DISCUSSION PAPER SERIES

DP14567

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FINANCIAL ECONOMICS

INTERNATIONAL MACROECONOMICS AND FINANCE

ISSN 0265-8003

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Discussion Paper DP14567
Published 06 April 2020
Submitted 01 April 2020

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Abstract

This paper explores how the carbon premium varies around the world. We estimate the stock return premium associated with carbon emissions at the firm level in a cross-section of over 14,400 firms in 77 countries. We find that there is a widespread carbon premium—higher stock returns for companies with higher carbon emissions—in all sectors over three continents, Asia, Europe, and North America. Stock returns are affected by both direct and indirect emissions through the supply chain. In addition, the carbon premium has been rising in recent years. We also find widespread divestment based on carbon emissions by institutional investors around the world, but institutional investors tend to focus their divestment on foreign companies.

JEL Classification: G12, G23, G30, D62

Keywords: N/A

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Acknowledgements
We thank seminar participants at HEC Montreal and McGill for helpful suggestions. We are grateful to Trucost for giving us access to their corporate carbon emissions data, and to Adrian Lam and Jingyu Zhang for their very helpful research assistance.

Carbon Premium Around the World[1]

Patrick Bolton[§] and Marcin Kacperczyk[φ]
March 13, 2020

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Keywords: Carbon Emissions, Climate Change, Stock Returns, Institutional Investors

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1 Introduction

This paper applies a very wide lens to the question of how investors around the world are addressing climate-change transition risk, the risk with respect to carbon emissions and the transition to renewable energy. Investors in companies that supply fossil fuel energy, and in companies that rely on this energy for their operations, are increasingly exposed to risk with respect to policies seeking to curb carbon emissions and to technological risk from alternative, more and more affordable, renewable energy. Indeed, all over the world public opinion, governments, business leaders, and institutional investors are awakening to the urgency of combatting climate change. As David Pitt-Watson, the former Chair of the United Nations Environmental Program Finance Initiative aptly put it "When it comes to climate change we are all players, we are not spectators." This powerful message is ever more resonating around the world. Yet, what impact is this growing awareness about climate change having on financial markets and investors around the world?

It is fair to say that we only have patchy evidence so far on the pricing of carbon risk, and on investors' hedging strategies to limit their exposure to transition risk. Accordingly, in this wide-ranging study we seek to explore how much stock returns reflect investor concerns about transition risk, and how widely exclusionary screening policies, that avoid companies with high carbon emissions, are applied by institutional investors around the world. Specifically, we explore how corporate carbon emissions affect stock returns for over 14,400 listed companies in 77 countries over a period ranging from 2005 to 2018. This is essentially the universe of all listed companies globally for which it is possible to obtain carbon emissions data.

A first contribution of our paper is to shed light on the distribution of corporate carbon emissions across the 77 countries in our sample. The unit of analysis of most studies of carbon emissions around the world is the country, but little information is provided in these studies about the breakdown of emissions across companies within these countries. According to Fortune magazine, in 2017 the 500 largest companies in the world generated $30 trillion in revenues[2]. This compares with $80 trillion of World GDP in 2017 according to the CIA's World Factbook, or 37.5% of World GDP. It is thus natural to view climate change mitigation around the world not just through the lens of the largest emitting countries, but also through the lens of the largest emitting companies. As a by-product of our analysis we provide an overview of how carbon emissions are distributed among the listed companies around the world and how much institutional investors are exposed to that risk.

[2] https://fortune.com/global500/2018/

Our study is the first comprehensive exploration of carbon transition risk around the world at the firm level and a priori we were largely uncertain as to what we might find. There are a number of general considerations that might lead one to expect particular results. First, a plausible null hypothesis is that we would not find a carbon premium (that is, higher stock returns for companies with high carbon emissions) in many parts of the world, on the grounds that investor awareness about climate change has not yet become salient, except for in Europe (and to some extent in the United States, Japan, and perhaps a few other OECD countries). Similarly, divestment from companies associated with high carbon emissions is mostly to be expected in these countries, where the sustainable investment movement has deeply permeated the institutional investor community, but not elsewhere.

Another reasonable hypothesis is that the carbon premium is to be found in the parts of the world responsible for the highest fraction of carbon emissions, that is, in the largest and most developed economies. An important reason is that this is where emission reductions are most urgent and therefore where transition risks are highest. All the more so that the more developed economies also have more capabilities to innovate in renewable energy technologies. To the extent that the objective of investors is to reduce exposure to carbon risk one would also expect to see the most divestment to take place in these parts of the world.

It is also plausible to conjecture that in countries with large commodity export sectors (Australia, Brazil) there would be more political opposition to the introduction of policies limiting carbon emissions, and therefore, that investors would perceive a lower transition risk in these countries. More generally, it is less clear how the political or legal environment of a country might affect transition risk. Public opinion clearly matters more in more democratic countries and climate activists may have greater success in the courts of countries with a stronger rule of law. Yet, greater political "voice" or stronger rule of law can cut both ways. It can empower green public opinion, but it can also entrench opposition to climate change mitigation. How the carbon premium should be expected to vary with countries' political and legal traditions is thus largely an open question.

Another somewhat less plausible, but nevertheless important hypothesis is that cross-country differences may not matter so much in a world of globally integrated stock markets. To the extent that the same representative investors hold all the public companies around the world, there should be a uniform treatment by these investors of firm-level carbon risk around the world. By this hypothesis, differences in carbon premia across countries would then mostly reflect different expected policy risk.

We are able to explore all of these hypotheses and to partly confirm some or reject others. A few general striking results emerge from our analysis, but the overall picture that emerges is relatively nuanced. A first surprising general finding is that there is actually a positive and significant carbon premium in most areas of the world. It is present in North America, Europe, and Asia. The only exception is Africa, Australia, and South America, where we do not find a significant premium. Moreover, this premium is related to both direct emissions from production and indirect emissions firms are associated with through their supply chain. Importantly, firms associated with higher emissions generate higher stock returns, after controlling for size, book-to-market, momentum, and other well-recognized firm characteristics such as the value of property, plant & equipment (PPE), profitability, and investment over assets that predict returns.

Equally surprising is the result that there are similar carbon premia in China and in the U.S. Although these two economies are the largest carbon emitters in the world, they are very different in many respects: their level of economic development and relative size of manufacturing and energy sectors, the size of their financial markets and asset management sectors, their political systems, their demographics, and their public opinions on the environment and climate change. Despite all these differences, we find that the carbon premium is similar in both economies. A related surprise is that, more generally differences in level of development do not explain the variation in carbon premia across countries.

A second general finding is that the carbon premium is related to the level of emissions (and changes in the level of emissions), but not to emission intensity—the ratio of a firm's total emissions to sales. This result is altogether not entirely surprising, simply because climate mitigation policies mostly target total emissions and not emission intensity. In addition, what drives technological innovation in renewable energy is the size of emissions and not the energy efficiency of companies. Indeed, carbon emissions must be significantly curbed in the next two decades whether or not companies are wasteful in their fossil energy consumption or not. Therefore, a firm's transition risk with respect to carbon emissions is proportional to the level of emissions. Interestingly, both levels and changes in emissions affect the carbon premium, which we interpret as reflecting both long-run and short-run exposures. Given that emissions are highly persistent over time, the level of emissions picks up the long-run exposure to transition risk, whereas changes reflect a company's short-run drift away from or into greater future emissions. Changes in emissions could also reflect changes in earnings, but we control for this effect by adding the company's return on equity among our independent variables.

What is surprising, however, is that although the carbon premium around the world is only sensitive (if at all) to the level of emissions a firm is associated with (and also year-to-year changes in emissions), institutional investor divestment policies are focused entirely on a firm's direct *emission intensity* (the ratio of direct emissions from production to sales). True, emission intensity is positively correlated with the level of emissions, but we find that the correlation coefficient is low, so that emission intensity is a poor filter to apply to reduce investors' exposure to transition risk. With the exception of hedge funds, institutional investors consistently use direct emission intensity for their exclusionary screening (divestment) policies. Thus, their objective seems to be primarily to pick the best in class in terms of fossil energy use, and not to minimize their transition risk exposure.

Even if the level of development cannot explain cross-country variations in the carbon premium, several other country characteristics matter. We group these characteristics into two categories, social and energy variables. We find that both voice and rule of law significantly affect the short-run carbon premium associated with changes in emissions. More democratic countries with stronger rule of law tend to have lower carbon premia, other things equal. One possible interpretation of this result is that in these countries green public opinion has already resulted in significant tightening of regulations of carbon emissions, so that the transition risk going forward is lower. To be sure, this interpretation is consistent with two other of our findings, namely that the carbon premium is lower in countries with a higher share of renewable energy, and higher in countries with larger oil, gas, and coal producing sectors. Finally, we also find that countries that have been exposed to greater damages from climate disasters (floods, wild-fires, droughts, etc.) have a somewhat higher carbon premium associated with the level of direct emissions. This is not really surprising in light of the fact that climate disasters tend to raise awareness about climate change.

Given that climate change has become a salient issue for investors only recently we also explore how the carbon premium around the world has changed in recent years. We do this by comparing the estimated premia for the two years leading up to the Paris agreement and following the agreement. A number of striking results emerge from this analysis. First, when we pool all countries together we find that there was no significant premium before the Paris agreement, but a highly significant and large premium in the years following the agreement. This general result is consistent with the view that investors have only recently become aware of the urgency of climate change. Given that many new firms are added to our sample in 2016, one concern might be that this effect is entirely driven by the new addition of firms, but this is not the case as we establish by estimating the premium again post Paris on the smaller sample that excludes the new firms. Second, when we break down the change in the carbon premium around the Paris agreement by continent, we find that the premium is

insignificant in North America before and after Paris, has declined in Europe, but, astonishingly, has sharply risen in Asia. In effect, Asia is entirely responsible for the rise in the global carbon premium around the Paris agreement.

One obvious mechanism that can give rise to a carbon premium is divestment (Hong and Kacperczyk, 2009). If there is significant divestment by some investor constituencies from companies associated with high carbon emissions, then portfolios are no longer optimally diversified and contain more risk, leading to a demand for higher expected returns. We systematically explore this channel by looking at the extent to which institutional investors are underweight companies with high carbon emissions around the world. We make several remarkable discoveries. First, as we have already highlighted, while there is significant divestment, it is all based on a direct emission-intensity screen. Neither the level of emissions (whether direct or indirect) nor changes in emissions significantly affect institutional investors' holdings, with the exception of hedge funds, who can generally be seen as holding contrarian positions from the other institutional investors. This is true around the world, with significant divestment in the U.S. (but not North America, excluding the U.S.), and in Europe. There is also significant divestment in Asia, but to a lesser extent than in Europe or the U.S, and relatively little divestment in China.

Second, we break down divestment policies by different institutional investor categories. We find that overall divestment is concentrated among three categories, investment companies, independent advisers, and pension funds, who are significantly underweight companies with high direct emission intensity. The most revealing breakdown, however, is between foreign and domestic institutional investors. By far the largest divestments are by foreign investors in domestic companies, or put differently, domestic institutional investors concentrate their exclusionary screening primarily on foreign companies. Another interesting breakdown is between passive and actively managed funds. To the extent that passive investments are index investments there would appear to be no scope for divestment. However, in recent years index providers have put in place low-carbon index alternatives to the major market indexes. By holding the low-carbon version, passive investors thus can reduce their exposure to carbon emissions. What we find is that, although most divestment is concentrated among active investors, there is also significant divestment among passive investors.

Finally, we also look at changes in divestment before and after the Paris agreement and find that overall there is less divestment after Paris. The biggest decline in divestment is in North America,

where there is no significant effect after Paris. However, in Europe, divestment has actually increased post Paris.

Overall, our analysis paints a nuanced picture of the pricing of carbon transition risk around the world. The pricing is uneven across countries but widespread in North America, Asia, and Europe. The pricing is also rising, with a significant increase post Paris agreements. There does not appear to be a direct relation between the pricing of transition risk and divestment. Although there is significant divestment related to carbon emissions, it is not directly related to transition risk.

Related Literature: We are obviously not the first to undertake a cross-country analysis. As informative as such analyses can be and as suggestive the results are, it is important to underline the important limitation that we cannot draw any causal inferences from this analysis. The closest such analysis to ours is by Görgen, Jacob, Nerlinger, Riordan, Rohleder, and Wilkens (2020), who estimate stock return differences between a group of "brown" and "green" firms around the world. Also, related in terms of general subject matter are the studies by Dyck, Lins, Roth, and Wagner (2019) and by Gibson, Glossner, Krueger, Matos, and Steffen (2019), who both explore how environmental, social, and governance (ESG) motivated investing varies around the world. Other related cross-country studies are Iliev, Lins, Miller, and Roth (2015), who analyze how shareholders vote around the world, Aggarwal, Erel, Ferreira, and Matos (2011), who study the differences in corporate governance around the world, and Ferreira and Matos (2008), who look at institutional investor holdings around the world.

Next to this cross-country literature there is, of course, a growing country-level literature, mostly focused on the U.S. In an early theoretical contribution, Heinkel, Kraus, and Zechner (2001) have shown how divestment from companies with high emissions can give rise to higher stock returns. Another relevant analysis for transition risk by Shapiro and Walker (2018) finds that air pollution by U.S. manufacturers has declined significantly as a result of tightening pollution regulations between 1990 and 2008. Our study obviously fits into the recent literature on climate change and finance. An early study by Matsumura, Prakash, and Vera-Munoz (2014) finds that higher emissions are associated with lower firm values. Relatedly, Chava (2014) finds that firms with higher carbon emissions have higher costs of capital. More recently, Ilhan, Sautner, and Vilkov (2019) have found that carbon emission risk is reflected in out-of-the-money put option prices. Hsu, Li, and Tsou (2019) find that highly polluting firms are more exposed to environmental regulation risk and command higher average returns. Monasterolo and De Angelis (2019) explore whether investors demand higher risk premia for carbon-intensive assets following the COP 21 agreement. Garvey, Iyer, and Nash (2018) study the

effect of changes in direct emissions on stock returns, and Bolton and Kacperczyk (2019) find that there is a significantly positive effect of carbon emissions on U.S. firms' stock returns for both direct and indirect carbon emissions.

The remainder of the paper is organized as follows. Section 2 describes the data and provides summary statistics. Section 3 discusses the results. Section 4 concludes.

2 Data and Sample

Our primary database matches two data sets by respectively Trucost, which provides annual information on firm-level carbon and other greenhouse gas emissions, and FactSet, which assembles data on stock returns, corporate balance sheets, and institutional ownership. We performed the matching using ISIN as a main identifier. In some instances, in which ISIN was not available to create a perfect match, we relied on matching based on company names.[3] Finally, when there are multiple subsidiaries of a given company, we used the primary location as a matching entity. The ultimate matching produced 14,468 unique companies out of 16,222 companies available in Trucost. They represent 77 countries. Among the companies we were not able to match, more than two thirds are not exchange listed and the remaining ones are small and are not available through Factset. The top three countries in terms of missing data are China, Japan, and the United States. In sum, our sample essentially covers more than 98% of publicly listed companies in terms of their market capitalization, for which we have emissions data. We augment this data with country-level variables from the World Bank, Germanwatch, the provider of the global climate risk index (CRI), and Morgan Stanley for the MSCI world index data.

2.1 Data on Corporate Carbon Emissions

Trucost's firm-level carbon emissions data follows the Greenhouse Gas Protocol that sets the standards for measuring corporate emissions.[4] The Greenhouse Gas Protocol distinguishes between three different sources of emissions: scope 1 emissions, which cover direct emissions over one year from establishments that are owned or controlled by the company; these include all emissions from fossil fuel used in production. Scope 2 emissions come from the generation of purchased heat, steam, and electricity consumed by the company. Scope 3 emissions are caused by the operations and products of the company but occur from sources not owned or controlled by the company. These

[3] After standardizing the company names in FactSet and Trucost, respectively, we choose companies whose names have a similarity score of one based on the standardized company names.
[4] See https://ghgprotocol.org.

include emissions from the production of purchased materials, product use, waste disposal, and outsourced activities. The Greenhouse Gas Protocol provides detailed guidance on how to identify a company's most important sources of scope 3 emissions and how to calculate them. For purchased goods and services, this basically involves measuring inputs, or "activity data", and applying emission factors to these purchased inputs that convert activity data into emissions data. Trucost's upstream scope 3 data is constructed using an input-output model that provides the fraction of expenditures from one sector across all other sectors of the economy. This model is extended to include sector-level emission factors, so that an upstream scope 3 emission estimates can be determined from each firm's expenditures across all sectors from which it obtains its inputs (see Trucost, 2019).[5]

The Trucost EDX database reports all three scopes of carbon emissions in units of tons of CO2 emitted in a year. We first provide basic summary statistics on carbon emissions across our 77 countries aggregated up from the firm-level emissions reported by Trucost. Table 1 reports the country-level distribution of firms in our sample and various measures of emissions broken down into scope 1, scope 2, and scope 3. We consider the average total yearly emissions in tons of CO2 equivalent per firm in each country (*S1TOT*, *S2TOT*, and *S3TOT*), the (winsorized) yearly percentage rate of change in emissions (*S1CHG*, *S2CHG*, and *S3CHG*), the (winsorized) average emission intensity by country (*S1INT*, *S2INT*, and *S3INT*) calculated as the ratio of total firm-level emissions in tons of CO2 equivalents and firm-level dollar-denominated revenues (in million), and the total yearly emissions by country (*TOTS1*, *TOTS2*, and *TOTS3*).

The largest country by number of observations is obviously the United States, but remarkably it only represents around 19.8% of total observations, with Japan a close second with 14% of observations, and China third with around 8.2% of observations. Importantly for our analysis, Table 1 highlights that the majority of listed firms in our sample is not concentrated in these three large economies. In aggregate, the entire population of countries in our sample produces a staggering 11.81 billion tons of scope 1, 1.62 billion tons of scope 2, and 7.99 billion tons of scope 3 emissions per year. The three biggest contributors in terms of total carbon emissions produced are China producing 2.91 billion tons of scope 1 emissions per year, followed by the U.S. with 2.33 billion, and Japan contributing 980 million. The same three countries also dominate scope 2 and scope 3-emissions, except that the ranking changes with U.S producing 2.1 billion of scope 3 emissions, followed up by Japan with 1.25 billion, and China with 841 million tons of CO2.

[5] Downstream scope 3 emissions, caused by the use of sold products, can also be estimated and are increasingly reported by companies. Trucost has recently started assembling this data (see Trucost, 2019); however, we do not include this data in our study.

The global production of emissions does not necessarily reflect the contribution of each firm to the total, as the relative sizes of countries vary. In fact, the top three countries in terms of scope 1 emissions per firm are Russia, the Netherlands, and Greece, with their respective emission levels of 10.1 million, 5.6 million, and 4.2 million tons of CO2 per year. An average Russian firm also leads the rankings in terms of scope 3 emissions with 6.1 million tons of CO2, followed by Germany and France, with respective numbers of 3.4 and 2.9 million tons of CO2. A slightly different picture can be painted when we compare firm-level emission intensities. The most intense countries in terms of scope 1 emissions include Estonia, Morocco, and Peru. Among the largest countries, Russia, India, and China score relatively high, while France, Japan, and the United Kingdom score relatively low.

Another striking observation is that carbon emissions are growing in most countries throughout our sample period. The country with the highest growth rate in scope 1 emissions is Mauritius, with an average yearly growth rate of 45%. The second largest is Bulgaria with a 35% growth rate, and the third, fourth, and fifth largest are, respectively, Iceland, Kenya, and Lithuania. All these five countries have witnessed rapid GDP growth over our ample period. Among the largest economies, the ones with the highest growth rate in emissions are China with nearly 18%, the Russian Federation with 16%, the United States with 7.9%, and Germany with 7.1% growth rates. Among the countries with the lowest growth rates in scope 1 emissions are, remarkably, Saudi Arabia, with a negative 10.5% growth rate (this may reflect the fact that a lot of companies have gone public over our sample period, lowering the average per-company scope 1 emissions), Luxembourg with a negative 33% growth rate, and Jordan with a minus 7.5% growth rate. When it comes to the growth rate in scope 3 emissions, some of these rankings are reversed, reflecting the fact that some countries increasingly rely on imports whose production generates high emissions. Thus, Saudi Arabia has a 4.3% growth rate in scope 3 emissions.

In Figures 1 to 3, we further represent the detailed cross-country variation in total emissions over two equal-length time periods, which classify countries into four categories by their performance in these metrics. The left panel of each figure represents scope 1 emissions, the middle panel scope 2 emissions, and the right panel scope 3 emissions. As can be seen in Figure 1, the countries with the highest total average yearly emissions are first, the countries with the highest GDP, second the countries with the largest populations, and third the largest commodity exporting countries. Important exceptions are Sweden, which has the lowest emissions among developed countries, Iceland, and the Czech Republic. Importantly for our analysis, there is considerable cross-country variation in total emissions. To the extent that the carbon premium reflects concerns about the level of emissions, we expect to see considerable variation in the premium across countries.

We further show how the performance of countries has changed from the first half period of our sample from 2005 to 2011 to the second half period from 2012 to 2018. The most noteworthy changes are the deterioration in total emission performance of Latin America, the Russian Federation, Turkey, and Australia.

Interestingly, however, there is little correlation between a country's levels of total emissions, average per-firm emissions, and average per-firm emission-intensity as can be seen in respectively Figure 2, which represents the cross-country variation in average per-firm emissions, and Figure 3, which represents average per-firm emission-intensity. Among the worst performers in the world in per-firm emissions are the United States, Saudi Arabia, Argentina, Colombia, China, the Russian Federation, India, Japan and the European Union (excluding the U.K.). On the other hand, when it comes to emission intensity, the composition of the group of worst performers changes substantially, with only the Russian Federation, India, Argentina, Colombia, and Saudi Arabia remaining in this group, and other countries such as Nigeria and Turkey joining this group. Investors may care more about emission intensity, in which case the carbon premium should be expected to be higher not only in countries with higher total emissions, but also in countries with worse emission intensity.

In Table 2, Panel A we report summary statistics on per-firm carbon emissions in units of tons of CO2 emitted in a year, normalized using the natural log scale. Thus, the log of total scope 1 emissions of the average firm in our sample (*LOGS1TOT*) is 10.32, with a standard deviation of 2.95. Note that the median number is the largest for scope 3 emissions (*LOGS3TOT*), indicating that most companies in our sample are significantly exposed to indirect emissions. To mitigate the impact of outliers we have winsorized all growth and intensity measures at the 2.5% level. In Panel B, we report the correlations between the total emissions variable and the emission intensity variable for the three different categories of emissions. Interestingly, the correlation coefficients are quite low, indicating that the emission intensity variable reflects a combination of firms with both high levels of emissions and sales, and firms with both low levels of emissions and sales. In other words, the emission intensity variable is a noised-up variable reflecting different firm exposures to carbon emission risk.

Panel C reports summary statistics on institutional ownership. The variable $IO_{i,t}$ gives the fraction of shares of company *i* held by institutions at the end of year *t*. This variable is calculated by adding the shares held by all types of institutions at the end of the year and dividing by the number of shares outstanding at the end of the year. Remarkably, the average institutional ownership in our sample is 30%, which is much lower than the average institutional ownership in the U.S (76%). This is due to the fact that ownership blocks by individual families and foundations are much larger outside the U.S (see, Barca and Becht, 2001 and La Porta, Lopez-De-Silanes, and Shleifer, 2002), and defined-contribution pensions much smaller (see, Scharfstein, 2017).

We decompose institutional ownership into the following categories: *IO_BANKS*, which is the ownership share of banks; *IO_INSURANCE*, which is the ownership share of insurance companies; *IO_INVESTCOS*, the ownership share of investment companies (mutual funds); *IO_ADVISERS*, the ownership share of independent investment advisers; *IO_PENSIONS*, the share of pension funds; and, *IO_HFS*, the ownership share of hedge funds. Investment advisers and mutual funds are two largest institutional holders of shares, with a combined ownership share of more than 25%.

Another decomposition we report is by national origin of ownership. Thus, *IO_DOM*, is the share of domestic institutional ownership; *IO_FOR*, is the share of foreign institutions' ownership. Domestic investors make up about two thirds of the total institutional ownership but the variation of each group across firms and countries is quite significant. Also, looking at global investments through the lens of U.S investors, *IO_FOR_US* represents the ownership in foreign companies by U.S institutional investors, and *IO_FOR_NUS* represents the ownership in foreign companies by other institutional investors.

Yet another decomposition is by style of investment. Thus, *IO_ACT* is the share held by actively managed funds, *IO_PAS* refers to passive institutional ownership through market indexes; similarly, *IO_DOM_ACT* is the share of active domestic institutions, and *IO_FOR_ACT* is the share of foreign active investors; finally, *IO_DOM_PAS* is the share of passively managed domestic institutions, and *IO_FOR_PAS* is the share of foreign passively managed funds. Among the groups, domestic active funds are the largest holder of shares, on average.

Finally, Panel D provides summary statistics on stock returns and several control variables we use in our subsequent tests. The dependent variable, $RET_{i,t}$, in our cross-sectional return regressions is the monthly return of an individual stock *i* in month *t*. The average return in our sample is 1.08% with a standard deviation of 10.23%. We use the following control variables in our cross-sectional regressions: $LOGSIZE_{i,t}$, which is given by the natural logarithm of firm *i*'s market capitalization (price times shares outstanding) at the end of year *t*; $B/M_{i,t}$, which is firm *i*'s book value divided by its market cap at the end of year *t*; *LEVERAGE*, which is the ratio of debt to book value of assets; momentum, $MOM_{i,t}$, which is given by the average of the most recent 12 months' returns on stock *i*, leading up to and including month *t-1*; capital expenditures $INVEST/A$, which we measure as the firm's capital expenditures divided by the book value of its assets; a measure of the firm's specialization, *HHI* , which is the Herfindahl concentration index of the firm with respect to its different business segments, based on each segment's revenues; the firm's stock of physical capital, *LOGPPE*, which is given by the natural logarithm, of the firm's property, plant, and equipment; the firm's earnings performance $ROE_{i,t}$, which is given by the ratio of firm i's net yearly income divided by the value of its equity; the firm's idiosyncratic risk, $VOLAT_{i,t}$, which is the standard deviation of returns based on the past 12

monthly returns; $PRINV_{i,t}$, which is the inverse of firm *i*'s share price at the end of year *t*; $VOL_{i,t}$, which is the average daily trading volume (in $million) of stock *i* over the calendar year *t*; and, $MSCI_{i,t}$, which is an indicator variable equal to one if a stock *i* is part of the MSCI World index in year *t*, and zero otherwise. To mitigate the impact of outliers we winsorize *B/M, LEVERAGE, INVEST/A*, *ROE*, and *VOLUME* at the 2.5% level, and *MOM, VOLAT*, and *PRINV* at the 0.5% level.

The average firm's monthly stock return equals 1.08%, with a standard deviation of 10.23%. The average firm has a market capitalization of $66 billion, significantly larger than the size of the median firm in our sample, which is $15 billion. The average book-to-market ratio is 0.57, and average book leverage is 23%. The average return on equity equals 11.1%, slightly more than the median of 10.87%.

Table 3 provides summary statistics by year for the total number of firms in our sample in any given year and for total emissions, the level and percentage change in emission intensity, for all three *SCOPE* categories. Note in particular the large increase in coverage after 2015, when the number of firms jumps from 5427 in 2015 to 11961 in 2016. This is due to the fact that Trucost has been able to expand the set of firms worldwide for which it was able to collect data on carbon emissions.

We also report the distribution of firms by industry in Table 4, using the six-digit Global Industry Classification (GIC 6). Our global database should reflect a greater proportion of firms in manufacturing and agriculture than is the case in developed economies. This is indeed what is reflected in Table 4, with 580 companies in the machinery industry, 530 in the chemicals industry, 520 in the electronic equipment, instruments and components industry, 506 in metals and mining, and 440 food products companies. In the services sector the largest represented industries are banking with 679 banks and real estate, with 619 companies (some of which are also engaged in construction and development).

Finally, we report summary statistics on the main determinants of carbon emissions in Table 5. We regress in turn the log of total firm-level emissions, the percentage change in total emissions, and the levels of emission intensity on the following firm-level characteristics: *LOGSIZE, B/M, ROE, LEVERAGE, INVEST/A, HHI, LOGPPE*, and *MSCI*. To allow for systematic differences in correlations across countries and over time, we include year/month fixed effects and country fixed effects. In this regard, our identification comes from within-country variation in a given year. In columns (4)-(6), we also include industry fixed effects to account for possible differences across industries. In Panel A, we show considerable variation across industries in the effect of these variables on emissions (for example, the R-square increases from 0.696 to 0.779 when we add industry fixed effects to the regression for *LOGS1TOT*). Accordingly, we focus on the regressions with industry fixed effects and note that total emissions significantly increase with the size of the firm (in particular if it is a constituent of the MSCI World index), its book to market ratio, its leverage, and its tangible

capital stock (*PPE*). This is altogether not surprising, to the extent that emissions are generated by economic activity, which is proportional to the size of the firm. Somewhat surprising is the strong effect of leverage. The most likely explanation is that bigger firms in the same industry have higher leverage. Interestingly, investment has a strong negative effect on emissions, suggesting that new capital vintages are more carbon efficient. Industry specialization (a high HHI) also has a negative effect on emissions, perhaps because non-specialized conglomerates tend to be larger. Alternatively, conglomeration can reflect a firm's response to potential costs of high emissions in a particular sector. Panel C reports the determinants of emission intensities. What is most striking about these regression results is that our balance sheet variables have lower explanatory power, especially when we do not include industry fixed effects. Focusing again on the regressions with industry fixed effects, we note that firm size is only highly significant for *S1INT* and *S3INT*. Recall that lower intensity means lower emissions per unit of sales. Since sales are proportional to firm size it is to be expected that firm size has a negative effect on intensity. Among the other variables, the only consistently significant variable across all three categories of emissions is tangible capital, which positively affects emission intensity, and HHI, which negatively affects intensity. The likely explanation for the capital effect is that older capital vintages are less carbon efficient.

3 Results

We organize our discussion into two subsections. The first reports results on the carbon premium and the second results on divestment.

3.1 Carbon Premium Around the World

Our analysis of the carbon premium around the world centers on three different cross-sectional regression models. First, we relate companies' total emissions to their corresponding stock returns in the cross-section. This regression reflects the long-run, structural firm-level effects of emissions on stock returns:

$$RET_{i,t} = a_0 + a_1(TOT\ Emissions)_{i,t} + a_2 Controls_{i,t-1} + \mu_t + \varepsilon_{i,t} \qquad (1)$$

where $RET_{i,t}$ measures the stock return of company *i* in month *t* and *TOT Emissions* is a generic term standing for respectively *LOGS1TOT*, *LOGS2TOT*, and *LOGS3TOT*. The vector of controls includes the firm-specific variables *LOGSIZE, B/M, LEVERAGE, MOM, INVEST/ASSETS, HHI, LOGPPE, ROE,* and *VOLAT*. Our model also includes industry and country fixed effects, as well as year/month fixed effects. We cluster standard errors at the firm and year levels. Our coefficient of interest is a_1.

Second, we relate companies' percentage changes in total emissions to their stock returns by estimating the following cross-sectional regression model:

$$RET_{i,t} = a_0 + a_1 \Delta(Total\ Emission)_{i,t} + a_2 Controls_{i,t-1} + \mu_t + \varepsilon_{i,t} \quad (2)$$

The percentage change in total emissions (*S1CHG*, *S2CHG*, and *S3CHG*) captures short run effects of emissions on stock returns. In particular, changes in total emissions reflect the extent to which companies load up on or decrease their material risk with respect to carbon emissions. Third, we also estimate a cross-sectional regression relating stock returns to levels of emission intensity:

$$RET_{i,t} = a_0 + a_1 (Emission\ Intensity)_{i,t} + a_2 Controls_{i,t-1} + \mu_t + \varepsilon_{i,t} \quad (3)$$

Emission intensity (*S1INT*, *S2INT*, and *S3INT*) normalizes total emissions by sales. As we will show in the next subsection, this measure, also sometimes referred to as "carbon ratio" (see Garvey et al., 2018), is what best explains institutional investors' exclusionary screening policies. It is a commonly used measure in other studies of the stock-price implications of carbon emissions. One reason why this is the preferred variable is that it better reflects how wasteful a firm is in its fossil fuel energy consumption. Investors may care more about wasteful emissions than about emissions per se, especially if low carbon intensity also correlates with greater managerial efficiency and future profitability. We estimate these three cross-sectional regressions using pooled OLS.

One overarching conclusion from our analysis is that for the carbon premium around the world what matters is *total firm-level emissions* and percentage changes in total emissions, but not levels of emission intensity. This latter variable has essentially no significant impact on the carbon premium in any sector or region of the world. This general finding is altogether not totally surprising based on first principles because transition risk with respect to carbon emissions is first and foremost associated with the level of emissions, and not emission intensity. What drives technological innovation and regulatory interventions is the size of emissions, which must be significantly curbed in the next two decades to avoid rising average temperatures beyond the 2 degrees Celsius target. This reduction must take place whether carbon emissions are wastefully used by firms or not.

We begin our analysis by comparing the results for these three regression models for the two economies with the largest emissions, China and the U.S. We report the results in Table 6. These two economies differ in fundamental ways and one would expect the carbon premium to reflect fundamental differences in the level of economic and financial development, and in the legal and political regimes. Yet, we find that the results for scope 1 emissions are surprisingly similar. Once one

controls for industry and time period, as well as a battery of firm characteristics, firm-level differences in *LOGS1TOT* generate a highly significant carbon premium of similar size both in China (.067) and in the U.S. (.083), or equivalently 2.39% and 2.85% per one standard deviation change in each respective country's total emission level. Using a slightly shorter time period (2005-2017), Bolton and Kacperczyk (2019) find that the premium for U.S. companies is slightly lower (.060). Here we find a higher premium estimated over the time interval 2005-2018. This higher premium is in line with their findings that the carbon premium is rising over time, especially since the Paris agreement in 2015.

Our result of the presence of a firm-level carbon premium for listed Chinese companies is novel and surprising. Although China in many ways has been a pioneer in the promotion of renewable energy, it does not stand out for its *ESG* institutional investor constituency, nor for its institutional investors' focus on carbon emissions. Yet, financial markets in China do price in a carbon premium at the firm level, at least when it comes to direct emissions. As reported in Panel A, the carbon premium associated with scope 2 and 3 emissions is only significant at the 10% level in China, while it is significant at the 1% level in the U.S. The similarities in the results are even more striking for the carbon premium associated with percentage changes in emissions, as can be seen in Panel B. For both countries, the premium is highly significant and of similar size, except for changes in scope 2 emissions, for which the premium is nearly double in China. Another striking result is that investors do not seem to care about emission intensity, except for scope 1 emission intensity in the U.S, where the effect is only marginally significant.

We next turn to the estimation of the carbon premium for the full sample of 77 countries. Relative to our previous specification, we also include country-fixed effects and report results with and without industry fixed effects. We report the results in Table 7. Interestingly, when we do not control for industry there is no significant carbon premium at the firm level for total scope 1 emissions. However, when we add an industry fixed effect, the premium is large and highly significant. A one-standard-deviation increase in *LOGS1TOT* is associated with a return premium of 2.34% per year. These results reflect the fact that variations in stock returns across industries, which to some extent capture the effect of inter-industry differences in carbon emissions, swamp the effect on stock returns of variations in firm-level emissions within a given industry. Put differently, while we find a global carbon premium at the firm level once we control for country and industry, this premium explains only a small fraction of stock returns as reflected in the small differences in R-squares between the regressions without and with industry fixed effects.

Note that the coefficient of *LOGS3TOT* is highly significant in the regressions without and with industry fixed effects. It is also economically significant, as a one-standard-deviation increase in *LOGS3TOT* is associated with a return premium of 3.08% for the specification without industry fixed effects, and 4.54% with the fixed effects. This is to be expected given that total scope 3 emissions are determined using an input-output matrix. More surprising is the coefficient of *LOGS2TOT*, which is also highly significant and similar in size under the specifications including or not industry fixed effects.

The results with respect to percentage changes in carbon emissions are all highly significant and are not affected at all by the inclusion of industry fixed effects, as can be seen in Panel B. Per one-standard-deviation change in scope 1 and scope 3, the corresponding return premia amount to 2.5% and 4.1% per year, similar in magnitude to the effects we observed for the levels of emissions. These results suggest that in the short run the main effect on the carbon premium is firm-level differences in changes in emissions. Of course, statistically speaking, taking differences in emissions is very close to including industry fixed effects.

Finally, as Panel C highlights, when we pool all countries together there is no significant carbon premium with respect to emission intensity, whether or not we include industry fixed effects. This particular firm characteristic simply cannot explain differences in stock returns in the cross-section. Firms with similar emission intensity could be large or small, and therefore have large or small total emissions. But the risk that investors are exposed to with respect to carbon emissions is proportional to a firm's *level of total emissions*. This is likely why carbon intensity does not explain stock returns.

A relevant question is in which sectors are stock returns affected the most by carbon emissions. Is it the case that the carbon premium is mostly concentrated in the oil & gas, utilities, and motor sectors? To address this question, we estimate the same regression specification for our 77 countries as in Table 7, excluding the salient industries mentioned above. We report the results in Table 8. Remarkably, when we exclude these industries, we find that, the premium, if anything, is larger and statistically more significant for the scope 1 level of emissions[6]. It also remains highly significant for the premium associated with the changes in emissions. These findings are consistent with the results in Table 7 revealing that variations in stock returns across industries swamp within industry effects of carbon emissions on stock returns. Thus, the additional conclusion to be drawn from the results in Table 8 (where we exclude the salient industries tied to fossil fuels) is that globally across the 77 countries the

[6] For brevity, we do not report the results for *SCOPE 2* emissions, which is the less important category. Henceforth we only report results for *SCOPE 2* emissions when they are strikingly different than for *SCOPE 1* emissions.

carbon premium is more widespread, and it is not purely concentrated within the energy, utilities, and transportation industries.

As a robustness check we also estimate the carbon premium on the subsample of firms that excludes all the new firms that Trucost added in 2015 to its corporate carbon emissions dataset. Institutional investors may not immediately take into account the carbon emission risk in these firms, in which case we would be underestimating the true carbon premium for the "old" firms already in the sample before 2015. The results for when we exclude new firms are reported in Table 31. There is little change in the results, as the coefficient of *LOGS1TOT* remains insignificant when we do not control for industry, but it is still highly significant when we add industry fixed effects. The results for scope 3 emissions are also very similar.

Another informative representation of the carbon premium around the world is to report how the premium varies by continent. We report these results in Table 9. The effects of total emissions on stock returns for North America are very similar to those obtained when we pool all countries together. In contrast, in the EU the level of scope 1 emissions has a somewhat weaker effect on stock returns, even when we add industry fixed effects. This is surprising given that the EU has arguably put in place some of the strictest regulations limiting carbon emissions. One possible explanation might be that as a result of the EU's "single market" regulations there is a much smaller variation in emissions across firms, once we control for other firm characteristics**.** As it turns out, this single-market conjecture for the EU is consistent with the other results obtained for Europe as a whole, where the carbon premium is much more in line with the premium obtained when we pool all countries together. The results for Asia are quite similar to those in North America for scope 1 emissions, but they are visibly larger for scope 3 emissions, especially when we factor in industry fixed effects. When it comes to percentage changes in emissions, the regions of the world that stand out are Africa, Australia, and South America, where the coefficient of *S1CHG* is insignificant when we add industry fixed effects. Also, the magnitudes of the effects for Europe are visibly smaller than those in North America and Asia. Again, as Panel C reveals, there is no carbon premium with respect to carbon intensity in any region of the world.

The similarities in firm-level carbon premia between the U.S. and China notwithstanding, our continent-level results reveal that there is substantial variation in the carbon premium around the world. Consequently, we turn next to an investigation of which country characteristics are likely to affect the carbon premium.

A number of hypotheses immediately come to mind. First, the carbon premium could be lower in developing countries, as these countries have much lower exposure to carbon emission risk. In addition, these countries' economies are not as deeply founded on fossil fuel energy consumption and may therefore be able to transition more easily to a renewable energy development path. Second, differences in cultural and legal traditions are likely to affect the carbon premium. For example, in countries where traditionally a larger role is played by the government, and where therefore companies may face greater transition risk with respect to regulations limiting future carbon emissions, we may find a higher carbon premium. Third, some countries are already well advanced in their energy transition. For these countries, the risk with respect to carbon emissions may to some extent already be behind them. Fourth, companies in commodity exporting countries with large fossil fuel production may be more exposed to transition risk, and therefore they may be associated with a higher carbon premium. Fifth, countries in which the government has made the most ambitious pledges to reduce carbon emissions may be associated with a higher carbon premium.

Interestingly, although these hypotheses are quite plausible, not all of them are borne out in the data. Most remarkably, as we show in Table 10, the carbon premium does not seem to be related to countries' level of development. We broadly categorize developed countries to be the G20 countries and the remaining group of countries to be developing countries.[7] When we add industry fixed effects, we observe from Table 10 that the G20 group of countries have highly significant carbon premia related to the level of emissions for all three scope categories. But this is also the case for the most part for the group of developing countries (scope 2 emissions are only significant at the 10% level for this group of countries). Moreover, the size of the coefficients is similar. As for the short run effects of carbon emissions on stock returns, we observe from Table 10 that they are again highly significant for both the G20 countries (controlling for industry) and the group of developing countries. Also, the size of the coefficients is again broadly similar. Finally, variations in emission intensity have, not surprisingly, an insignificant impact on stock returns in both groups of countries.

Admittedly, the above classification of countries into two groups, developing and developed is rather course, and there is substantial heterogeneity in country characteristics within each group. Accordingly, we also investigate the effect of interacting GDP per capita, and other development variables such as the share of the manufacturing sector in GDP and health expenditure per capita, with respectively the level, changes in emissions, and emission intensity. As we show in Panel A of

[7] The results are qualitatively very similar, reported in Panel B, if we define developed countries based on OECD membership.

Table 11, the interaction of per capita GDP and the level of emissions is insignificant. The same is true for the interaction of the share of manufacturing and the level of emissions, and for the interaction of per capita health expenditures and the level of emissions. Overall, these results indicate that differences in development do not appear to explain much of the variation in carbon premia across countries. Some nuance needs to be brought to this conclusion, however, given that the coefficients of the interaction terms with respect to changes in emissions reported in Panel B come out highly significant.

If the level of a country's development does not seem to affect the carbon premium, perhaps other characteristics of developed and developing countries matter more. One important difference besides the level of income between developed and emerging economies is that developed countries tend to produce a larger share of electricity through renewable energy. We therefore also investigate whether countries with a higher share of renewable energy have lower carbon premia, by interacting the share of renewables variables with the level and change in carbon emissions. The results are reported in Table 12. As it turns out, the hypothesis that a more renewable-energy based economy is associated with lower carbon premia is broadly borne out in the data for the short run impact of changes in emissions. Countries with a larger fraction of renewable energy production have lower carbon premia with respect to changes in emissions, as indicated by the negative highly significant coefficients for the interaction terms shown in Panel B.

Another country-level variable that is likely to affect the carbon premium is the size of the fossil fuel production sector. To investigate this hypothesis, we explore whether the share of a country's energy sector has a significant and positive effect on the carbon premium. The results of this analysis are reported in Table 12. The coefficients of the interaction terms between the share of the energy sector and changes in emissions are again highly significant and positive, indicating that investors perceive the risk with respect to carbon emissions to be greater in countries with large fossil fuel energy sectors.

Besides their level of development or their sectoral composition, other relevant differences across countries relate to their cultural and legal traditions. A large literature in development economics has emphasized how a country's legal tradition can affect its economic development. Accordingly, we explore whether a country's "rule of law" and "voice" affects a country's carbon premium. Another indirect measure of social and political stability we look at is the country's income inequality as reflected in the Gini coefficient. As reported in Table 13.B, we find that the coefficients on the interaction terms between respectively "rule of law" and changes in emissions, and between "voice" and changes in emissions, are both highly significant and negative, indicating that the carbon premium

is lower in countries with better rule of law and more democratic political institutions. Similarly, the coefficient for the interaction term between the Gini coefficient and changes in emissions is significant and positive, meaning that in countries with higher inequalities the carbon premium is likely to be larger.

Finally, another relevant country characteristic is the extent to which a country has been exposed to climate disasters. Using year-by-year data on climate physical risks from Germanwatch, we classify countries into high and low physical climate risk countries based on the realization of the climate risk index (CRI) in each year. Countries with the CRI index above the sample median are considered high risk and those with the values below the median as low risk. We then estimate the carbon premium separately for each group. The results are reported in Table 14. We observe a significant positive premium related to both levels and changes in emissions for both groups of countries, but the premium is larger in the high physical risk countries, particularly for measures based on emission changes. We interpret this result as the effect of greater awareness about climate change in countries that have experienced a major climate catastrophe.

Our analysis so far has explored the carbon premium around the world, pooling all observations from 2005 to 2018 together. Arguably, however, awareness about risks tied to carbon emissions is a recent phenomenon. By pooling the effect on stock returns for later years with the earlier years, our cross-sectional results do not adequately capture the true impact of carbon emissions on stock returns now that the world is mobilizing to combat climate change. We therefore also explore how the carbon premium has changed in recent years, in particular following the landmark Paris climate agreement at the COP 21 in December 2015. Specifically, we regress stock returns on carbon emissions by pooling the observations together for respectively the two years (2014-2015) preceding and the two years (2016-2017) following the Paris agreement. We report the results in a series of tables, starting with Table 15, which provides the estimates for respectively the level and changes in emissions as well as intensity for our 77 countries. Notably, there is no significant premium associated with the level of emissions right before Paris (even with industry fixed effects), whereas there is a highly significant and large positive premium after Paris. In turn, the results for changes in emissions are significant in both periods and show no visible difference. One way to interpret this difference is that as a result of COP 21, investors updated significantly their beliefs about the long-term effects of carbon risk. This result is consistent with the findings reported in Bolton and Kacperczyk (2019) and Ramadorai and Zeni (2019) for the U.S. sample.

We also undertake this analysis after excluding the salient industries associated with fossil fuels. Recall that our cross-sectional analysis when we pool all years together established that the carbon premium is present even beyond these industries. The results reported in Table 16 reveal similar robustness in carbon premium around the Paris shock. Indeed, there is a highly significant and positive premium associated with the level of emissions in other industries as well post Paris. Somewhat different than in our other results, the carbon premium based on emission intensity is negative in the pre-period and it becomes positive and insignificant in the post period.

In which parts of the world did the Paris agreement have the biggest effect? To explore this question, we estimate the same model as in Table 15 for each continent. We report the results for measures related to the level of carbon emissions in Table 17. Notably, there is no apparent change for North America. Both before and after the Paris agreement there is no significant carbon premium associated with the level of emissions. In Europe there is no change either. However, both before and after Paris there is a significant carbon premium (except that the premium for scope 1 emissions becomes insignificant after Paris). The biggest change is in Asia, where the carbon premium was insignificant before Paris, but became highly significant after Paris. This is true, whether we exclude China or not. Finally, in the other continents (Africa, Australia, and South America) there is also no apparent change before and after Paris.

Another relevant breakdown is between the group of G20 countries and the group of other countries. The results for measures related to the level of carbon emissions are reported in Table 18. Again, the difference in the carbon premium before and after Paris is dramatic for the group of G20 countries. Before the agreement there was no significant carbon premium, but after the agreement there is a highly significant positive premium, whether we include industry fixed effects or not. In contrast, the changes in the other group of countries are much smaller. While there is a shift towards a significant premium, it is mostly for scope 3 emissions.

All in all, these results paint a rather striking picture of the carbon premium around the world. On average across all 77 countries there is a significant carbon premium with respect to the level of emissions, reflecting firms' long-run exposure to transition risk with respect to carbon emissions. There is also a perceived transition risk with respect to changes in emissions, which capture the risk associated with the short-run drift away or into greater future emissions. The carbon premium, however, is far from uniformly distributed across these countries, across sectors, and over time. Interestingly, the carbon premium does not appear to be tied to a country's level of development (although countries with higher per capita GDP have a lower premium associated with changes in

emissions). However, the broad intuition that energy and commodities exporting countries should be associated with a higher premium, and countries well on their way in their transition to renewable energy should have a lower premium, is confirmed in the data. The other striking and surprising finding is that awareness about carbon risk, as reflected in the carbon premium, has changed the most in Asia, where investor awareness has jumped after the Paris agreements, whereas it has remained basically unchanged in Europe and North America, either because these regions already had greater awareness of climate change (Europe) or had less awareness and did not revise their beliefs (North America).

We turn next to an analysis of a key mechanism behind the carbon premium, divestment. How much have institutional investors started to shun stocks of companies associated with high carbon emissions? Where has divestment been most significant? How is divestment linked to the carbon premium? These are the key questions we explore in the next section.

3.2 Divestment Around the World

We observe institutional investors' portfolio compositions and can therefore explore how portfolio holdings are affected by corporate carbon emissions.
We estimate the following pooled regression model:

$$IO_{i,t} = d_0 + d_1 Emission_{j,t} + d_2 Controls_{j,t} + \varepsilon_{i,t} \quad (4)$$

In our regressions, we include the following vector of controls: *LOGSIZE, PRINV, B/M, MOM, ROE, VOLAT, VOLUME,* and *MSCI*. Moreover, all regressions include year/month fixed effects and country fixed effects. Our coefficient of interest is d_1, which measures how much institutional investors avoid holding stocks of firms with greater carbon emissions. We cluster standard errors at the industry and year levels.
A first remarkable general result emerges from our analysis: Although institutional investors do significantly divest from companies associated with high carbon emissions, they do so by screening companies based on carbon intensity, and not by their total level of emissions (or changes in emissions). Indeed, while we find a negative significant coefficient associated with a portfolio's carbon intensity, we do not find any significant coefficient associated with the portfolio's total emissions (or changes in emissions). This general result is particularly conspicuous when seen in light of our evidence on the carbon premium, which is tied to the level and changes in emissions, but not to carbon intensity. This means that, although investors perceive transition risk to be related to the level of emissions, and

price in a premium for holding stocks with high levels of emissions, institutional investors do not screen firms based on this risk. Rather they screen firms based on how efficiently they use fossil fuel energy. In other words, in their portfolio construction, institutional investors do not seem to be primarily motivated by reducing their exposure to transition risk associated with total carbon emissions, but rather by picking the best in class in terms of carbon intensity, or by aligning their divestment with their overall investment preferences such as a preference for liquid stocks.

We begin again by comparing exclusionary screening in the U.S. and in China. The results are reported in Table 19. Overall, we find that institutional investors in both countries apply the same exclusionary screening methodology. In both the U.S. and China, companies are excluded on the basis of their scope 1 (but not scope 2 or scope 3) intensity. The divestment happens based on differences in emissions across industries rather than within industries, as the coefficients become insignificant when we include industry fixed effects. Levels and changes in emissions do not affect institutional investor portfolios in either country. If there is a salient difference with respect to divestment between the U.S. and China, it is that there is more divestment in the U.S. This may partly be due to the fact that reporting on firm-level carbon emissions is much less widespread in China than in the U.S.

Next, we estimate divestment for the pooled portfolios of institutional investors in all countries. In the regression models, we additionally include country fixed effects. As we show in Panel A of Table 20, in aggregate, institutional investors are underweight companies with higher scope 1 emission intensity. The coefficient associated with this variable is both highly statistically significant and negative (whether we add industry fixed effects or not). The economic magnitudes are not large but still notable. In the specification without (with) industry fixed effects, a one-standard-deviation increase in *S1INT* is associated with 0.9 (0.35) percentage points lower institutional ownership. Investors' portfolio composition, however, is unaffected by the other two categories of emissions. The coefficients of emission intensity are essentially insignificant (it is weakly significant for *S3INT* when we add industry fixed effects). In contrast, as shown in Panels B and C, there is no exclusionary screening based on levels or changes in emissions. If anything, portfolios seem to be slightly overweight stocks with high scope 2 emissions (although they are underweight stocks with high growth in scope 2 emissions).

We next break down institutional investors by different categories, as some groups of investors, such as insurance companies, investment advisers, or pension funds, are more likely to put in place exclusionary screening policies. Specifically, we divide the institutional investors' universe into the following six categories: banks, insurance companies, investment companies, independent advisers, pension funds, and hedge funds. We determine their portfolio holdings year by year and estimate the regression model in (4) for each category separately. We report the results for emission intensity in

Panel A of Table 21. As can be seen, there is a clear cross-sectional variation in portfolios. Investment companies, independent advisers, and pension funds are significantly underweight companies with high scope 1 emission-intensity whereas the other three categories of investors are not. In turn, none of the investor subgroups divests stocks based on scope 3 intensity, except for hedge funds which are slightly underweight. Panel B reports the results for levels of total emissions. None of the six categories of investors base their exclusionary screening on this measure, except for banks who overweight high level companies a bit. In Panel C, we report the results for changes in emissions, which reflects responses of institutions to short-term effects of carbon risk. Here we find that pension funds and hedge funds are two categories significantly underweight both scope 1 and scope 3. All other categories show no visible differences.

In an international context a natural question is whether institutional investors divest more domestic or foreign companies. In other words, do institutional investors display a home bias in their exclusionary screening of companies with high carbon emissions? To address this question, we distinguish between domestic and foreign investors and compare the extent to which they are more underweight emission-intensive firms. We report the results in Table 22. We find that without controlling for industry, both domestic and foreign investors are significantly underweight scope 1 intensive firms, but, remarkably, the coefficient for foreign investors is twice as large as that for domestic investors. When we add industry fixed effects, we find that there is no significant exclusionary screening based on scope 1 intensity for domestic investors, but still a highly significant divestment by foreign investors. It is worth noting that foreign investors also significantly divest based on scope 3 intensity (adding or not industry fixed effects), whereas domestic investors do not. In turn, we observe no significant divestment in either group based on levels or changes in total emissions. In sum, when it comes to divestment, institutional investors are far more likely to divest from a foreign company with high emission-intensity than from a domestic company.

Another important distinction is between active and passive investors. Given that passive investors track market indexes one would expect that divestment is entirely undertaken by actively managed funds. However, index providers have recently introduced low-carbon versions of the main market indexes (see Andersson, Bolton, and Samama, 2016), so that passive investors can now also reduce their exposure to companies with high carbon emissions by holding the low-carbon version of the market index. Little is known about the extent to which passive investors are underweight or not emission-intensive firms following the introduction of these indexes. Table 23 reports the results for each category of investors. As expected, we find that the coefficient of *S1INT* is highly significant and negative for active investors (when we add industry fixed effects). Surprisingly, however, we also find a negative and highly significant coefficient for passive investors, albeit a smaller one. This finding

suggests that passive investments could already have shifted significantly towards the low-carbon versions of the main market indexes. Moreover, we find that passive investors are particularly sensitive to changes in firms' total emissions, both scope 1 and scope 3, which is consistent with the increasing role of low-carbon index funds.

As a robustness check, we also estimate the coefficient of *S1INT* on the subsample of firms that excludes all the new firms that Trucost added in 2015 to its corporate carbon emissions dataset. Recall that Trucost was able to substantially expand the coverage of firms in 2015 for which it could collect data on carbon emissions. Conceivably, once firm-level carbon emissions are available for these new firms, institutional investors may apply an exclusionary screen disproportionately on these new firms. Alternatively, institutional investors may be slow in expanding their exclusionary screens to these new firms, in which case their portfolios would be less underweight scope 1 intensity than in the restricted sample. To find out we compare the estimates obtained for the full sample to the estimates excluding the new firms added after 2015. The results for when we exclude new firms are reported in Table 24. The statistical significance of the coefficient for scope 1 intensity is unchanged, but the magnitude is slightly higher, suggesting that institutional investors have been slow in extending their exclusionary screens to the new firms. Another important difference is that the portfolios without the new firms are significantly underweight scope 3 intensity, which is consistent with the view that the new firms are less familiar to the investor community, and therefore do not attract the same level of scrutiny. In turn, the familiarity narrative has no bearing on the screening based on levels and changes in total emissions.

We also explore in which regions of the world institutional investors apply exclusionary screening policies. Are these policies only used in the U.S. and Europe, or are they implemented more widely? We find that there is substantial divestment based on scope 1 intensity screening in North America (when we do not control for industry), but somewhat surprisingly, outside the U.S, in particular Canada, there is no significant divestment, as the results in Panel A of Table 25 indicate. In Europe (and the EU) there is also significant divestment based on *SCOPE 1* intensity. Significantly, the same is true in Asia (including China or not). In the other parts of the world, however, there is no significant divestment based on scope 1 intensity. Also, as the results in Panels B and C reveal, there is no significant divestment based on other firm-level measures of emissions (levels and changes for any of the three categories of emissions) anywhere in the world. Overall, we find a reasonably consistent approach to divestment by institutional investors around the world. Investors apply the same exclusionary screens based on scope 1 intensity in the main financial markets around the world. If there is one surprise it is that there is no significant divestment in North America, excluding the U.S.

Another relevant question is whether divestment is focused entirely in a few sectors (fossil fuel energy companies, electric utilities, motor companies). To find out we look at institutional investor portfolios excluding the salient industries tied to fossil fuels and estimate how underweight these portfolios are with respect to companies with high carbon emissions. The results are reported in Table 26. There does indeed appear to be a greater focus on divestment from these salient industries, but there is still significant exclusionary screening in the other industries (without industry fixed effects). Interestingly, portfolios in the other industries also are significantly underweight scope 3 intensity (when industry fixed effects are added).

We further explore the role of economic development in the divestment decision by comparing firms located in G20 and non-G20 countries. In general, we do not find significant differences across the two types of economies. Firms with high scope 1 intensities are shunned both in developed and developing economies. One nuanced difference is that firms in developing countries are also divested based on their levels and percentage changes in total scope 1 carbon emissions, though the level effect only holds for the specification with industry fixed effects. We report the results in Table 27.

Finally, we compare divestment before and after the Paris agreement. Is it the case that greater awareness of climate change has encouraged institutional investors to intensify their exclusionary screening? If anything, the results in Table 28 indicate that, overall, divestment has slackened. In Table 29, we estimate the same coefficient before and after Paris, but now excluding all the new companies that have been added after 2015. Comparing the coefficients before and after Paris, we find a weaker levelling off in divestment. This is consistent with our results in Table 24, where we find a smaller coefficient for *S1INT* after excluding the firms added in 2015. Nevertheless, there is a levelling off even for the restricted sample, which is surprising given that transition risks with respect to carbon emissions have increased post Paris agreement. When we look at changes in divestment by continent in Table 30, we find that the biggest decline in divestment is for North America, where the coefficient for *S1INT* is highly significant and negative before the Paris agreement and insignificant after. In contrast, in Europe (and the EU) divestment has actually increased post Paris, consistent with the general rise of sustainable investment in Europe over this period. As for Asia, there appears to have been a moderate levelling off in divestment (both including and excluding China).

4 Conclusion

We have analyzed whether and how carbon transition risk is reflected at the firm level in a cross-section of over 14,400 listed companies in 77 countries. Very little is known about how carbon emissions affect stock returns around the world. Our exploratory study provides a first insight into this question. We find that the presence of a carbon premium—higher stock returns for companies

with higher carbon emissions—is far from an isolated phenomenon. It is not just present in a few countries (U.S., EU) or in a few sectors tied to fossil fuels. It is widespread, affecting firms in all sectors over three continents, Asia, Europe, and North America. Moreover, stock returns are related not just to firms' direct emissions but also to their indirect emissions through the supply chain. In addition, we find that the carbon premium has been rising in recent years, in line with growing awareness about the urgency of combatting climate change and the rise of the sustainable investment movement. We also find that divestment or exclusionary screening based on carbon emissions by institutional investors is not just confined to the U.S. and Europe. It is far more widespread. Also, we find that institutional investors (U.S. asset managers being the largest among them) tend to focus their divestment on foreign companies. Thus, exclusionary screening, in effect, reinforces the home bias, but also is far-reaching, to the extent that the largest asset managers in the world hold global portfolios.

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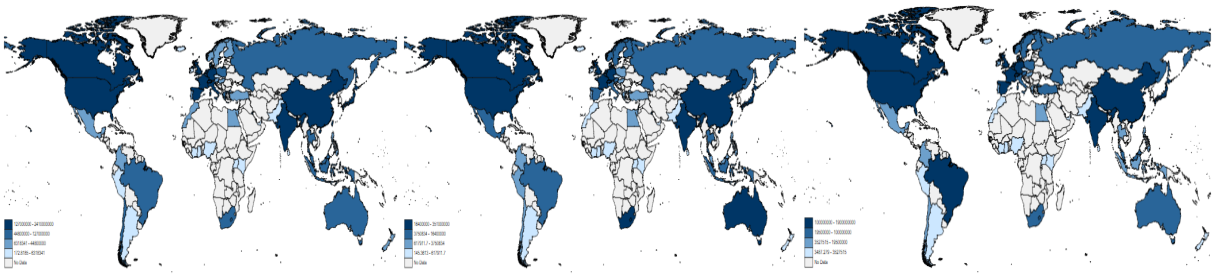
2005-2011



2012-2018

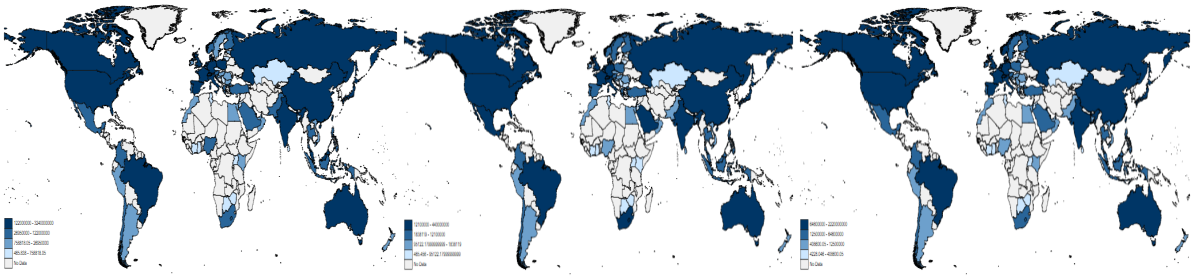
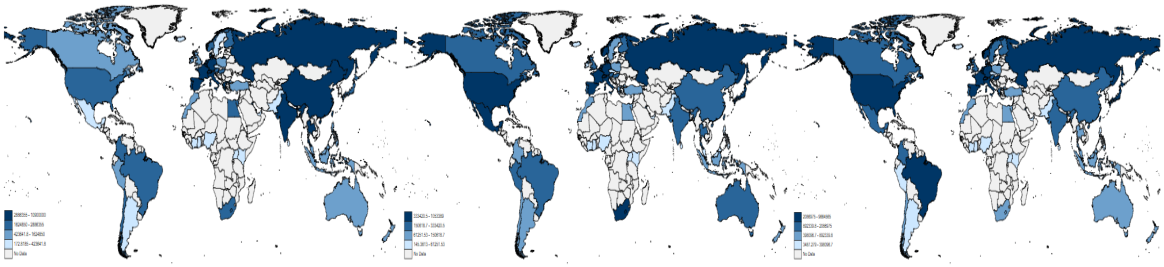


Figure 1: Total Annual Carbon Emissions by Country

2005-2011



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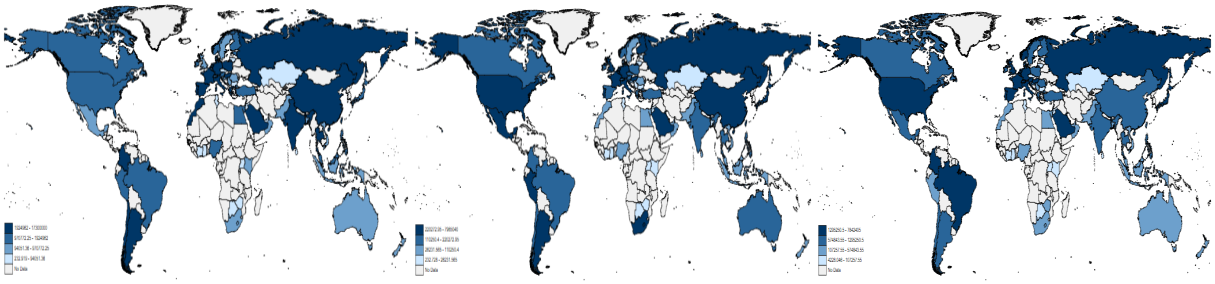
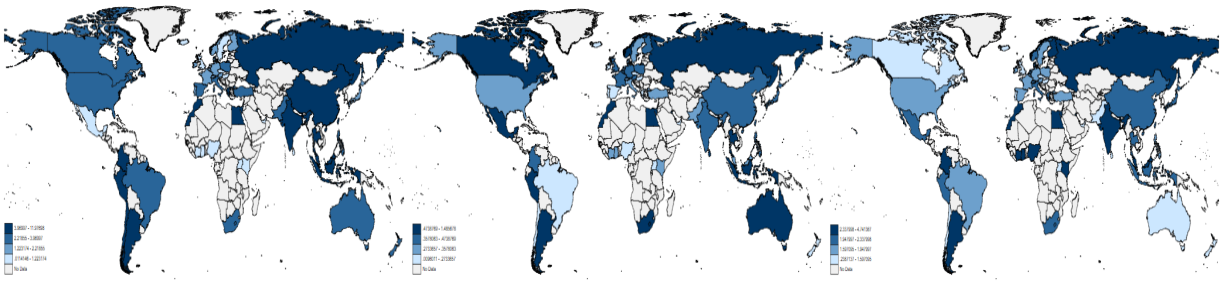


Figure 2: Average Annual Total Carbon Emissions per Firm

2005-2011



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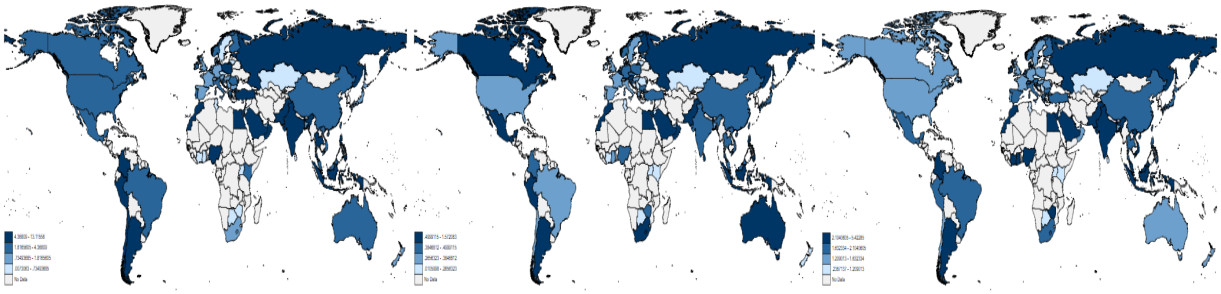

Figure 3: Average Annual Total Carbon Emission Intensity per Firm

Table 1: Carbon Emissions by Country: 2005-2018

S1TOT (S2TOT ; S3TOT) measures the firm-level average (by country) of scope 1(scope 2; scope 3) carbon emissions measured in tons of CO2e. S1INT (S2INT; S3INT) measures a firm's carbon intensity of scope 1 (scope 2; scope 3) emissions in terms of its annual revenues (in tons CO2e/USD m.)/100 (winsorized at 2.5%); S1CHG (S2CHG; S3CHG) measures the percentage growth rate in carbon emissions of scope 1 (scope 2; scope 3) (winsorized at 2.5%). TOTS1 (TOTS2; TOTS3) is a sum of S1TOT (S2TOT; S3TOT) within a country in a given year (averaged across all years).

CODE	COUNTRY	Freq.	Perc.	# co.	S1TOT	S2TOT	S3TOT	S1CHG	S2CHG	S3CHG	S1INT	S2INT	S3INT	TOTS1	TOTS2	TOTS3
AE	UAE	1,748	0.2	34	382822	45424	133220	10.93%	16.32%	11.05%	0.980	0.283	0.996	13000000	1106904	3338979
AR	ARGENTINA	550	0.06	6	1977235	259067	1032782	11.18%	38.18%	10.24%	5.732	1.089	2.543	9816885	1137898	4831946
AT	AUSTRIA	3,741	0.42	42	1543117	175280	1478427	10.00%	16.37%	7.56%	1.728	0.487	1.729	34500000	4073719	33900000
AU	AUSTRALIA	37,405	4.21	471	580313	225151	390624	14.38%	20.19%	11.88%	2.252	0.621	1.450	141000000	51700000	91500000
BD	BANGLADESH	254	0.03	5	112458	23661	145789	16.66%	25.97%	14.83%	1.102	0.262	1.390	490572	106452	624504
BE	BELGIUM	3,883	0.44	52	1611505	398625	1586838	5.88%	11.12%	6.28%	1.245	0.475	1.576	35200000	9368517	39000000
BG	BULGARIA	123	0.01	3	49815	11011	44659	34.85%	6.04%	14.60%	0.684	0.422	1.646	1010125	85163	303958
BH	BAHRAIN	198	0.02	3	1986	5858	28640	7.04%	8.84%	9.21%	0.022	0.068	0.349	5696	16924	83299
BR	BRAZIL	10,249	1.15	126	1846871	200604	2147921	11.05%	16.74%	9.09%	2.717	0.300	1.762	119000000	12700000	145000000
BW	BOTSWANA	68	0.01	2	3986	16534	38093	12.15%	21.45%	21.82%	0.060	0.260	0.642	6650	28041	64964
CA	CANADA	25,479	2.87	399	1179827	194523	794471	13.80%	18.99%	11.30%	2.976	0.584	1.497	226000000	35700000	147000000
CH	SWITZERLAND	12,638	1.42	172	1751558	219020	1848782	5.40%	9.95%	5.63%	0.838	0.269	1.845	142000000	18500000	144000000
CI	CÔTE D'IVOIRE	154	0.02	2	10867	13642	102418	5.46%	6.50%	6.45%	0.286	0.234	2.517	18779	25697	181503
CL	CHILE	3,991	0.45	37	2520658	150335	526513	9.99%	17.85%	9.09%	6.157	0.262	1.380	61800000	3816032	13500000
CN	CHINA	73,490	8.28	1660	4009318	258028	1121424	17.16%	24.86%	16.47%	3.335	0.460	2.069	2910000000	232000000	841000000
CO	COLOMBIA	1,141	0.13	13	2638497	153165	1602004	16.65%	23.03%	13.89%	6.939	0.428	2.888	24900000	1460375	14600000
CZ	CZECH REP.	446	0.05	5	80966	84133	106096	3.29%	8.69%	-2.05%	0.442	0.309	0.769	298304	276486	311847
DE	GERMANY	19,023	2.14	253	4126920	584281	3403940	7.12%	13.69%	7.24%	1.484	0.393	1.696	458000000	70800000	397000000
DK	DENMARK	4,310	0.49	48	1830641	81427	715844	6.29%	8.37%	5.98%	1.174	0.270	1.927	48000000	2101215	19200000
EE	ESTONIA	116	0.01	2	1324801	23427	72707	10.45%	18.91%	5.49%	11.938	0.394	0.924	2649601	46855	145415
EG	EGYPT	2,855	0.32	30	1300763	71534	347754	4.98%	10.42%	5.58%	6.787	0.626	2.843	22200000	1285661	6255982
ES	SPAIN	7,140	0.8	84	3733641	254727	2095625	9.14%	15.39%	6.55%	2.022	0.273	1.776	153000000	11100000	89400000
FI	FINLAND	4,049	0.46	42	1401658	320239	1548562	2.96%	10.18%	3.74%	2.001	0.485	2.194	34300000	7964368	37800000
FR	FRANCE	20,256	2.28	248	3537015	457697	2902571	7.12%	11.09%	6.26%	1.406	0.318	1.651	411000000	57400000	355000000
GB	UK	68,153	7.68	660	1037499	263688	1350755	7.47%	8.86%	6.25%	1.111	0.368	1.467	436000000	110000000	560000000
GH	GHANA	235	0.03	2	3583	3103	68338	0.63%	3.23%	2.96%	0.337	0.287	5.265	6882	5945	133928
GR	GREECE	1,929	0.22	23	4208318	155010	938891	13.98%	18.93%	7.11%	4.116	0.301	2.008	47800000	2284545	11200000
HK	HONG KONG	28,827	3.25	830	1963473	177584	524083	14.95%	28.14%	14.69%	2.755	0.459	1.658	383000000	45200000	119000000
HR	CROATIA	128	0.01	2	839807	101136	745120	-6.99%	-1.29%	12.21%	2.729	0.399	2.449	1503091	194606	1321002
HU	HUNGARY	474	0.05	3	2033690	348850	2292191	8.91%	22.72%	0.16%	1.197	0.275	1.508	6100691	1046018	6871986
ID	INDONESIA	8,865	1	130	982778	88318	416476	12.58%	14.81%	10.12%	4.915	0.536	2.217	62100000	5377655	28000000
IE	IRELAND	1,749	0.2	20	1013523	88576	854927	5.99%	9.48%	5.64%	2.024	0.245	1.985	12700000	1108046	10300000
IL	ISRAEL	5,688	0.64	92	207414	49185	289135	12.32%	15.74%	9.46%	0.965	0.282	1.340	9144490	1943727	10900000
IN	INDIA	33,514	3.78	518	3452714	141930	1006817	13.04%	19.06%	12.24%	4.793	0.427	2.367	831000000	34700000	248000000
IS	ICELAND	81	0.01	3	1257	1412	26849	32.91%	28.11%	28.32%	0.012	0.022	0.280	3156	3806	67937
IT	ITALY	6,656	0.75	107	4129000	307340	2549945	6.26%	11.40%	5.64%	2.258	0.354	1.987	169000000	14300000	118000000
JM	JAMAICA	68	0.01	2	335	1422	11711	1.05%	16.31%	12.74%	0.008	0.031	0.262	671	2843	23423
JO	JORDAN	196	0.02	4	1325	6190	30871	-7.52%	0.47%	6.09%	0.026	0.057	0.690	4338	17295	102857
JP	JAPAN	124,903	14.07	2258	1312299	231427	1511355	4.90%	10.72%	5.22%	1.257	0.378	2.025	980000000	204000000	1250000000
KE	KENYA	524	0.06	8	103831	8819	75464	24.97%	27.08%	14.38%	2.821	0.120	1.086	799872	58883	458581
KW	KOREA	51,738	5.83	843	1243235	166251	1001098	10.34%	14.19%	9.15%	1.580	0.413	2.347	397000000	60700000	344000000
KZ	KAZAKHSTAN	45	0.01	1	1153	1005	21863	19.74%	18.64%	13.32%	0.012	0.010	0.239	1153	1005	21863
LB	LEBANON	85	0.01	2	3788	11484	34112	10.68%	13.73%	19.42%	0.027	0.089	0.261	5696	17485	54787
LK	SRI LANKA	452	0.05	4	11715	29408	42644	10.17%	23.04%	6.94%	0.306	0.598	1.021	28522	89216	136662
LT	LITHUANIA	58	0.01	1	1590	4595	18366	23.73%	20.36%	21.61%	0.045	0.131	0.524	1590	4595	18366

LU	LUXEMBOURG	54	0.01	3	1035	1368	8149	-33.03%	-36.01%	-24.82%	0.042	0.090	0.450	2263	2823	17197
MA	MOROCCO	1,352	0.15	13	1690454	67664	307399	6.16%	8.18%	5.86%	11.151	1.003	3.465	15400000	582425	2563349
MU	MAURITIUS	114	0.01	3	925	1368	9340	45.24%	67.68%	27.90%	0.037	0.053	0.325	2115	3259	22106
MX	MEXICO	4,157	0.47	65	630508	322220	1146013	10.20%	15.58%	9.50%	1.903	0.588	2.086	23000000	10100000	36900000
MY	MALAYSIA	12,596	1.42	188	1289048	58716	364614	12.85%	18.36%	9.32%	3.827	0.398	2.217	108000000	6093201	32100000
NG	NIGERIA	1,182	0.13	16	1556752	68555	299827	1.31%	5.69%	0.65%	4.438	0.465	2.458	23600000	1024925	4236235
NL	NETHERLANDS	5,579	0.63	63	5563867	702550	2898875	5.06%	7.38%	4.50%	1.489	0.326	2.017	188000000	23700000	97700000
NO	NORWAY	5,680	0.64	97	1269294	294583	1627966	10.02%	13.26%	9.33%	2.655	0.391	1.905	49000000	9238739	56700000
NZ	NEW ZEALAND	3,011	0.34	50	393267	32502	239998	5.67%	9.68%	8.79%	1.904	0.263	1.436	8036961	707115	5067580
OM	OMAN	488	0.05	8	369577	60682	106543	6.60%	16.64%	8.10%	7.571	0.815	1.441	2686115	433197	755255
PE	PERU	544	0.06	5	1023906	213257	201341	15.87%	18.77%	10.71%	10.256	1.367	1.982	3617539	755370	721199
PH	PHILIPPINES	5,583	0.63	72	1077980	87818	518201	17.10%	26.63%	12.56%	4.367	0.569	1.751	49100000	4010504	23100000
PK	PAKISTAN	3,169	0.36	51	750597	40021	217645	12.02%	14.41%	9.61%	7.505	0.550	2.470	25900000	1223456	6959005
PL	POLAND	5,672	0.64	60	2368805	158750	619717	12.22%	18.37%	10.16%	3.654	0.439	1.635	94300000	6032271	22200000
PT	PORTUGAL	1,351	0.15	17	3179836	233808	1365071	2.71%	12.34%	3.92%	3.058	0.302	1.355	26400000	1974726	11800000
QA	QATAR	1,222	0.14	23	611145	45424	210790	7.31%	12.18%	6.43%	4.364	0.311	1.177	10900000	812774	3752829
RO	ROMANIA	250	0.03	4	886381	56688	680844	14.92%	9.79%	8.08%	3.526	0.195	1.615	3381664	202319	2430224
RS	SERBIA	168	0.02	3	272240	23975	196896	23.17%	18.38%	19.48%	1.312	0.144	1.091	601691	55795	452004
RU	RUSSIA	1,925	0.22	26	10100000	816962	6098643	16.11%	19.48%	9.72%	7.024	0.572	2.563	147000000	10800000	72600000
SA	SAUDI ARABIA	1,088	0.12	98	2345866	1002530	1190067	-10.47%	8.66%	4.26%	5.703	0.842	2.589	66100000	22600000	43600000
SE	SWEDEN	11,560	1.3	174	228060	74868	703569	7.48%	11.15%	7.68%	0.492	0.282	1.683	17000000	6014555	53200000
SG	SINGAPORE	9,881	1.11	145	864602	122194	1143235	12.55%	18.94%	10.64%	1.758	0.434	1.567	55800000	8285673	74100000
SI	SLOVENIA	220	0.02	3	13270	26995	71210	1.05%	21.79%	5.40%	0.099	0.248	0.580	37469	78045	203048
TH	THAILAND	5,767	0.65	106	2089681	167475	674012	14.69%	23.17%	13.21%	5.174	0.452	2.004	88800000	6770391	31000000
TN	TUNISIA	140	0.02	2	239	235	5106	-6.55%	0.70%	-1.53%	0.011	0.011	0.240	477	469	10212
TR	TURKEY	4,706	0.53	58	1697617	130762	768350	15.98%	18.69%	8.58%	4.547	0.438	1.704	55000000	4237040	23400000
TW	TAIWAN	41,061	4.63	684	530858	134310	531483	10.24%	17.23%	7.74%	1.812	0.497	2.189	135000000	41300000	147000000
UG	UGANDA	88	0.01	1	842	1470	4194	34.73%	71.91%	4.62%	0.047	0.083	0.240	842	1470	4194
US	USA	175,377	19.76	3013	2012926	323727	1733058	7.87%	13.84%	8.24%	1.958	0.338	1.612	2330000000	403000000	2100000000
VN	VIET NAM	820	0.09	15	479322	43086	343905	12.19%	18.35%	14.68%	4.290	0.432	3.249	6087639	552733	4260247
ZA	SOUTH AFRICA	14,883	1.68	148	1074195	444228	423650	10.53%	17.41%	6.08%	2.161	0.963	1.840	95900000	41400000	40100000
ZW	ZIMBABWE	56	0.01	2	15480	14546	138070	-6.75%	1.28%	8.77%	0.343	0.445	3.102	48346	45915	457559
Total		887429	100	14468	1874065	246606	1301047	9.73%	15.35%	8.86%	2.223	0.417	1.844	11813099883	1615895170	7990066031

Table 2: Summary Statistics

This tables reports summary statistics (averages, medians, and standard deviations) for the variables used in regressions. The sample period is 2005-2018. Panels A and B report the emission variables and their pairwise correlations. Panel C reports the ownership variables. $IO_{i,t}$ is the fraction of the shares of company *i* held by institutions in the FactSet Database at the end of year *t*. *IO* is calculated by aggregating the shares held by all types of institutions at the end of the year, and then dividing this amount by shares outstanding at the end of the year. *IO_BANKS* is the ownership by banks; *IO_INSURANCE* is the ownership by insurance companies; *IO_INVESTCOS* is the ownership by investment companies (e.g., mutual funds); *IO_ADVISERS* is the ownership by independent investment advisers; *IO_PENSIONS* is the ownership by pension funds; *IO_HFS* is the ownership by hedge funds. Panel D reports the control variables. *RET* is the monthly stock return; *LOGSIZE* is the natural logarithm of market capitalization (in $ million); *B/M* is the book value of equity divided by market value of equity; *ROE* is the return on equity; *LEVERAGE* is the book value of leverage defined as the book value of debt divided by the book value of assets; *MOM* is the cumulative stock return over the one-year period; *INVEST/A* is the CAPEX divided by book value of assets; *HHI* is the Herfindahl index of the business segments of a company with weights proportional to revenues; *LOGPPE* is the natural logarithm of plant, property & equipment (in $ million); *VOLAT* is the monthly stock return volatility calculated over the one year period; $PRINV_{i,t}$ is the inverse of firm *i*'s share price at the end of year *t*; $VOLUME_{i,t}$ is the average daily trading volume (in $million) of stock *i* over the calendar year *t*; $MSCI_{i,t}$ is an indicator variable equal to one if a stock *i* is part of MSCI World Index in year *t*, and zero otherwise;.

Panel A: Carbon Emissions

Variable	Mean	Median	St. deviation
Log (Carbon Emissions Scope 1 (tons CO2e)) [LOGS1TOT]	10.317	10.135	2.951
Log (Carbon Emissions Scope 2 (tons CO2e)) [LOGS2TOT]	10.173	10.233	2.265
Log (Carbon Emissions Scope 3 (tons CO2e)) [LOGS3TOT]	11.966	12.021	2.219
Growth Rate in Carbon Emissions Scope 1 (winsorized at 2.5%) [S1CHG]	9.73%	3.34%	41.34%
Growth Rate in Carbon Emissions Scope 2 (winsorized at 2.5%) [S2CHG]	15.35%	5.83%	49.01%
Growth Rate in Carbon Emissions Scope 3 (winsorized at 2.5%) [S2CHG]	8.86%	5.44%	25.74%
Carbon Intensity Scope 1 (tons CO2e/USD m.)/100 (winsorized at 2.5%) [S1INT]	2.223	0.191	6.269
Carbon Intensity Scope 2 (tons CO2e/USD m.)/100 (winsorized at 2.5%) [S2INT]	0.417	0.211	0.574
Carbon Intensity Scope 3 (tons CO2e/USD m.) /100 (winsorized at 2.5%) [S3INT]	1.844	1.190	1.806

Panel B: Carbon Emissions: Correlations

	S1INT	S2INT	S3INT	LOGS1TOT	LOGS2TOT	LOGS3TOT
S1INT	1					
S2INT	0.2856	1				
S3INT	0.3632	0.3028	1			
LOGS1TOT	0.4934	0.0764	0.2236	1		
LOGS2TOT	0.1249	0.3206	0.1317	0.2916	1	
LOGS3TOT	0.0724	0.0341	0.2489	0.3733	0.4831	1

Panel C: Ownership

Variable	Mean	Median	St. deviation
IO (in %)	30.18	17.51	30.31
IO_BANKS (in %)	0.02	0.00	0.08
IO_INSURANCE (in %)	0.13	0.00	1.50
IO_INVESTCOS. (in %)	6.56	2.78	8.52
IO_ADVISERS (in %)	19.10	11.95	18.58
IO_PENSIONS (in %)	1.81	1.07	2.53
IO_HFS (in %)	2.56	0.12	6.22
IO_DOM (in %)	19.04	4.44	28.34
IO_FOR (in %)	11.14	7.48	13.39
IO_ACT (in %)	27.80	15.75	28.59
IO_PAS (in %)	2.38	1.23	4.10
IO_FOR_US (in %)	5.19	2.37	9.15
IO_FOR_NUS (in %)	5.96	4.04	6.86
IO_DOM_ACT (in %)	18.20	4.26	27.29
IO_DOM_PAS (in %)	0.84	0.00	2.53
IO_FOR_ACT (in %)	9.60	6.20	11.80
IO_FOR_PAS (in %)	1.54	0.84	3.11

Panel D: Regression Controls

Variable	Mean	Median	St. deviation
RET (%)	1.076	0.054	10.229
LOGSIZE	11.105	9.644	5.212
B/M (winsorized at 2.5%)	0.572	0.440	0.510
LEVERAGE (winsorized at 2.5%)	0.227	0.209	0.175
MOM (winsorized at 0.5%)	0.150	0.089	0.452
INVEST/A (winsorized at 2.5%)	0.049	0.035	0.048
HHI	0.798	0.985	0.252
LOGPPE	7.748	7.684	3.313
ROE (winsorized at 2.5%)	11.094	10.870	16.076
VOLAT (winsorized at 0.5%)	0.092	0.079	0.058
PRINV (winsorized at 0.5%)	0.187	0.030	0.554
VOLUME (in $million) (winsorized at 2.5%)	73.183	16.932	142.601
MSCI	0.337	0	0.473

Table 3: Carbon Emissions by Year

The table reports the annual averages across all countries of all emission variables over the period 2005-2018.

year	# firms	S1TOT	S2TOT	S3TOT	S1CHG	S2CHG	S3CHG	S1INT	S2INT	S3INT	TOTS1	TOTS2	TOTS3
2005	3232	2391417	246612	1822093	.	.	.	2.834	0.403	2.299	917000000	106000000	828000000
2006	3532	2367787	264064	1705187	16.18%	18.59%	9.83%	2.686	0.399	2.150	894000000	115000000	749000000
2007	3689	2488889	290500	1800563	18.89%	22.94%	15.94%	2.613	0.393	2.030	934000000	125000000	766000000
2008	3736	2541971	330705	1679148	9.34%	18.13%	-0.16%	2.430	0.399	1.775	955000000	146000000	728000000
2009	3949	2285281	311700	1643489	3.24%	8.47%	10.02%	2.518	0.416	1.955	870000000	136000000	720000000
2010	4098	2407166	308070	1633414	14.26%	18.14%	8.34%	2.515	0.426	1.857	904000000	130000000	689000000
2011	4221	2563380	322518	1825353	9.51%	15.73%	14.51%	2.426	0.412	1.825	937000000	136000000	761000000
2012	4253	2402493	317779	1791769	8.71%	10.60%	3.31%	2.318	0.408	1.733	868000000	133000000	748000000
2013	4912	2211603	297793	1619450	7.06%	8.43%	4.06%	2.319	0.398	1.688	878000000	135000000	743000000
2014	5323	2118666	292460	1432881	6.88%	20.46%	4.90%	2.234	0.432	1.632	895000000	142000000	694000000
2015	5427	2009876	276453	1228497	3.87%	2.48%	-1.76%	2.302	0.431	1.633	860000000	137000000	604000000
2016	11961	1038161	143425	693127	5.95%	11.13%	10.81%	1.825	0.395	1.727	1130000000	183000000	902000000
2017	12817	1046853	167407	759076	13.60%	26.03%	19.03%	1.783	0.423	1.803	1230000000	221000000	1050000000
2018	8781	1136396	148745	729199	10.53%	12.24%	6.21%	1.809	0.427	1.851	1050000000	142000000	663000000

Table 4: Industry Representation

The table reports the distribution of unique firms in our sample with regard to GIC 6 industry classification. *#Co.* represents the total number of firms in each industry. The sample period is 2005-2018.

Industry	GICSIX	# Co.
Energy Equipment & Services	1	170
Oil, Gas & Consumable Fuels	2	467
Chemicals	3	530
Construction Materials	4	162
Containers & Packaging	5	102
Metals & Mining	6	506
Paper & Forest Products	7	92
Aerospace & Defense	8	99
Building Products	9	165
Construction & Engineering	10	380
Electrical Equipment	11	282
Industrial Conglomerates	12	144
Machinery	13	580
Trading Companies & Distributors	14	195
Commercial Services & Supplies	15	261
Professional Services	16	150
Air Freight & Logistics	17	70
Airlines	18	75
Marine	19	87
Road & Rail	20	115
Transportation Infrastructure	21	124
Auto Components	22	313
Automobiles	23	75
Household Durables	24	270
Leisure Products	25	73
Textiles, Apparel & Luxury Goods	26	262
Hotels, Restaurants & Leisure	27	359
Diversified Consumer Services	28	105
Media	29	325
Distributors	30	64
Internet & Direct Marketing Retail	31	92
Multiline Retail	32	117
Specialty Retail	33	354
Food & Staples Retailing	34	200
Beverages	35	126
Food Products	36	440
Tobacco	37	25
Household Products	38	41
Personal Products	39	100
Health Care Equipment & Supplies	40	229

Health Care Providers & Services	41	224
Health Care Technology	42	35
Biotechnology	43	273
Pharmaceuticals	44	371
Life Sciences Tools & Services	45	61
Banks	46	679
Thrifts & Mortgage Finance	47	70
Diversified Financial Services	48	180
Consumer Finance	49	116
Capital Markets	50	351
Mortgage Real Estate Investment Trusts (REITs)	51	2
Insurance	52	234
Internet Software & Services	53	180
IT Services	54	301
Software	55	367
Communications Equipment	56	154
Technology Hardware, Storage & Peripherals	57	167
Electronic Equipment, Instruments & Components	58	520
Semiconductors & Semiconductor Equipment	59	398
Diversified Telecommunication Services	60	131
Wireless Telecommunication Services	61	74
Media	62	142
Entertainment	63	114
Interactive Media & Services	64	36
Electric Utilities	65	159
Gas Utilities	66	66
Multi-Utilities	67	57
Water Utilities	68	44
Independent Power and Renewable Electricity Producers	69	152
Equity Real Estate Investment Trusts (REITs)	70	274
Real Estate Management & Development	71	619

Table 5: Predictors of Carbon Emissions

The sample period is 2005-2018. The dependent variables are carbon emission levels (Panel A), the percentage changes in emissions (Panel B), and carbon emission intensities (Panel C). All variables are defined in Tables 1 and 2. We report the results of the pooled regression with standard errors clustered at the firm and year levels. All regressions include year-month fixed effects and country fixed effects. In columns (4) through (6), we additionally include industry-fixed effects. ***1% significance; **5% significance; *10% significance.

Panel A: Levels

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	LOGS1TOT	LOGS2TOT	LOGS3TOT	LOGS1TOT	LOGS2TOT	LOGS3TOT
LOGSIZE	-0.246***	-0.165***	-0.163***	0.329***	0.472***	0.453***
	(0.018)	(0.017)	(0.016)	(0.020)	(0.027)	(0.023)
B/M	-0.154***	-0.106**	-0.148***	0.371***	0.451***	0.381***
	(0.042)	(0.043)	(0.035)	(0.044)	(0.051)	(0.047)
ROE	0.015***	0.015***	0.016***	0.008***	0.008***	0.009***
	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
LEVERAGE	1.103***	1.096***	0.822***	0.669***	0.671***	0.370***
	(0.124)	(0.156)	(0.120)	(0.099)	(0.127)	(0.097)
INVEST/A	-2.196***	-3.081***	-4.251***	-1.136***	-1.928***	-3.089***
	(0.321)	(0.279)	(0.241)	(0.371)	(0.322)	(0.287)
HHI	-1.597***	-1.117***	-1.147***	-1.216***	-0.660***	-0.722***
	(0.094)	(0.089)	(0.090)	(0.074)	(0.059)	(0.062)
LOGPPE	0.395***	0.300***	0.311***	0.428***	0.336***	0.346***
	(0.016)	(0.014)	(0.012)	(0.015)	(0.016)	(0.016)
MSCI	1.246***	1.438***	1.359***	0.176***	0.256***	0.218***
	(0.111)	(0.133)	(0.130)	(0.040)	(0.049)	(0.042)
Constant	10.597***	9.854***	11.728***	3.902***	2.415***	4.555***
	(0.158)	(0.201)	(0.134)	(0.215)	(0.260)	(0.212)
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	No	Yes	Yes	Yes
Observations	874,592	874,736	875,270	874,592	874,736	875,270
R-squared	0.696	0.551	0.629	0.779	0.715	0.793

Panel B: Percentage Changes

VARIABLES	(1) S1CHG	(2) S2CHG	(3) S3CHG	(4) S1CHG	(5) S2CHG	(6) S3CHG
LOGSIZE	0.029***	0.029***	0.027***	0.025***	0.027***	0.025***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.005)	(0.003)
B/M	-0.059***	-0.063***	-0.065***	-0.067***	-0.069***	-0.070***
	(0.009)	(0.008)	(0.006)	(0.009)	(0.009)	(0.007)
ROE	-0.001***	-0.001***	-0.001***	-0.001***	-0.002***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LEVERAGE	0.062***	0.064***	0.047***	0.060***	0.063***	0.043***
	(0.011)	(0.012)	(0.008)	(0.012)	(0.012)	(0.008)
INVEST/A	0.494***	0.568***	0.344***	0.451***	0.525***	0.317***
	(0.096)	(0.072)	(0.063)	(0.085)	(0.063)	(0.052)
HHI	0.015**	-0.016	0.022***	0.011*	-0.017	0.020***
	(0.006)	(0.013)	(0.004)	(0.005)	(0.014)	(0.004)
LOGPPE	-0.024***	-0.023***	-0.021***	-0.023***	-0.022***	-0.021***
	(0.003)	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)
MSCI	-0.041***	-0.042***	-0.033***	-0.033***	-0.040***	-0.029***
	(0.005)	(0.008)	(0.003)	(0.005)	(0.005)	(0.004)
Constant	-0.025	0.047*	-0.028	0.020	0.071	-0.015
	(0.018)	(0.025)	(0.016)	(0.024)	(0.062)	(0.031)
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	No	Yes	Yes	Yes
Observations	755,257	755,267	755,819	755,257	755,267	755,819
R-squared	0.040	0.046	0.119	0.047	0.055	0.131

Panel C: Emission Intensity

VARIABLES	(1) S1INT	(2) S2INT	(3) S3INT	(4) S1INT	(5) S2INT	(6) S3INT
LOGSIZE	-0.173***	-0.021***	-0.053***	-0.179***	-0.005	-0.066***
	(0.026)	(0.004)	(0.007)	(0.034)	(0.004)	(0.007)
B/M	0.026	0.006	-0.011	0.155*	0.022**	-0.017
	(0.076)	(0.011)	(0.022)	(0.074)	(0.009)	(0.019)
ROE	0.002	-0.000	0.001***	-0.000	-0.001**	0.001***
	(0.002)	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)
LEVERAGE	1.339***	0.056**	-0.049	1.332***	0.065**	-0.044
	(0.241)	(0.023)	(0.050)	(0.261)	(0.022)	(0.051)
INVEST/A	3.634***	0.587***	0.135	3.351***	0.545***	0.102
	(0.822)	(0.072)	(0.165)	(0.812)	(0.071)	(0.165)
HHI	-1.630***	-0.057***	-0.411***	-1.722***	-0.037**	-0.435***
	(0.202)	(0.016)	(0.042)	(0.212)	(0.016)	(0.043)
LOGPPE	0.205***	0.020***	0.079***	0.213***	0.023***	0.077***
	(0.018)	(0.003)	(0.006)	(0.019)	(0.003)	(0.007)
MSCI	0.082	0.043***	-0.045**	0.143	0.016	-0.015
	(0.087)	(0.011)	(0.019)	(0.092)	(0.010)	(0.019)
Constant	3.308***	0.477***	2.152***	3.336***	0.271***	2.326***
	(0.288)	(0.029)	(0.063)	(0.386)	(0.043)	(0.081)
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	No	Yes	Yes	Yes
Observations	875,270	875,270	875,270	875,270	875,270	875,270
R-squared	0.586	0.505	0.731	0.592	0.518	0.733

Table 6: Carbon Emissions and Stock Returns: U.S. and China

The sample period is 2005-2018. The dependent variable is *RET*. The main independent variables are carbon emission levels (Panel A), the percentage changes in emissions (Panel B), and carbon emission intensities (Panel C). All variables are defined in Table 1 and Table 2. We report the results of the pooled regression with standard errors clustered at the firm and year level. All regressions include year-month fixed effects, country fixed effects, and industry-fixed effects. Columns (1)-(3) provide the results for firms from the U.S, columns (4)-(6) provide the results for firms from China. ***1% significance; **5% significance; *10% significance.

Panel A: Levels

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)
		United States			China	
LOGS1TOT	0.083***			0.067**		
	(0.020)			(0.028)		
LOGS2TOT		0.098**			0.149*	
		(0.035)			(0.072)	
LOGS3TOT			0.156***			0.213*
			(0.045)			(0.108)
LOGSIZE	-0.118	-0.146	-0.175	-0.329***	-0.360***	-0.380***
	(0.121)	(0.126)	(0.129)	(0.094)	(0.108)	(0.112)
B/M	0.525	0.507	0.476	0.981**	0.938**	0.919**
	(0.327)	(0.321)	(0.326)	(0.404)	(0.382)	(0.371)
LEVERAGE	-0.482*	-0.491*	-0.503*	-0.107	-0.118	-0.194
	(0.249)	(0.237)	(0.240)	(0.203)	(0.188)	(0.174)
MOM	0.254	0.265	0.266	0.713	0.706	0.696
	(0.312)	(0.311)	(0.311)	(0.417)	(0.411)	(0.401)
INVEST/A	0.434	0.579	0.848	-0.468	-0.217	-0.121
	(2.462)	(2.462)	(2.394)	(0.786)	(0.859)	(0.868)
HHI	0.034	-0.019	0.025	0.611	0.563	0.565
	(0.114)	(0.091)	(0.103)	(0.429)	(0.418)	(0.413)
LOGPPE	0.005	0.005	-0.010	0.058	0.037	0.001
	(0.045)	(0.048)	(0.048)	(0.081)	(0.067)	(0.053)
ROE	0.005	0.005	0.005	0.026*	0.025*	0.024*
	(0.003)	(0.003)	(0.003)	(0.013)	(0.012)	(0.012)
VOLAT	3.521	3.345	3.434	-2.920	-2.962	-2.827
	(4.064)	(4.010)	(4.035)	(1.798)	(1.776)	(1.739)
Constant	0.496	0.639	0.034	2.789	2.621	2.138
	(0.928)	(0.976)	(1.012)	(1.582)	(1.613)	(1.825)
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	143,399	143,375	143,495	60,218	60,218	60,218
R-squared	0.224	0.224	0.224	0.301	0.301	0.301

Panel B: Percentage Changes

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)
		United States			China	
S1CHG	0.736***			0.799**		
	(0.168)			(0.267)		
S2CHG		0.373**			0.616***	
		(0.138)			(0.188)	
S3CHG			1.413***			1.980***
			(0.418)			(0.496)
LOGSIZE	-0.121	-0.107	-0.141	-0.335***	-0.327***	-0.358***
	(0.117)	(0.117)	(0.118)	(0.098)	(0.094)	(0.104)
B/M	0.598*	0.578*	0.653*	1.051**	0.985**	1.111**
	(0.322)	(0.320)	(0.302)	(0.422)	(0.395)	(0.413)
LEVERAGE	-0.482*	-0.456*	-0.489*	-0.059	-0.014	-0.115
	(0.249)	(0.251)	(0.259)	(0.237)	(0.224)	(0.243)
MOM	0.204	0.226	0.142	0.608	0.621	0.479
	(0.306)	(0.309)	(0.301)	(0.423)	(0.409)	(0.372)
INVEST/A	-0.100	0.078	-0.406	-0.766	-1.104	-1.201
	(2.472)	(2.422)	(2.475)	(0.853)	(0.826)	(0.850)
HHI	-0.097	-0.061	-0.109	0.542	0.538	0.421
	(0.097)	(0.100)	(0.098)	(0.418)	(0.405)	(0.387)
LOGPPE	0.069	0.057	0.087	0.108	0.102	0.120
	(0.047)	(0.045)	(0.050)	(0.084)	(0.083)	(0.095)
ROE	0.007**	0.007**	0.008**	0.029*	0.029*	0.029*
	(0.003)	(0.003)	(0.003)	(0.014)	(0.014)	(0.014)
VOLAT	3.191	3.297	3.225	-2.976	-3.167	-3.137
	(4.140)	(4.135)	(4.204)	(1.806)	(1.866)	(1.847)
Constant	1.056	0.984	1.052	3.082*	3.073*	3.241*
	(0.899)	(0.914)	(0.927)	(1.575)	(1.567)	(1.588)
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	143,423	143,363	143,495	60,218	60,218	60,218
R-squared	0.224	0.224	0.225	0.302	0.301	0.303

Panel C: Emission Intensity

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)
		United States			China	
S1INT	0.011*			0.004		
	(0.005)			(0.006)		
S2INT		0.099			0.073	
		(0.103)			(0.052)	
S3INT			0.048			0.024
			(0.028)			(0.045)
LOGSIZE	-0.090	-0.093	-0.091	-0.312***	-0.310***	-0.311***
	(0.121)	(0.120)	(0.121)	(0.091)	(0.089)	(0.092)
B/M	0.557	0.556	0.555	0.993**	0.992**	0.995**
	(0.328)	(0.331)	(0.329)	(0.408)	(0.406)	(0.407)
LEVERAGE	-0.455	-0.447	-0.444	-0.021	-0.010	-0.024
	(0.258)	(0.253)	(0.256)	(0.205)	(0.211)	(0.218)
MOM	0.254	0.256	0.253	0.714	0.713	0.714
	(0.312)	(0.313)	(0.311)	(0.420)	(0.419)	(0.421)
INVEST/A	0.325	0.326	0.349	-0.583	-0.598	-0.605
	(2.477)	(2.484)	(2.477)	(0.810)	(0.778)	(0.863)
HHI	-0.043	-0.071	-0.051	0.542	0.529	0.535
	(0.100)	(0.099)	(0.098)	(0.408)	(0.408)	(0.401)
LOGPPE	0.042	0.041	0.042	0.093	0.092	0.091
	(0.050)	(0.049)	(0.049)	(0.090)	(0.088)	(0.092)
ROE	0.006*	0.006*	0.006*	0.027*	0.027*	0.027*
	(0.003)	(0.003)	(0.003)	(0.013)	(0.013)	(0.013)
VOLAT	3.479	3.410	3.457	-2.959	-2.988	-2.968
	(4.052)	(4.023)	(4.059)	(1.799)	(1.821)	(1.794)
Constant	0.937	0.983	0.892	3.050*	3.019*	3.012*
	(0.914)	(0.917)	(0.921)	(1.547)	(1.531)	(1.520)
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	143,495	143,495	143,495	60,218	60,218	60,218
R-squared	0.224	0.224	0.224	0.301	0.301	0.301

Table 7: Carbon Emissions and Stock Returns: Full Sample

The sample period is 2005-2018. The dependent variable is *RET*. The main independent variables are carbon emission levels (Panel A), the percentage changes in emissions (Panel B), and carbon emission intensities (Panel C). All variables are defined in Table 1 and Table 2. We report the results of the pooled regression with standard errors clustered at the firm and year level. All regressions include year-month fixed effects and country fixed effects. In columns (4) through (6), we additionally include industry-fixed effects. ***1% significance; **5% significance; *10% significance.

Panel A: Levels

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)
LOGS1TOT	0.029			0.066***		
	(0.022)			(0.016)		
LOGS2TOT		0.096***			0.118***	
		(0.030)			(0.027)	
LOGS3TOT			0.118***			0.174***
			(0.032)			(0.037)
LOGSIZE	-0.150***	-0.182***	-0.182***	-0.186***	-0.225***	-0.249***
	(0.040)	(0.042)	(0.042)	(0.041)	(0.042)	(0.045)
B/M	0.501**	0.496**	0.505**	0.610**	0.588**	0.576**
	(0.216)	(0.214)	(0.215)	(0.216)	(0.210)	(0.211)
LEVERAGE	-0.439**	-0.443**	-0.371**	-0.387**	-0.417**	-0.401**
	(0.182)	(0.170)	(0.168)	(0.163)	(0.151)	(0.154)
MOM	0.823**	0.830**	0.828**	0.815**	0.824**	0.825**
	(0.325)	(0.325)	(0.324)	(0.330)	(0.330)	(0.329)
INVEST/A	-0.775	-0.724	-0.409	-0.466	-0.303	-0.003
	(1.115)	(1.176)	(1.236)	(1.065)	(1.093)	(1.111)
HHI	0.014	0.031	0.104	0.059	0.059	0.108
	(0.120)	(0.118)	(0.115)	(0.126)	(0.122)	(0.128)
LOGPPE	-0.003	-0.025	-0.042	0.008	-0.003	-0.023
	(0.018)	(0.022)	(0.024)	(0.017)	(0.018)	(0.019)
ROE	0.013***	0.013***	0.012***	0.013***	0.013***	0.012***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
VOLAT	-0.404	-0.560	-0.494	-0.182	-0.231	-0.202
	(3.465)	(3.415)	(3.451)	(3.244)	(3.222)	(3.238)
Constant	1.874**	1.731**	1.337*	1.666**	1.672**	1.171
	(0.631)	(0.659)	(0.700)	(0.636)	(0.657)	(0.701)
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	No	Yes	Yes	Yes
Observations	746,642	746,797	747,290	736,851	737,006	737,499
R-squared	0.150	0.150	0.150	0.151	0.151	0.151

Panel B: Percentage Changes

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)
S1CHG	0.500***			0.515***		
	(0.089)			(0.091)		
S2CHG		0.301***			0.307***	
		(0.062)			(0.065)	
S3CHG			1.342***			1.364***
			(0.257)			(0.266)
LOGSIZE	-0.162***	-0.159***	-0.178***	-0.174***	-0.170***	-0.189***
	(0.042)	(0.041)	(0.042)	(0.041)	(0.041)	(0.041)
B/M	0.519**	0.513**	0.557**	0.657**	0.650**	0.696***
	(0.215)	(0.214)	(0.217)	(0.219)	(0.218)	(0.221)
LEVERAGE	-0.455**	-0.441**	-0.492**	-0.372**	-0.357*	-0.403**
	(0.185)	(0.179)	(0.180)	(0.170)	(0.166)	(0.165)
MOM	0.785**	0.800**	0.705**	0.773**	0.789**	0.694*
	(0.321)	(0.321)	(0.314)	(0.327)	(0.327)	(0.320)
INVEST/A	-0.908	-0.768	-1.115	-0.758	-0.661	-0.961
	(1.187)	(1.205)	(1.204)	(1.065)	(1.065)	(1.058)
HHI	-0.050	-0.040	-0.071	-0.028	-0.018	-0.050
	(0.124)	(0.126)	(0.121)	(0.122)	(0.124)	(0.120)
LOGPPE	0.030	0.026	0.045**	0.048**	0.043**	0.063***
	(0.021)	(0.020)	(0.021)	(0.016)	(0.016)	(0.017)
ROE	0.014***	0.014***	0.015***	0.014***	0.014***	0.015***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
VOLAT	-0.500	-0.434	-0.450	-0.289	-0.239	-0.222
	(3.461)	(3.477)	(3.524)	(3.241)	(3.256)	(3.286)
Constant	2.064***	2.040***	2.067***	1.911***	1.890**	1.909***
	(0.596)	(0.599)	(0.591)	(0.624)	(0.628)	(0.624)
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	No	Yes	Yes	Yes
Observations	746,738	746,749	747,290	736,947	736,958	737,499
R-squared	0.150	0.150	0.151	0.152	0.151	0.152

Panel C: Emission Intensity

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)
S1INT	-0.007			-0.001		
	(0.007)			(0.004)		
S2INT		0.014			-0.001	
		(0.089)			(0.045)	
S3INT			0.019			0.013
			(0.018)			(0.017)
LOGSIZE	-0.157***	-0.152***	-0.145***	-0.164***	-0.164***	-0.163***
	(0.040)	(0.040)	(0.039)	(0.040)	(0.040)	(0.040)
B/M	0.505**	0.500**	0.506**	0.635**	0.635**	0.635**
	(0.214)	(0.214)	(0.218)	(0.218)	(0.217)	(0.218)
LEVERAGE	-0.405*	-0.426**	-0.417**	-0.341*	-0.342*	-0.342*
	(0.188)	(0.180)	(0.174)	(0.171)	(0.167)	(0.168)
MOM	0.830**	0.826**	0.823**	0.816**	0.816**	0.815**
	(0.325)	(0.327)	(0.327)	(0.331)	(0.331)	(0.331)
INVEST/A	-0.542	-0.640	-0.643	-0.519	-0.520	-0.524
	(1.155)	(1.082)	(1.170)	(1.052)	(1.046)	(1.055)
HHI	-0.072	-0.045	-0.023	-0.024	-0.023	-0.017
	(0.120)	(0.121)	(0.108)	(0.118)	(0.120)	(0.119)
LOGPPE	0.026	0.020	0.015	0.037**	0.037**	0.036**
	(0.019)	(0.018)	(0.018)	(0.016)	(0.016)	(0.016)
ROE	0.014***	0.014***	0.014***	0.014***	0.014***	0.014***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
VOLAT	-0.392	-0.391	-0.384	-0.188	-0.187	-0.186
	(3.457)	(3.440)	(3.460)	(3.243)	(3.242)	(3.243)
Constant	2.089***	2.050***	1.969***	1.916***	1.914***	1.883**
	(0.592)	(0.609)	(0.616)	(0.617)	(0.625)	(0.620)
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	No	Yes	Yes	Yes
Observations	747,290	747,290	747,290	737,499	737,499	737,499
R-squared	0.150	0.150	0.150	0.151	0.151	0.151

Table 8: Carbon Emissions and Stock Returns: Excluding Salient Industries

The sample period is 2005-2018. The sample excludes companies in the oil & gas (gic=2), utilities (gic=65-69), and motor (gic=18, 19, 23) industries. The dependent variable is *RET*. The main independent variables are carbon emission levels (columns (1)-(4)), the percentage changes in emissions (columns (5)-(8)), and carbon emission intensities (columns (9)-(12)). All variables are defined in Table 1 and Table 2. We report the results of the pooled regression with standard errors clustered at the firm and year level. All regressions include year-month fixed effects and country fixed effects. All regression models include the controls of Table 7 (unreported for brevity). In even-numbered columns, we additionally include industry-fixed effects. ***1% significance; **5% significance; *10% significance.

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
LOGS1TOT	0.045*		0.072***									
	(0.024)		(0.020)									
LOGS3TOT		0.109**		0.173***								
		(0.036)		(0.041)								
S1CHG					0.524***		0.533***					
					(0.097)		(0.096)					
S3CHG						1.487***		1.500***				
						(0.283)		(0.289)				
S1INT									-0.003		-0.001	
									(0.009)		(0.006)	
S3INT										0.017		0.010
										(0.021)		(0.017)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observations	670,416	671,064	660,781	661,429	670,524	671,064	660,889	661,429	671,064	671,064	661,429	661,429
R-squared	0.152	0.153	0.154	0.154	0.153	0.153	0.154	0.155	0.152	0.152	0.154	0.154

Table 9: Carbon Emissions and Stock Returns: Regional

The sample period is 2005-2018. The dependent variable is *RET*. The main independent variables are carbon emission levels (Panel A), the percentage changes in firm-level total emissions (Panel B), and carbon emission intensities (Panel C). All variables are defined in Table 1 and Table 2. We report the results of the pooled regression with standard errors clustered at the firm and year level. All regressions include year-month fixed effects and country fixed effects. All regression models include the controls of Table 7 (unreported for brevity). In columns (3)-(4) and (7)-(8), we additionally include industry-fixed effects. Our sample firms include alternately North America, North America (ex U.S.), Europe, the European Union, Asia, Asia (ex. China), and Others (Africa, Australia, and South America). ***1% significance; **5% significance; *10% significance.

Panel A: Levels

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	North America				North America (excl. USA)			
LOGS1TOT	0.042		0.077***		0.013		0.136**	
	(0.024)		(0.018)		(0.034)		(0.046)	
LOGS3TOT		0.116***		0.135***		0.091*		0.196**
		(0.036)		(0.042)		(0.051)		(0.080)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year/month fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
Observations	170,635	170,791	168,452	168,608	25,215	25,275	25,053	25,113
R-squared	0.202	0.202	0.205	0.205	0.158	0.158	0.168	0.168

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Europe				EU			
LOGS1TOT	0.035		0.045**		0.042		0.054*	
	(0.021)		(0.021)		(0.025)		(0.026)	
LOGS3TOT		0.127***		0.158***		0.135***		0.166***
		(0.029)		(0.046)		(0.034)		(0.049)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
Observations	170,338	170,518	167,506	167,686	148,080	148,188	145,436	145,544
R-squared	0.189	0.189	0.193	0.193	0.195	0.195	0.199	0.200

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Asia				Asia (excl. China)			
LOGS1TOT	0.023		0.070**		0.025		0.068**	
	(0.024)		(0.025)		(0.023)		(0.024)	
LOGS3TOT		0.116**		0.204***		0.113**		0.197***
		(0.043)		(0.057)		(0.038)		(0.046)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
Observations	335,387	335,531	331,338	331,482	274,842	274,986	271,120	271,264
R-squared	0.161	0.161	0.163	0.163	0.159	0.160	0.161	0.162

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)
	Others			
LOGS1TOT	-0.007		0.110***	
	(0.031)		(0.032)	
LOGS3TOT		0.054		0.249***
		(0.050)		(0.065)
Controls	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes
Observations	68,812	68,980	68,085	68,253
R-squared	0.126	0.127	0.131	0.131

Panel B: Percentage Changes

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	North America				North America (excl. USA)			
S1CHG	0.722***		0.762***		0.683***		0.771***	
	(0.109)		(0.119)		(0.173)		(0.193)	
S3CHG		1.427***		1.488***		1.513***		1.645***
		(0.317)		(0.354)		(0.414)		(0.406)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
Observations	170,659	170,791	168,476	168,608	25,215	25,275	25,053	25,113
R-squared	0.203	0.203	0.206	0.206	0.159	0.159	0.168	0.169

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Europe				EU			
S1CHG	0.290***		0.306***		0.267**		0.286***	
	(0.081)		(0.079)		(0.091)		(0.089)	
S3CHG		1.093***		1.166***		1.108***		1.190***
		(0.277)		(0.276)		(0.319)		(0.324)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
Observations	170,362	170,518	167,530	167,686	148,080	148,188	145,436	145,544
R-squared	0.189	0.189	0.193	0.193	0.195	0.195	0.199	0.200

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Asia				Asia (excl. China)			
S1CHG	0.606***		0.613***		0.530***		0.537***	
	(0.140)		(0.135)		(0.114)		(0.107)	
S3CHG		1.623***		1.623***		1.443***		1.450***
		(0.359)		(0.353)		(0.318)		(0.311)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
Observations	335,411	335,531	331,362	331,482	274,866	274,986	271,144	271,264
R-squared	0.161	0.162	0.163	0.164	0.160	0.161	0.162	0.163

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)
			Others	
S1CHG	0.162*		0.157	
	(0.084)		(0.105)	
S3CHG		0.573*		0.603*
		(0.296)		(0.298)
Controls	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes
Observations	68,836	68,980	68,109	68,253
R-squared	0.127	0.127	0.131	0.131

Panel C: Emission Intensity

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
			North America				North America (excl. USA)	
S1INT	-0.008		0.006		-0.014		0.010	
	(0.010)		(0.005)		(0.011)		(0.013)	
S3INT		0.035		0.025		-0.021		-0.027
		(0.031)		(0.029)		(0.044)		(0.059)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
Observations	170,791	170,791	168,608	168,608	25,275	25,275	25,113	25,113
R-squared	0.202	0.202	0.205	0.205	0.158	0.158	0.167	0.167

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
			Europe				EU	
S1INT	-0.012		-0.005		-0.012		-0.007	
	(0.010)		(0.008)		(0.012)		(0.007)	
S3INT		0.057*		0.035		0.057*		0.005
		(0.028)		(0.024)		(0.030)		(0.028)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
Observations	170,518	170,518	167,686	167,686	148,188	148,188	145,544	145,544
R-squared	0.189	0.189	0.193	0.193	0.195	0.195	0.199	0.199

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
			Asia				Asia (excl. China)	
S1INT	-0.007		-0.002		-0.008		-0.003	
	(0.006)		(0.004)		(0.005)		(0.005)	
S3INT		-0.002		0.001		0.005		-0.005
		(0.018)		(0.022)		(0.017)		(0.024)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
Observations	335,531	335,531	331,482	331,482	274,986	274,986	271,264	271,264
R-squared	0.161	0.161	0.162	0.162	0.160	0.159	0.161	0.161

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)
			Others	
S1INT	-0.010		-0.004	
	(0.008)		(0.007)	
S3INT		-0.046		-0.020
		(0.030)		(0.043)
Controls	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes
Observations	68,980	68,980	68,253	68,253
R-squared	0.127	0.127	0.131	0.131

Table 10: Carbon Emissions and Stock Returns: Economic Development

The sample period is 2005-2018. The dependent variable is *RET*. The main independent variables are carbon emission levels (columns 1-4), the percentage changes in emissions (columns 5-8), and carbon emission intensities (columns 9-12). All variables are defined in Table 1 and Table 2. We report the results of the pooled regression with standard errors clustered at the firm and year level. Panel A reports the results for a sample of firms coming from G-20 and non-G20 countries. Panel B reports the results for a sample of firms from OECD and non-OECD countries. All regression models include the controls of Table 7 (unreported for brevity), year-month fixed effects, and country fixed effects. In selected columns, we additionally include industry-fixed effects. ***1% significance; **5% significance; *10% significance.

Panel A: G20

Developed (G20)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
LOGS1TOT	0.032		0.072***									
	(0.026)		(0.015)									
LOGS3TOT		0.126***		0.185***								
		(0.036)		(0.037)								
S1CHG					0.517***		0.538***					
					(0.093)		(0.093)					
S3CHG						1.276***		1.308***				
						(0.275)		(0.286)				
S1INT									-0.008		-0.001	
									(0.008)		(0.004)	
S3INT										0.015		0.011
										(0.020)		(0.017)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observations	575,858	576,338	567,704	568,184	575,930	576,338	567,776	568,184	576,338	576,338	568,184	568,184
R-squared	0.151	0.151	0.153	0.153	0.151	0.152	0.153	0.153	0.151	0.151	0.152	0.152

Developing (non-G20)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
LOGS1TOT	0.028**		0.060**									
	(0.012)		(0.023)									
LOGS3TOT		0.105***		0.167***								
		(0.032)		(0.052)								
S1CHG					0.427***		0.416***					
					(0.101)		(0.103)					
S3CHG						1.438***		1.461***				
						(0.231)		(0.235)				
S1INT									-0.006		-0.000	
									(0.006)		(0.006)	
S3INT										0.036		0.044*
										(0.022)		(0.022)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observations	170,784	170,952	169,147	169,315	170,808	170,952	169,171	169,315	170,952	170,952	169,315	169,315
R-squared	0.163	0.163	0.166	0.166	0.164	0.165	0.166	0.167	0.163	0.163	0.166	0.166

Panel B: OECD

Developed (OECD)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
LOGS1TOT	0.038		0.055***									
	(0.022)		(0.013)									
LOGS3TOT		0.124***		0.149***								
		(0.028)		(0.029)								
S1CHG					0.471***		0.495***					
					(0.088)		(0.091)					
S3CHG						1.185***		1.219***				
						(0.279)		(0.295)				
S1INT									-0.010		-0.001	
									(0.009)		(0.004)	
S3INT										0.033		0.005
										(0.021)		(0.020)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observations	524,888	525,512	517,058	517,682	524,984	525,512	517,154	517,682	525,512	525,512	517,682	517,682
R-squared	0.158	0.159	0.160	0.161	0.159	0.159	0.161	0.161	0.158	0.158	0.160	0.160

Developing (non-OECD)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
LOGS1TOT	0.011		0.085***									
	(0.024)		(0.023)									
LOGS3TOT		0.105*		0.223***								
		(0.049)		(0.069)								
S1CHG					0.509***		0.514***					
					(0.130)		(0.129)					
S3CHG						1.462***		1.455***				
						(0.286)		(0.284)				
S1INT									-0.008		-0.001	
									(0.005)		(0.004)	
S3INT										-0.005		0.030
										(0.019)		(0.017)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observations	221,754	221,778	219,793	219,817	221,754	221,778	219,793	219,817	221,778	221,778	219,817	219,817
R-squared	0.174	0.174	0.176	0.177	0.175	0.176	0.177	0.177	0.174	0.174	0.176	0.176

Table 11: Carbon Emissions and Stock Returns: Interaction Effects (Economic Development)

The sample period is 2005-2018. The dependent variable is *RET*. The main independent variables are carbon emission levels (Panel A), the percentage changes in emissions (Panel B), and carbon emission intensities (Panel C). *GDPPC* measures a country's GDP per capita in current dollars in a given year; *MANUFPERC* is the percentage of a country's GDP that is produced in a given year in manufacturing sector; *HEALTHEXPPC* is a country's health expenditures per capita in current dollars in a given year. All other variables are defined in Table 1 and Table 2. We report the results of the pooled regression with standard errors clustered at the firm and year level. All regression models include the controls of Table 7 (unreported for brevity), year-month fixed effects, and country fixed effects. In selected columns, we additionally include industry-fixed effects. ***1% significance; **5% significance; *10% significance.

Panel A: Levels

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
GDPPC	-0.000**	-0.000**	-0.000**	-0.000**								
	(0.000)	(0.000)	(0.000)	(0.000)								
MANUFPERC					0.139	0.156*	0.147*	0.164*				
					(0.084)	(0.086)	(0.084)	(0.086)				
HEALTHEXPPC									-0.000	-0.000	-0.000	-0.000
									(0.000)	(0.000)	(0.000)	(0.000)
LOGS1TOT	0.031		0.067***		0.033		0.077***		0.010		0.050***	
	(0.021)		(0.018)		(0.023)		(0.019)		(0.022)		(0.018)	
LOGS3TOT		0.122***		0.178***		0.143***		0.202***		0.082**		0.139***
		(0.032)		(0.034)		(0.032)		(0.033)		(0.032)		(0.034)
GDPPC*LOGS1TOT	-0.000		-0.000									
	(0.000)		(0.000)									
GDPPC*LOGS3TOT		-0.000		-0.000								
		(0.000)		(0.000)								
MANUFPERC*LOGS1TOT					-0.000		-0.001					
					(0.001)		(0.001)					
MANUFPERC*LOGS3TOT						-0.001		-0.002				
						(0.002)		(0.002)				
HEALTHEXPPC*LOGS1TOT									0.000		0.000	
									(0.000)		(0.000)	
HEALTHEXPPC*LOGS3TOT										0.000*		0.000
										(0.000)		(0.000)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observations	712,464	713,112	702,878	703,526	679,882	680,506	671,384	672,008	484,675	485,191	478,846	479,362
R-squared	0.150	0.150	0.152	0.152	0.152	0.152	0.153	0.153	0.175	0.175	0.177	0.177

Panel B: Percentage Changes

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
GDPPC	-0.000**	-0.000**	-0.000**	-0.000**								
	(0.000)	(0.000)	(0.000)	(0.000)								
MANUFPERC					0.125	0.111	0.129	0.116				
					(0.082)	(0.082)	(0.082)	(0.082)				
HEALTHEXPPC									-0.000	-0.000	-0.000	-0.000
									(0.000)	(0.000)	(0.000)	(0.000)
S1CHG	0.632***		0.647***		0.170		0.192*		0.765***		0.799***	
	(0.112)		(0.111)		(0.107)		(0.107)		(0.124)		(0.124)	
S3CHG		1.658***		1.681***		0.739***		0.792***		1.715***		1.780***
		(0.260)		(0.263)		(0.270)		(0.266)		(0.286)		(0.289)
GDPPC*S1CHG	-0.000		-0.000									
	(0.000)		(0.000)									
GDPPC*S3CHG		-0.000*		-0.000*								
		(0.000)		(0.000)								
MANUFPERC*S1CHG					0.021***		0.021***					
					(0.007)		(0.007)					
MANUFPERC * S3CHG						0.035**		0.033**				
						(0.015)		(0.015)				
HEALTHEXPPC*S1CHG									-0.000**		-0.000**	
									(0.000)		(0.000)	
HEALTHEXPPC*S3CHG										-0.000*		-0.000*
										(0.000)		(0.000)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observations	712,560	713,112	702,974	703,526	679,990	680,506	671,492	672,008	484,759	485,191	478,930	479,362
R-squared	0.150	0.151	0.152	0.152	0.152	0.152	0.153	0.154	0.175	0.176	0.177	0.177

Panel C: Emission Intensity

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
GDPPC	-0.000**	-0.000**	-0.000**	-0.000**	0.136*	0.137*	0.139*	0.142*	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.082)	(0.082)	(0.082)	(0.082)	(0.000)	(0.000)	(0.000)	(0.000)
MANUFPERC												
HEALTHEXPPC												
S1INT	-0.003		0.003		-0.013		-0.005		-0.007		0.004	
	(0.006)		(0.005)		(0.008)		(0.007)		(0.006)		(0.006)	
S3INT		0.015		0.011		0.032		0.038		0.030		0.029
		(0.020)		(0.023)		(0.029)		(0.026)		(0.022)		(0.026)
GDPPC*S1INT	-0.000		-0.000									
	(0.000)		(0.000)									
GDPPC*S3INT		0.000		0.000								
		(0.000)		(0.000)								
MANUFPERC*S1INT					0.000		0.000					
					(0.000)		(0.000)					
MANUFPERC*S3INT						-0.001		-0.001				
						(0.001)		(0.001)				
HEALTHEXPPC*S1INT									-0.000		-0.000	
									(0.000)		(0.000)	
HEALTHEXPPC*S3INT										-0.000		-0.000
										(0.000)		(0.000)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observations	713,112	713,112	703,526	703,526	680,506	680,506	672,008	672,008	485,191	485,191	479,362	479,362
R-squared	0.150	0.150	0.151	0.151	0.152	0.152	0.153	0.153	0.175	0.175	0.176	0.176

Table 12: Carbon Emissions and Stock Returns: Interaction Effects (Energy Dependence)

The sample period is 2005-2018. The dependent variable is *RET*. The main independent variables are carbon emission levels (Panel A), the percentage changes in emissions (Panel B), and carbon emission intensities (Panel C). *ELRENEW* measures a country's share of electricity generated by renewable power plants in total electricity generated by all types of plants in a given year; *ENINT* is the ratio between energy supply and gross domestic product measured at purchasing power parity in a given country. Energy intensity is an indication of how much energy is used to produce one unit of economic output in a given year; *ENUSEPC* is a country's energy consumption (in kg of oil equivalent per capita) in a given year. All other variables are defined in Table 1 and Table 2. We report the results of the pooled regression with standard errors clustered at the firm and year level. All regression models include the controls of Table 7 (unreported for brevity), year-month fixed effects, and country fixed effects. In selected columns, we additionally include industry-fixed effects. ***1% significance; **5% significance; *10% significance.

Panel A: Levels

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
ELRENEW	0.080*	0.027	0.083**	0.024								
	(0.041)	(0.050)	(0.042)	(0.050)								
ENINT					-0.093	0.008	-0.111	0.037				
					(0.608)	(0.613)	(0.608)	(0.614)				
ENUSEPC									-0.001**	-0.001***	-0.001***	-0.001**
									(0.001)	(0.001)	(0.001)	(0.001)
LOGS1TOT	0.008		0.064***		0.031		0.072***		-0.006		0.039*	
	(0.024)		(0.020)		(0.028)		(0.028)		(0.024)		(0.022)	
LOGS3TOT		0.080**		0.140***		0.164***		0.230***		0.082**		0.155***
		(0.031)		(0.035)		(0.053)		(0.054)		(0.040)		(0.042)
ELRENEW*LOGS1TOT	0.000		-0.000									
	(0.002)		(0.002)									
ELRENEW*LOGS3TOT		0.005*		0.005*								
		(0.003)		(0.003)								
ENINT*LOGS1TOT					-0.004		-0.002					
					(0.006)		(0.005)					
ENINT*LOGS3TOT						-0.012		-0.013				
						(0.008)		(0.008)				
ENUSEPC*LOGS1TOT									0.000		0.000	
									(0.000)		(0.000)	
ENUSEPC*LOGS3TOT										0.000		0.000
										(0.000)		(0.000)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observations	438,528	439,008	433,331	433,811	438,570	439,050	433,373	433,853	423,376	423,856	418,311	418,791
R-squared	0.185	0.185	0.187	0.187	0.185	0.185	0.187	0.187	0.190	0.190	0.192	0.192

Panel B: Percentage Changes

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
ELRENEW	0.081**	0.081**	0.083**	0.082**								
	(0.033)	(0.033)	(0.034)	(0.034)								
ENINT					-0.199	-0.239	-0.192	-0.234				
					(0.603)	(0.601)	(0.602)	(0.600)				
ENUSEPC									-0.001**	-0.001**	-0.001**	-0.001**
									(0.001)	(0.001)	(0.001)	(0.001)
S1CHG	0.704***		0.752***		0.135		0.148		0.380**		0.381**	
	(0.105)		(0.105)		(0.208)		(0.209)		(0.160)		(0.158)	
S3CHG		1.408***		1.504***		0.362		0.411		0.955**		0.991**
		(0.279)		(0.276)		(0.410)		(0.405)		(0.385)		(0.385)
ELRENEW*S1CHG	-0.022**		-0.025**									
	(0.011)		(0.011)									
ELRENEW*S3CHG		-0.002		-0.007								
		(0.027)		(0.027)								
ENINT*S1CHG					0.087**		0.091**					
					(0.042)		(0.042)					
ENINT*S3CHG						0.197**		0.201**				
						(0.080)		(0.080)				
ENUSEPC*S1CHG									0.000		0.000	
									(0.000)		(0.000)	
ENUSEPC*S3CHG										0.000		0.000
										(0.000)		(0.000)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observations	438,624	439,008	433,427	433,811	438,666	439,050	433,469	433,853	423,472	423,856	418,407	418,791
R-squared	0.186	0.186	0.188	0.188	0.185	0.186	0.187	0.188	0.190	0.190	0.192	0.192

Panel C: Emission Intensity

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
ELRENEW	0.084**	0.084**	0.085**	0.085**								
	(0.034)	(0.034)	(0.034)	(0.035)								
ENINT					-0.153	-0.148	-0.149	-0.144				
					(0.606)	(0.606)	(0.606)	(0.606)				
ENUSEPC									-0.001**	-0.001**	-0.001**	-0.001**
									(0.001)	(0.001)	(0.001)	(0.001)
S1INT	0.002		0.016**		-0.022**		-0.007		-0.007		0.006	
	(0.007)		(0.007)		(0.010)		(0.010)		(0.007)		(0.007)	
S3INT		0.015		0.022		0.004		0.001		0.020		0.020
		(0.026)		(0.026)		(0.039)		(0.040)		(0.026)		(0.030)
ELRENEW*S1INT	-0.003***		-0.003***									
	(0.001)		(0.001)									
ELRENEW*S3INT		-0.002		-0.002								
		(0.003)		(0.003)								
ENINT*S1INT					0.002		0.002					
					(0.002)		(0.002)					
ENINT*S3INT						0.000		0.002				
						(0.008)		(0.008)				
ENUSEPC*S1INT									-0.000		-0.000	
									(0.000)		(0.000)	
ENUSEPC*S3INT										-0.000		-0.000
										(0.000)		(0.000)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
R-squared	0.185	0.185	0.187	0.187	0.185	0.185	0.187	0.187	0.190	0.190	0.192	0.192

Table 13: Carbon Emissions and Stock Returns: Interaction Effects (Social Development)

The sample period is 2005-2018. The dependent variable is *RET*. The main independent variables are carbon emission levels (Panel A), the percentage changes in emissions (Panel B), and carbon emission intensities (Panel C). *RULELAW* measures a country's perceptions in a given year of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution; *VOICE* captures perceptions in a given year of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution; *GINI* is a country's GINI index in percentage terms in a given year. All other variables are defined in Table 1 and Table 2. We report the results of the pooled regression with standard errors clustered at the firm and year level. All regression models include the controls of Table 7 (unreported for brevity), year-month fixed effects, and country fixed effects. In selected columns, we additionally include industry-fixed effects. ***1% significance; **5% significance; *10% significance.

Panel A: Levels

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
RULELAW	-0.679	-0.725	-0.661	-0.710								
	(0.752)	(0.767)	(0.756)	(0.777)								
VOICE					-0.734	-0.712	-0.755	-0.733				
					(0.808)	(0.826)	(0.805)	(0.832)				
GINI									-0.067	-0.073	-0.069	-0.080
									(0.120)	(0.120)	(0.120)	(0.120)
LOGS1TOT	0.027		0.064***		0.033*		0.071***		0.018		0.021	
	(0.017)		(0.014)		(0.017)		(0.014)		(0.082)		(0.082)	
LOGS3TOT		0.113***		0.170***		0.125***		0.182***		0.081		0.080
		(0.026)		(0.029)		(0.025)		(0.028)		(0.115)		(0.116)
RULELAW*LOGS1TOT	0.002		0.002									
	(0.009)		(0.009)									
RULELAW*LOGS3TOT		0.004		0.003								
		(0.015)		(0.015)								
VOICE*LOGS1TOT					-0.005		-0.006					
					(0.011)		(0.011)					
VOICE*LOGS3TOT						-0.009		-0.009				
						(0.018)		(0.017)				
GINI*LOGS1TOT									0.000		0.001	
									(0.002)		(0.002)	
GINI*LOGS3TOT										0.001		0.002
										(0.003)		(0.003)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observations	746,432	747,080	736,641	737,289	746,432	747,080	736,641	737,289	238,079	238,271	235,058	235,250
R-squared	0.150	0.150	0.151	0.151	0.150	0.150	0.151	0.151	0.195	0.195	0.198	0.198

Panel B: Percentage Changes

DEP. VAR.: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
RULELAW	-0.656	-0.629	-0.639	-0.610								
	(0.737)	(0.739)	(0.738)	(0.739)								
VOICE					-0.738	-0.744	-0.771	-0.771				
					(0.807)	(0.812)	(0.807)	(0.813)				
GINI									-0.069	-0.085	-0.061	-0.078
									(0.123)	(0.123)	(0.123)	(0.123)
S1CHG	0.653***		0.669***		0.593***		0.606***		-0.296		-0.237	
	(0.095)		(0.095)		(0.073)		(0.073)		(0.387)		(0.391)	
S3CHG		1.684***		1.700***		1.485***		1.499***		-0.895		-0.684
		(0.225)		(0.226)		(0.176)		(0.177)		(1.028)		(1.023)
RULELAW*S1CHG	-0.137**		-0.138**									
	(0.062)		(0.062)									
RULELAW*S3CHG		-0.319**		-0.315**								
		(0.152)		(0.151)								
VOICE * S1CHG					-0.139**		-0.136**					
					(0.054)		(0.054)					
VOICE * S3CHG						-0.232*		-0.221*				
						(0.130)		(0.130)				
GINI * S1CHG									0.022**		0.021*	
									(0.011)		(0.011)	
GINI * S3CHG										0.060**		0.056**
										(0.027)		(0.027)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observations	746,528	747,080	736,737	737,289	746,528	747,080	736,737	737,289	238,127	238,271	235,106	235,250
R-squared	0.150	0.151	0.152	0.152	0.150	0.151	0.152	0.152	0.195	0.196	0.198	0.198

Panel C: Emission Intensity

DEP. VAR.: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
RULELAW	-0.649	-0.666	-0.630	-0.649								
	(0.738)	(0.739)	(0.739)	(0.740)								
VOICE					-0.761	-0.800	-0.787	-0.826				
					(0.807)	(0.814)	(0.807)	(0.814)				
GINI									-0.061	-0.062	-0.053	-0.057
									(0.123)	(0.123)	(0.123)	(0.123)
S1INT	-0.004		0.002		-0.006		0.001		0.005		0.019	
	(0.005)		(0.005)		(0.005)		(0.004)		(0.032)		(0.033)	
S3INT		0.013		0.008		0.014		0.009		0.034		-0.031
		(0.017)		(0.020)		(0.015)		(0.018)		(0.096)		(0.095)
RULELAW*S1INT	-0.004		-0.003									
	(0.004)		(0.003)									
RULELAW*S3INT		0.005		0.004								
		(0.012)		(0.012)								
VOICE*S1INT					-0.004		-0.004					
					(0.003)		(0.003)					
VOICE * S3INT						0.008		0.006				
						(0.013)		(0.013)				
GINI * S1INT									-0.000		-0.000	
									(0.001)		(0.001)	
GINI * S3INT										-0.000		0.001
										(0.002)		(0.002)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observations	747,080	747,080	737,289	737,289	747,080	747,080	737,289	737,289	238,271	238,271	235,250	235,250
R-squared	0.150	0.150	0.151	0.151	0.150	0.150	0.151	0.151	0.195	0.195	0.198	0.198

Table 14: Carbon Emissions and Stock Returns: Climate Risk Index

The sample period is 2005-2018. The dependent variable is *RET*. The main independent variables are carbon emission levels (columns 1-4), the percentage changes in emissions (columns 5-8), and carbon emission intensities (columns 9-12). All variables are defined in Table 1 and Table 2. We report the results of the pooled regression with standard errors clustered at the firm and year level. All countries are sorted in each year into high risk (above median) and low risk (below median) category based on their annual values of Climate Risk Index (CRI). CRI measures to what extent countries and regions have been affected by impacts of weather-related loss events (storms, floods, heatwaves etc.). All regression models include the controls of Table 7 (unreported for brevity), year-month fixed effects, and country fixed effects. In selected columns, we additionally include industry-fixed effects. ***1% significance; **5% significance; *10% significance.

High Risk	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
DEP. VARIABLE: RET												
LOGS1TOT	0.024		0.073***									
	(0.024)		(0.017)									
LOGS3TOT		0.109***		0.175***								
		(0.030)		(0.033)								
S1CHG					0.581***		0.605***					
					(0.098)		(0.099)					
S3CHG						1.446***		1.486***				
						(0.290)		(0.293)				
S1INT									-0.006		0.002	
									(0.009)		(0.004)	
S3INT										0.021		0.038*
										(0.024)		(0.019)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observations	312,844	313,060	308,506	308,722	312,892	313,060	308,554	308,722	313,060	313,060	308,722	308,722
R-squared	0.176	0.176	0.178	0.178	0.176	0.177	0.178	0.179	0.176	0.176	0.178	0.178

Low Risk	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
LOGS1TOT	0.035		0.065***									
	(0.022)		(0.021)									
LOGS3TOT		0.127***		0.178***								
		(0.036)		(0.051)								
S1CHG					0.447***		0.460***					
					(0.090)		(0.093)					
S3CHG						1.285***		1.301***				
						(0.295)		(0.303)				
S1INT									-0.009		-0.004	
									(0.006)		(0.005)	
S3INT										0.020		0.001
										(0.021)		(0.019)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observations	433,798	434,230	428,345	428,777	433,846	434,230	428,393	428,777	434,230	434,230	428,777	428,777
R-squared	0.143	0.144	0.145	0.146	0.144	0.144	0.146	0.146	0.143	0.143	0.145	0.145

Table 15: Carbon Emissions and Stock Returns: Pre/Post

The dependent variable is *RET*. The main independent variables are carbon emission levels (columns 1-4), the percentage changes in emissions (columns 5-8), and carbon emission intensities (columns 9-12). All variables are defined in Table 1 and Table 2. We report the results of the pooled regression with standard errors clustered at the firm and year level. Panel A reports the results for a sample covering the period January 2014-November 2015 (two years before Paris COP 21 conference). Panel B reports the results for a sample covering the period January 2016-December 2017 (two years after Paris COP 21 conference). All regression models include the controls of Table 7 (unreported for brevity), year-month fixed effects, and country fixed effects. In selected columns, we additionally include industry-fixed effects. ***1% significance; **5% significance; *10% significance.

Panel A: Pre Paris

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
LOGS1TOT	-0.032		0.019									
	(0.023)		(0.018)									
LOGS3TOT		0.007		0.096*								
		(0.038)		(0.050)								
S1CHG					0.731***		0.722***					
					(0.119)		(0.119)					
S3CHG						1.924***		1.891***				
						(0.338)		(0.345)				
S1INT									-0.019*		-0.014	
									(0.009)		(0.009)	
S3INT										-0.062***		-0.001
										(0.021)		(0.028)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observations	109,394	109,578	108,143	108,327	109,394	109,578	108,143	108,327	109,578	109,578	108,327	108,327
R-squared	0.090	0.090	0.098	0.098	0.091	0.092	0.099	0.100	0.090	0.090	0.098	0.098

Panel B: Post Paris

DEP. VAR.: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
LOGS1TOT	0.095***		0.096***									
	(0.031)		(0.025)									
LOGS3TOT		0.209***		0.265***								
		(0.043)		(0.043)								
S1CHG					0.527***		0.509***					
					(0.100)		(0.105)					
S3CHG						1.611***		1.584***				
						(0.237)		(0.247)				
S1INT									-0.002		-0.012	
									(0.010)		(0.008)	
S3INT										0.058*		0.028
										(0.028)		(0.032)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observations	192,678	192,810	190,047	190,179	192,678	192,810	190,047	190,179	192,810	192,810	190,179	190,179
R-squared	0.048	0.049	0.053	0.053	0.048	0.049	0.053	0.054	0.048	0.048	0.053	0.053

Table 16: Carbon Emissions and Stock Returns: Pre/Post (Excluding Salient Industries)

The sample excludes companies in the oil & gas (gic=2), utilities (gic=65-69), and motor (gic=18, 19, 23) industries. The dependent variable is *RET*. The main independent variables are carbon emission levels (columns 1-4), the percentage changes in emissions (columns 5-8), and carbon emission intensities (columns 9-12). All variables are defined in Table 1 and Table 2. We report the results of the pooled regression with standard errors clustered at the firm and year level. Panel A reports the results for a sample covering the period January 2014-November 2015 (two years before Paris COP 21 conference). Panel B reports the results for a sample covering the period January 2016-December 2017 (two years after Paris COP 21 conference). All regression models include the controls of Table 7 (unreported for brevity), year-month fixed effects, and country fixed effects. In selected columns, we additionally include industry-fixed effects. ***1% significance; **5% significance; *10% significance.

Panel A: Pre Paris

DEP. VAR.: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
LOGS1TOT	-0.045*		0.005									
	(0.026)		(0.022)									
LOGS3TOT		-0.047		0.052								
		(0.044)		(0.057)								
S1CHG					0.741***		0.746***					
					(0.120)		(0.114)					
S3CHG						2.131***		2.182***				
						(0.275)		(0.276)				
S1INT									-0.036***		-0.031***	
									(0.007)		(0.008)	
S3INT										-0.090***		-0.049*
										(0.025)		(0.026)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	96,826	97,010	95,597	95,781	96,826	97,010	95,597	95,781	97,010	97,010	95,781	95,781
R-squared	0.088	0.088	0.096	0.096	0.089	0.090	0.096	0.097	0.088	0.088	0.096	0.096

Panel B: Post Paris

DEP. VAR.: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
LOGS1TOT	0.129***		0.122***									
	(0.037)		(0.031)									
LOGS3TOT		0.207***		0.272***								
		(0.045)		(0.049)								
S1CHG					0.559***		0.533***					
					(0.114)		(0.108)					
S3CHG						1.824***		1.787***				
						(0.255)		(0.249)				
S1INT									0.023		0.004	
									(0.015)		(0.013)	
S3INT										0.061*		0.042
										(0.033)		(0.043)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	175,629	175,761	173,034	173,166	175,629	175,761	173,034	173,166	175,761	175,761	173,166	173,166
R-squared	0.049	0.049	0.054	0.054	0.048	0.050	0.054	0.055	0.048	0.048	0.053	0.053

Table 17: Carbon Total Firm Emissions and Stock Returns: Regional (Pre/Post)

Our sample firms include alternately North America, North America (ex U.S.), Europe, the European Union, Asia, Asia (ex. China), and Others (Africa, Australia, and South America). The dependent variable is *RET*. The main independent variable is carbon emission level. All variables are defined in Table 1 and Table 2. We report the results of the pooled regression with standard errors clustered at the firm and year level. Panel A reports the results for a sample covering the period January 2014-November 2015 (two years before Paris COP 21 conference). Panel B reports the results for a sample covering the period January 2016-December 2017 (two years after Paris COP 21 conference). All regression models include the controls of Table 7 (unreported for brevity), year-month fixed effects, and country fixed effects. In selected columns, we additionally include industry-fixed effects. ***1% significance; **5% significance; *10% significance.

Panel A: Pre Paris

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	North America				North America (excl. USA)			
LOGS1TOT	-0.014		0.008		-0.038		-0.055	
	(0.049)		(0.040)		(0.065)		(0.094)	
LOGS3TOT		-0.004		0.040		0.163*		0.087
		(0.088)		(0.094)		(0.080)		(0.217)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
Observations	26,898	26,955	26,551	26,608	5,357	5,380	5,345	5,368
R-squared	0.150	0.150	0.166	0.165	0.161	0.162	0.184	0.185

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Europe				EU			
LOGS1TOT	0.018		0.068*		0.020		0.106***	
	(0.033)		(0.037)		(0.034)		(0.036)	
LOGS3TOT		0.082		0.215**		0.108		0.281***
		(0.067)		(0.080)		(0.077)		(0.087)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
Observations	27,815	27,850	27,349	27,384	23,588	23,612	23,145	23,169
R-squared	0.117	0.117	0.132	0.133	0.127	0.127	0.146	0.146

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Asia				Asia (excl. China)			
LOGS1TOT	-0.058*		-0.044		-0.045		-0.042	
	(0.029)		(0.038)		(0.032)		(0.036)	
LOGS3TOT		-0.026		0.069		0.040		0.121
		(0.057)		(0.084)		(0.072)		(0.080)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
Observations	42,151	42,208	41,828	41,885	33,588	33,645	33,288	33,345
R-squared	0.116	0.116	0.124	0.124	0.093	0.093	0.104	0.104

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)
	Others			
LOGS1TOT	-0.100		0.168*	
	(0.065)		(0.098)	
LOGS3TOT		-0.054		0.230*
		(0.090)		(0.122)
Controls	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes
Observations	12,231	12,266	12,115	12,150
R-squared	0.086	0.085	0.112	0.112

Panel B: Post Paris

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	North America				North America (excl. USA)			
LOGS1TOT	0.038		0.069		-0.053		0.071	
	(0.042)		(0.051)		(0.072)		(0.113)	
LOGS3TOT		0.115		0.091		0.028		0.095
		(0.076)		(0.092)		(0.098)		(0.185)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
Observations	47,539	47,575	46,918	46,954	7,625	7,649	7,535	7,559
R-squared	0.065	0.066	0.075	0.075	0.068	0.069	0.087	0.088

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Europe				EU			
LOGS1TOT	0.052		0.049		0.074*		0.065	
	(0.038)		(0.036)		(0.043)		(0.044)	
LOGS3TOT		0.201***		0.265***		0.223***		0.317***
		(0.061)		(0.087)		(0.066)		(0.087)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
Observations	36,155	36,191	35,567	35,603	29,779	29,779	29,247	29,247
R-squared	0.087	0.088	0.102	0.102	0.096	0.097	0.112	0.113

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Asia				Asia (excl. China)			
LOGS1TOT	0.108**		0.127***		0.105**		0.106**	
	(0.041)		(0.043)		(0.040)		(0.043)	
LOGS3TOT		0.235***		0.331***		0.187***		0.256***
		(0.061)		(0.061)		(0.062)		(0.064)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
Observations	92,619	92,643	91,408	91,432	71,817	71,841	70,728	70,752
R-squared	0.062	0.062	0.068	0.069	0.048	0.048	0.056	0.056

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)
	Others			
LOGS1TOT	0.081		0.095	
	(0.056)		(0.077)	
LOGS3TOT		0.142		0.219
		(0.116)		(0.146)
Controls	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes
Observations	16,029	16,065	15,818	15,854
R-squared	0.056	0.057	0.077	0.077

Table 18: Carbon Total Firm Emissions and Stock Returns: Economic Development (Pre/Post)

The dependent variable is *RET*. The main independent variable is carbon emission level. All variables are defined in Table 1 and Table 2. We report the results of the pooled regression with standard errors clustered at the firm and year level. Columns (1)-(4) consider a sample of firms located in developed (G-20) countries, columns (5)-(8) consider a sample from developing (non-G20) countries. Panel A reports the results for a sample covering the period January 2014-November 2015 (two years before Paris COP 21 conference). Panel B reports the results for a sample covering the period January 2016-December 2017 (two years after Paris COP 21 conference). All regression models include the controls of Table 7 (unreported for brevity), year-month fixed effects, and country fixed effects. In selected columns, we additionally include industry-fixed effects. ***1% significance; **5% significance; *10% significance.

Panel A: Pre Paris

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Developed Countries (G-20)				Developing Countries			
LOGS1TOT	-0.046		0.012		0.009		-0.000	
	(0.029)		(0.024)		(0.033)		(0.033)	
LOGS3TOT		-0.010		0.088*		0.066		0.086
		(0.041)		(0.051)		(0.053)		(0.092)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
Observations	83,578	83,727	82,556	82,705	25,816	25,851	25,587	25,622
R-squared	0.095	0.095	0.104	0.104	0.091	0.091	0.103	0.103

Panel B: Post Paris

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Developed Countries (G-20)				Developing Countries			
LOGS1TOT	0.112***		0.100***		0.055*		0.090**	
	(0.034)		(0.025)		(0.030)		(0.037)	
LOGS3TOT		0.221***		0.259***		0.187***		0.289***
		(0.046)		(0.047)		(0.055)		(0.071)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes
Observations	148,067	148,151	145,875	145,959	44,611	44,659	44,171	44,219
R-squared	0.051	0.051	0.056	0.057	0.050	0.051	0.062	0.063

Table 19: Carbon Emissions and Institutional Ownership: U.S. and China

The sample period is 2005-2018. The dependent variable is *IO*. The main independent variables are carbon emission intensities (Panel A), carbon emission levels (Panel B), and the percentage changes in emissions (Panel C). All variables are defined in Table 1 and Table 2. We report the results of the pooled regression with standard errors clustered at the firm and year level. All regressions include year-month fixed effects, country fixed effects, and industry-fixed effects. Columns (1)-(3) provide the results for firms from the U.S., columns (4)-(6) provide the results for firms from China. ***1% significance; **5% significance; *10% significance.

Panel A: Emission Intensity

DEP. VAR.: IO	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	U.S.						China					
S1INT	-0.219***	0.107					-0.094**	-0.000				
	(0.057)	(0.082)					(0.037)	(0.037)				
S2INT			-1.437	-1.859					-0.298	1.676		
			(1.283)	(1.270)					(0.715)	(1.120)		
S3INT					-0.193	-0.474					-0.150	0.076
					(0.500)	(0.386)					(0.323)	(0.162)
LOGSIZE	0.440	0.637	0.453	0.701	0.419	0.648	-1.511	-1.176*	-1.517	-1.144*	-1.511	-1.176*
	(1.332)	(1.212)	(1.298)	(1.221)	(1.302)	(1.211)	(1.096)	(0.622)	(1.103)	(0.608)	(1.110)	(0.620)
PRINV	-47.35***	-42.16***	-47.18***	-41.92***	-47.34***	-42.18***	-5.49***	-4.88***	-5.48***	-4.97***	-5.50***	-4.88***
	(4.645)	(4.431)	(4.541)	(4.307)	(4.637)	(4.427)	(1.595)	(1.112)	(1.616)	(1.139)	(1.624)	(1.107)
MOM	-0.885	0.399	-1.010	0.398	-0.983	0.435	4.756**	3.923**	4.751**	3.857**	4.747**	3.922**
	(1.236)	(0.940)	(1.207)	(0.929)	(1.232)	(0.940)	(1.942)	(1.637)	(1.964)	(1.645)	(1.958)	(1.642)
B/M	-0.329	3.204**	-0.950	3.287**	-0.939	3.294**	-0.508	1.014	-0.785	0.930	-0.781	1.004
	(1.002)	(1.363)	(1.055)	(1.353)	(1.044)	(1.356)	(0.776)	(0.861)	(0.813)	(0.850)	(0.802)	(0.862)
VOLAT	26.94	-6.88	31.22*	-6.11	29.25	-7.18	-15.76**	-13.45**	-15.32**	-14.07***	-15.69**	-13.48**
	(17.915)	(12.095)	(17.289)	(12.026)	(17.874)	(12.086)	(6.385)	(4.533)	(6.191)	(4.298)	(6.487)	(4.542)
VOLUME	-0.019***	-0.017***	-0.018**	-0.017***	-0.018***	-0.017***	-0.005**	-0.001	-0.005**	-0.001	-0.005**	-0.001
	(0.006)	(0.004)	(0.006)	(0.004)	(0.006)	(0.004)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
MSCI	3.096**	3.065**	3.038**	3.078**	2.999**	3.030**	12.200**	11.117**	12.144**	10.974**	12.134**	11.111**
	(1.339)	(1.145)	(1.344)	(1.147)	(1.320)	(1.138)	(4.042)	(4.354)	(4.064)	(4.413)	(4.051)	(4.378)
Constant	75.871***	74.361***	75.671***	74.525***	76.015***	75.274***	33.319*	26.749**	33.373*	25.715**	33.526*	26.600**
	(11.666)	(10.167)	(11.428)	(10.110)	(12.035)	(10.408)	(16.706)	(10.043)	(16.817)	(9.553)	(17.335)	(10.207)
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	132,865	132,865	132,865	132,865	132,865	132,865	58,813	58,813	58,813	58,813	58,813	58,813
R-squared	0.090	0.268	0.086	0.268	0.085	0.268	0.176	0.341	0.174	0.343	0.174	0.341

Panel B: Levels

DEP. VAR.: IO	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	U.S.						China					
LOGS1TOT	0.426	1.078*					0.010	0.724***				
	(0.463)	(0.515)					(0.178)	(0.236)				
LOGS2TOT			1.598**	1.297*					0.580**	1.588***		
			(0.633)	(0.636)					(0.226)	(0.501)		
LOGS3TOT					1.473*	2.042**					0.853**	1.891***
					(0.744)	(0.902)					(0.335)	(0.574)
LOGSIZE	0.049	-0.209	-1.001	-0.518	-0.876	-1.107*	-1.510	-1.588**	-1.761	-2.025**	-1.988*	-2.316***
	(0.988)	(0.910)	(0.895)	(0.762)	(0.794)	(0.588)	(1.052)	(0.662)	(1.103)	(0.722)	(1.048)	(0.698)
PRINV	-47.29***	-42.08***	-47.61***	-42.61***	-47.25***	-42.36***	-5.48***	-4.72***	-5.34***	-4.70***	-5.34***	-4.64***
	(4.695)	(4.340)	(4.674)	(4.447)	(4.659)	(4.287)	(1.636)	(1.112)	(1.606)	(1.162)	(1.669)	(1.140)
MOM	-0.875	0.524	-0.319	0.662	-0.603	0.735	4.740**	3.910**	4.635**	3.780**	4.589**	3.752**
	(1.111)	(0.924)	(0.995)	(0.882)	(1.059)	(0.869)	(1.949)	(1.660)	(1.899)	(1.565)	(1.875)	(1.549)
B/M	-1.356	2.224	-1.366	2.136	-1.890*	1.481	-0.831	0.318	-1.409	-0.305	-1.707*	-0.684
	(1.032)	(1.464)	(1.068)	(1.418)	(1.053)	(1.573)	(0.785)	(0.898)	(0.822)	(0.895)	(0.831)	(0.936)
VOLAT	28.987	-5.556	22.120	-7.356	29.889*	-4.913	-15.690**	-12.382**	-16.294**	-12.410**	-14.420*	-10.895**
	(16.913)	(11.778)	(13.545)	(11.577)	(15.762)	(11.727)	(6.599)	(4.380)	(6.686)	(4.345)	(6.802)	(4.449)
VOLUME	-0.017***	-0.017***	-0.019**	-0.018***	-0.018**	-0.019***	-0.005**	-0.001	-0.006**	-0.002	-0.006**	-0.002
	(0.006)	(0.005)	(0.006)	(0.005)	(0.006)	(0.006)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
MSCI	2.939*	3.003**	2.733*	2.841**	2.942*	2.924**	12.125**	10.606**	11.678**	9.891**	11.533**	9.901**
	(1.368)	(1.201)	(1.378)	(1.263)	(1.386)	(1.293)	(4.025)	(4.323)	(3.991)	(4.113)	(3.932)	(4.005)
Constant	74.377***	70.441***	71.474***	71.153***	68.349***	64.299***	33.115*	24.730**	31.002*	22.370*	29.643	19.670
	(12.464)	(12.080)	(12.414)	(12.071)	(14.559)	(14.940)	(17.212)	(10.157)	(17.188)	(10.532)	(17.904)	(11.336)
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	132,793	132,793	132,745	132,745	132,865	132,865	58,813	58,813	58,813	58,813	58,813	58,813
R-squared	0.088	0.272	0.104	0.272	0.098	0.275	0.174	0.346	0.178	0.355	0.181	0.357

Panel C: Percentage Changes

DEP. VARIABLE: IO	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	U.S.						China					
S1CHG	-0.325	-0.276					1.184*	0.690				
	(0.613)	(0.554)					(0.625)	(0.500)				
S2CHG			-1.514***	-0.877*					1.336*	0.688		
			(0.469)	(0.482)					(0.691)	(0.481)		
S3CHG					0.022	-0.016					3.790**	2.710***
					(1.038)	(1.017)					(1.538)	(0.634)
LOGSIZE	0.415	0.639	0.463	0.668	0.410	0.636	-1.519	-1.186*	-1.541	-1.194*	-1.570	-1.223*
	(1.310)	(1.213)	(1.303)	(1.209)	(1.313)	(1.213)	(1.098)	(0.621)	(1.106)	(0.625)	(1.093)	(0.615)
PRINV	-47.34***	-42.18***	-47.23***	-42.12***	-47.34***	-42.18***	-5.49***	-4.88***	-5.61***	-4.94***	-5.52***	-4.90***
	(4.643)	(4.425)	(4.635)	(4.398)	(4.654)	(4.449)	(1.606)	(1.107)	(1.646)	(1.116)	(1.603)	(1.088)
MOM	-0.965	0.432	-0.828	0.498	-0.991	0.411	4.585**	3.836**	4.535**	3.822**	4.279**	3.613**
	(1.242)	(0.940)	(1.215)	(0.916)	(1.190)	(0.939)	(1.959)	(1.676)	(1.972)	(1.678)	(1.896)	(1.613)
B/M	-0.970	3.211**	-0.973	3.196**	-0.933	3.238**	-0.724	1.065	-0.792	1.018	-0.554	1.211
	(1.044)	(1.368)	(1.004)	(1.382)	(1.045)	(1.391)	(0.838)	(0.874)	(0.812)	(0.864)	(0.822)	(0.876)
VOLAT	29.576	-6.873	29.928	-6.593	29.304	-7.061	-16.010**	-13.566**	-16.416**	-13.798**	-16.821**	-13.999**
	(17.654)	(12.030)	(17.547)	(11.945)	(17.696)	(12.060)	(6.502)	(4.547)	(6.486)	(4.533)	(6.556)	(4.600)
VOLUME	-0.018**	-0.017***	-0.018**	-0.017***	-0.018**	-0.017***	-0.005**	-0.001	-0.005**	-0.001	-0.005**	-0.001
	(0.006)	(0.004)	(0.006)	(0.004)	(0.006)	(0.004)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
MSCI	3.016**	3.067**	2.895*	2.990**	3.018**	3.069**	12.192**	11.154**	12.128**	11.117**	12.219**	11.182**
	(1.329)	(1.146)	(1.344)	(1.158)	(1.335)	(1.146)	(4.065)	(4.375)	(4.060)	(4.391)	(4.081)	(4.403)
Constant	75.710***	74.574***	75.488***	74.449***	75.734***	74.586***	33.122*	26.749**	33.390*	26.869**	33.380*	26.885**
	(11.413)	(10.194)	(11.350)	(10.148)	(11.409)	(10.207)	(16.666)	(9.881)	(16.732)	(9.951)	(16.575)	(9.819)
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	132,817	132,817	132,733	132,733	132,865	132,865	58,813	58,813	58,813	58,813	58,813	58,813
R-squared	0.085	0.267	0.086	0.267	0.085	0.267	0.175	0.341	0.176	0.341	0.178	0.343

Table 20: Carbon Emissions and Institutional Ownership: Full Sample

The sample period is 2005-2018. The dependent variable is *IO*. The main independent variables are carbon emission intensities (Panel A), carbon emission levels (Panel B), and the percentage changes in emissions (Panel C). All variables are defined in Table 1 and Table 2. We report the results of the pooled regression with standard errors clustered at the firm and year level. All regressions include year-month fixed effects and country fixed effects. In addition, even-numbered columns include industry-fixed effects. ***1% significance; **5% significance; *10% significance.

Panel A: Emission Intensity

DEP. VARIABLE: IO	(1)	(2)	(3)	(4)	(5)	(6)
S1INT	-0.138***	-0.055**				
	(0.025)	(0.021)				
S2INT			0.007	-0.289		
			(0.390)	(0.287)		
S3INT					-0.159	-0.254*
					(0.132)	(0.118)
LOGSIZE	1.931**	2.215**	1.902*	2.216**	1.902*	2.217**
	(0.880)	(0.829)	(0.887)	(0.829)	(0.887)	(0.828)
PRINV	-2.158***	-2.220***	-2.167***	-2.212***	-2.179***	-2.225***
	(0.319)	(0.319)	(0.315)	(0.320)	(0.328)	(0.321)
MOM	0.359	0.549**	0.328	0.545*	0.347	0.555**
	(0.263)	(0.251)	(0.269)	(0.252)	(0.275)	(0.250)
B/M	-0.455	0.719	-0.725	0.699	-0.693	0.715
	(1.076)	(1.002)	(1.097)	(1.006)	(1.097)	(0.995)
VOLAT	3.747	-4.366	3.789	-4.332	3.759	-4.409
	(6.195)	(5.634)	(6.189)	(5.637)	(6.292)	(5.643)
VOLUME	-0.005***	-0.004**	-0.005***	-0.004**	-0.005***	-0.004**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
MSCI	3.644***	3.569***	3.609***	3.563***	3.605***	3.558***
	(0.923)	(0.935)	(0.925)	(0.937)	(0.928)	(0.939)
Constant	8.418	4.972	8.594	4.956	8.886	5.308
	(11.359)	(10.849)	(11.437)	(10.841)	(11.518)	(10.987)
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes
Observations	688,521	688,521	688,521	688,521	688,521	688,521
R-squared	0.740	0.755	0.739	0.755	0.739	0.755

Panel B: Levels

DEP. VARIABLE: IO	(1)	(2)	(3)	(4)	(5)	(6)
LOGS1TOT	-0.002	0.083				
	(0.155)	(0.156)				
LOGS2TOT			0.513**	0.462**		
			(0.203)	(0.204)		
LOGS3TOT					0.452*	0.661*
					(0.244)	(0.322)
LOGSIZE	1.898**	2.143**	1.522	1.845**	1.552*	1.676**
	(0.857)	(0.776)	(0.883)	(0.782)	(0.826)	(0.709)
PRINV	-2.167***	-2.217***	-2.175***	-2.236***	-2.149***	-2.223***
	(0.317)	(0.320)	(0.311)	(0.317)	(0.319)	(0.321)
MOM	0.332	0.552**	0.374	0.585**	0.355	0.606**
	(0.267)	(0.253)	(0.260)	(0.253)	(0.261)	(0.257)
B/M	-0.725	0.600	-1.071	0.301	-1.068	0.151
	(1.093)	(0.954)	(1.091)	(0.985)	(1.051)	(0.924)
VOLAT	3.764	-4.356	3.062	-4.243	4.071	-3.881
	(6.273)	(5.656)	(6.010)	(5.597)	(6.148)	(5.661)
VOLUME	-0.005***	-0.004**	-0.005***	-0.004**	-0.005***	-0.004**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
MSCI	3.626***	3.550***	3.427***	3.385***	3.483***	3.375***
	(0.916)	(0.922)	(0.897)	(0.896)	(0.887)	(0.872)
Constant	8.646	4.865	7.968	4.610	7.306	3.330
	(11.490)	(10.953)	(11.610)	(11.044)	(11.836)	(11.511)
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes
Observations	687,957	687,957	688,028	688,028	688,521	688,521
R-squared	0.739	0.755	0.740	0.755	0.740	0.755

Panel C: Percentage Changes

DEP. VARIABLE: IO	(1)	(2)	(3)	(4)	(5)	(6)
S1CHG	-0.122	-0.094				
	(0.198)	(0.163)				
S2CHG			-0.457**	-0.308*		
			(0.170)	(0.165)		
S3CHG					0.524	0.492
					(0.614)	(0.409)
LOGSIZE	1.898*	2.208**	1.914*	2.221**	1.900*	2.210**
	(0.886)	(0.830)	(0.887)	(0.831)	(0.886)	(0.830)
PRINV	-2.168***	-2.220***	-2.156***	-2.213***	-2.165***	-2.214***
	(0.318)	(0.318)	(0.320)	(0.321)	(0.318)	(0.318)
MOM	0.340	0.554*	0.368	0.568**	0.282	0.501*
	(0.273)	(0.257)	(0.270)	(0.251)	(0.268)	(0.246)
B/M	-0.735	0.676	-0.735	0.671	-0.689	0.716
	(1.089)	(1.004)	(1.089)	(1.007)	(1.086)	(1.003)
VOLAT	3.831	-4.355	3.767	-4.363	3.713	-4.424
	(6.274)	(5.666)	(6.226)	(5.633)	(6.263)	(5.649)
VOLUME	-0.005***	-0.004**	-0.005***	-0.004**	-0.005***	-0.004**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
MSCI	3.620***	3.569***	3.575***	3.527***	3.620***	3.566***
	(0.928)	(0.941)	(0.924)	(0.936)	(0.926)	(0.937)
Constant	8.645	4.956	8.533	4.853	8.559	4.869
	(11.421)	(10.825)	(11.434)	(10.839)	(11.412)	(10.818)
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes
Observations	688,065	688,065	687,980	687,980	688,521	688,521
R-squared	0.739	0.755	0.740	0.755	0.739	0.755

Table 21: Carbon Emissions and Institutional Ownership: Investment Categories

The sample period is 2005-2018. The dependent variables are *IO_BANK, IO_INSURANCE, IO_INVESTCOS, IO_ADVISERS, IO_PENSIONS,* and *IO_HFS*. The main independent variables are carbon emission intensities (Panel A), carbon emission levels (Panel B), and the percentage changes in emissions (Panel C). All variables are defined in Table 1 and Table 2. We report the results of the pooled regression with standard errors clustered at the firm and year level. All regressions include year-month fixed effects and country fixed effects. All regression models include the controls of Table 19 (unreported for brevity). ***1% significance; **5% significance; *10% significance.

Panel A: Emission Intensity

	(1) Banks	(2) Insur.	(3) Inv. Cos.	(4) Advisers	(5) Pensions	(6) HFs	(7) Banks	(8) Insur.	(9) Inv. Cos.	(10) Advisers	(11) Pensions	(12) HFs
S1INT	0.000	-0.003	-0.018***	-0.100***	-0.011***	-0.006						
	(0.000)	(0.002)	(0.006)	(0.019)	(0.002)	(0.006)						
S3INT							0.001*	-0.002	-0.022	-0.060	-0.004	-0.071**
							(0.000)	(0.012)	(0.037)	(0.085)	(0.013)	(0.028)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	688,521	688,521	688,521	688,521	688,521	688,521	688,521	688,521	688,521	688,521	688,521	688,521
R-squared	0.251	0.025	0.609	0.646	0.355	0.473	0.252	0.025	0.609	0.645	0.354	0.473

Panel B: Levels

VARIABLES	(1) Banks	(2) Insur.	(3) Inv. Cos.	(4) Advisers	(5) Pensions	(6) HFs	(7) Banks	(8) Insur.	(9) Inv. Cos.	(10) Advisers	(11) Pensions	(12) HFs
LOGS1TOT	0.001**	-0.007	0.007	-0.031	0.006	0.023						
	(0.000)	(0.010)	(0.036)	(0.103)	(0.015)	(0.018)						
LOGS3TOT							0.001*	-0.003	0.079	0.309*	0.047	0.017
							(0.001)	(0.010)	(0.061)	(0.165)	(0.034)	(0.033)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	687,957	687,957	687,957	687,957	687,957	687,957	688,521	688,521	688,521	688,521	688,521	688,521
R-squared	0.253	0.025	0.609	0.645	0.354	0.473	0.252	0.025	0.609	0.646	0.355	0.473

Panel C: Percentage Changes

VARIABLES	(1) Banks	(2) Insur.	(3) Inv. Co.	(4) Advisers	(5) Pensions	(6) HFs	(7) Banks	(8) Insur.	(9) Inv. Co.	(10) Advisers	(11) Pensions	(12) HFs
S1CHG	0.001	-0.011	-0.023	-0.206	-0.105***	0.221**						
	(0.001)	(0.007)	(0.052)	(0.135)	(0.031)	(0.077)						
S3CHG							0.002	-0.026	0.144	0.142	-0.231**	0.493***
							(0.002)	(0.017)	(0.155)	(0.435)	(0.076)	(0.144)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	688,065	688,065	688,065	688,065	688,065	688,065	688,521	688,521	688,521	688,521	688,521	688,521
R-squared	0.252	0.025	0.609	0.645	0.354	0.473	0.251	0.025	0.609	0.645	0.354	0.473

Table 22: Carbon Emissions and Institutional Ownership: Domestic/Foreign

The sample period is 2005-2018. The dependent variable is *IO*. The main independent variables are carbon emission intensities (columns 1-4), carbon emission levels (columns 5-8), and the percentage changes in emissions (columns 9-12). Panel A considers ownership of all institutions that are domiciled in the same country as the stock that they hold (domestic institutions); Panel B considers ownership of all institutions that are domiciled outside the country as the stock that they hold (foreign institutions). All variables are defined in Table 1 and Table 2. We report the results of the pooled regression with standard errors clustered at the firm and year level. All regressions include year-month fixed effects and country fixed effects. In addition, even-numbered columns include industry-fixed effects. ***1% significance; **5% significance; *10% significance.

Panel A: Domestic Institutions

DEP. VAR.: IO_DOM	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
S1INT	-0.046***	-0.011										
	(0.014)	(0.016)										
S3INT			-0.008	-0.003								
			(0.084)	(0.069)								
LOGS1TOT					0.079	0.181						
					(0.091)	(0.106)						
LOGS3TOT							0.328*	0.433*				
							(0.168)	(0.201)				
S1CHG									-0.248	-0.161		
									(0.167)	(0.157)		
S3CHG											-0.162	0.003
											(0.396)	(0.371)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	688,521	688,521	688,521	688,521	687,957	687,957	688,521	688,521	688,065	688,065	688,521	688,521
R-squared	0.819	0.827	0.819	0.827	0.819	0.827	0.819	0.828	0.819	0.827	0.819	0.827

Panel B: Foreign Institutions

DEP. VAR.: IO_FOR	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
S1INT	-0.092***	-0.044**										
	(0.017)	(0.016)										
S3INT			-0.151*	-0.252**								
			(0.079)	(0.095)								
LOGS1TOT					-0.081	-0.098						
					(0.095)	(0.125)						
LOGS3TOT							0.123	0.227				
							(0.154)	(0.264)				
S1CHG									0.126	0.067		
									(0.239)	(0.215)		
S3CHG											0.686	0.488
											(0.621)	(0.482)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	688,521	688,521	688,521	688,521	687,957	687,957	688,521	688,521	688,065	688,065	688,521	688,521
R-squared	0.222	0.261	0.220	0.261	0.220	0.260	0.220	0.261	0.219	0.260	0.220	0.261

Table 23: Carbon Emissions and Institutional Ownership: Active/Passive

The sample period is 2005-2018. The dependent variable is *IO*. The main independent variables are carbon emission intensities (columns 1-4), carbon emission levels (columns 5-8), and the percentage changes in emissions (columns 9-12). Panel A considers ownership of all institutions that are actively managed; Panel B considers ownership of all institutions that are passively managed. All variables are defined in Table 1 and Table 2. We report the results of the pooled regression with standard errors clustered at the firm and year level. All regressions include year-month fixed effects and country fixed effects. In addition, even-numbered columns include industry-fixed effects. ***1% significance; **5% significance; *10% significance.

Panel A: Actively Managed Institutions

DEP. VAR.: IO_ACT	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
S1INT	-0.011	-0.046**										
	(0.047)	(0.020)										
S3INT			-0.462**	-0.264**								
			(0.204)	(0.105)								
LOGS1TOT					2.757***	0.055						
					(0.247)	(0.137)						
LOGS3TOT							5.025***	0.517*				
							(0.353)	(0.265)				
S1CHG									-2.184***	0.063		
									(0.455)	(0.130)		
S3CHG											-3.419*	0.784*
											(1.631)	(0.366)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	688,521	688,521	688,521	688,521	687,957	687,957	688,521	688,521	688,065	688,065	688,521	688,521
R-squared	0.281	0.772	0.281	0.772	0.309	0.772	0.340	0.772	0.282	0.772	0.281	0.772

Panel B: Passively Managed Institutions

DEP. VAR: IO_PAS	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
S1INT	-0.013***	-0.009**										
	(0.004)	(0.003)										
S3INT			-0.025	0.010								
			(0.028)	(0.025)								
LOGS1TOT					0.257***	0.028						
					(0.081)	(0.039)						
LOGS3TOT							0.529***	0.143				
							(0.158)	(0.103)				
S1CHG									-0.294***	-0.157**		
									(0.068)	(0.068)		
S3CHG											-0.551***	-0.293**
											(0.110)	(0.122)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	688,521	688,521	688,521	688,521	687,957	687,957	688,521	688,521	688,065	688,065	688,521	688,521
R-squared	0.158	0.302	0.158	0.302	0.168	0.302	0.186	0.303	0.158	0.302	0.158	0.302

Table 24: Carbon Emissions and Institutional Ownership: Excluding New Firms

The sample period is 2005-2018. The dependent variable is *IO*. The main independent variables are carbon emission intensities (columns 1-4), carbon emission levels (columns 5-8), and the percentage changes in emissions (columns 9-12). The sample are all firms that have presence in the sample any year prior to 2016. All variables are defined in Table 1 and Table 2. We report the results of the pooled regression with standard errors clustered at the firm and year level. All regressions include year-month fixed effects and country fixed effects. In addition, even-numbered columns include industry-fixed effects. ***1% significance; **5% significance; *10% significance.

DEP. VARIABLE: IO	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
S1INT	-0.148***	-0.054**										
	(0.023)	(0.024)										
S3INT			-0.258*	-0.323***								
			(0.121)	(0.104)								
LOGS1TOT					-0.141	-0.119						
					(0.129)	(0.092)						
LOGS3TOT							0.161	0.226				
							(0.196)	(0.205)				
S1CHG									0.075	0.092		
									(0.193)	(0.136)		
S3CHG											0.901	0.748*
											(0.598)	(0.382)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observations	575,125	575,125	575,125	575,125	574,561	574,561	575,125	575,125	574,669	574,669	575,125	575,125
R-squared	0.757	0.773	0.756	0.773	0.756	0.773	0.756	0.773	0.756	0.773	0.756	0.773

Table 25: Carbon Emissions and Institutional Ownership: Regional

The sample period is 2005-2018. Our sample firms include alternately North America, North America (ex U.S.), Europe, the European Union, Asia, Asia (ex. China), and Others (Africa, Australia, and South America). The dependent variable is *IO*. The main independent variables are carbon emission intensities (Panel A), carbon emission levels (Panel B), and the percentage changes in emissions (Panel C). All variables are defined in Table 1 and Table 2. We report the results of the pooled regression with standard errors clustered at the firm and year level. All regression models include the controls of Table 19 (unreported for brevity), year-month fixed effects, and country fixed effects. In addition, even-numbered columns include industry-fixed effects. ***1% significance; **5% significance; *10% significance.

Panel A: Emission Intensity

DEP. VARIABLE: IO	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	North America				North America (excl. USA)			
S1INT	-0.186***	0.002			-0.075	-0.217		
	(0.059)	(0.077)			(0.144)	(0.126)		
S3INT			-0.081	-0.555			0.422	-0.451
			(0.460)	(0.364)			(0.939)	(0.525)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Observations	155,124	155,124	155,124	155,124	22,259	22,259	22,259	22,259
R-squared	0.353	0.461	0.351	0.461	0.275	0.580	0.275	0.579

DEP. VARIABLE: IO	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Europe				EU			
S1INT	-0.219***	-0.096*			-0.240***	-0.099		
	(0.048)	(0.053)			(0.050)	(0.058)		
S3INT			-0.090	-0.223			-0.107	-0.203
			(0.181)	(0.257)			(0.191)	(0.302)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Observations	154,890	154,890	154,890	154,890	134,185	134,185	134,185	134,185
R-squared	0.337	0.423	0.334	0.423	0.339	0.428	0.336	0.427

DEP. VARIABLE: IO	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Asia				Asia (excl. China)			
S1INT	-0.114***	-0.063***			-0.125***	-0.085***		
	(0.020)	(0.020)			(0.020)	(0.023)		
S3INT			-0.274**	-0.258*			-0.272**	-0.322**
			(0.122)	(0.130)			(0.092)	(0.128)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Observations	316,809	316,809	316,809	316,809	257,996	257,996	257,996	257,996
R-squared	0.202	0.248	0.200	0.248	0.254	0.298	0.251	0.298

DEP. VARIABLE: IO	(1)	(2)	(3)	(4)
			Others	
S1INT	-0.084*	-0.018		
	(0.041)	(0.041)		
S3INT			-0.071	-0.098
			(0.190)	(0.332)
Controls	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes
Observations	60,471	60,471	60,471	60,471
R-squared	0.282	0.413	0.281	0.413

Panel B: Levels

DEP. VARIABLE: IO	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	North America				North America (excl. USA)			
LOGS1TOT	0.463	0.899*			0.378	-0.373		
	(0.404)	(0.464)			(0.535)	(0.369)		
LOGS3TOT			1.132	1.393			-0.823	-1.952**
			(0.698)	(0.860)			(0.959)	(0.806)
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Observations	154,992	154,992	155,124	155,124	22,199	22,199	22,259	22,259
R-squared	0.353	0.463	0.356	0.464	0.275	0.579	0.277	0.583

DEP. VARIABLE: IO	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Europe				EU			
LOGS1TOT	-0.184	-0.281			-0.180	-0.253		
	(0.171)	(0.196)			(0.160)	(0.214)		
LOGS3TOT			0.403	0.369			0.398	0.426
			(0.235)	(0.405)			(0.233)	(0.436)
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Observations	154,758	154,696	154,890	154,890	134,125	134,125	134,185	134,185
R-squared	0.335	0.423	0.335	0.423	0.337	0.428	0.337	0.428

DEP. VARIABLE: IO	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Asia				Asia (excl. China)			
LOGS1TOT	-0.149	0.089			-0.198	-0.128		
	(0.128)	(0.165)			(0.126)	(0.172)		
LOGS3TOT			0.286	0.755**			0.127	0.317
			(0.230)	(0.319)			(0.219)	(0.292)
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Observations	316,665	316,665	316,809	316,809	257,852	257,852	257,996	257,996
R-squared	0.199	0.248	0.200	0.251	0.251	0.298	0.250	0.298

DEP. VARIABLE: IO	(1)	(2)	(3)	(4)
		Others		
LOGS1TOT	0.067	-0.250		
	(0.199)	(0.209)		
LOGS3TOT			0.044	0.015
			(0.358)	(0.547)
Yr/mo fixed effects	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes
Observations	60,315	60,315	60,471	60,471
R-squared	0.281	0.413	0.281	0.413

Panel C: Percentage Changes

DEP. VARIABLE: IO	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	North America				North America (excl. USA)			
S1CHG	-0.287	-0.172			-0.618	0.282		
	(0.538)	(0.561)			(0.954)	(0.874)		
S3CHG			0.661	0.436			1.489	2.052
			(0.846)	(0.722)			(1.858)	(1.617)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Observations	155,016	155,016	155,124	155,124	22,199	22,199	22,259	22,259
R-squared	0.351	0.461	0.351	0.461	0.274	0.578	0.275	0.579

DEP. VARIABLE: IO	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Europe				EU			
S1CHG	-0.763**	-0.523			-0.641*	-0.345		
	(0.329)	(0.340)			(0.329)	(0.374)		
S3CHG			-0.542	-0.041			-0.904	-0.267
			(1.251)	(1.130)			(1.301)	(1.277)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Observations	154,794	154,672	154,890	154,890	134,137	134,137	134,185	134,185
R-squared	0.334	0.423	0.334	0.423	0.337	0.428	0.336	0.427

DEP. VARIABLE: IO	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Asia				Asia (excl. China)			
S1CHG	0.386*	0.348			0.021	0.063		
	(0.211)	(0.224)			(0.210)	(0.202)		
S3CHG			1.323**	1.235***			0.148	0.246
			(0.562)	(0.368)			(0.510)	(0.408)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Observations	316,689	316,689	316,809	316,809	257,876	257,876	257,996	257,996
R-squared	0.199	0.248	0.199	0.248	0.250	0.298	0.250	0.298

DEP. VARIABLE: IO	(1)	(2)	(3)	(4)
	Others			
S1CHG	-0.179	-0.437		
	(0.499)	(0.293)		
S3CHG			-0.459	-0.901
			(1.022)	(0.656)
Controls	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes
Observations	60,339	60,339	60,471	60,471
R-squared	0.281	0.413	0.281	0.413

Table 26: Carbon Emissions and Institutional Ownership: Excluding Salient Industries

The sample period is 2005-2018. The sample excludes companies in the oil & gas (gic=2), utilities (gic=65-69), and motor (gic=18, 19, 23) industries. The dependent variable is *IO*. The main independent variables are carbon emission intensities, carbon emission levels, and the percentage changes in emissions. All regression models include the controls of Table 19 (unreported for brevity). All variables are defined in Table 1 and Table 2. We report the results of the pooled regression with standard errors clustered at the firm and year level. All regressions include year-month fixed effects and country fixed effects. In addition, even-numbered columns include industry-fixed effects. ***1% significance; **5% significance; *10% significance.

DEP. VARIABLE: IO	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
S1INT	-0.063**	-0.050										
	(0.027)	(0.033)										
S3INT			-0.077	-0.334**								
			(0.145)	(0.125)								
LOGS1TOT					0.279	0.175						
					(0.160)	(0.176)						
LOGS3TOT							0.604**	0.760**				
							(0.262)	(0.341)				
S1CHG									-0.033	-0.098		
									(0.188)	(0.169)		
S3CHG											0.717	0.555
											(0.561)	(0.388)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	616,835	616,835	616,835	616,835	616,271	616,271	616,835	616,835	616,391	616,391	616,835	616,835
R-squared	0.741	0.756	0.741	0.756	0.742	0.756	0.742	0.757	0.741	0.756	0.741	0.756

Table 27: Carbon Emissions and Institutional Ownership: Development

The sample period is 2005-2018. The dependent variable is *IO*. The main independent variables are carbon emission intensities, carbon emission levels, and the percentage changes in emissions. All regression models include the controls of Table 19 (unreported for brevity). All variables are defined in Table 1 and Table 2. We report the results of the pooled regression with standard errors clustered at the firm and year level. Top panel reports the results for a sample of firms coming from G-20 and the bottom panel results for non-G20 countries. All regressions include year-month fixed effects and country fixed effects. In addition, even-numbered columns include industry-fixed effects. ***1% significance; **5% significance; *10% significance.

Developed (G20)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
S1INT	-0.140***	-0.056*										
	(0.031)	(0.028)										
S3INT			-0.170	-0.230								
			(0.158)	(0.151)								
LOGS1TOT					0.066	0.215						
					(0.172)	(0.186)						
LOGS3TOT							0.496	0.782*				
							(0.283)	(0.367)				
S1CHG									0.026	0.088		
									(0.256)	(0.212)		
S3CHG											0.927	0.883*
											(0.688)	(0.456)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	534,414	534,414	534,414	534,414	534,006	534,006	534,414	534,414	534,078	534,078	534,414	534,414
R-squared	0.755	0.771	0.754	0.771	0.754	0.771	0.755	0.771	0.754	0.771	0.754	0.771

Developing (non G20)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
S1INT	-0.129***	-0.068**										
	(0.022)	(0.030)										
S3INT			-0.146	-0.257*								
			(0.129)	(0.133)								
LOGS1TOT					-0.176	-0.319***						
					(0.137)	(0.104)						
LOGS3TOT							0.327	0.258				
							(0.186)	(0.225)				
S1CHG									-0.539**	-0.478*		
									(0.224)	(0.259)		
S3CHG											-0.798	-0.578
											(1.016)	(0.873)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	154,107	154,107	154,107	154,107	153,951	153,951	154,107	154,107	153,987	153,987	154,107	154,107
R-squared	0.404	0.481	0.402	0.481	0.402	0.481	0.403	0.481	0.402	0.480	0.402	0.480

Table 28: Carbon Emissions and Institutional Ownership: Pre/Post

The dependent variable is *IO*. The main independent variables are carbon emission intensities (columns 1-4), carbon emission levels (columns 5-8), and the percentage changes in emissions (columns 9-12). Panel A reports the results for a sample covering the period January 2014-November 2015 (two years before Paris COP 21 conference). Panel B reports the results for a sample covering the period January 2016-December 2017 (two years after Paris COP 21 conference). All variables are defined in Table 1 and Table 2. We report the results of the pooled regression with standard errors clustered at the firm and year level. All regressions include year-month fixed effects and country fixed effects. In addition, even-numbered columns include industry-fixed effects. ***1% significance; **5% significance; *10% significance.

Panel A: Pre Paris

DEP. VARIABLE: IO	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
S1INT	-0.153***	-0.084**										
	(0.027)	(0.039)										
S3INT			-0.243*	-0.388**								
			(0.126)	(0.156)								
LOGS1TOT					-0.133	-0.114						
					(0.104)	(0.128)						
LOGS3TOT							0.226	0.346				
							(0.151)	(0.229)				
S1CHG									0.659	0.657		
									(0.477)	(0.425)		
S3CHG											3.316***	2.372**
											(1.052)	(0.934)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	99,631	99,631	99,631	99,631	99,447	99,447	99,631	99,631	99,447	99,447	99,631	99,631
R-squared	0.804	0.826	0.803	0.826	0.803	0.825	0.803	0.826	0.803	0.825	0.804	0.826

Panel B: Post Paris

DEP. VARIABLE: IO	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
S1INT	-0.099***	-0.040										
	(0.024)	(0.033)										
S3INT			0.015	-0.200								
			(0.135)	(0.138)								
LOGS1TOT					0.271**	0.395***						
					(0.129)	(0.135)						
LOGS3TOT							0.882***	1.188***				
							(0.179)	(0.215)				
S1CHG									-0.241	-0.287		
									(0.276)	(0.248)		
S3CHG											-0.819*	-0.414
											(0.477)	(0.449)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	175,895	175,895	175,895	175,895	175,763	175,763	175,895	175,895	175,763	175,763	175,895	175,895
R-squared	0.788	0.803	0.788	0.803	0.788	0.803	0.790	0.805	0.788	0.803	0.788	0.803

Table 29: Carbon Emissions and Institutional Ownership: Excluding New Firms (Pre/Post)

The sample period is 2005-2018. The dependent variable is *IO*. The main independent variables are carbon emission intensities (columns 1-4), carbon emission levels (columns 5-8), and the percentage changes in emissions (columns 9-12). The sample are all firms that have presence in the sample any year prior to 2016. Panel A reports the results for a sample covering the period January 2014-November 2015 (two years before Paris COP 21 conference). Panel B reports the results for a sample covering the period January 2016-December 2017 (two years after Paris COP 21 conference). All variables are defined in Table 1 and Table 2. We report the results of the pooled regression with standard errors clustered at the firm and year level. All regressions include year-month fixed effects and country fixed effects. In addition, even-numbered columns include industry-fixed effects. ***1% significance; **5% significance; *10% significance.

Panel A: Pre Paris

DEP. VARIABLE: IO	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
S1INT	-0.153***	-0.084**										
	(0.027)	(0.039)										
S3INT			-0.243*	-0.388**								
			(0.126)	(0.156)								
LOGS1TOT					-0.133	-0.114						
					(0.104)	(0.128)						
LOGS3TOT							0.226	0.346				
							(0.151)	(0.229)				
S1CHG									0.659	0.657		
									(0.477)	(0.425)		
S3CHG											3.316***	2.372**
											(1.052)	(0.934)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observations	99,631	99,631	99,631	99,631	99,447	99,447	99,631	99,631	99,447	99,447	99,631	99,631
R-squared	0.804	0.826	0.803	0.826	0.803	0.825	0.803	0.826	0.803	0.825	0.804	0.826

Panel B: Post Paris

DEP. VARIABLE: IO	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
S1INT	-0.121***	-0.037										
	(0.022)	(0.034)										
S3INT			-0.224*	-0.322*								
			(0.113)	(0.158)								
LOGS1TOT					-0.110	-0.125						
					(0.090)	(0.110)						
LOGS3TOT							0.183	0.218				
							(0.139)	(0.197)				
S1CHG									0.067	0.158		
									(0.291)	(0.276)		
S3CHG											-0.415	0.241
											(0.652)	(0.589)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observations	113,620	113,620	113,620	113,620	113,488	113,488	113,620	113,620	113,488	113,488	113,620	113,620
R-squared	0.807	0.825	0.807	0.825	0.807	0.825	0.807	0.825	0.807	0.825	0.807	0.825

Table 30: Carbon Intensity and Institutional Ownership: Regional (Pre/Post)

The sample period is 2005-2018. Our sample firms include alternately North America, North America (ex U.S.), Europe, the European Union, Asia, Asia (ex. China), and Others (Africa, Australia, and South America). The dependent variable is *IO*. The main independent variables are carbon emission intensities (Panel A), carbon emission levels (Panel B), and the percentage changes in emissions (Panel C). All variables are defined in Table 1 and Table 2. We report the results of the pooled regression with standard errors clustered at the firm and year level. All regression models include the controls of Table 19 (unreported for brevity), year-month fixed effects, and country fixed effects. Panel A reports the results for a sample covering the period January 2014-November 2015 (two years before Paris COP 21 conference). Panel B reports the results for a sample covering the period January 2016-December 2017 (two years after Paris COP 21 conference). In addition, even-numbered columns include industry-fixed effects. ***1% significance; **5% significance; *10% significance.

Panel A: Pre Paris

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DEP. VARIABLE: IO	North America				North America (excl. USA)			
S1INT	-0.234***	-0.119			-0.239	-0.011		
	(0.076)	(0.130)			(0.154)	(0.188)		
S3INT			-0.139	-0.317			-0.065	-0.972
			(0.438)	(0.572)			(0.980)	(1.324)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Observations	24,372	24,372	24,372	24,372	4,854	4,854	4,854	4,854
R-squared	0.456	0.598	0.453	0.598	0.267	0.608	0.262	0.608

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DEP. VARIABLE: IO	Europe				EU			
S1INT	-0.104	0.023			-0.118	0.080		
	(0.079)	(0.091)			(0.083)	(0.099)		
S3INT			-0.067	-0.567			-0.056	-0.553
			(0.228)	(0.501)			(0.259)	(0.579)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Observations	25,098	25,098	25,098	25,098	21,131	21,131	21,131	21,131
R-squared	0.405	0.556	0.405	0.557	0.386	0.554	0.386	0.555

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DEP. VARIABLE: IO	Asia				Asia (excl. China)			
S1INT	-0.132***	-0.076**			-0.136***	-0.115***		
	(0.022)	(0.031)			(0.022)	(0.037)		
S3INT			-0.469***	-0.491***			-0.418***	-0.640***
			(0.134)	(0.136)			(0.087)	(0.131)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Observations	39,533	39,532	39,533	39,532	31,077	31,076	31,077	31,076
R-squared	0.213	0.382	0.211	0.383	0.264	0.421	0.260	0.423

	(1)	(2)	(3)	(4)
DEP. VARIABLE: IO	Others			
S1INT	-0.152***	-0.142**		
	(0.041)	(0.067)		
S3INT			-0.258	-0.694*
			(0.225)	(0.374)
Controls	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes
Observations	10,421	10,421	10,421	10,421
R-squared	0.232	0.491	0.225	0.491

Panel B: Post Paris

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DEP. VARIABLE: IO	North America				North America (excl. USA)			
S1INT	-0.054	0.169			-0.018	-0.098		
	(0.072)	(0.126)			(0.130)	(0.163)		
S3INT			0.659	-0.198			0.131	-0.050
			(0.408)	(0.674)			(0.733)	(1.246)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Observations	43,321	43,321	43,321	43,321	6,704	6,704	6,704	6,704
R-squared	0.375	0.480	0.376	0.480	0.327	0.600	0.327	0.600

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DEP. VARIABLE: IO	Europe				EU			
S1INT	-0.165**	-0.109			-0.170**	-0.112		
	(0.073)	(0.079)			(0.075)	(0.084)		
S3INT			-0.097	-0.538			-0.129	-0.645
			(0.196)	(0.406)			(0.219)	(0.457)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Observations	32,734	32,734	32,734	32,734	26,768	26,768	26,768	26,768
R-squared	0.391	0.515	0.389	0.515	0.391	0.532	0.390	0.532

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DEP. VARIABLE: IO	Asia				Asia (excl. China)			
S1INT	-0.096***	-0.068***			-0.103***	-0.078***		
	(0.019)	(0.021)			(0.022)	(0.026)		
S3INT			-0.228**	-0.234**			-0.200***	-0.299***
			(0.086)	(0.090)			(0.066)	(0.101)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes	No	Yes	No	Yes
Observations	86,081	86,081	86,081	86,081	65,844	65,844	65,844	65,844
R-squared	0.304	0.376	0.301	0.376	0.319	0.396	0.316	0.396

	(1)	(2)	(3)	(4)
DEP. VARIABLE: IO	Others			
S1INT	-0.145***	-0.104*		
	(0.042)	(0.052)		
S3INT			-0.084	-0.281
			(0.181)	(0.343)
Controls	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	No	Yes	No	Yes
Observations	13,540	13,540	13,540	13,540
R-squared	0.264	0.532	0.257	0.531

Table 31: Carbon Emissions and Stock Returns: Excluding New Firms

The sample period is 2005-2018. The sample are all firms that have presence in the sample any year prior to 2016. The dependent variable is *RET*. The main independent variables are carbon emission levels (columns (1)-(4)), the percentage changes in emissions (columns (5)-(8)), and carbon emission intensities (columns (9)-(12)). All variables are defined in Table 1 and Table 2. We report the results of the pooled regression with standard errors clustered at the firm and year level. All regressions include year-month fixed effects and country fixed effects. All regression models include the controls of Table 7 (unreported for brevity). In even-numbered columns, we additionally include industry-fixed effects. ***1% significance; **5% significance; *10% significance.

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
LOGS1TOT	0.023		0.057***									
	(0.021)		(0.014)									
LOGS3TOT		0.117***		0.166***								
		(0.029)		(0.027)								
S1CHG					0.500***		0.520***					
					(0.085)		(0.087)					
S3CHG						1.343***		1.379***				
						(0.229)		(0.239)				
S1INT									-0.009		-0.000	
									(0.007)		(0.003)	
S3INT										0.023		0.016
										(0.021)		(0.019)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observations	624,116	624,764	616,701	617,349	624,212	624,764	616,797	617,349	624,764	624,764	617,349	617,349
R-squared	0.165	0.165	0.167	0.167	0.165	0.166	0.167	0.167	0.165	0.165	0.166	0.166

Table 32: Carbon Emissions and Stock Returns: Excluding New Firms (Pre/Post)

The sample period is 2005-2018. The sample are all firms that have presence in the sample any year prior to 2016. The dependent variable is *RET*. The main independent variables are carbon emission levels (columns (1)-(4)), the percentage changes in emissions (columns (5)-(8)), and carbon emission intensities (columns (9)-(12)). All variables are defined in Table 1 and Table 2. We report the results of the pooled regression with standard errors clustered at the firm and year level. All regressions include year-month fixed effects and country fixed effects. All regression models include the controls of Table 7 (unreported for brevity). Panel A reports the results for a sample covering the period January 2014-November 2015 (two years before Paris COP 21 conference). Panel B reports the results for a sample covering the period January 2016-December 2017 (two years after Paris COP 21 conference). In even-numbered columns, we additionally include industry-fixed effects. ***1% significance; **5% significance; *10% significance.

Panel A: Pre Paris

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
LOGS1TOT	-0.032		0.019									
	(0.023)		(0.018)									
LOGS3TOT		0.007		0.096*								
		(0.038)		(0.050)								
S1CHG					0.731***		0.722***					
					(0.119)		(0.119)					
S3CHG						1.924***		1.891***				
						(0.338)		(0.345)				
S1INT									-0.019*		-0.014	
									(0.009)		(0.009)	
S3INT										-0.062***		-0.001
										(0.021)		(0.028)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observations	109,394	109,578	108,143	108,327	109,394	109,578	108,143	108,327	109,578	109,578	108,327	108,327
R-squared	0.090	0.090	0.098	0.098	0.091	0.092	0.099	0.100	0.090	0.090	0.098	0.098

Panel B: Post Paris

DEP. VARIABLE: RET	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
LOGS1TOT	0.081**		0.057**									
	(0.030)		(0.026)									
LOGS3TOT		0.217***		0.230***								
		(0.052)		(0.055)								
S1CHG					0.299***		0.288***					
					(0.094)		(0.090)					
S3CHG						1.148***		1.101***				
						(0.270)		(0.281)				
S1INT									-0.004		-0.014**	
									(0.009)		(0.006)	
S3INT										0.094***		0.030
										(0.028)		(0.032)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Yr/mo fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes	Yes
Observations	125,199	125,331	123,715	123,847	125,199	125,331	123,715	123,847	125,331	125,331	123,847	123,847
R-squared	0.071	0.071	0.077	0.078	0.070	0.071	0.078	0.078	0.070	0.070	0.077	0.077