

# Corporate Carbon Performance Study Across Nations: The Point of View of Global Investors

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## Abstract

The paper aims to examine the global carbon performance of companies from the perspective of national diffusion. According to the Paris Agreement, listed companies from non-OECD countries produce average carbon dioxide cheaper than listed companies from OECD countries. However, the spread of corporate carbon dioxide emissions is lower in OECD countries compared to non-OECD countries, due to the increase in average national carbon dioxide emissions. Also, the spread of corporate carbon dioxide emissions at the country level in the post-Paris Agreement period is inversely correlated with foreign stock ownership. This result confirms our hypothesis that advanced foreign investors from rich countries have a significant positive effect on the efficiency of indigenous firms in developing countries in managing carbon emissions. While the sources checked for this paper may focus on different dependent variables at times, they all address the subject of whether a stricter and more enforceable regulatory framework on carbon emission may lead to a healthier and sustainable environment. We used the quantitative and qualitative analysis to see in what extent large sets of data regarding various indicators of corporate carbon performance are confirmed by a rate of success in the yearly sustainability reports released by the large international companies and international organizations. Further research may also focus on different strategies which aim to produce effects in the long run, not necessarily linked with corporate targets. For this, the topic should be addressed on the level of the entire society and the mission of the governments, and the international community is to find the best way for cooperation.

## Keywords

Carbon performance; Paris Agreement; emissions management; carbon emissions.

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## Introduction

Economic studies have long been interested in problems relating to carbon. By connecting carbon and climate challenges with company financial performance, climate finance research, which has just recently emerged, brings a new dimension to environmental study.

Also, the availability of a variety of commercial ESG data for academic research has speed up the development of climate research that employs firm-level ESG metrics designed for asset managers and buy-side analysts to seek alphas. Our study makes use of the recent growth in global commercial data on the carbon performance of firms to examine how foreign investments affect carbon performance at the national level.

Our work expands on the examination of carbon emissions by connecting corporate carbon management performance to global stock investments in listed companies, which is in line with the path that financial research has recently taken.

Grossman and Krueger (1991, 1995), are only a few examples of the numerous works that provide evidence of the economic and financial implications of carbon emissions. Listed companies are significant

contributors to the production of carbon, according to stakeholders. Corporate management and governance are predicted to have a substantial impact on a company's carbon performance. As a result, various research investigate how different board governance models and traits may influence climate disclosure and carbon performance (e.g., Peters and Romi, 2014).

In the same time, several studies concentrate on specific environmental initiatives at the board level and their beneficial effects on carbon performance.

On the other hand, earlier research has shown that more knowledgeable foreign investors from industrialized nations have a considerable impact on local businesses in emerging nations. For instance, listed companies in emerging stock markets benefit from an improved information environment and have stronger growth, increased investment, profitability, and efficiency while using less leverage (Bae et al., 2006). (Mitton, 2006). International investors can also help local businesses in developing countries lower the cost of equity capital by stabilizing and monitoring the market (Li et al., 2011).

In this paper, we adopt the stance that the sophistication of corporate management and control of carbon risk can have an impact on the carbon performance of listed enterprises. Listed companies in rich nations should, therefore, have a better awareness of and commitment to carbon risk mitigation than listed companies in poor ones. International equity investments have the potential to be a powerful catalyst for increasing business understanding of this climate risk. With equity ownership, foreign investors from industrialized nations contribute managerial expertise and higher expectations for carbon performance to their investees in order to achieve corporate sustainability.

Thus, we contend that national company carbon performance is positively influenced by global equity ownership.

The most important selection criterion should enable establishing a single corporate carbon management measure that considers both the exposure to carbon-related climate risk and the associated management approaches of listed companies throughout the world. When evaluating the effectiveness of carbon management, the measure must also account for firm-, industry-, and country/region-specific carbon risk contexts. The reason for this management strategy and actions should correspond to the degree of exposure. For instance, a company with a significant exposure to carbon risk should also have very strong carbon management, whereas a company with a low exposure to carbon risk may handle the exposure in a very understated manner.

In accordance with the literature, the mean logarithm of deviations and the Theil index are used as two metrics of inequality to determine the dispersion (e.g., Abiad et al., 2008; Acemoglu and Dell, 2010; Chancel and Piketty, 2015). The dispersion variables can assess the overall effectiveness of enhancing corporate carbon management in a country if the variety in corporate carbon performance within a country reduces while average businesses attain a high carbon performance (Cho, 1988; Abiad et al., 2008). Then, the carbon performance at the national level is compared between OECD (or developed) and non-OECD (or developing) nations, as well as between the Paris Agreement's ex-post and ex-ante implementation.

## 1. Key points according to literature review

### CO2 emissions at the national level and economic expansion

Several scholars have been examining how economic activity affects greenhouse gas pollution of the environment (hereafter GHG). Grossman and Krueger (1991, 1995) show that while governments will eventually pay more attention as economies expand, economic activities have detrimental effects on the environment in the early stages. As a result, the Environmental Kuznets Curve (hereafter EKC) hypothesis, which was proposed by Grossman and Krueger in 1991 and 1995, is the first to uncover evidence of an inverted U-shaped link between economic development and air pollution.

Yet, there is some disagreement in the studies on the relationship between income growth and carbon emissions. Whereas Khan et al. (2019) indicates a positive influence of economic development on CO2 emissions in a worldwide sample of 193 economies, Omri et al. (2014) demonstrate bi-directional connection in the sample of MENA<sup>1</sup> nations.

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<sup>1</sup> **MENA Nations:** Western Asia (18): Armenia, Azerbaijan, Bahrain, Cyprus, Georgia, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, State of Palestine, Syrian Arab Republic, Turkey, United Arab Emirates, Yemen. Northern Africa (7): Algeria, Egypt, Libya, Morocco, Sudan, Tunisia, Western Sahara.

Cheikh et al. (2021) found in a study of 12 Middle Eastern and North African countries that energy consumption has a positive and larger (smaller) impact on carbon emissions for low- and high-income countries, but that the significantly negative environmental impact of GDP growth is dependent on high energy consumption growth. On the other hand, studies by Acheampong (2018) and Shoaib et al. (2020), for instance, show that economic growth and carbon emissions are negatively correlated in both emerging and developed nations. While developing nations frequently fall behind in institutional quality, developed economies typically have robust institutional frameworks. Several studies show that institutional quality considerably reduces carbon emissions (Danish and Ulucak, 2020), for example, by implementing strict and enforceable environmental rules. Yet, inadequate institutional foundations foster a climate that is hospitable to corruption, incompetent administration, and disrespect for environmental problems (e.g., Danish et al., 2019a).

### **Firm-level carbon dioxide emissions between developed and developing countries**

Another part of the literature deals with greenhouse gases from the perspective of firms. According to stakeholder and resource), companies that deal with environmental issues should experience different benefits, such as improved reputation, increased efficiency and access to new green markets. However, empirical evidence on the benefits of increased CO emissions is inconclusive.

According to Elmawazin et al. (2022), US listed companies with greater environmental technology innovation tend to have less expensive equity capital. According to their findings, businesses with fewer CO<sub>2</sub> emissions experience lower returns (better outcomes) in the short and long terms compared to those with greater emissions.

Muttakkin et al. (2022) recently came to the conclusion that businesses in nations with robust democratic systems have a negative relationship with carbon intensity. There is a ton of proof that firms in developed nations with stringent environmental regulations (like national carbon trading schemes in the EU) have bought carbon emissions from upstream and downstream firms in developing nations despite the strict (and frequently poorly enforced) regulation in the global supply chain. As a result, carbon dioxide emissions shift from developed countries (such those in the EU) to emerging nations (e.g. China).

Several research look at the sorts of management techniques and governmental traits that might influence climate data and business success. The reporting of carbon dioxide emissions and proactive environmental government activities are positively correlated, according to Peters and Romi (2014). Additional research shows that gender diversity and board qualities have a favorable impact on carbon emissions. Moreover, some materials are focused on different environmental government efforts and their impacts on carbon dioxide emissions. For instance, Ntim (2022) contend that emission reduction programs, environmental innovations, and resource efficiency show a positive association with carbon emissions, whereas assert that a stronger environmental orientation of cardboard can enhance carbon emissions.

### **Corporate carbon emissions and profitability of investments**

More than 4000 institutional investors from 60 countries and more than 120 trillion US dollars in assets under management signed up for the Principles for Responsible Investing starting in April 2021 and pledge to include ESG factors into their investment choices (UNPRI, 2021). The empirical research on institutional investors' motivations, tactics, and impacts on company carbon performance and initiatives (post-Paris Agreement) is expanding quickly.

Institutional long-term investors who care about the environment had the biggest beneficial influence on business disclosures of climate change risk. This resulted in a favorable reaction from the U.S. equity market. According to Bolton and Kacperczyk's findings in 2021 and 2022, institutional investors use unique screening techniques for sectors with the greatest direct carbon emission intensity. This may indicate that their efforts to compel pledges were successful. In a review research, Kruger et al. (2020) discovered that 29% of 39 institutional investors are attempting to lower the carbon footprint of their portfolios, with risk management and active engagement (divestment) being the (most) common technique without sacrificing returns.

### **Standardized assessments of the environment impact**

Beyond reporting of measured emissions, the ultimate challenge is to assess the effective environment impact. In order to have comparable results and credible conclusions based on such results, a uniform method of measuring the emissions and a commonly agreed methodology of assessment is absolutely necessary. One must take account not only quantitate elements, but also the actual effect, impact or risks to the environment. Indeed, few emissions have only an immediate global effect. Unlike carbon, most

emissions will have a different local, regional or global impact depending not only on the amount discharged but also on its environmental disruption nature. Thus, it is recommended to tackle the actual risks the emissions may pose to the environment rather than pure accounting approach in collecting and reporting data on carbon emission. Otherwise, the information disclosed to the markets and to the investors could not be optimal.

Several standardization initiatives in this context have emerged at regional but also international level. A good example is the European standard EN 17463:202 Valuation of Energy Related Investments (VALERI), a standard developed by CEN and CENELEC which focuses mainly on the valuation and documentation of the economic impact of energy related investments, also reflecting the method to gather, calculate, evaluate and document information. Assessment of green financial projects is foreseen in ISO 14100 standard. It outlines a process to identify criteria for environmental impacts and performance to consider when is related with projects, assets and activities seeking finance. Another relevant international standard is ISO 14067 specifying principles, requirements and guidelines for the quantification and reporting of the carbon footprint of a product. Several draft standards are under development for setting a universally recognized methodology to calculate carbon emissions. Businesses in developed countries are actively involved in standards-setting activities. As such they are more aware and knowledgeable of efficient instruments to increase their carbon performance and to make environmentally calculated investments than companies in emerging economies.

## 2. Research Methodology

The authors started the article with a critical analysis of the existing worldwide relevant literature in the field. Having in mind the empirical data, together with the descriptive character of the paper, the authors focus on checking in what extent the large data sets based on a variety of indicators regarding the corporate carbon performance are confirmed also by the reports released by OECD which aims to picture the global environment. The keywords used were “carbon performance”; “Paris Agreement”; “emissions management”; “carbon emissions” and the selected papers for this research were directly showing the impact of the involvement of foreign investors on the carbon strategy when the decisions for starting new business are made. For this reason, we correlated the MSCI Index which shows in what extent the carbon emissions are part of the strategy of the new investors with the average corporate carbon emissions score and dispersion in OECD versus non-OECD group of countries before and after the Paris agreement. This hypothesis, along with the others highlighted, points to the need to look at other important and evolving links between foreign investors and carbon performance. Finally, the authors will present their own observations and conclusions regarding the contextualization of the carbon emissions performance and show that only the corporate efforts are not enough to reach the proposed targets.

## 3. Research and Discussion

The number of businesses having MSCI carbon emissions<sup>2</sup> ratings for each year of the study period is shown in Table 1. (2010–2020). We can see that there are more businesses now than there were in 2010 (1855 vs. 14,346 in 2020). Also, the bulk of the observations in each of the examined years are from OECD nations. In particular, the sample is most and least imbalanced (in terms of the ratio of OECD to non-OECD enterprises), respectively, in 2010 and 2020, i.e., the coverage of firms in non-OECD nations gets considerably better over time more quickly. By 2020, 90.33% of listed companies in the OECD countries will have a carbon performance rating thanks to MSCI, which gradually covers the majority of listed companies in these nations.

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<sup>2</sup> The MSCI Climate Action Indexes are designed to help institutional investors seeking to invest for the transition and finance companies' emissions reduction to drive change in the real economy.

**Table no. 1. The number of firms in each year (2010-2020).**

Year	No. of firms			% of listed firms		
	All	OECD	Non-OECD	All	OECD	Non-OECD
2010	1855	1702	153	6.05%	8.34%	1.64%
2011	1845	1710	135	5.88%	8.15%	1.50%
2012	2924	2590	334	8.21%	10.84%	3.76%
2013	6880	5909	971	28.99%	47.47%	9.15%
2014	1090	6212	878	28.08%	47.99%	8.17%
2015	6956	5904	1052	31.23%	53.07%	10.95%
2016	10.725	9047	1678	42.72%	73.33%	16.49%
2017	11.605	9700	1905	45.69%	79.75%	17.51%
2018	13.453	10.067	3386	53.95%	88.86%	24.02%
2019	14.208	10.419	3789	49.25%	81.50%	27.02%
2020	14.343	10.659	3684	45.54%	79.13%	22.75%

*Source: UNFCCC. (2022). The Paris Agreement (<https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>)*

Within the MSCI ESG ratings for public firms' environmental pillar, carbon emissions play a significant role. To analyze corporate carbon risk and its performance, MSCI specifically utilizes corporate carbon risk and raw data from sources such as annual reports, sustainability disclosures, government and academic databases, and media. So, in order to earn the same total materiality score, "greater levels of risk demand larger degrees of demonstrated managerial competence" (MSCI, 2022). MSCI CO<sub>2</sub> emissions ratings therefore vary from 0 to 10, with a score of 0 (respectively, 10) denoting extremely low (respectively, exceptionally good) performance.

The table that follows was taken straight from the MSCI ESG Rating Methodology Overview page. A total of 35 substantial ESG concerns are included in the table, which are divided into 10 themes and 3 pillars. The environment pillar is where the most crucial subjects are listed for clarity's sake. This pillar includes individual themes as well as 13 big topics, as illustrated below. One of the main challenges in this pillar is CO<sub>2</sub> emissions.

**Table no. 2. MSCI ESG Rating**

Pillar	Themes	ESG Key Issues
Environment	Climate Change	Carbon Emissions Product Carbon Footprint
	Natural Capital	Water Stress Biodiversity & Land Use
	Pollution & Waste	Toxic Emissions & Waste Packaging Material & Waste
	Environmental Opportunities	Opportunities in Clean Tech Opportunities in Green Building
		Financing Environmental Impact Climate Change Vulnerability Raw Material Sourcing Electronic Waste Opportunities in Renewable Energy

*Source: UNFCCC. (2022). The Paris Agreement (<https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>)*

Evaluation of a material issue: The MSCI ESG grading approach assesses both risk exposure and risk control. A 0–10 scale is used to assess risk exposure. This score indicates if a business has a proven track record of thinking and dealing with particular risks and opportunities. Major challenges are first quantified across all industries, however the vulnerability of each organization to each issue differs.

As a result, the MSCI ESG Ratings use precise breakdowns such as operational sectors, locations of operations, outsourced manufacturing, or reliance on government contracts to determine company-level exposure to important ESG risks. Management needs to address the degree of exposure if they want to rank higher on important problems. In other words, it is expected that highly engaged businesses would have extremely capable management groups. As a result, a company with poor management and high ESG risk

will perform worse than a company with similar management practices but lower ESG risk. On the other hand, businesses with less exposure could choose a more cautious strategy to get the same grade.

Before and after the Paris Agreement, Table 3 displays the average CO<sub>2</sub> performance values (CARBON) and the variation of values (THEIL and MLD) in OECD and non-OECD nations. We can observe that following the Paris Agreement, the CO<sub>2</sub> levels for both samples rose or became better. Also, as predicted, the CO<sub>2</sub> levels for businesses with headquarters in OECD nations were much higher than those of businesses in non-OECD nations for both subsample times.

Moreover, following the Paris Agreement, the CO<sub>2</sub> value for firms in OECD nations reached 7.92, while the CO<sub>2</sub> value for companies in non-OECD countries was 7.636 during the same period, showing that both OECD and non-OECD country enterprises have reasonably decent carbon footprints. Once nations agreed to limit their carbon emissions in accordance with the Paris Agreement, you may see that you have attained management capability. Overall, the Performance gap between the two samples shrunk substantially, with non-OECD companies overtaking their OECD competitors.

At the time after the Paris Agreement, the gap in carbon performance values between OECD and non-OECD enterprises decreased to 0.395 (0.307). Also, non-OECD enterprises experienced a somewhat higher average increase in carbon performance value (1.32) than post-Paris OECD companies (1.3) compared to the prior Paris Agreement. The differences mentioned above are all statistically significant at the 1% or 5% level, which is important to note from Table no. 3.

**Table no. 3. Average corporate carbon emissions scores and the dispersion in OECD versus non-OECD groups of countries before and after the Paris Agreement**

Period	OECD	Non-OECD	Diff. (OECD - Non-OECD)	t-stat
<b>Average carbon performance score:</b>				
Before Paris Agreement (2010–2015)	6.598	6.203	0.395	(1.97)* *
After Paris Agreement (2016–2020)	7.942	7.636	0.307	(3.34)* **
Diff. (After - Before)	1.344	1.432		
t-stat	(10.09)* **	(8.00)* **		
<b>Theil index:</b>				
Before Paris Agreement (2010–2015)	0.065	0.053	0.012	(1.84)*
After Paris Agreement (2016–2020)	0.050	0.050	-0.000	(-0.04)
Diff. (After - Before)	-0.015	-0.003		
t-stat	(-2.74)* **	(-0.53)		
<b>MLD index:</b>				
Before Paris Agreement (2010–2015)	0.063	0.052	0.010	(1.61)
After Paris Agreement (2016–2020)	0.042	0.040	0.002	(0.68)
Diff. (After - Before)	-0.020	-0.013		
t-stat	(-4.23)* **	(-2.48)* *		

\*\*\*1%, \*\*5%, \*10%

Source: UNFCCC. (2022). *The Paris Agreement* (<https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>)

## Conclusions

According to Generation Investment Management (2021), publicly listed corporations on international markets were responsible for 40% of greenhouse gas emissions. Because of this, publicly listed corporations are crucial to achieving the Paris Agreement's primary goal of reducing global temperature rise. The effectiveness of bettering carbon management across listed firms in six countries is investigated in the study from 2010 to 2020. Firm carbon performance (i.e. firm exposure to carbon risk and capacity to manage carbon risk), as opposed to other research that concentrated on the carbon emissions of individual enterprises, is utilized to generate country-level carbon emissions. Corporate carbon management based on yearly observations from 91,88 enterprises and a sample of 20,712 listed companies.

Our empirical study demonstrates that, following the Paris Agreement, the average carbon footprint of listed businesses in non-OECD nations expanded more quickly than in OECD countries, and that, in recent years, carbon emissions from developing to developed countries have been dropping. Additionally, we discovered that OECD countries had a greater decline in corporate carbon emissions variability following the Paris Agreement than non-OECD nations. We may draw the conclusion that the reduced variability in corporate carbon performance across OECD nations implies increased carbon management efficiency by combining the results of improved average country-level carbon performance and smaller spreads.

Also, the ownership of foreign investors is unfavorably correlated with the performance of business carbon emissions after the Paris Agreement. According to other research (Aggarwal et al., 2011, Bena et al., 2017) foreign investors have a considerable impact on local enterprises' corporate governance, ESG performance, and carbon performance.

Finally, compared to OECD nations, non-OECD countries have seen a greater drop in the dispersion of corporate carbon performance since the Paris Agreement. In conclusion, this study demonstrates that more experienced foreign investors from industrialized nations significantly influence domestic businesses in developing countries to increase their effectiveness in managing carbon emissions. Consequently, by using a special mix of carbon management data and the dispersion (Theil index) technique to assess corporate carbon management effectiveness within a nation from a global perspective, our work adds new knowledge to the literature on carbon.

According to earlier studies, the variation of the MSCI firm's carbon management score serves as a proxy for carbon management effectiveness (i.e. Abiad et al., 2008; Acemoglu and Dell, 2010; Chancel and Piketty, 2015). Having as milestone the Paris Agreement, many research compared the levels before and after this signature' moment, the carbon management performance of listed firms in OECD (considered developed countries) and non-OECD (considered as developing nations), and analyzed how foreign investment influences the effectiveness of carbon management at the national level.

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