493)	(-2.669)	(-2.888)	(-2.366)	(-5.981)
Included × Post	0.205***	0.209***	0.154***	0.200***	0.177***
	(7.563)	(9.082)	(11.862)	(6.989)	(14.546)
Observations	12,162	12,162	12,162	12,162	12,162
Adjusted R-squared	0.968	0.938	0.979	0.968	0.969
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 Inclusions

This table presents the regression results of Scopes 1 through 3 as well as direct and indirect log GHG emissions intensities. The main regressor is the interaction of two indicator variables, *Included* and *Post*: *Included* is an indicator variable that takes a value of 1 for treated firms that are newly included to the MSCI Emerging Market (EM) Index and 0 for matched control firms; and *Post* is an indicator variable that takes a value of 1 for the index inclusion year and the following years and 0 for other years. Firm, country-by-year, and industry-by-year fixed effects are included. The sample consists of treated and matched control firms for a window of [-4, 3] years around index inclusions. Matching is done in an identical manner to Table 1. 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	-0.025	-0.030	-0.003	-0.020	-0.006
	(-0.785)	(-0.834)	(-0.315)	(-0.665)	(-0.429)
Included × Post	0.056***	0.058**	0.006	0.053**	0.028*
	(3.309)	(2.437)	(0.652)	(2.783)	(1.868)
Observations	12,004	12,004	12,004	12,004	12,004
Adjusted R-squared	0.961	0.911	0.975	0.961	0.957
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. GHG Emissions Intensity Around the China A-Share MSCI EM Index Inclusions

This table presents the regression results of Scopes 1 through 3 as well as direct and indirect log GHG emissions intensities. The main regressor is the interaction of two indicator variables, *Included* and *Post*: *Included* is an indicator variable that takes a value of 1 for treated firms that are newly included to the MSCI Emerging Market (EM) Index as a part of the market-wide China A-share inclusions in 2018 and 2019, and 0 for matched control firms; and *Post* is an indicator variable that takes a value of 1 for the index inclusion year and the following years and 0 for other years. Firm, country-by-year, and industry-by-year fixed effects are included. The sample consists of treated and matched control firms for a window of [-4, 3] years around index inclusions. Matching is done in an identical manner to Table 1. 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	0.014	0.002	-0.023	0.017	-0.004
	(0.556)	(0.063)	(-1.239)	(0.670)	(-0.178)
Included × Post	0.098**	0.033	0.032	0.096**	0.040
	(2.509)	(1.323)	(1.586)	(2.504)	(1.626)
Observations	4,438	4,438	4,438	4,438	4,438
Adjusted R-squared	0.951	0.900	0.970	0.951	0.953
Firm FE	YES	YES	YES	YES	YES
Industry ×Year FE	YES	YES	YES	YES	YES

Table 5. GHG Emissions Intensity Around the MSCI DM Index Inclusions

This table presents the regression results of Scopes 1 through 3 as well as direct and indirect log GHG emissions intensities. The main regressor is the interaction of two indicator variables, *Included* and *Post*: *Included* is an indicator variable that takes a value of 1 for treated firms that are newly included to the MSCI Developed Market (DM) Index and 0 for matched control firms; and *Post* is an indicator variable that takes a value of 1 for the index inclusion year and the following years and 0 for other years. Firm, country-by-year, and industry-by-year fixed effects are included. The sample consists of treated and matched control firms for a window of [-4, 3] years around index inclusions. Matching is done in an identical manner to Table 1. 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 GHG emissions intensity				
	(1)	(2)	(3)	(4)	(5)
	Scope 1	Scope 2	Scope 3	Direct	Indirect
Post	0.034	-0.001	0.009	0.037	0.009
	(1.300)	(-0.035)	(0.725)	(1.348)	(.514)
Included × Post	-0.062**	0.018	-0.013	-0.065**	0.014
	(-2.407)	(0.572)	(-0.906)	(-2.524)	(0.836)
Observations	13,680	13,680	13,680	13,678	13,680
Adjusted R-squared	0.955	0.891	0.956	0.956	0.950
Firm FE	YES	YES	YES	YES	YES
Country ×Year FE	YES	YES	YES	YES	YES
Industry ×Year FE	YES	YES	YES	YES	YES

Table 6. Evidence on GHG Emission Abatement Activities Around the MSCI Index Inclusions

This table presents the regression results of corporate GHG emission reduction targets (Panel A) and environmental expenditure (Panel B). The main regressor is the interaction of two indicator variables, *Included* and *Post*: *Included* is an indicator variable that takes a value of 1 for treated firms that are newly included to the MSCI Index and 0 for matched control firms; and *Post* is an indicator variable that takes a value of 1 for the index inclusion year and the following years and 0 for other years. Column (1) and (2) are for MSCI Emerging Market (EM) index and columns (3) and (4) are for Developed Market (DM) index. Firm, country-by-year, and industry-by-year fixed effects are included. The sample consists of treated and matched control firms for a window of [-4, 3] years around index inclusions. Matching is done in an identical manner to Table 1. 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 country and year are presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Emission reduction target in percentage terms

	Dependent variable: Emission reduction target (%)			
	Emerging Market		Developed Market	
	(1)	(2)	(3)	(4)
Post	1.535	0.462	-0.342	-0.127
	(1.489)	(0.430)	(-0.501)	(-0.188)
Included × Post	-2.835**	-0.654	0.860	0.346
	(-2.360)	(-0.678)	(1.045)	(0.392)
Observations	4,768	3,767	8,026	6,528
Adjusted R-squared	0.333	0.431	0.361	0.409
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: Environmental expenditure			
	Emerging Market		Developed Market	
	(1)	(2)	(3)	(4)
Post	0.352*	0.634*	-0.007	0.066
	(1.981)	(1.897)	(-0.044)	(0.525)
Included × Post	-0.389**	-0.752**	0.303	0.260
	(-2.841)	(-2.880)	(1.663)	(1.234)
Observations	741	584	640	508
Adjusted R-squared	0.891	0.865	0.861	0.873
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 7. Post-Inclusion Stock Returns of MSCI-Included Firms

This table presents regression results for one, two-, and three-year stock returns of firms after inclusion into the MSCI Emerging Market (EM) or Developed Market (DM) indices, measured from the beginning of the inclusion year. The regressor is EM inclusion indicator variable that takes the value of 1 for firms that were included to MSCI EM index and 0 for firm included to DM index each year for the first time. Panel A consists of the full sample, Panel B consists DM index included firms and EM index included firms with the increase in carbon emissions intensities after index inclusions compared to a year before the inclusions, and Panel C consists DM index included firm and EM index included firms with a decrease in carbon emissions intensities after index inclusions compared to a year before the inclusions. Control variables include inclusion years' log market capitalization, market-to-book ratio, profitability, and investment, along with year fixed effects. The sample consists of firms who are included into either MSCI EM or DM index for the first time. 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: Stock returns		
	(1)	(2)	(3)
	One-year return	Two-year return	Three-year return
Panel A. Full sample			
EM inclusion	0.011***	0.011***	0.013***
	(7.01)	(5.041)	(4.627)
Observations	2,682	2,430	2,052
Adjusted R-squared	0.378	0.310	0.181
Controls	YES	YES	YES
Year FE	YES	YES	YES
Panel B. Change in carbon emissions intensities > 0			
EM inclusion	0.013***	0.013***	0.013***
	(7.896)	(5.366)	(4.255)
Observations	1,734	1,575	1,412
Adjusted R-squared	0.361	0.352	0.217
Controls	YES	YES	YES
Year FE	YES	YES	YES
Panel C. Change in carbon emissions intensities < 0			
EM inclusion	0.005***	0.005*	0.009***
	(2.663)	(1.731)	(2.681)
Observations	1,989	1,811	1,563
Adjusted R-squared	0.385	0.319	0.196
Controls	YES	YES	YES
Year FE	YES	YES	YES

Table 8. Changes in portfolio-level carbon emission

This table presents regression results at the fund-year level for portfolio-level changes in demeaned weighted average of log emissions of (i) all (ii) emerging market (EM), and (iii) developed market (DM) foreign firms held within a fund portfolio following their portfolio firms' inclusions into and exclusions from the MSCI Emerging Market Index. Each component of fund-level weighted emissions is demeaned by the overall portfolio weighted-average log emissions at the same year-end. The main variable of interest is previous year's *Net MSCI-Inclusion Holdings*, namely the difference between the combined portfolio weight of all newly-included MSCI EM firms and that of all newly-excluded (former) MSCI EM firms. Morningstar-category-by-year fixed effects, where Morningstar category refers to the fund characteristics, are included in all specifications, and fund fixed effect is additionally included in columns (4) through (6). The sample funds consist of those holding at least one domestic, DM foreign, and EM foreign firm, respectively. 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 Morningstar category and year are presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variable: Change in average log Scope 1 GHG emissions (relative to overall portfolio) of					
	(1)	(2)	(3)	(4)	(5)	(6)
	All foreign firms	EM foreign firms	DM foreign firms	All foreign firms	EM foreign firms	DM foreign firms
Net MSCI-inclusion EM holdings	0.002	0.013***	-0.022***	0.004	0.020**	-0.018*
	(1.002)	(3.037)	(-4.148)	(1.193)	(2.173)	(-1.747)
Observations	57,777	57,777	57,777	53,823	53,823	53,823
Adjusted R-squared	0.122	0.064	0.099	0.062	-0.027	0.051
Morningstar-category-by-year FE	YES	YES	YES	YES	YES	YES
Fund FE	NO	NO	NO	YES	YES	YES

Table 9. Evidence on Pollution Haven

This table presents the regression results for Scope 1 GHG emission intensities, segmented by subsamples based on the characteristics of funds holding the sample firms, the sample firms' countries of domicile, and the industries in which they operate. The main regressor is the interaction of two indicator variables, *Included* and *Post*: *Included* is an indicator variable that takes a value of 1 for treated firms newly included in the MSCI Index and 0 for matched control firms, while *Post* is an indicator variable that takes a value of 1 for the index inclusion year and the subsequent years and 0 for other years. First, sample firms are categorized based on Environmental Policy Stringency (EPS) scores of the countries in which the funds holding the firm are domiciled. Firms are defined as having a 'high fund EPS score' if mutual funds from countries with high EPS scores hold more shares compared to the funds from countries with low EPS scores; otherwise, they are considered to have a 'low fund EPS score'. Countries are defined as having high (low) EPS scores if their latest yearly EPS is higher (lower) than the median value for the same year. Second, sample firms are categorized based on the Sustainability scores of holding funds. Firms are defined as having a 'high fund portfolio Sustainability score' if mutual funds with higher than median Sustainalytics overall sustainability scores hold more shares than funds with lower than median scores; otherwise, they are considered to have a 'low fund portfolio Sustainability score'. Third, the sample firms are categorized based on the carbon risk of holding funds in the analogous manner to Sustainability score subsamples. Fourth, we define firms as having a 'high country EPS score' if the countries in which they reside have higher than median EPS score a year before the inclusion, and as having a 'low country EPS score' if otherwise. Fifth, firms are defined as being in a 'high capital-intensive industry' if the industry-average capital intensity (measured by asset-to-sales ratio) is higher than median in each year, and as being in a 'low capital-intensive industry' otherwise. Continuous variables are winsorized at the 1% and 99% levels. Regressions include firm, country-by-year, and industry-by-year fixed effects in all specifications, except in row (4) where the regression includes firm and industry-by-year fixed effects. The sample consists of treated and matched control firms for a window of [-4, 3] years around the index inclusions. Matching is done in an identical manner to Table 1. All other specifications are identical to Table 3. *t*-statistics based on standard errors robust to heteroskedasticity and two-way clustered by country and year in row (1)-(3) and (5), and by year in row (4), 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) Fund domicile country EPS score	Low	High
Included × Post	-0.087	0.098***
	(-0.431)	(4.146)
(2) Portfolio Sustainability score	Low	High
Included × Post	0.065**	0.169***
	(2.622)	(3.743)
(3) Portfolio carbon risk	Low	High
Included × Post	0.199***	0.068**
	(7.530)	(2.482)
(4) Firm country EPS score	Low	High
Included × Post	0.116***	0.048
	(4.111)	(0.911)
(5) Industry-level capital intensity	Low	High
Included × Post	-0.027	0.064**
	(-1.329)	(2.220)
Firm FE	YES	YES
Country ×Year FE	YES	YES
Industry ×Year FE	YES	YES

Table 10. Local vs. Foreign Firms' GHG Emissions Intensity Change as a Driver of Fund Trading

This table presents the regression results of the likelihood of a fund increasing its position in a portfolio firm on the change in Scope 1 GHG emissions intensity. Increased fund position is an indicator variable that takes the value of one if a fund either newly acquires a firm or increases its position in a firm relative to the previous year-end, and zero otherwise. The main variables of interest are the contemporaneous year-on-year change in Scope 1 GHG emissions intensity, interacted with two mutually exclusive domestic and foreign firm indicators. The sample consists of funds with holdings information in the Morningstar Global database that hold at least one domestic and one foreign firm at a given calendar year-end. The cross-sectional unit of observation is each fund-firm pair, and the frequency is annual. Control variables include log market capitalization, book-to-market, 12-month momentum, operating profitability, and investment, with operating profitability and investment defined as in Fama and French (2015) using the fiscal data for year $t-1$ available at June of year t (with June of year t market capitalization used to calculate log market capitalization and book-to-market). Different combinations of firm, fund-by-year, country-by-year, and industry-by-year fixed effects are considered in each column. 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 country and year are presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variables:			
	(1)	(2)	(3)	(4)
	Increase in fund position			
Change in Scope 1 GHG intensity × Foreign firm	0.005**	0.005**	0.007***	0.006***
	(2.398)	(2.190)	(3.494)	(3.242)
Change in Scope 1 GHG intensity	0.002	0.003	-0.002	0.000
	(0.651)	(1.129)	(-0.736)	(0.035)
Foreign firm	0.024***	0.024***	0.023***	0.023***
	(4.781)	(4.753)	(5.150)	(5.129)
Observations	14,753,275	14,753,248	14,753,501	14,753,414
Adjusted R-squared	0.339	0.340	0.327	0.329
Controls	YES	YES	YES	YES
Firm FE	YES	YES	NO	NO
Fund-by-year FE	YES	YES	YES	YES
Country-by-year FE	NO	YES	YES	YES
Industry-by-year FE	NO	NO	NO	YES

Table 11. GHG Emissions Around Local Index Inclusions

This table presents the regression results of sales, log GHG emissions levels and intensities for Scopes 1 through 3 of firms traded on Mainland China stock exchanges. The main regressor is the interaction of two indicator variables, *Included* and *Post*: *Included* is an indicator variable that takes a value of 1 for treated firms that are newly included to the CSI 300 Index and 0 for matched control firms; and *Post* is an indicator variable that takes a value of 1 for the index inclusion year and the following years and 0 for other years. The regressions include firm and industry-by-year fixed effects. The sample consists of treated and matched control firms for a window of [-4, 3] years around index inclusions. Matching is done in a manner analogous to Table 1. All continuous variables are winsorized at the 1% and 99% levels. *t*-statistics based on standard errors robust to heteroskedasticity and clustered by year are presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variables:						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
		GHG Scope 1		GHG Scope 2		GHG Scope 3	
	Sales	Level	Intensity	Level	Intensity	Level	Intensity
Post	0.009	-0.003	-0.014	-0.075	-0.086**	0.032	0.009
	(0.336)	(-0.074)	(-0.297)	(-1.419)	(-2.168)	(1.117)	(0.336)
Included × Post	0.083**	0.051	-0.033	0.084*	0.000	0.062*	-0.023***
	(2.434)	(1.024)	(-0.802)	(1.963)	(0.007)	(1.839)	(-3.614)
Observations	2,815	2,815	2,815	2,815	2,815	2,815	2,815
Adjusted R-squared	0.979	0.980	0.979	0.938	0.930	0.984	0.987
Firm FE	YES	YES	YES	YES	YES	YES	YES
Industry × Year FE	YES	YES	YES	YES	YES	YES	YES

Table 12. Other Types of Local Pollution Around MSCI EM Index Inclusions

This table presents the regression results of waste pollutions. The main regressor is the interaction of two indicator variables, *Included* and *Post*: *Included* is an indicator variable that takes a value of 1 for treated firms that are newly included to the MSCI Index and 0 for matched control firms; and *Post* is an indicator variable that takes a value of 1 for the index inclusion year and the following years and 0 for other years. Column (1) and (2) use inclusions in MSCI Emerging Market (EM) index and columns (3) and (4) use market-wide China A-share inclusions into the MSCI EM index. In columns (1) and (2), firm, country-by-year, and industry-by-year fixed effects are included. In column (3) and (4), firm and industry-by-year fixed effects are included. The sample consists of treated and matched control firms for a window of [-4, 3] years around index inclusions. Matching is done in an identical manner to Table 1. 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 country and year, in columns (1) and (2), and year, in columns (3) and (4), are presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variables:			
	(1)	(2)	(3)	(4)
	Waste landfill intensity	Waste incineration intensity	Waste landfill intensity	Waste incineration intensity
Sample:	All EM index inclusions		China A-shares EM index inclusions	
Post	-0.016*	-0.019	-0.064**	-0.008
	(-1.914)	(-0.963)	(-3.079)	(-0.281)
Included × Post	0.035**	0.062***	0.085***	0.088**
	(2.211)	(3.564)	(3.939)	(3.485)
Observations	12,877	12,893	4,378	4,381
Adjusted R-squared	0.900	0.879	0.882	0.836
Firm FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Country ×Year FE	YES	YES	YES	YES
Industry ×Year FE	YES	YES	YES	YES

Table 13. Evidence on Fund Incentives: Fund Characteristics and GHG Emissions Intensity

This table presents the regression results of Scope 1 GHG emissions intensities in subsamples based on the characteristics of funds holding the sample firms. The regressors include the interaction of two indicator variables, *Included* and *Post*: *Included* is an indicator variable that takes a value of 1 for treated firms that are newly included to the MSCI Index and 0 for matched control firms. *Post* is an indicator variable that takes a value of 1 for the index inclusion year and the following years, and 0 for other years. First, firms are defined as being held by funds with 'high 12-month return' if mutual funds with better-than-median 12-month returns hold more shares than their lower-than-median counterparts in these firms. 'Low 12-month return' is defined analogously. Second, firms are defined as being held by funds with 'high turnover' if mutual funds with higher-than-median fund turnover hold more shares than their lower-than-median counterparts in these firms. 'Low turnover' is defined analogously. Third, firms are defined as being held by 'passive funds' if passive funds hold more shares than active funds. 'Active funds' is defined analogously. Finally, sample firms are divided into with and without holdings by the 'Big 3' (BlackRock, State Street Global Advisors, and Vanguard) prior to the inclusion. The sample consists of treated and matched control firms for a window of [-4, 3] years around the index inclusions. Matching is done in an identical manner to Table 1. All other specifications are identical to Table 2. Continuous variables are winsorized at the 1% and 99% levels. Regressions 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 country 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) 12-month return	Low	High
Included × Post	0.111***	0.058
	(4.676)	(1.387)
(2) Turnover	Low	High
Included × Post	0.046**	0.263***
	(2.286)	(5.191)
(3) Passive vs Active	Passive	Active
Included × Post	0.113**	0.089***
	(2.479)	(4.686)
(4) Holdings by Big 3 funds	With	Without
Included × Post	0.107***	-0.101
	(3.381)	(-1.079)
Firm FE	YES	YES
Country ×Year FE	YES	YES
Industry ×Year FE	YES	YES

Internet Appendix to:

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

This Version: May 9, 2024

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

This table reports the differences in firm characteristics among firms that are newly included in MSCI Emerging Market (EM) index from 2003 to 2021 (treated firms), firms that are not included throughout the entire sample period, and their matched control firms. For a detailed explanation of the matching procedure, refer to Table 1. Differences between the subsamples are tested using regression with year fixed effect. *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	23.295	20.234	14.318	0.007***	0.460
Market capitalization	8.34	7.92	4.722	0.211	0.145
Sales	6.211	6.835	4.783	0.483	0.554
Profitability	0.124	0.097	0.107	< 0.001***	0.041**
Physical assets	2.628	3.045	2.534	0.291	0.650
Capital expenditure	0.435	0.447	0.372	0.102*	0.924
Market-to-book	0.265	0.739	0.272	< 0.001***	0.728
GHG (Scope 1)	2.379	1.538	2.277	< 0.001***	0.720
Observations	1,073	107,498	1,019		

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

This table presents the changes in institutional ownership before and after firms' inclusions to the MSCI Index. Dependent variables include foreign and total institutional ownership, all in percentage terms. Columns (1) and (2) cover all inclusions to the EM index, columns (3) and (4) focus on China A-share inclusions to the EM index in 2018 and 2019. Firms are classified as operating in EMs if they operate in countries constituting the MSCI EM Index. *Included* [$t + i$] indicates i quarters relative to the index inclusion quarter. The base time for the analysis is the quarter preceding the inclusion, thus all coefficients represent the differences relative to time 't – 1'. Continuous variables are winsorized at the 1% and 99% levels. Regressions include firm and year-quarter fixed effects in all specifications. t-statistics based on standard errors robust to heteroskedasticity and two-way clustered by firm and year-quarter are presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variables: Institutional ownership (%)			
	(1)	(2)	(3)	(4)
	EM index inclusions		China A-share EM index inclusions	
Quarter	Foreign	Total	Foreign	Total
Included [t – 4]	-0.859	-1.107*	-0.673***	-1.562
	(-1.560)	(-1.885)	(-3.279)	(-1.640)
Included [t – 3]	-0.653	-0.578	-0.471***	-0.852
	(-1.488)	(-1.189)	(-3.364)	(-1.206)
Included [t – 2]	-0.494	-0.391	-0.260**	-0.679
	(-1.544)	(-1.152)	(-2.225)	(-1.408)
Included [t]	0.530***	0.392	0.354***	-0.157
	(2.892)	(1.623)	(3.508)	(-0.317)
Included [t + 1]	0.944***	0.791**	0.626***	0.062
	(3.140)	(2.115)	(5.490)	(0.109)
Included [t + 2]	1.074**	1.074**	0.844***	0.432
	(2.563)	(2.268)	(4.874)	(0.615)
Included [t + 3]	1.047*	0.988*	0.931***	0.389
	(1.931)	(1.679)	(4.202)	(0.536)
Observations	10,109	10,109	2,935	2,935
Adjusted R-squared	0.924	0.894	0.893	0.857
Firm FE	YES	YES	YES	YES
Year-quarter FE	YES	YES	YES	YES

Table A.3. Investment Mandates of U.S. International Equity Funds

This table presents the number of funds (Panel A) and the aggregate assets under management (AUM) (Panel B) of U.S. international equity funds that refer to an MSCI index in the principal investment strategy (PIS) section of their fund prospectus filed in the EDGAR database for each year-end between 2010 and 2020. U.S. international equity funds are defined as those with the first two letters of CRSP objective code "EF" in the CRSP Survivor-Bias-Free Mutual Funds database, with fund prospectuses between 2010Q1 and 2020Q4. For each fund-quarter, a fund is defined as having an "MSCI mandate" if the reference to an MSCI index is made at least once within the latest four quarters, as many funds report full prospectuses to the EDGAR database only on an annual basis.

Panel A. Number of funds

	Number of U.S. international equity funds								
	Full sample			Passive funds			Active funds		
Year-end	Funds with MSCI mandate	All funds	MSCI mandate %	Funds with MSCI mandate	All funds	MSCI mandate %	Funds with MSCI mandate	All funds	MSCI mandate %
2010	174	1472	11.8%	42	311	13.5%	132	1161	11.4%
2011	238	1574	15.1%	85	354	24.0%	153	1220	12.5%
2012	313	1700	18.4%	115	395	29.1%	198	1305	15.2%
2013	380	1765	21.5%	130	428	30.4%	250	1337	18.7%
2014	406	1857	21.9%	134	468	28.6%	272	1389	19.6%
2015	471	2006	23.5%	156	527	29.6%	315	1479	21.3%
2016	548	2041	26.8%	189	570	33.2%	359	1471	24.4%
2017	586	2009	29.2%	198	567	34.9%	388	1442	26.9%
2018	612	2042	30.0%	206	623	33.1%	406	1419	28.6%
2019	607	2026	30.0%	198	631	31.4%	409	1395	29.3%
2020	595	1894	31.4%	199	584	34.1%	396	1310	30.2%

Panel B. Asset Under Management

Year-end	AUM of U.S. international equity funds ($ bn)								
	Full sample			Passive funds			Active funds		
	Funds with MSCI mandate	All funds	MSCI mandate %	Funds with MSCI mandate	All funds	MSCI mandate %	Funds with MSCI mandate	All funds	MSCI mandate %
2010	384.3	1,840.1	20.9%	191.4	454.0	42.2%	192.9	1,386.1	13.9%
2011	366.2	1,595.9	22.9%	279.5	408.1	68.5%	86.6	1,187.8	7.3%
2012	522.3	1,957.5	26.7%	371.4	539.6	68.8%	150.8	1,417.9	10.6%
2013	625.9	2,471.9	25.3%	411.7	708.7	58.1%	214.2	1,763.2	12.1%
2014	467.2	2,513.2	18.6%	238.9	755.7	31.6%	228.3	1,757.4	13.0%
2015	521.2	2,633.9	19.8%	272.1	783.7	34.7%	249.1	1,850.2	13.5%
2016	622.4	2,844.4	21.9%	308.3	870.0	35.4%	314.2	1,974.3	15.9%
2017	890.7	3,834.4	23.2%	487.8	1,365.5	35.7%	403.0	2,469.0	16.3%
2018	777.7	3,324.2	23.4%	424.9	1,257.9	33.8%	352.8	2,066.4	17.1%
2019	836.9	3,997.9	20.9%	347.0	1,532.7	22.6%	489.9	2,465.2	19.9%
2020	801.8	4,341.4	18.5%	370.9	1,633.2	22.7%	431.0	2,708.2	15.9%

Table A.4. Equity and Debt Issuances Around MSCI Index Inclusion

This table presents the regression results of new equity and debt financing. The amount of new equity issuance is defined as net proceeds from issue of stocks minus purchased, retired, converted, or redeemed stocks, divided by total assets. The amount of new debt is defined as long-term borrowings minus reduction in long-term debt plus increase in short-term borrowings divided by total assets. Equity issuance is an indicator variable that takes the value of 1 if the amount of new equity issuance is greater than zero. Debt issuance is an indicator variable that takes the value of 1 if amount of new debt is greater than zero. The sample consists of treated and matched control firms for a window of [-4, 3] years around the index inclusions. Matching is done in an identical manner to Table 1. 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:			
	(1)	(2)	(3)	(4)
	Amount		Indicator	
	Equity Issuance	Debt Issuance	Equity Issuance	Debt Issuance
Post	0.000	0.001	-0.021	0.043
	(0.145)	(0.147)	(-1.445)	(0.993)
Included × Post	0.005***	0.012*	0.048**	0.037
	(3.369)	(1.948)	(2.797)	(1.138)
Observations	9,699	3,244	9,699	3,244
Adjusted R-squared	0.386	0.392	0.506	0.327
Firm FE	YES	YES	YES	YES
Country ×Year FE	YES	YES	YES	YES
Industry ×Year FE	YES	YES	YES	YES

Table A.5. Mutual Fund Shareholdings and GHG Emissions Intensity

This table presents the regression results of log Scope 1 GHG emissions intensity on domestic, domestic passive, domestic active, foreign, foreign passive, and foreign active mutual fund shareholdings for all Emerging Market (EM) firms, regardless of whether they are included in the MSCI Emerging Market (EM) index. Control variables are log total assets, leverage, market-to-book, profitability, and tangibility as well as firm and country-by-industry-by-year fixed effects. Sample consists of firms covered both in Trucost and Morningstar mutual fund holdings data. 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	-0.111					
	(-1.106)					
Domestic passive shareholdings		-0.608*				
		(-1.851)				
Domestic active shareholdings			-0.114			
			(-0.802)			
Foreign fund shareholdings				0.133		
				(1.464)		
Foreign passive fund shareholdings					0.054	
					(0.164)	
Foreign active fund shareholdings						0.150
						(1.452)
Controls	YES	YES	YES	YES	YES	YES
Observations	77,230	77,230	77,230	77,230	77,230	77,230
Adjusted R-squared	0.950	0.950	0.950	0.950	0.950	0.950
Firm FE	YES	YES	YES	YES	YES	YES
Country × Industry × Year FE	YES	YES	YES	YES	YES	YES

Table A.6. Index Exclusion from MSCI EM Index

This table presents the regression results of institutional investment (Panel A), firm financials (Panel B), Scopes 1 through 3, as well as direct and indirect log GHG emissions levels (Panel C) and emissions intensity (Panel D) around the index exclusions from MSCI Emerging Market (EM) index. *Excluded* is an indicator variable that takes the value of 1 for treated firms and 0 for the matched control firms. *Excluded* [*t* + *i*] indicates *i* quarters relative to the time of index exclusion of a firm. *Post* is an indicator variable which is 1 if a given year is on or after a firm or its matched control firms are excluded from the index and 0 otherwise. We include firm, country-by-time, and industry-by-time fixed effects. The sample consists of treated and matched control firms for a window of [-4, 3] quarters in Panel A and [-4, 3] years in Panel B, C, and D around the index exclusions. Matching is performed in a manner analogous to Table 1, with the firms that are excluded from the MSCI EM index considered as treated firms. 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 country and year are presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Changes in shareholdings

	Dependent variables:	
	(1)	(2)
Quarter	Foreign institutional ownership	Total institutional ownership
Excluded [*t* – 4]	-0.120	-0.612*
	(-0.513)	(-1.921)
Excluded [*t* – 3]	0.094	-0.109
	(0.353)	(-0.224)
Excluded [*t* – 2]	0.309	0.419
	(0.798)	(1.225)
Excluded [*t*]	-1.062*	-1.272**
	(-1.990)	(-2.140)
Excluded [*t* + 1]	-3.342**	-3.909**
	(-2.109)	(-2.272)
Excluded [*t* + 2]	-3.181***	-3.310***
	(-3.109)	(-3.223)
Excluded [*t* + 3]	-2.142**	-4.057***
	(-2.060)	(-3.709)
Observations	522	522
Adjusted R-squared	0.969	0.957
Firm FE	YES	YES
Country ×Year FE	YES	YES
Industry ×Year FE	YES	YES

Panel B. Firm financials

	Dependent variables:			
	(1)	(2)	(3)	(4)
	Log sales	Log total assets	Log employees	Profitability
Post	0.006	0.008	0.015	-0.004
	(0.402)	(0.660)	(1.166)	(-1.709)
Excluded × Post	-0.055*	-0.028	-0.016	-0.011***
	(-1.771)	(-1.376)	(-0.308)	(-3.555)
Observations	6,732	6,731	5,137	6,705
Adjusted R-squared	0.990	0.988	0.975	0.719
Firm FE	YES	YES	YES	YES
Country ×Year FE	YES	YES	YES	YES
Industry ×Year FE	YES	YES	YES	YES

Panel C. GHG emissions levels

	Dependent variables: Log GHG emission				
	(1)	(2)	(3)	(4)	(5)
	Scope 1	Scope 2	Scope 3	Direct	Indirect
Post	0.014	0.035	0.015	0.012	0.029**
	(0.396)	(1.609)	(0.950)	(0.360)	(2.225)
Excluded × Post	-0.140*	-0.078	-0.079**	-0.135*	-0.120**
	(-2.023)	(-0.787)	(-2.426)	(-1.915)	(-2.239)
Observations	6,732	6,732	6,732	6,732	6,732
Adjusted R-squared	0.971	0.946	0.983	0.971	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 D. GHG emissions intensities

	Dependent variables: Log GHG emissions intensity				
	(1)	(2)	(3)	(4)	(5)
	Scope 1	Scope 2	Scope 3	Direct	Indirect
Post	0.002	0.010	-0.002	0.010	0.009
	(0.044)	(0.479)	(-0.191)	(0.511)	(.563)
Excluded × Post	-0.113**	-0.007	0.003	-0.031	-0.045
	(-2.538)	(-0.067)	(0.132)	(-0.737)	(-0.870)
Observations	6,597	6,597	6,597	6,597	6,597
Adjusted R-squared	0.962	0.914	0.985	0.976	0.968
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.7. Firm Expansion and GHG Emission Levels Around China A-Share MSCI EM Index Inclusions

This table presents the regression results of log sales, log total assets, log employees, and profitability (Panel A) and Scopes 1 through 3 as well as direct and indirect log GHG emissions levels (Panel B), but with a specific focus on China A-share inclusions into the MSCI Emerging Market (EM) index in 2018 and 2019 as in Table 4. *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. The regressions include firm and industry-by-year fixed effects. The sample consists of treated and matched control firms for a window of [-4, 3] years around the 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. Firm financials

	Dependent variables:			
	(1)	(2)	(3)	(4)
	Log sales	Log total assets	Log employees	Profitability
Post	-0.079*	-0.048**	-0.050*	-0.007
	(-1.976)	(-3.185)	(-2.359)	(-1.611)
Included × Post	0.147***	0.124***	0.096***	0.013***
	(8.856)	(7.371)	(5.213)	(7.240)
Observations	4,438	4,438	4,381	4,386
Adjusted R-squared	0.970	0.987	0.978	0.651
Firm FE	YES	YES	YES	YES
Industry × Year FE	YES	YES	YES	YES

Panel B. GHG emissions levels

	Dependent variables: Log GHG emission				
	(1)	(2)	(3)	(4)	(5)
	Scope 1	Scope 2	Scope 3	Direct	Indirect
Post	-0.037	-0.050	-0.073	-0.035	-0.055
	(-0.656)	(-1.761)	(-1.519)	(-0.626)	(-1.067)
Included × Post	0.223***	0.157***	0.156***	0.221***	0.165***
	(4.481)	(8.122)	(5.039)	(4.457)	(6.236)
Observations	4,440	4,440	4,440	4,440	4,440
Adjusted R-squared	0.960	0.932	0.975	0.960	0.965
Firm FE	YES	YES	YES	YES	YES
Industry × Year FE	YES	YES	YES	YES	YES

Table A.8. Firm Expansion and GHG Emission Levels Around the MSCI DM Index Inclusions

This table presents summary statistics of Developed Market (DM) firm sample (Panel A) and the regression results of log sales, log total assets, log employees, and profitability (Panel B) and Scopes 1 through 3 as well as direct and indirect log GHG emissions levels (Panel C). The main regressor is the interaction of two indicator variables, *Included* and *Post*: *Included* is an indicator variable that takes a value of 1 for treated firms that are newly included to the MSCI DM Index. Firm, country-by-year, and industry-by-year fixed effects are included. The sample consists of treated and matched control firms for a window of [-4, 3] years around index inclusions. Matching is done in an identical manner to Table 1. 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 country and year are presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Summary statistics

	Obs.	Mean	St. Dev.	P1	P25	Median	P75	P99
Total assets ($ millions)	13,680	15.638	1.549	12.327	14.621	15.482	16.489	20.102
Log total assets	13,676	14.911	1.479	11.15	13.972	14.867	15.871	18.364
Log sales	13,656	15.457	1.156	12.696	14.728	15.395	16.119	18.524
Log market capitalization	12,955	8.935	1.677	4.466	7.909	9.020	10.044	12.502
Log employees	9,132	15.358	3.621	8.903	12.905	14.724	16.928	24.72
Log physical assets	9,105	13.526	3.481	7.415	11.161	12.745	15.077	22.564
Log capital expenditure	13,656	1.731	1.657	0.114	0.790	1.194	1.982	9.020
Market-to-book	13,587	0.116	0.105	-0.231	0.063	0.111	0.165	0.416
Profitability	10,493	0.117	0.105	-0.226	0.065	0.111	0.165	0.416
				GHG emissions (million tCO_2e)				
Scope 1	13,680	1.668	6.463	0.000	0.008	0.045	0.277	46.340
Scope 2	13,680	0.274	0.671	0.000	0.014	0.052	0.192	4.451
Scope 3 (Upstream)	13,680	1.567	3.737	0.004	0.085	0.305	1.149	23.145
Direct	13,680	1.680	6.476	0.000	0.008	0.046	0.281	46.456
Indirect	13,680	0.906	2.230	0.002	0.041	0.167	0.633	14.463
				GHG emissions intensity (emissions/sales)				
Scope 1	13,680	0.250	1.003	0.000	0.004	0.015	0.053	5.425
Scope 2	13,680	0.047	0.156	0.000	0.008	0.018	0.044	0.500
Scope 3 (Upstream)	13,680	0.198	1.443	0.012	0.048	0.098	0.234	1.170
Direct	13,680	0.253	1.007	0.000	0.004	0.015	0.054	5.425
Indirect	13,680	0.122	0.310	0.003	0.024	0.057	0.134	1.005

Panel B. Firm financials

	Dependent variables:			
	(1) Log sales	(2) Log total assets	(3) Log employees	(4) Profitability
Post	-0.050**	-0.037**	-0.027	-0.004
	(-2.414)	(-2.252)	(-1.561)	(-1.244)
Included × Post	0.139***	0.184***	0.112***	0.007*
	(5.151)	(6.149)	(3.957)	(1.759)
Observations	13,724	13,736	12,911	13,632
Adjusted R-squared	0.983	0.972	0.980	0.718
Firm FE	YES	YES	YES	YES
Country × Year FE	YES	YES	YES	YES
Industry × Year FE	YES	YES	YES	YES

Panel C. GHG emissions levels

	Dependent variables: Log GHG emissions				
	(1) Scope 1	(2) Scope 2	(3) Scope 3	(4) Direct	(5) Indirect
Post	-0.017	-0.050	-0.041*	-0.015	-0.040
	(-0.410)	(-1.463)	(-1.990)	(-0.347)	(-1.304)
Included × Post	0.075**	0.155***	0.124***	0.072*	0.151***
	(2.122)	(3.373)	(4.118)	(2.022)	(4.693)
Observations	13,736	13,736	13,736	13,734	13,736
Adjusted R-squared	0.964	0.935	0.976	0.965	0.970
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.9. Environment-Related ESG Violation Around the MSCI Index Inclusions

This table presents the regression results of the likelihood of environment-related ESG violation around the MSCI Emerging Market (EM) index inclusions (Panel A) and Developed Market (DM) index inclusions (Panel B). 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. The main regressor is the interaction of two indicator variables, *Included* and *Post*: *Included* is an indicator variable that takes a value of 1 for treated firms that are newly included to the MSCI EM or DM indices. Firm, country-by-year, and industry-by-year fixed effects are included. The sample consists of treated and matched control firms for a window of [-4, 3] years around index inclusions. Matching is done in an identical manner to Table 1. 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 country and year are presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A. Emerging Market

	Dependent variables: Environmental violation indicator			
	(1)	(2)	(3)	(4)
	Incidents related to			
	All environment-related	Climate and GHG pollution	Local pollution	Waste
Post	-0.032	0.034	-0.160	-0.018
	(-0.136)	(0.310)	(-1.083)	(-0.201)
Included × Post	0.425**	0.163*	0.362**	0.185***
	(2.492)	(1.707)	(2.883)	(3.080)
Observations	2,145	2,145	2,145	2,145
Adjusted R-squared	0.853	0.717	0.798	0.585
Firm FE	YES	YES	YES	YES
Country ×Year FE	YES	YES	YES	YES
Industry ×Year FE	YES	YES	YES	YES

Panel B. Developed Market

	Dependent variables: Environmental violation indicator			
	(1)	(2)	(3)	(4)
	Incidents related to			
	All environment-related	Climate and GHG pollution	Local pollution	Waste
Post	0.693	0.196	0.410	0.083
	(1.050)	(0.929)	(0.810)	(0.551)
Included × Post	-0.082	-0.010	-0.078	0.086
	(-0.153)	(-0.083)	(-0.205)	(0.370)
Observations	2,076	2,076	2,076	2,076
Adjusted R-squared	0.851	0.852	0.733	0.605
Firm FE	YES	YES	YES	YES
Country ×Year FE	YES	YES	YES	YES
Industry ×Year FE	YES	YES	YES	YES

Table A.10. Disclosure Quality and GHG Emissions Intensity
This table presents the regression results of disclosure quality (column (1)), GHG Scope 1 intensity in the sample without the improvement in disclosure quality (column (2)), and among the subsample of firms with GHG Scope 1 intensity estimated by Trucost (column (3)) or self-disclosed (column (4)). Disclosure quality is the weighted disclosure score of various scopes of carbon emissions from Trucost, with the amount of emission of each scope as the weight. The main regressor is the interaction of two indicator variables, *Included* and *Post*: *Included* is an indicator variable that takes a value of 1 for treated firms that are newly included to the MSCI Emerging Market (EM) Index. Firm, country-by-year, and industry-by-year fixed effects are included. The sample consists of treated and matched control firms for a window of [-4, 3] years around index inclusions. Matching is done in an identical manner to Table 1. 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 country and year are presented in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

	Dependent variables:			
	(1)	(2)	(3)	(4)
	Disclosure quality	GHG Scope 1 emission intensities		
Sample:	Full	Without increase in disclosure quality	Estimated	Disclosed
Post	0.016	-0.002	-0.022***	-0.164***
	(0.969)	(-0.085)	(-3.003)	(-3.319)
Included × Post	-0.032	0.068***	0.039***	0.116**
	(-1.673)	(3.024)	(3.013)	(2.243)
Observations	12,162	10,580	8,049	2,822
Adjusted R-squared	0.793	0.969	0.990	0.974
Firm FE	YES	YES	YES	YES
Country × Year FE	YES	YES	YES	YES
Industry × Year FE	YES	YES	YES	YES