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Does Listing Farther Influence Carbon Emissions Production? Evidence From Internationally Cross-Border Listed Firms

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ABSTRACT

The past decade has witnessed an increase in stakeholder pressures for publicly-listed firms to reduce their emissions. While most firms have been receptive to these pressures, they have also been observed to devise strategies to circumvent regulatory guidelines and avoid liabilities. Drawing on a sustainable finance dataset on cross-border listed firms, this article examines how geographical distance in cross-border listings may exacerbate the amount of Scope 1, Scope 2, and Scope 3 emissions that firms produce to varying degrees. The findings across different model specifications reveal that distance is associated with increases in emissions among cross-listed firms, but the effect of distance is stronger for ln Scope 1 and ln Scope 2 Emissions among non-primary listings, whereas the effect is stronger for ln Scope 3 Emissions among primary listings. This article offers evidence that geographical distance in cross-border listings is a form of jurisdictional arbitrage used by firms to circumvent emissions regulations. Consistent with the way that firms offshore profits and operations to avoid tax liabilities, firms are theorized to offshore emissions and avoid emissions liabilities by listing in cross-border jurisdictions that are geographically distant from their home jurisdictions.

1 | Introduction

"Your company's planning for a net zero [carbon] world is an important element of [stakeholder capitalism]… we ask businesses to demonstrate how they're going to deliver on their responsibility to shareholders, including through sound environmental… practices and policies," wrote Blackrock CEO Larry Fink (2022) in an open letter to the CEOs of publicly-listed firms with ownership by his firm. As the largest institutional asset manager worldwide with over US$10 trillion of AUM, Blackrock's apparent missive struck a powerful chord in corporate America. Fink's (2022) call for environmental concerns builds on a recent upsurge in shareholder concerns for emissions control and environmental sustainability in general. From the 2010s onward, firms embraced a corporate turn to emphasizing multistakeholder interests toward the objective of improving environmental sustainability (Aguilera et al. 2007; Aguilera et al. 2021; Aguinis and Glavas 2012; Leins 2020; Parfitt 2020).

Being able to address investor concerns about environmental sustainability has been essential for firm performance and reputations, in part because consumers evaluate the firm more favorably and respond with brand loyalty (Arora and Henderson 2007; Bear et al. 2010; Miller et al. 2020).

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As a result, recent studies allege that emissions compliance can generate excess profits for firms and even improve firm performance (Cappucci 2018; Friede et al. 2015; Velte 2017). Those that fail are made the target of shareholder resolutions with threats to displace the board. According to the U.S. SIF Foundation (2020, 2022), climate change measured in emissions reduction ranked among the most prevalent issues among all shareholder proposals filed from 2018 to 2022, capturing 415 out of 2404 (17.3%) of all proposals. Correspondingly, environmental concerns have taken center stage in stakeholder-driven initiatives for realigning firm operations and capital allocation decisions (Eccles et al. 2011, 2017, 2020). These initiatives have centered around the objective of "mitigat[ing] a firm's impact on the natural environment, [including] implementing products, processes, and policies that reduce energy consumption and waste, us[ing] ecologically sustainable resources, and employ[ing] environmental management systems" (Walls et al. 2011, 73).

However, while the incentives and pressures to pursue environmental sustainability are apparent for firms, little work has been done on how firms evade environmental regulations. General Electric, for instance, initiated its "ecoimagination" campaign while simultaneously lobbying against climate change regulations. In a more egregious example, Volkswagen retrofitted their diesel vehicles with software designed to mislead regulators by reducing vehicle emissions only during tests (United States Environmental Protection Agency 2015). Seeking to appear good without doing good, firms may misrepresent their credentials by failing to align their managerial practices with environmental objectives or by exaggerating their credentials altogether, such as relying on within-firm metrics not widely adopted elsewhere or committing fraud outright (Bauer and Hann 2010; Eccles and Serafeim 2013). For these reasons, vocal pronouncements about commitments to environmental sustainability such as BlackRock's 2022 letter may be disconnected from corporate management practices (Lim and Tsutsui 2012).

Existing research on firms avoiding obligations and regulations has overwhelmingly focused on tax noncompliance through jurisdictional arbitrage (Dine and Koutsias 2019). Jurisdictional arbitrage concerns firms choosing to incorporate farther or move subsets of their operations away from their home jurisdictions to avoid or evade liabilities. Firms incorporate subsidiaries in jurisdictions that provide them with legal, yet unethical tax loopholes (Dine and Koutsias 2019). For this reason, multinational firms such as Apple have elected to incorporate in Ireland to lower their tax obligations (Barrera and Bustamante 2018). Firms in other industries also offshore parts of their operations to evade taxes and elevate net profits (Bebchuk and Cohen 2003; Daines 2001; Dine and Koutsias 2019; Johnson 2013). Incorporating farther from home jurisdictions also facilitates jurisdictional arbitrage within countries. Firms in the U.S. incorporate out-of-state, especially in Delaware, to reap tax benefits and antitakeover statutes that would protect the firm from takeovers (Daines 2001; Bebchuk and Cohen 2003; Johnson 2013). Bebchuk and Cohen (2003) went further to illustrate that newer firms prefer to incorporate out-of-state, and even enlist out-of-state law firms to better facilitate their move.

Drawing on agency theory, this article examines how geographical distance in cross-border listings, or how far the location a firm's listed shares is from their home jurisdiction, may be a prospective strategy that firms pursue to avoid emissions liabilities. Firms that list farther away from their home jurisdictions may leverage jurisdictional arbitrage to produce emissions in another (farther) jurisdiction. Accordingly, this article sets out to address one fundamental research question:

- Does geographical distance affect firm emissions for cross-border listings?

This article focuses on primary listings, or where firms choose to list their shares first through an IPO. Primary listings are seen as higher status compared to non-primary listings, such as secondary listings, which is typically reflected in a greater number of prospective investors being able to access and purchase shares. Additionally, secondary listings are governed by a relatively laxer set of standards established by the secondary exchange, whereas primary listings are subject to stricter regulations of the main exchange (Anderson and Dyl 2008). The present analysis innovates by foregrounding the differential effects that geographical distance has on firm emissions depending on their source (Scopes 1, 2, and 3) and the listing status of the firm's shares. In so doing, this article offers empirical evidence and a framework for understanding the effects of distance on firm emissions in cross-border listings between home and host countries.

2 | Literature Review: Existing Research on Jurisdictional Arbitrage Among Firms

Jurisdictional arbitrage refers to the firm practice of relocating parts of operations to external jurisdictions in order to reap firm advantages and avoid liabilities. According to Dine and Koutsias (2019), jurisdictional arbitrage "creates an additional layer of protection to the… company shielding it further against unlawful or harmful acts" (p. 7). To illustrate, when firms establish operations abroad, they create subsidiaries in these respective jurisdictions that allow them to invoke limited liability and even avoid taxes.

Empirical research on jurisdictional arbitrage finds that firms commonly use it to lower their tax liabilities by offshoring their profits and production to jurisdictions outside their home jurisdictions (Barth et al. 2017; Ritsatos 2014; Slemrod 2007). By paying low effective tax rates, firms can accumulate large offshore profits (Nerudova et al. 2023). Economists, including work by the Federal Reserve, observe that firms have additionally capitalized on this jurisdictional arbitrage by borrowing onshore against offshore profits to pay dividends and conduct buybacks (Guvenen et al. 2017; Smolyansky et al. 2019). This has energized dialogue about a potential OECD global minimum tax rate to avoid a "race to the bottom," when governments compete with one another by lowering their corporate tax rates, which ultimately lowers tax revenues worldwide (Setser 2023).

The economic and moral harms of jurisdictional arbitrage are well-established. In a review of tax noncompliance studies, Ritsatos (2014) finds that regardless of whether firms avoid their liabilities legally or illegally (see also Kirchler et al. 2008), they financially benefit at the *cost* of other stakeholders. Firms may distort prices upward on goods exported to developing countries, but distort prices downward on goods imported from developing countries, resulting in a transfer of income from developing to developed economies (Fuest and Riedel 2009). Multinational firms also separate profits generated in different jurisdictions or countries, which they do by setting transfer prices for intra-firm trade. Firms manipulate these prices to reduce their tax burden. In a comprehensive review of the literature on jurisdictional arbitrage, Fuest and Riedel (2009) find that it creates distortions in the economy in the form of tax revenue losses for their governments. This implies deleterious transfers of wealth from households to corporations when tax revenue shortfalls are compensated by, and corporate subsidies are funded by household taxes (Dyreng et al. 2008; Khan et al. 2017; Shevlin et al. 2020). While the full scale of tax noncompliance remains elusive, researchers estimate that tax revenue shortfalls sit around US$100 billion per year for developing economies because of corporate tax noncompliance, including trade mispricing (Fuest and Riedel 2009).

However, this research on jurisdictional arbitrage slights two important issues: how geographical distance facilitates successful arbitrage and how jurisdictional arbitrage leads to corporate avoidance not just of tax liabilities, but environmental liabilities as well. These two gaps are related, because the benefits of geographical distance for jurisdictional arbitrage go beyond tax evasion. Firms that list farther from their home jurisdictions benefit by creating information opacity and additional monitoring costs for regulators. Information becomes more difficult and costly for regulators in home jurisdictions to obtain to enforce legal action. This information asymmetry benefits firms by stalling time for any legal recourse, such as lawsuits and tax cases, and lowering the probability of successful regulatory enforcements altogether (Jensen et al. 2015).

Greater distance between jurisdictions reduces the likelihood of cooperative agreement and mutual understanding between pairs of jurisdictions. Research on capital flows, for instance, has fruitfully discovered that greater physical distance between pairs of jurisdictions is correlated with cultural distance and legal differences (Blonigen et al. 2020; Head and Ries 2008). García et al. (2018) similarly identify spatial similarities in regulatory and firm attitudes, namely, that treatment of tax noncompliance and fiscal behaviors in a home country mirror those in a neighboring country. As a corollary, geographical distance creates information asymmetries (Kubick et al. 2017), where firms that are farther from their home jurisdictions more easily avoid taxes, especially when they are listed across regions (Chen et al. 2022).

Geographical distance altogether negatively affects the "ease and efficiency of communication, coordination, and monitoring of activity" (Blonigen et al. 2020, 602), ultimately preventing regulatory regimes from mounting the requisite cooperation for regulating corporate malpractice or ensuring compliance. By raising the monitoring costs, time, and likelihood of legal enforcement, geographical distance thus allows firms to establish complex intra-company structures and other "undoubtedly legal tools which can relieve the [firm] from many regulatory… burdens" (Dine and Koutsias 2019, 13; Silvers 2016).

3 | Theoretical Framework and Hypothesis Development

3.1 | Agency Theory, Agency Conflicts, and Firm Emissions Liabilities

This article builds on agency theory to articulate firm attitudes toward emissions liabilities, namely, their motivations for pursuing emissions noncompliance. Agency theory begins with the recognition that,

> …the firm is not an individual. It is a legal fiction which serves as a focus of a complex process in which the conflicting objectives of individuals (some of whom may 'represent' other organizations) are brought into equilibrium within a framework of contractual relations…
>
> (Jensen and Meckling 1976, 311)

Agency theory implicitly recognizes that different stakeholders have different contractual relationships with firms that are institutionalized as a "nexus of contracts." The firm perpetually attempts to equilibrate the objectives of different parties within each's contractual limits. Firms typically attempt to balance them by coordinating transactions (and thus, economic productivity) in pursuit of rents (Gartenberg and Zenger 2023; Gibbons et al. 2021; Stoelhorst 2023). Rents are not only for managerial gain; rents importantly direct the efficiency of productive coordination within firms. Productivity, in turn, is what enables the firm to sustain itself as a subeconomic model. This is founded on the idea that held that price movements direct production outside of the firm, while production is directed by actors within the firm (Coase 1937).

Agency conflicts in firms thus arise when the firm fails to balance stakeholder relations, given the conflicting objectives of and information asymmetry between owners and managers (Coase 1937; Jensen and Meckling 1976). Ceteris paribus, firm governance structures and firm managers seek to avoid these agency conflicts by maximizing rents (Eisenhardt 1989). This is because rents, regardless of whether they are Schumpeterian profits or Ricardian rents, offer a quantifiable measure of firm efficiency. Accordingly, corporate governance structures have evolved to better align owners and manager interests by expanding managerial compensation mechanisms from salaries to restricted stock units and stock options (Fligstein 2021). In principle, these structures prevent managers from maximizing utility at the expense of shareholder value (Dey 2008).

However, the rise of sustainability has introduced new stakeholders, beyond owners and managers, representing a different set of interests. This largely includes communities that reside in areas disproportionately affected by firm emissions, and their vocal advocacy groups. From an agency theoretical perspective, this newfound focus on environmental sustainability portends agency conflicts within the firm, because it is difficult to reconcile with the existing equilibrium of contractual relations. Environmental preservation centers moral content that is an externality to the core financial obligations of a firm, namely, generating rents. Environmental sustainability alone also does not offer any metric on *how* to balance contractual relations, stressing emissions reduction without regard for the investment required nor the disruption it would pose to profitability (Phillips et al. 2003, 485).

More specifically, environmental sustainability captures two kinds of agency conflicts, namely, moral-hazard and earnings retention conflicts (Jensen and Meckling 1976). Moral-hazard conflicts refer to those where firms effectively incentivize their pursuit of investments that align with managerial preferences rather than investing in positive net present value (NPV) projects (McColgan 2001; Robinson 2019). According to an agency theoretical perspective, environmental sustainability comprises resource wastage as the costs of investing in renewable energy sources are capital expenditures that lower operating profits. For similar reasons, environmental sustainability constitutes an earnings retention conflict between investment and cash distribution. Shareholders prefer retaining earnings for higher levels of cash distribution, but investments and research costs for environmental sustainability siphon cash away, especially in the absence of positive NPV investment opportunities. At its core, environmental sustainability falls under this category by directing cash outside of the firm, similar to an additional tax.

Thus, agency theory would assert that environmental sustainability comprises interests that depart from pursuing rents or creating shareholder value and that firms are generally reluctant to pursue emissions reductions. The pursuit of environmental sustainability and the pursuit of profit have accordingly been argued to create trade-offs between revenue stability, profitability, product prices, and emissions containment (Bebchuk and Tallarita 2020; Fligstein and Goldstein 2022; Leins 2020).

This conceptualization of environmental sustainability as agency costs energizes recent work on organized hypocrisy. The concept of organized hypocrisy builds on agency theory's assumptions that the firm is a nexus of contractual relations with entities whose interests may compete with one another (Jensen and Meckling 1976). However, as firms seek to balance these competing interests and stakeholder relations, they may opt instead to simply signal their commitment to a particular set of interests, while "hypocritically" pursuing another set of practices in actuality. Seminal analyses of organized hypocrisy examined how organizations manage issues related to human rights and societal wellbeing (Barnett 2002; Krasner 1999; Lipson 2007). Peacekeeping organizations like the United Nations were accused of failing to act in accordance to ideals they propounded, such as their failures to prevent military conflicts from unfolding within their designated security zones (Lipson 2007).

At the heart of organized hypocrisy is the position that firms seek to improve their reputations, but mainly through talk and discourse, rather than action (Brunsson 2007). As Brunsson (2007) alleges, firms pursue organized hypocrisy as "a way of handling conflicts by reflecting them in inconsistencies among talk, decisions, and actions" (2007, 115). Within this framework, firms seek legitimacy as moral latitude for rent-seeking behaviors, more than for a genuine desire to improve societal wellbeing or achieve its stated ideals.

The issue is compounded by the fact that prominent shareholders reward firms for pursuing profits over sustainability, much as they do when firms manage to avoid taxes. To illustrate, corporate leaders who successfully facilitate tax avoidance are rewarded with improvements to their personal reputation as business executives, proxied with an increased number of external board seats (Lanis et al. 2022). If executives are rewarded for reducing liabilities, this creates an adverse selection effect, when they have an agentic incentive to pursue jurisdictional arbitrage for personal reputational gain (Jensen and Meckling 1976).

Thus, organized hypocrisy is a powerful framework for analyzing the place of sustainability in firm operations. Indeed, the rise of interest in environmental sustainability has added to the complexity of balancing stakeholder relations. Although more and more firms have taken to producing voluntary sustainability disclosures about their emissions profile and commitments to carbon neutrality (Malsch 2013), researchers have meaningfully critiqued their import for firm emissions and business practices (Farias et al. 2024; Snelson-Powell et al. 2020). Researchers have critiqued sustainability disclosures as a tool for creating legitimacy for the firm, rather than a genuine vehicle for pursuing sustainability goals (Cho et al. 2012; Milne and Gray 2013).

Cho et al. (2015) argue that firms produce sustainability reports to merely virtue signal their commitments to emissions reduction as a façade. This façade allows firms to improve their legitimacy and satisfy conflicting stakeholder demands, while pursuing "business-as-usual" without operational changes that would yield emissions reductions. This creates noticeable discrepancies between sustainability discourse and emissions production, where sustainability reports are used to deflect and obfuscate poor environmental performance (Cho et al. 2010). Like peacekeeping organizations that failed or refused to act in accordance with their own ideals (Lipson 2007), firms talk the talk, but do not walk the walk.

Regulatory pressures may impel firms to reduce emissions, but firms beholden to producing shareholder value (and who are rewarded for it) will find ways to circumvent these liabilities. In this scenario, organized hypocrisy theory would hold that firms seek to satisfy investor demand for environmental sustainability by signaling their commitment to emission reduction in regular public disclosures, but while refusing to make operational changes needed to reduce emissions. Evidence is mounting of firms overlooking decarbonization targets to maintain "business-as-usual," namely, to accommodate for profit and cost concerns (Bowen 2014; Dyllick and Muff 2016; Wright and Nyberg 2017). Firms may deflect poor environmental performance with disingenuous corporate communications, misleading investors and consumers about their sustainability credentials and carbon footprint (Tateishi 2018). These discursive efforts ultimately "create 'green talk' through statements aimed at satisfying stakeholder requirements in terms of sustainability but without any concrete action" (Siano et al. 2017, 27). Indeed, many firms and institutional investors that announce their commitments to sustainability still design corporate management practices around maximizing rents, without changing their emissions production.

3.2 | Jurisdictional Arbitrage in Emissions Regulations

This article investigates how firms pursue legal avenues to avoid environmental liabilities. An important gap in the literature on organized hypocrisy in firm sustainability is explaining mechanisms of noncompliance. Why, for instance, many firms appear able to avoid punishment for misconduct remains a pressing question (Barnett 2014). This article contributes to this work by examining how firms use jurisdictional arbitrage to avoid their emissions liabilities. I consider how geographical distance offers a form of jurisdictional arbitrage in terms of firms evading emissions regulations.

Firms avoid punishment for their misconduct largely because of the difficulty that stakeholders face with policing firm performance. Managers face limitations of attention and resources that inhibit their choice sets (Clyde 1997). Once a firm is discovered to have misbehaved, stakeholders are confronted with the decision of how to design and implement a commensurate penalty. Barnett (2014) posits that this decision typically leads away from punishment, "not necessarily because the firm has accrued moral capital ample to offset its misconduct, but because [the stakeholder] perceives that punishment requires too much effort relative to other demands on [their] limited resources" (p. 680).

The difficulties of policing firm performance are compounded when firms incorporate their operations or their listings in other jurisdictions. Emissions regulations have risen over the past decade as political pressures mount over the role that firms play in environmental sustainability (Eccles et al. 2017, 2020; de Freitas Netto et al. 2020). Resembling a form of organized hypocrisy, firms universally signal their commitment to environmental sustainability, but use jurisdictional arbitrage to placate their stakeholders agitating for emissions reductions while continuing "business-as-usual" without any change to emissions.

It is important to note that emissions regulations are highly decentralized across countries. By moving across geographical boundaries, firms are able to not only exploit regulatory differences, but avoid monitoring and accountability in their home jurisdictions. This article indirectly tests this by considering how cross-border listed firms differ in their emissions and the role that the geographical distance in listing abroad may play in firm emissions.

Cross-border listings, when firms list their shares on exchanges overseas, not only represent a form of financial liberalization, but an ambiguous regulatory zone whose ramifications for the emissions that firms produce is not yet understood. Addressing this gap, this article focuses on geographical distance in cross-border listings through depositary receipts. In this arrangement, a firm issues shares to depositary banks in a foreign nation, which list depositary receipts representing underlying shares of the firm to foreign stock exchanges for purchase by foreign investors. Firms may be incentivized to list in foreign markets to raise new capital and gain coverage from a broader range of analysts and experts. The resultant financial reporting may ultimately lead to higher valuations (Bae et al. 2020; Edison and Warnock 2008; Song et al. 2021).

However, there are also underexamined non-financial (regulatory) benefits that cross-border listings yield for firms, namely, jurisdictional arbitrage. Listing across borders is an important, yet understudied practice for firms to generate geographical distance and jurisdictional arbitrage from home jurisdictions. Similar to how firms offshore profits to evade liabilities by creating monitoring costs for regulators, a study by McKinsey identified that moving across jurisdictions for cross-listed firms tends to alleviate reporting costs and legal liabilities for the firm (Cogman and Poon 2012).

Geographical distance in cross-border listings thus increases compliance burdens for regulators. For one, the aforementioned cultural distance and legal differences that are inherent in geographical distance prevent pairs of jurisdictions from cooperating to monitor and clamp down on firm emissions (Blonigen et al. 2020; Head and Ries 2008). Another reason is that host market regulators are constrained by broader geopolitical agendas from their oversight of foreign firms, leading to diminished abilities to swiftly investigate related-party transactions, front-running, or settlement failures (Silvers 2021; Tsang et al. 2023). This issue is compounded by the absence of multilateral memoranda of understanding between many of the world's exchanges.

This article thus examines how geographical distance may be associated with greater emissions among cross-border listed firms, possibly owing to jurisdictional arbitrage by way of compliance burdens and information asymmetries. I adopt geographical distance as a proxy for jurisdictional arbitrage, similar to studies of tax noncompliance (Barth et al. 2017; Guvenen et al. 2017; Ritsatos 2014; Slemrod 2007; Smolyansky et al. 2019). My contributions are to offer empirical evidence and a framework for understanding the effects of distance on firm emissions in cross-border listings between home and host countries, while accounting for emissions sources. Accordingly, this article develops a core hypothesis:

Hypothesis. *Geographical distance in cross-border listings is positively associated with firm emissions.*

Firm emissions are stratified into three types or sources, each capturing emissions generated by a firm with different levels of proximity. Scope 1 emissions include greenhouse gas emissions directly produced by sources controlled by the firm. This could include fossil fuel combustion or basic materials processing within the boundaries of its jurisdiction. Scope 2 emissions include indirectly produced by firm operations, such as energy consumption. This includes the emissions generated by the electricity a firm purchases from external power plants. Scope 3 emissions are the broadest measure, focusing on greenhouse gases emitted upstream in the supply chain related to the firm. This includes the transportation and procurement of goods and services, and processing at the end of the product lifecycle, such as waste disposal.

By parsing out emissions into three Scopes, researchers have been able to identify the different climate impact of different production models, based on their carbon intensity (Wei et al. 2020). For instance, Scope 3 emissions is useful for capturing carbon emissions leakages, taking stock of electricity-related carbon emissions from a firm's consumption. Accounting for the three types of emissions also better captures the total carbon footprint of a firm. Investors tend to focus on Scopes 1 and 2 emissions in shareholder resolutions for better sustainability, while overlooking Scope 3 emissions (Stanny 2013). Accordingly, if firms respond by producing fewer Scopes 1 and 2 emissions, but greater Scope 3 emissions, this may indicate a firm attempting to offshore its production without reducing its total carbon footprint. Failures to account for all three Scope emissions, according to Brander et al. (2018), may misrepresent carbon footprints and lead to a misallocation of climate change mitigation efforts. These three measures collectively offer useful nuance for distinguishing the types of emissions that distance may or may not abet.

4 | Research Design

4.1 | Data and Sample Selection

This article uses data from Morningstar and Sustainalytics, proprietary sustainable finance databases on firms worldwide. These offer a rare resource with which to collate data on firm-level carbon-related policies and achievements. Morningstar Direct and Sustainalytics are among the foremost databases for sustainable finance and have been the subject of many studies in the financial literature (Del Guercio and Tkac 2008; Lisi and Caporin 2012). In fact, Morningstar assessments and ratings of firms exert a nonnegligible effect on investor perceptions and firm value itself (Blake and Morey 2000; Lisi and Caporin 2012). Filbeck et al. (2019) observe that the environmental sustainability ratings of individual firms provided by Sustainalytics has an impact on their stock performance. Recent work on emissions have also used these databases to assess firm sustainability (Harrison et al. 2023). The impact of Morningstar Direct and Sustainalytics on these firms themselves owes to their industry-leading level of nuance in their measures of sustainability and popular use by fund managers and firm executives themselves (Erhart 2022).

From a universe of approximately 143,130 firms listed on exchanges worldwide, this study applied a set of filters to refine its sample:

1. Firms were recorded whose shares are classified as depositary receipts. Depositary receipts are securities issued by a depositary for a company, whose shares are traded on a foreign exchange.
2. Only firms with carbon dioxide emissions data were included, given this study's focus on emissions.
3. Special purpose acquisition companies (SPACs) were removed. SPACs are effectively blank check holding companies that publicly trade for 2 years, during which it must merge with (partial acquisition) or acquire (full acquisition) a private company as an alternative pathway (compared to the traditional IPO) for it to obtain a public listing. Given that SPACs have no operations of their own and that they resemble a cost rather than an organizational structure (Klausner et al. 2022), they were excluded from the sample.
4. Duplicate share classifications for companies with multiple classifications were removed (e.g., Class A vs. Class C shares). Since share classes differ only in terms of their rights afforded to shareholders but do not change underlying company performance, only shares with the most voting rights were included (e.g., Class A). Voting shares are thus more theoretically salient because they are seen as superior to non-voting shares, and because firms often make strategic and financing decisions based on their voting shares (Hauser and Lauterbach 2004). Berkshire Hathaway, for instance, notoriously makes buyback decisions based on the book value of their voting-class A-shares, rather than their B-shares.

The final sample included 4748 firms ($n=4748$) that are statistically representative of operating firms that are publicly listed on foreign exchanges. For each firm, data were collected about their financial assets, liabilities, revenues and related costs of revenue, shareholder ownership, organizational structures, and emissions. Their annual reports assess the scope of their corporate operations and the extent of their ESG compliance across segmented operations. Similarly, share ownership data were collated from U.S. Securities and Exchange Commissions (SEC) Form 13F files and annual reports.

4.2 | Outcome Variable

The outcome variable is *carbon dioxide emissions*. This study focuses on measures of emissions at time $t=2023$ and decomposed across three major types of emissions. Emissions were measured in metric tonnes of carbon dioxide equivalent (MTCO2e). Emissions were parsed out into Scopes 1, 2, and 3 emissions at time t.

While studies have used both unscaled emissions in raw units of emissions (Bolton and Kacperczyk 2021) and scaled emissions by comparing emissions to assets (Lu et al. 2021), Cole et al. (2013) argue that scaled emissions are appropriate for assessing firm-specific emissions intensity, whereas unscaled emissions better capture the environmental impact of a firm (see also Harrison et al. 2023). As such, this study focuses on unscaled emissions, but transforms all three Scope emissions logarithmically to improve interpretability. Scope emissions SE are measured by adopting the Intergovernmental Panel on Climate Change (IPCC) method. In a firm i where m types of fuels are consumed to generate electricity, PG_k as the amount of kth fuel consumed in power generation, and EF_k is the carbon emissions intensity of kth fuel, emissions of Scope n can be expressed as:

$$SE_{n,i} = \sum_{k=1}^{m} PG_k \cdot EF_k, n = 1 \ldots 3 \quad (1)$$

The same formula applies for Scopes 1, 2, and 3, as PG_k captures multiple sources of fuel consumption (even if the sources themselves vary) and must be multiplied by EF_k to produce emissions of any Scope. Scopes 1, 2, and 3 emissions are further logarithmically transformed to improve interpretability, resulting in ln $SE_{1,i}$, ln $SE_{2,i}$, and ln $SE_{3,i}$, respectively.

4.3 | Independent Variable

The independent variable is *geographical distance*. Geographical distance is measured in thousands of kilometers between the distance between the epicenter of the business country (where a firm is headquartered) and the exchange country (where a firm has listed their shares). This is consistent with studies of the effects of distance on other forms of jurisdictional arbitrage (Demirgüç-Kunt et al. 2023; Subramanian and Overby 2017). Measures of country distance were obtained from ArcGIS.

This measure was chosen instead of border distance or capital distance for several reasons. Let us take the case of Brazil and Colombia. Though the two share a border, much of the Brazilian region that lines the border consists of the Amazon rainforest, with the capital located to the far south of Brazil. Measuring distance based on borders would produce a value of 0 km, while measuring the distance between the two capitals would produce a value of 7372 km.

The two are problematic for different reasons. The distance between borders produces an unrealistic assumption that two nations are considered one. The distance between capitals produces the opposite extreme of overstating the distance, especially since populations are distributed across the nation, and not exclusively concentrated in capitals. More importantly, multiple societies covered in the dataset do not have capitals, such as Hong Kong and Singapore.

For these reasons, distance was measured based on an intermediate measure between the two, namely, the distance between the epicenter of two nations. There are three exceptions for societies with exceptionally low population densities (below 10 persons per km^2): Canada (4.35 persons per km^2), Iceland (3.6 persons per km^2), and Australia (3.5 persons per km^2). For these nations, geographical distance is measured between nations based on their capitals. This article's argument, after all, is not about the place of incorporation, but about the connections between geography and flows of capital across borders.

4.4 | Control Measures

Building on López-Manuel et al. (2023), who most recently observed that firm effects account for 32.8% of the total variance of firm emissions, this study controls for other firm-level covariates of emissions.

Size: The size of a firm matters directly for emissions, which is operationalized in terms of market capitalization, revenues, and profitability. Firms that produce more goods and services for consumption will inevitably generate more emissions, creating a positive selection effect among the most successful firms. That is, firms with greater revenues and profitability, and by extension those most likely to command a higher valuation in market capitalization, are more likely to produce more emissions (see also Choi and Luo 2021).

Size is controlled for using market capitalization at $t-1$, which is logarithmically transformed for better comparison: ln *market* cap_{t-1}. Sales are controlled for through the logarithm of revenues at $t-1$: ln $revenues_{t-1}$. Investor returns are included through return on equity (ROE) at $t-1$, which measures the investor's profit (earnings leftover) as a result of their equity investment after debt service costs have been factored in (Pennacchi and Santos 2021). In this case, ROE_{t-1} is given by dividing net income at $t-1$ by book value of equity at $t-2$.

Financial leverage: Evidence on emissions and the financial health of a firm is inconclusive. Higher emissions and informational opaqueness about emissions have positive, significant effects on loan spreads, which raise the cost of debt that firms pay when assuming loans (Kleimeier and Viehs 2018). Recent research also identifies that firms with worse emissions are likely to face even greater borrowing costs when residing in a regulatory jurisdiction with stringent environmental regulations (Caragnano et al. 2020; Choi and Luo 2021). Evidence of the reverse effect, whether financial leverage affects emissions, is unavailable.

I control for the financial leverage of the firm through the *debt-to-equity ratio* at $t-1$, based on total liabilities divided by total shareholders' equity, as well as *financial leverage* at $t-1$, based on total assets divided by total shareholders' equity. The two ratios indicate the amount of debt a firm i uses in its capital structure.

Gender diversity: The recent corporate turn to a purported stakeholder values ideology that emphasizes multistakeholder interests in alignment with notions of environmental sustainability has also brought with it a focus on gender diversity in board membership (Leins 2020). This broad-based push for gender equality has generated research on the positive effects of gender representation on firm boards for returns on investment (Dezsö and Ross 2012), entrepreneurship (Lyngsie and Foss 2017), and corporate innovation (Chen et al. 2018). Given that environmental sustainability concerns are often paired with calls for equity in corporate governance, the *percentage of executives and directors in the firm who are female* at $t-1$ is also included.

Finally, a series of fixed effects specifications are included for robustness checks. This includes time fixed effects, which focuses on the year that a firm publicly lists; country fixed effects, which includes the countries in which firms operate in; and industry-fixed effects, based on the six-digit North American Industry Classification System (NAICS) industry codes. While discourse surrounding environmental sustainability appears to totalize firms altogether in mass media coverage, pressures for emissions reduction and their potential revenue destabilization effects are heterogeneous across different industries. The significance of industry-level effects, however, is entrenched in reports by supranational organizations (IPCC 2022; UNIDO 2023), domestic regulatory bodies for emissions reduction (Department for Energy Security and Net Zero 2021), and academic research (López-Manuel et al. 2023).

Among them, for instance, the focus of attention on emissions reduction centers on industrial production. The United Nations Industrial Development Organization's (UNIDO) *Industry*

Decarbonization agenda focuses on decarbonization in the basic materials industry. Basic materials processing refers to the discovery or processing of raw materials, such as mining and metal refining, chemical products, and other raw commodities. Using macro-level datasets from developing countries, economists and social scientists have estimated using regression analysis that industrial production (in addition to adherent energy consumption) has been responsible for the most emissions production (Azevedo et al. 2018; Karakurt and Aydin 2023; Wu et al. 2015).

4.5 | Analysis

In order to address the research question, this article adopts a three-step analysis with multivariate testing. The first step involved Mann–Whitney *U*-tests to determine whether statistically significant differences exist in the amount of firm emissions produced by firms with different types of listings. Specifically, this study first compares differences in firm emissions between firms whose depositary receipt shares are primary listings and those whose shares are not. Examining between-group differences using medians, Mann–Whitney *U*-tests are inferential tests for assessing differences between groups of different sizes that do not distribute normally. Following Rosner and Grove (1999), this study considers that depositary receipt primary listings and non-primary listings are not clustered with samples A and B of sizes a and b, respectively. The U-statistic W_{AB} is given by:

$$W_{AB} = \sum_{i=1}^{a} \sum_{j=1}^{b} U_{ij} \tag{2}$$

such that $U_{ij} = 1$ if $A_i < B_j$, $U_{ij} = 0$ if $A_i > B_j$, and $U_{ij} = 0.5$ if $A_i = B_j$ for firms i and j in the two groups, from which the null hypothesis H_0 derives that the probability of $\{U_{ij} = 1\}$ = probability of $\{U_{ij} = 0\}$, meaning there are no differences between groups, and the hypothesis H_1 that probability of $\{U_{ij} = 1\}$ = probability of $\{U_{ij} = 0\}$, meaning that there are differences between the groups. Under H_0, it follows that:

$$E(W_{AB}) = \frac{ab}{2}$$
$$var(W_{AB}) = ab \cdot var(U_{ab}) + ab(a-1)cov(U_{ij}, U_{kj}) + ab(b-1)cov(U_{ij}, U_{il}) \tag{3}$$

Let us assume that there are s unique values and t is the number of occurrences of the qth value, where $q = 1, \ldots, s$. Under H_0, it also follows that:

$$var(W_{AB}) = \frac{ab}{12}\left[(a+b+1) - \frac{\sum_{q=1}^{s} t_q\left(t_q^2 - 1\right)}{(a+b)(a+b-1)}\right] \tag{4}$$

But expanded to a large sample size, the following test statistic emerges under H_0:

$$z = \frac{\left(\left|W_{AB} - \frac{ab}{2}\right| - 1\right)}{\left[var(W_{AB})\right]^{1/2}} \sim N(0,1) \tag{5}$$

The second and third steps estimate how the effect of distance on firm carbon emissions differ depending on the type of listing, namely, those whose cross-border listings are their primary listing and those who are not their primary listing, respectively. These two steps thus involve separately examining the predictors of ln $SE_{n,i,t}$ among variegated types of firms. The sample was stratified into two subsamples based on the listing status of their depositary receipts: primary listing ($n = 1511$) and non-primary listing ($n = 3237$).

Tables 1 and 2 present the descriptive statistics for these subsamples. This subsample analysis based on firm type captured the size of the main effects on ln $SE_{n,i,t}$ and lent for comparisons between different types of firms. Missing cases were removed by listwise deletion. The results were the same when multiple imputation was used for handling missing data.

Following Karakurt and Aydin (2023), both the second and third steps involved estimating a series of logarithmic equations

TABLE 1 | Descriptive statistics for primary listed firms.

	Mean	Standard deviation	Range
Distance	7.32	4.09	0–19
Ln market cap$_{t-1}$	9.67	1.80	4.06–14.6
Ln revenue$_{t-1}$	8.14	2.89	−2.40 to 19.4
ROE$_{t-1}$	52.43	790.94	−1702.02 to 28,805.8
Debt to equity$_{t-1}$	1.39	4.18	0.0001–77
Financial leverage$_{t-1}$	5.13	8.36	1.03–140.9
Percentage of female executives and directors$_{t-1}$	27.33	13.91	0–100
N	1511		

TABLE 2 | Descriptive statistics for non-primary listings.

	Mean	Standard deviation	Range
Distance	5.82	4.07	0–18.4
Ln market cap$_{t-1}$	9.47	1.67	4.0–12.9
Ln revenue$_{t-1}$	10.87	2.94	−2.0–19.5
ROE$_{t-1}$	13.16	34.17	−240.02 to 493.9
Debt to equity$_{t-1}$	0.97	2.24	0.0001–28.5
Financial leverage$_{t-1}$	4.76	7.59	1.01–226.4
Percentage of female executives and directors$_{t-1}$	26.64	17.25	0–100
N	3237		

for emissions of Scope n for firm i at time t given by a common structure:

$$\begin{aligned}\ln SE_{n,i,t} = \; & \beta_0 + \beta_1 \text{distance} + \beta_2 \ln \text{market cap}_{t-1} \\ & + \beta_3 \ln \text{revenues}_{t-1} + \beta_4 \text{ROE}_{t-1} \\ & + \beta_5 \text{female representation}_{t-1} + \beta_6 Y_t + \beta_7 Y_i \\ & + \beta_8 Y_c + \varepsilon_i, n = 1, \ldots, 3 \end{aligned} \tag{6}$$

including time fixed effects Y_t, industry fixed effects Y_i, and country fixed effects Y_c. The robustness of these estimates was verified by examining the sensitivity of the results to various fixed effects specifications of the regression models and the inclusion of different control variables (full models in Appendix A). These variations of fixed effects specifications for the focal and an array of control variables offer an important way of implementing robustness controls to ensure structural validity (Au 2024).

Following O'Brien (2007), further robustness tests included computing the multicollinearity of the focal variables using tolerance of the ith independent variable in the analysis $(1 - R_i^2)$. This represents the proportion of variance in the ith independent variable that is unrelated to other independent variables in the model. For interpretability, the inverse of the tolerance is also calculated to give the Variance Inflation Factor (VIF), or $\frac{1}{1-R_i^2}$. Standard errors for the coefficients are also bootstrapped for robustness (Addi and Abubakar 2024). All VIF values were below 10 (presented in Tables 3 and 4), indicating low multicollinearity, and standard error values (presented in the regression results) were sufficiently low, also suggesting structural validity (O'Brien 2007).

5 | Results: Estimates of Carbon Emissions

The first step of the results used Mann–Whitney *U*-tests expressed in Equations (2–5) to determine whether statistically significant differences exist in the amount of firm emissions produced by firms with different types of listings. The business-exchange geographical distance of firm listings and carbon emissions are first compared between the two groups of primary and non-primary listings (Table 5). Whitney–Mann *U*-tests reveal statistically significant differences in the geographical choice of listing. Firms whose depositary receipts are primary listings are more likely to choose geographically distant countries to list in than firms with non-primary listings. Carbon emissions also exhibit statistically significant differences, but only for emissions of Scopes 2 and 3, where firms whose listings are *primary* appear to produce fewer emissions (Table 6).

The second step involved producing estimates of carbon emissions across firms whose cross-border listings are their primary listing, in order to eventually determine whether the effect of distance on emissions differs by the type of listing. The effects of distance are reported using Equation (6) in the following models (full models in Appendix A). Let us first examine firms whose cross-border listed shares are their primary listing (full model in Table A1).

TABLE 3 | VIF values and tolerance levels for primary listings.

	VIF	Tolerance
Distance	2.86	0.350
Ln market cap$_{t-1}$	1.92	0.522
Ln revenue$_{t-1}$	1.42	0.704
ROE$_{t-1}$	1.29	0.777
Debt to equity$_{t-1}$	3.20	0.312
Financial leverage$_{t-1}$	3.30	0.303
Percentage of female executives and directors$_{t-1}$	1.27	0.787
Time	1.57	0.636
Business country	1.13	0.887
Exchange country	1.39	0.721
Industry	1.10	0.909

TABLE 4 | VIF values and tolerance levels for non-primary listings.

	VIF	Tolerance
Distance	4.30	0.233
Ln market cap$_{t-1}$	1.30	0.769
Ln revenue$_{t-1}$	1.50	0.667
ROE$_{t-1}$	1.08	0.930
Debt to equity$_{t-1}$	1.66	0.602
Financial leverage$_{t-1}$	1.75	0.570
Percentage of female executives and directors$_{t-1}$	1.40	0.713
Time	1.09	0.916
Business country	1.07	0.936
Exchange country	1.09	0.918
Industry	1.10	0.909

TABLE 5 | Mann–Whitney *U*-tests between depositary receipt shares that are primary listings compared to non-primary listings.

	Primary	Not primary	Test statistic	*p*
Distance	7.32 (0.105)	5.71 (0.096)	1.18e+6	<0.001
Ln Carbon Scope 1 Emissions	10.71 (0.092)	10.91 (0.091)	1.29e+6	0.061
Ln Carbon Scope 2 Emissions	11.22 (0.065)	11.30 (0.070)	1.30e+6	0.035
Ln Carbon Scope 3 Emissions	13.08 (0.091)	13.31 (0.097)	1.26e+6	0.003
N	1511	3237		

Note: Standard errors are in parentheses.

When focusing on ln Carbon Scope 1 Emissions for primary listings, distance in the baseline model is non-significant. Distance has a negative effect on emissions in the time fixed effects model ($\beta = -0.101$), but which becomes positive ($\beta = 0.153$) in the country fixed effects model. Despite these discrepancies, let us focus on the full model with all fixed effects included, which has the greatest explanatory power ($R^2 = 0.811$) and in which distance has a positive effect ($\beta = 0.056$) on ln Carbon Scope 1 Emissions. This supports the hypothesis.

Table 7 visualizes the effects of distance on ln Carbon Scope 2 Emissions (full model in Table A2). Unlike with ln Carbon Scope 1 Emissions, distance has a consistently positive effect in most of the models here. Distance is associated with a moderate change in ln Carbon Scope 2 Emissions in the baseline model ($\beta = 0.055$) and in the industry fixed effects model ($\beta = 0.054$). The effect of distance is highest ($\beta = 0.131$) in the country fixed effects model. Adding all fixed effects reveals a moderate and positive effect of distance on emissions ($\beta = 0.046$), which also explains the greatest amount of variance across all model specifications ($R^2 = 0.776$) in support of the hypothesis.

Table 8 observes that the effect of distance on ln Carbon Scope 3 Emissions is only significant in two models, with countervailing effects (full model in Table A3). The time fixed effects model, the effect is negative ($\beta = -0.05$), while the effect becomes positive in the country fixed effects model ($\beta = 0.142$). It is important to note, however, that these two models explain a low amount of variance ($R^2 \sim 0.359$–0.381).

Using Equation (6), the third step produces estimates of carbon emissions across firms whose cross-border listings are not their primary listing, creating the basis to compare the effect of distance between primary and non-primary listings.

Table 9 reports the effects of distance on ln Carbon Scope 1 Emissions (full model in Table A4). Here, distance has a negative effect in the baseline model ($\beta = -0.069$). Adding time fixed

TABLE 6 | Estimates of Ln Carbon Scope 1 Emissions for primary listings with various fixed effects specifications.

	Estimate of distance	Standard error	R^2	N
Baseline (with controls)	−0.025	0.020	0.269	1511
Add time fixed effects	−0.101***	0.024	0.337	1511
Add country fixed effects	0.153***	0.032	0.378	1511
Add industry fixed effects	0.019	0.013	0.776	1511
Add all fixed effects	0.056*	0.024	0.811	1511

$^*p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

TABLE 7 | Estimates of Ln Carbon Scope 2 Emissions for primary listings with various fixed effects specifications.

	Estimate of distance	Standard error	R^2	N
Baseline (with controls)	0.055***	0.013	0.409	1511
Add time fixed effects	0.014	0.015	0.475	1511
Add country fixed effects	0.131***	0.020	0.502	1511
Add industry fixed effects	0.054***	0.011	0.702	1511
Add all fixed effects	0.046*	0.019	0.776	1511

$^*p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

TABLE 8 | Estimates of Ln Carbon Scope 3 Emissions for primary listings with various fixed effects specifications.

	Estimate of distance	Standard error	R^2	N
Baseline (with controls)	0.010	0.020	0.307	1511
Add time fixed effects	−0.050*	0.023	0.359	1511
Add country fixed effects	0.142***	0.032	0.381	1511
Add industry fixed effects	0.030	0.018	0.639	1511
Add all fixed effects	0.020	0.031	0.684	1511

$^*p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

TABLE 9 | Estimates of Ln Carbon Scope 1 Emissions for non-primary listings with various fixed effects specifications.

	Estimate of distance	Standard error	R^2	N
Baseline (with controls)	−0.069***	0.021	0.296	3237
Add time fixed effects	−0.094***	0.024	0.370	3237
Add country fixed effects	0.123**	0.044	0.492	3237
Add industry fixed effects	−0.066***	0.013	0.844	3237
Add all fixed effects	0.089***	0.027	0.893	3237

$^*p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

effects ($\beta = -0.094$) and industry fixed effects ($\beta = -0.066$) does not change this negative effect. Adding country fixed effects, by contrast, shows the effect to be positive ($\beta = 0.123$). Adding all four fixed effects explains a significant amount of variance ($R^2 = 0.893$), the most of all model specifications. In this model, distance has a positive effect ($\beta = 0.089$) on emissions, supporting the hypothesis.

For ln Carbon Scope 2 Emissions, Table 10 reveals that the effect of distance is not significant in the baseline (full model in Table A5). Adding time fixed effects also produces a non-significant effect. However, the country fixed effects specification shows that a positive correlation between distance and emissions ($\beta = 0.095$). The effect turns negative when industry fixed effects ($\beta = -0.033$) are added. In the model specification with all fixed effects, the effect of distance is moderate and positively significant ($\beta = 0.075$). Though this model specification differs from other specifications, note that it once again explains a significant proportion of variance and lends support for the hypothesis ($R^2 = 0.827$).

TABLE 10 | Estimates of Ln Carbon Scope 2 Emissions for non-primary listings with various fixed effects specifications.

	Estimate of distance	Standard error	R^2	N
Baseline (with controls)	−7.54e−4	0.014	0.392	3237
Add time fixed effects	−0.015	0.016	0.452	3237
Add country fixed effects	0.095**	0.029	0.547	3237
Add industry fixed effects	−0.033**	0.011	0.731	3237
Add all fixed effects	0.075*	0.023	0.827	3237

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

TABLE 11 | Estimates of Ln Carbon Scope 3 Emissions for non-primary listings with various fixed effects specifications.

	Estimate of distance	Standard error	R^2	N
Baseline (with controls)	−0.133***	0.022	0.329	3237
Add time fixed effects	−0.129***	0.025	0.373	3237
Add country fixed effects	0.152**	0.049	0.441	3237
Add industry fixed effects	−0.093***	0.019	0.649	3237
Add all fixed effects	0.125**	0.042	0.742	3237

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

For ln Carbon Scope 3 Emissions (full model in Table A6), the effect of distance is negative in the baseline model in Table 11 ($\beta = -0.133$). This effect is largely intact when time fixed effects ($\beta = -0.129$) and industry fixed effects ($\beta = -0.093$) are added. But the effect of distance changes when considering all fixed effects in the final model specification, becoming highly positive and very significant ($\beta = 0.125$). This consistent with the effect observed in ln Carbon Scopes 1 and 2 Emissions, but even higher in scalar value, also offering strong evidence in support of the hypothesis.

6 | Discussion and Implications

Does geographical distance affect emissions for cross-border listings? To return to the original research question this article set out to answer, the results suggest that geographical distance is positively associated with firm emissions in cross-border listings, offering evidence in support of the hypothesis. The effect of geographical distance on firm emissions also differs depending on the type of emissions. For primary listings, distance is associated with increases in ln Scope 1 ($\beta = 0.056$), ln Scope 2 ($\beta = 0.046$), and ln Scope 3 emissions ($\beta = 0.142$). For non-primary listings, the effect of distance is also positively and significantly associated with greater ln Scope 1 ($\beta = 0.089$), ln Scope 2 ($\beta = 0.075$), and ln Scope 3 emissions ($\beta = 0.125$). Consistently, the model specification adding all fixed effects offered the most statistical explanatory power, except for ln Carbon Scope 3 Emissions for firms whose depositary shares are their primary listings. Otherwise, all estimates of emissions of all Scopes explained the most variance when all fixed effects were simultaneously specified.

6.1 | Theoretical Implications

The results raise several implications for jurisdictional arbitrage and the regulation of firm emissions in sustainability initiatives. They suggest that firms appear to use geographical distance in cross-border listings to avoid emissions liabilities and produce more emissions. Put differently, they offer evidence that geographical distance in cross-border listings represents an understudied form of jurisdictional arbitrage for firms seeking to circumvent emission reductions regulations that are on the rise (Eccles et al. 2020).

Theoretically, geographical distance surfaces as an important quality of cross-border listings that firms leverage to avoid liabilities, consistent with their use in other strategies to avoid liabilities, such as incorporating farther and offshoring profits. The evidence is consistent with arguments that geographical distance adds regulatory compliance costs and informational asymmetries that prevent firms from being monitored by regulators, which researchers have theorized is due to cultural distance and legal differences (Chen et al. 2022; Kubick et al. 2017).

More broadly, this article deepens our understanding of environmental sustainability as an emerging paradigm in corporate management through the lens of agency theory. Agency theory conceptualizes the firm as a "nexus of contracts" (Jensen and Meckling 1976) that primarily coordinates its many stakeholder relations by pursuing rents, which not only generate gains for owners and managers, but offer an important barometer of firm efficiency in resource mobilization. Innovations in compensation and corporate governance structures over time, such as stock options, have further aligned the interests of managers and owners.

The rise in attention to environmental emissions has posed a disruption to this set of relations by forcing attention to a new, more amorphous stakeholder: communities affected by emissions by firms. Although methodological innovations have attempted to capture direct and indirect sources of these emissions in Scopes 1, 2, and 3, this research suggests that the problem of how to integrate such concerns within existing stakeholder relations remains a challenge and a source of agency conflicts. Firms have come under scrutiny and pressured to release thorough disclosures on their emissions, but they remain committed to avoiding emissions liabilities. Existing evidence has focused on how firms pursue "business-as-usual," that is, by refusing to reduce emissions despite their disclosures.

The present research goes further to show how firms pursue legal avenues of avoiding emissions liabilities, namely, jurisdictional arbitrage in choosing where they list their shares. Agency theory offers a useful lens for understanding why firms are incentivized to avoid emissions liabilities and reduction efforts, namely, in order to avoid moral hazard and earnings retention conflicts. Although environmental sustainability advocates have pushed meaningfully for emissions reduction, an agency theoretical perspective illustrates a dearth of—and stresses the need—of mechanisms to equilibrate emissions reduction with concerns among managers and owners about developing NPV projects and preserving profitability.

Much research on environmental sustainability in corporations has focused on corporate communications. However, this article raises theoretical implications for this work, suggesting the limits of relying on what firms say as a proxy for what they do. This study demonstrates the importance of assessing what firms do in terms of managing emissions and their intersection with strategic decisions, such as the choice of where to list the firm.

This study contributes to work on jurisdictional arbitrage and on organized hypocrisy by (a) outlining a novel form of jurisdictional arbitrage, namely, cross-border listings. This study also demonstrates (b) how cross-border listings serve as a prospective mechanism for firms to avoid emissions liabilities. Pairs of jurisdictions do not always have cooperative agreement on emissions regulations, nor on oversight mechanisms and punishments for infractions. Firms exploit this jurisdictional arbitrage in a fashion similar to organized hypocrisy, for despite universal claims about firm commitments to emissions reductions, they resort to cross-border listings to gain latitude to produce emissions and conduct "business-as-usual."

While research on jurisdictional arbitrage has found that greater physical distance between pairs of jurisdictions is correlated with cultural distance and legal differences (Blonigen et al. 2020; Head and Ries 2008), this article advances this work by demonstrating the understated effects of distance on increasing or maintaining firm emissions. Like previous studies of tax noncompliance (Chen et al. 2022; Kubick et al. 2017), this study finds that geographical distance creates information asymmetries, such that firms that list farther from their home jurisdictions more easily avoid *emissions* liabilities just as they do tax liabilities.

6.2 | Managerial Implications

Studies of organized hypocrisy document the ways in which firms use sustainability reporting to signal their commitments to emissions reduction, but often as a façade to simply manage conflicting stakeholder demands and improve their legitimacy while pursuing "business-as-usual" (Brunsson 2007; Cho et al. 2015). In light of this, this article demonstrates that firms that list their shares in a geographically distant jurisdiction likely do so for latitude to avoid emissions liabilities. Considering these results, the geographical distance of an exchange should be a prime consideration in discussions about reducing firm emissions among boards, and should be a criterion on which firms are scrutinized when gauging their sustainability credentials. Boards seeking to maximize their impact on environmental sustainability should be encouraged to list their shares on an exchange geographically closer to their home jurisdictions.

In particular, boards may consider developing corporate policies and guidelines about where to list in order to disincentivize adverse selection effects and improve corporate communications and firm reputation. Just as corporate leaders who successfully facilitate tax avoidance are rewarded with improvements to their personal reputation as business executives (Lanis et al. 2022), listing farther to circumvent emissions guidelines may similarly see board members rewarded for helping the firm avoid liabilities.

This article suggests that cross-border listings may be grounds for these adverse selection effects. As a result, firms seeking to circumvent these prospective issues and enforce firm commitments to emissions reductions should create guidelines on how far to list as well as how to reduce or avoid jurisdictional arbitrage. Doing so would improve the quality of corporate communications and offer a superior proxy for firm commitment to sustainability. Indeed, more comprehensive corporate disclosures about how firms assess and maximize environmental sustainability and corporate social responsibility have been found to protect the firm from reputational damage during crisis periods.

6.3 | Regulatory Implications

This article also holds implications for monitoring firm emissions from a regulatory standpoint. Although examples of firms adjusting their products to cheat emissions tests like Volkswagen are far and few in between, this study shows that cross-border listings are a much more common, seemingly innocuous mechanism for avoiding emissions liabilities.

Regulatory initiatives to enforce environmental sustainability appear to be part of a rising tide in economies worldwide, this article paints a portrait of the heterogeneity in emissions regulations across international jurisdictions, given that firms can produce more emissions when they list farther from their home jurisdictions. Rather than regulations becoming isomorphic, it emerges that regulatory attitudes toward environmental sustainability may be highly fragmented, like how countries vary considerably in their corporate tax rates.

Analogous to how firms offshore their operations to offshore their profits and avoid tax liabilities (Blonigen et al. 2020; Cogman and Poon 2012; Head and Ries 2008), firms also appear to offshore emissions by listing their shares across borders in jurisdictions that are farther from their home jurisdiction. Much of the reason appears to be the same: governments often lower their tax rates and emissions criteria to attract firms to incorporate, onshore their operations, and list in their exchanges (Khan et al. 2017; Shevlin et al. 2020).

To maximize the reach and efficacy of environmental sustainability initiatives, cooperative agreements are required between different jurisdictions to monitor firm emissions and enforce emissions reduction regulations in a globalized economy. This builds upon, yet extends a similar dialogue unfolding about the prospects of an OECD global minimum tax rate to avoid a "race to the bottom," when governments continually lower their corporate tax rates to outbid one another in attracting firms, but at the cost of tax revenues worldwide (Dyreng et al. 2008; Fuest and Riedel 2009; Setser 2023). In parallel, this article illustrates the need for a consensus in emissions standards and monitoring requirements across multiple jurisdictions in order for them to be effective in any one jurisdiction.

7 | Conclusion

This study segues with and gains credence from research on firm commitments to sustainability as an organized hypocrisy: a tool for creating legitimacy for the firm, rather than a genuine vehicle for pursuing sustainability goals (Cho et al. 2012; Milne and Gray 2013). While previous studies of hypocrisy have focused on what firms say through disclosure (Cho et al. 2010, 2015; Farias et al. 2024; Snelson-Powell et al. 2020), this study goes further to investigate what firms do in terms of emissions management and their listing strategies. This article adds empirical nuance to existing work on organized hypocrisy and agency theory by identifying a unique form of jurisdictional arbitrage, cross-border listings, and its role as a prominent mechanism through which firms actively avoid accountability for emissions liabilities.

This study also contributes to extant research on jurisdictional arbitrage by investigating the relationships between geographical distance and firm emissions production. Analogous to how firms offshore their operations and profits to avoid tax liabilities or reap legal advantages (Dine and Koutsias 2019), this study outlines how firms also offshore emissions to circumvent their *emissions* liabilities, implicitly gaining the ability to produce the same or more emissions. Drawing on a large sample of firms, this article has illustrated that for a given firm i, listing depositary receipt shares in a jurisdiction farther from the country of its incorporation is generally associated with increases in firm emissions. However, this effect is heterogeneous, depending on whether a firm's depositary receipts are primary or non-primary listings. The evidence shows that distance is associated with increases in emissions among cross-listed firms, but the effect of distance is stronger for ln Scope 1 and ln Scope 2 Emissions among non-primary listings, whereas the effect is stronger for ln Scope 3 Emissions among primary listings. In terms of the type of listing, non-primary listings in general produce higher volumes of emissions than primary listings.

The results tentatively suggest that primary listings are subject to different firm considerations for emissions alleviation compared to non-primary listings. Primary listings have higher status and, correspondingly, an elevated amount of scrutiny from regulatory bodies compared to non-primary listings (Anderson and Dyl 2008). As a result, even though firms still appear to use primary listings to offshore emissions, they may choose to offshore more of their emissions to non-primary jurisdictions to benefit from less regulatory scrutiny. This legal maneuverability is also a core part of jurisdictional arbitrage, given that firms that incorporate offshore are broken down into subsidiaries and invoke limited liability, protecting parent firms from actions of their subsidiaries (Dine and Koutsias 2019).

However, this article focuses on predictors of emissions at a firm-level in a sample of thousands of firms. I lay the foundation for future research in three ways. First, while scholars have examined the consequences of jurisdictional arbitrage in tax evasion for firm performance (Bebchuk and Cohen 2003; Daines 2001; Dine and Koutsias 2019; Johnson 2013), future research should similarly examine how jurisdictional arbitrage in emissions liabilities reduction through cross-border listings would affect firm performance and investor perceptions.

Second, future research would do well to examine managerial views of jurisdictional arbitrage. To do so, infra-firm survey studies would help generate a micro-level view of managerial decisions about the trade-offs between jurisdictional arbitrage and the quality of corporate disclosures. They would also lend well for assessments of the monitoring costs involved with offshored emissions.

Third, an emerging body of research has meaningfully distinguished the single materiality (ESG) and double materiality (sustainability) dimensions of sustainability initiatives. The former examines the impact of ESG criteria on firm performance and the latter examines the impact of firm ESG initiatives on broader society. Research within this scope could trace the unequal impacts of firms' offshored emissions on different regions around the world and the regulatory structures that inhibit or facilitate the cross-border monitoring of firm emissions.

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Data Availability Statement

The data used is a private dataset from Morningstar.

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Appendix A

TABLE A1 | Model specifications of Ln Scope Carbon 1 for companies whose depositary receipt shares are primary listed.

	Baseline model		Time-fixed effects model		Country-fixed effects model		Industry-fixed effects model		All fixed-effects model	
Predictor	**Estimate**	**Standard error**	**Estimate**	**Standard error**	**Estimate**	**Standard error**	**Estimate**	**Standard error**	**Estimate**	**Standard error**
Distance	−0.025	0.020	−0.101***	0.024	0.153***	0.032	0.020	0.013	0.056*	0.024
Ln market cap$_{t-1}$	0.775***	0.051	0.708***	0.058	0.701***	0.061	0.793***	0.035	0.647***	0.049
Ln revenue$_{t-1}$	0.290***	0.030	0.354***	0.037	0.455***	0.043	0.128***	0.020	0.279***	0.036
ROE$_{t-1}$	3.96e−5	6.99e−4	1.12e−4	8.39e−4	−5.22e−4	6.78e−4	−0.001**	4.55e−4	−0.002**	5.56e−4
Debt to equity$_{t-1}$	0.429***	0.044	0.465***	0.046	0.480***	0.045	0.009	0.043	0.098*	0.049
Financial leverage$_{t-1}$	−0.228***	0.021	−0.224***	0.023	−0.242***	0.022	0.025	0.023	−0.021	0.026
Percentage of female executives and directors$_{t-1}$	−0.007	0.006	0.002	0.007	−0.014*	0.007	0.007	0.004	0.003	0.005
Intercept	1.848***	0.476	2.012	2.969	0.542	1.425	0.511	0.655	0.295	2.110
Time-fixed effects	NO		YES		NO		NO		YES	
Country-fixed effects	NO		NO		YES		NO		YES	
Industry-fixed effects	NO		NO		NO		YES		YES	
R^2	0.269		0.337		0.378		0.776		0.811	
N	1511		1511		1511		1511		1511	

$^*p<0.05$, $^{**}p<0.01$, $^{***}p<0.001$.

TABLE A2 | Model specifications of Ln Scope Carbon 2 for companies whose depositary receipt shares are primary listed.

	Baseline model		Time-fixed effects model		Country-fixed effects model		Industry-fixed effects model		All fixed-effects model	
Predictor	**Estimate**	**Standard error**	**Estimate**	**Standard error**	**Estimate**	**Standard error**	**Estimate**	**Standard error**	**Estimate**	**Standard error**
Distance	0.055***	0.013	0.014	0.015	0.131***	0.020	0.054***	0.011	0.046*	0.019
Ln market cap$_{t-1}$	0.665***	0.032	0.620***	0.036	0.668***	0.038	0.724***	0.028	0.674***	0.038
Ln revenue$_{t-1}$	0.254***	0.019	0.293***	0.024	0.325***	0.027	0.161***	0.017	0.260***	0.028
ROE$_{t-1}$	4.46e−4	4.44e−4	7.58e−4	5.27e−4	2.03e−4	4.29e−4	−7.67e−4*	3.71e−4	−6.56e−4	4.37e−4
Debt to equity$_{t-1}$	0.194***	0.028	0.224***	0.029	0.218***	0.029	−0.066	0.034	−0.023	0.038
Financial leverage$_{t-1}$	−0.104***	0.014	−0.120***	0.014	−0.111***	0.014	0.050**	0.019	0.027	0.020
Percentage of female executives and directors$_{t-1}$	0.001	0.004	0.007	0.004	−0.002	0.004	0.005	0.003	0.002	0.004
Intercept	2.605***	0.302	3.205	1.867	0.787	0.902	2.489***	0.534	2.003	1.659
Time-fixed effects	NO		YES		NO		NO		YES	
Country-fixed effects	NO		NO		YES		NO		YES	
Industry-fixed effects	NO		NO		NO		YES		YES	
R^2	0.409		0.475		0.502		0.702		0.776	
N	1511		1511		1511		1511		1511	

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

TABLE A3 | Model specifications of Ln Scope Carbon 3 for companies whose depositary receipt shares are primary listed.

	Baseline model		Time-fixed effects model		Country-fixed effects model		Industry-fixed effects model		All fixed-effects model	
Predictor	**Estimate**	**Standard error**	**Estimate**	**Standard error**	**Estimate**	**Standard error**	**Estimate**	**Standard error**	**Estimate**	**Standard error**
Distance	0.010	0.020	−0.050*	0.023	0.142***	0.032	0.030	0.018	0.020	0.031
Ln market cap$_{t-1}$	0.872***	0.050	0.792***	0.057	0.744***	0.061	0.833***	0.045	0.677***	0.063
Ln revenue$_{t-1}$	0.277***	0.030	0.328***	0.037	0.432***	0.043	0.145***	0.026	0.271***	0.047
ROE$_{t-1}$	8.94e−4	6.88e−4	0.001	8.23e−4	5.97e−4	6.84e−4	−0.001*	5.84e−4	−0.001	7.17e−4
Debt to equity$_{t-1}$	0.361***	0.043	0.358***	0.044	0.406***	0.046	0.005	0.054	0.021	0.062
Financial leverage$_{t-1}$	−0.189***	0.021	−0.185***	0.022	−0.208***	0.022	0.029	0.029	0.022	0.033
Percentage of female executives and directors$_{t-1}$	0.009	0.006	0.014*	0.006	−0.003	0.007	0.013*	0.005	0.005	0.006
Intercept	2.522***	0.471	5.4489	2.914	−0.373	1.438	4.249***	0.842	3.628	2.723
Time-fixed effects	NO		YES		NO		NO		YES	
Country-fixed effects	NO		NO		YES		NO		YES	
Industry-fixed effects	NO		NO		NO		YES		YES	
R^2	0.307		0.359		0.381		0.639		0.684	
N	1511		1511		1511		1511		1511	

$^{*}p<0.05$, $^{**}p<0.01$, $^{***}p<0.001$.

TABLE A4 | Model specifications of Ln Scope Carbon 1 for companies whose depositary receipt shares are not their primary listings.

	Baseline model		Time-fixed effects model		Country-fixed effects model		Industry-fixed effects model		All fixed-effects model	
Predictor	**Estimate**	**Standard error**	**Estimate**	**Standard error**	**Estimate**	**Standard error**	**Estimate**	**Standard error**	**Estimate**	**Standard error**
Distance	−0.069***	0.021	−0.094***	0.024	0.123**	0.044	−0.066***	0.013	0.089***	0.027
Ln market cap$_{t-1}$	0.649***	0.053	0.615***	0.064	0.512***	0.056	0.713***	0.031	0.698***	0.043
Ln revenue$_{t-1}$	0.341***	0.031	0.355***	0.038	0.686***	0.043	0.227***	0.019	0.433***	0.033
ROE$_{t-1}$	0.014***	0.002	0.014***	0.002	0.003	0.002	0.002	0.001	−0.001	0.001
Debt to equity$_{t-1}$	0.281***	0.038	0.243***	0.040	0.285***	0.049	0.108***	0.031	0.087*	0.034
Financial leverage$_{t-1}$	−0.095***	0.011	−0.077***	0.011	−0.092***	0.010	0.007	0.008	0.010	0.007
Percentage of female executives and directors$_{t-1}$	−0.011*	0.005	−0.010	0.006	−0.030***	0.005	0.003	0.003	−0.007	0.004
Intercept	2.274***	0.516	1.225	2.959	−0.511	0.929	1.293***	0.339	−0.984	1.449
Time-fixed effects	NO		YES		NO		NO		YES	
Country-fixed effects	NO		NO		YES		NO		YES	
Industry-fixed effects	NO		NO		NO		YES		YES	
R^2	0.296		0.370		0.492		0.844		0.893	
N	3237		3237		3237		3237		3237	

$^*p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

TABLE A5 | Model specifications of Ln Scope Carbon 2 for companies whose depositary receipt shares are not their primary listings.

	Baseline model		Time-fixed effects model		Country-fixed effects model		Industry-fixed effects model		All fixed-effects model	
Predictor	**Estimate**	**Standard error**	**Estimate**	**Standard error**	**Estimate**	**Standard error**	**Estimate**	**Standard error**	**Estimate**	**Standard error**
Distance	−7.54e−4	0.014	−0.015	0.016	0.095**	0.029	−0.033**	0.011	0.075*	0.023
Ln market cap$_{t-1}$	0.526***	0.034	0.514***	0.041	0.406***	0.037	0.602***	0.029	0.572***	0.037
Ln revenue$_{t-1}$	0.325***	0.020	0.319***	0.024	0.469***	0.028	0.261***	0.017	0.377***	0.029
ROE$_{t-1}$	0.005***	0.001	0.005**	0.002	0.004**	0.001	−0.003*	0.001	−4.59e−4	0.001
Debt to equity$_{t-1}$	0.135***	0.025	0.121***	0.026	0.117***	0.033	0.031	0.028	0.063*	0.029
Financial leverage$_{t-1}$	−0.050***	0.007	−0.041***	0.007	−0.045***	0.006	0.004	0.007	0.003	0.006
Percentage of female executives and directors$_{t-1}$	0.004	0.003	−9.57e−4	0.004	−0.014***	0.003	−4.07e−4	0.003	−0.010**	0.003
Intercept	3.206***	0.335	1.987	1.894	1.609***	0.613	4.153***	0.311	2.537*	1.261
Time-fixed effects	NO		YES		NO		NO		YES	
Country-fixed effects	NO		NO		YES		NO		YES	
Industry-fixed effects	NO		NO		NO		YES		YES	
R^2	0.392		0.452		0.547		0.731		0.827	
N	3237		3237		3237		3237		3237	

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

TABLE A6 | Model specifications of Ln Scope Carbon 3 for companies whose depositary receipt shares are not their primary listings.

	Baseline model		Time-fixed effects model		Country-fixed effects model		Industry-fixed effects model		All fixed-effects model	
Predictor	**Estimate**	**Standard error**	**Estimate**	**Standard error**	**Estimate**	**Standard error**	**Estimate**	**Standard error**	**Estimate**	**Standard error**
Distance	−0.133***	0.022	−0.129***	0.025	0.152**	0.049	−0.093***	0.019	0.125**	0.042
Ln market cap$_{t-1}$	0.797***	0.054	0.697***	0.065	0.491***	0.062	0.709***	0.049	0.483***	0.067
Ln revenue$_{t-1}$	0.347***	0.031	0.366***	0.039	0.703***	0.047	0.240***	0.029	0.453***	0.052
ROE$_{t-1}$	0.014***	0.002	0.013***	0.002	0.005*	0.002	0.006**	0.002	0.002	0.002
Debt to equity$_{t-1}$	0.269***	0.039	0.252***	0.041	0.258***	0.054	0.257***	0.049	0.173**	0.053
Financial leverage$_{t-1}$	−0.069***	0.011	−0.059***	0.011	−0.072***	0.011	0.006	0.012	1.39e−5	0.011
Percentage of female executives and directors$_{t-1}$	−0.003	0.005	−0.002	0.006	−0.021***	0.006	0.009*	0.005	−0.002	0.006
Intercept	3.281***	0.530	7.212*	3.004	−1.993	1.021	3.004***	0.538	3.857	2.289
Time-fixed effects	NO		YES		NO		NO		YES	
Country-fixed effects	NO		NO		YES		NO		YES	
Industry-fixed effects	NO		NO		NO		YES		YES	
R^2	0.329		0.373		0.441		0.649		0.742	
N	3237		3237		3237		3237		3237	

$^*p<0.05$, $^{**}p<0.01$, $^{***}p<0.001$.