Globalism and environmental sustainability: Do international firms emit less?

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ABSTRACT. We examine whether there is a connection between firm internationalization and environmental contribution such as emissions reduction. This is a test of institutional theory along with universal ethics consideration as it applies to firms and global environments. We find a positive association between firm internationalization and emissions reduction in both U.S. and non-U.S. countries. This supports the institutional theory as well as ethical universalism view, suggesting that emissions reduction indicates perceived environmental responsibilities by globalized formal institutions, such as MNCs. We further find the positive internationalization-emission reduction linkage is amplified by environmental regulation and global efforts through US regulation and Kyoto Protocol, i.e., informal institutions to combat against global warming and climate change issues. The results are robust to various modeling assumptions and after mitigating endogeneity concerns by quasi-natural experiments. We also observe that firm value increases because of the contributions to international public good caused by emissions reductions and that firm internationalization further strengthens this effect.

Keywords: Corporate environmental responsibility, Emissions reduction, Ethical relativism, Ethical universalism, Firm internationalization

Introduction

Two parallel debates inform our thoughts about the role of firms in the global economy. One is the debate on free trade and globalization.[1] After decades of unprecedented growth in world trade and investment and the concomitant emergence of multinational firms following World War II, there is now a significant political and popular push for economic nationalism (see opposing views by Friedman 2005; Smick 2008). The other is a deeper debate grounded in moral philosophy concerning whether the standard of morality and ethics is defined by universal absolutism or cultural relativism (for a philosophical argument, see Hartman 1975; for a firm-contextual argument, see Wicks 1990). Both debates shape our understanding of the role of multinational institutions such as MNCs in general, and their role in the environment specifically, which is considered one of the most challenging issues facing humanity today (Nordhaus 2018).

The environment is an asset shared by all humankind; hence, logic dictates a universal set of ethics and a global commitment to protecting the environment. Enderle (2015) argues that a common and sustainable ethos for an international public good such as the environment, as well as the creation of an international enforcement agency, is of great importance. Windsor (2004), however, believes that multiple regimes divided by policy areas, rather than a single international agency, are more probable. Considering the failure of ethics (Velasquez 2000) for governments and nongovernmental organizations (NGOs) to stop the growing threats to the global environment, it seems the only remaining institutions that might be able to combat global environmental degradation are some kind of corporations, such as social enterprises discussed by York et al. (2016). As combatting the environmental degradation requires massive shifts across transnational boundaries, this study highlights the role played by multinational

[1] We use internationalization and globalization interchangeably throughout this paper.

institutions, in particular, multinational corporations (MNCs), a formal institution, which has not been paid as much attention as other organizational forms.

Environmental pressures make it necessary for institutions to adopt certain strategies to guarantee their survival and legitimacy. Institutional theory is based on the notion that, in order to survive, organizations need to convince their stakeholders that they are legitimate entities that deserve support (Meyer & Rowan, 1977). To gain this environmental legitimacy, MNCs should take efforts to engage in emission-reducing efforts.

Yet no agreement has been reached on how MNCs should be committed to protecting the global environment. The work of Meyer and Rowan (1977), DeMagio and Powell (1983), and Friedland and Alford (1991) has stimulated a good deal of research regarding institutional theory based on the view that the behaviors of individuals and organizations are influenced by the surrounding context of institutions and their institutional logics which can, depending on the institutional context, produce isomorphic as well as heterogeneous responses (for reviews of this work see DiMaggio & Powell, 1991; Lawrence & Suddaby, 2006; Schneiberg & Clemens, 2006).

In addition, business ethicists and philosophers have long emphasized the demand for ethical universalist norms (Parsons and Shils 1951; Kohlberg 1958, 1973; Wicks 1990; Smeltzer and Jennings 1998; Windsor 2004; Demuijnck 2015). For instance, Demuijnck (2015, p. 818) suggests that "universalists maintain that we cannot just decide ourselves about what is right or wrong: we are all, including the universalists themselves, subject to the same objective standards." Alternatively, one can argue that different cultures and concepts inform different peoples of the world, based on the principle of ethical relativism (Fisher and Lovell 2006; DesJardins 2009; Demuijnck 2015), or ethical plurality rather than universality. In this view, globalization could cause tension between universal ethics and local norms (Mele and Sanchez-Runde 2013). Thus, the debates between different perspectives in institutional theory as well as ethical universalism over ethical relativism are important in both practical and ideological terms, as it influences global environmental policies and the role of MNCs.

In this paper, we investigate empirically the impact of internationalization on firms' decision to engage in emissions reduction activities that underscore firms' perceived environmental responsibility to reduce carbon and harmful emissions, such as carbon dioxide (CO_2), sulfur oxides (SOx), and nitrogen oxides (NOx). Firm internationalization is the process "through which a firm expands the sales of its goods or services across the borders of global regions and countries into different geographic locations or markets" (Hitt et al. 2007, p. 251), which corresponds to the firm production dimension of internationalization as classified by Hassel et al. (2003). The definition of MNCs includes foreign direct investments by green-field investments and acquisitions (Morck and Yeung 1991; Choi and Jiang 2009). In effect, our study is a test of the institutional theory as well as the relative importance of ethical universalism over ethical relativism at the firm level. We expect that firm internationalization, or an MNC, will be associated with greater emissions reduction because of the firm's exposure to global value systems.

Kohlberg (1958, 1973) states that the final stage of moral development is universal ethical principle orientation. Based on this premise, universal values such as dignity, respect, justice, and equality should guide the development of a meaningful set of ethical principles on the environment. To what extent, then, can common ground be found among countries and traditions through an international agreement (e.g., the Paris Accord or Kyoto Protocol) or an institution such as the United Nations that promotes the principle of universal values? Is it important or appropriate to seek universal values, or should there be more focus on establishing a framework for pluralist environmental values? Is there common institutional and/or ethical ground across cultures that can constitute the foundation for building and promoting sustainable economic growth, preserving diversity, and preventing the environment from deteriorating further?

These questions are at the core of organization behavior, international finance, and management because managers of MNCs must adapt to often conflicting expectations of institutional and universal norms and rules (Wines and Napier 1992; Tavakoli et al. 2003; Velasquez 2018). It is surprising, therefore, that the environmental dimension of the institutional theory and ethical universalism–relativism debate has been largely neglected in organization behavior, finance, and management research.

Based on a U.S. firm sample of 6,847 observations (985 unique firms) from 2002 to 2014, we find that firm internationalization in a given year has a positive and significant effect on reducing emissions in the same or following year. This finding is consistent with the view that firm internationalization enhances emissions reduction activities, thus increasing a firm's long-term sustainability and legitimacy. It supports the institutional theory as well as ethical universalism view rather than the ethical relativism explanation. Our main result is robust to alternative modeling assumptions and after mitigating endogeneity using two quasi-natural experiments based on an extreme heat disaster and the BP oil spill. A difference-in-difference method strengthens our main findings of a positive association between firm internationalization and emissions reduction.

Furthermore, because emission reduction efforts globally are more than ethical issues, we consider the impact of regulation and global alliance (informal institution) to combat emission on the globalization-emission reduction nexus. We find that environmental regulation affects the globalization-emission reduction linkage and that positively influences environmental sustainability beyond and above ethical consideration. Furthermore, we observe that firm value increases because of contributions to international public good by emissions reduction, and that firm internationalization further increases this effect, suggesting that managers' decision to reduce emissions, which addresses one aspect of corporate environmental paradigms (Halme

2002), can improve the firm’s ability to create shareholder value. This finding thus provides supportive evidence for the natural-resource-based view of the firm (see, for example, Chan 2005). Further analysis based on non-U.S. firms indicates that the positive relation between firm internationalization and emissions reduction is not solely a U.S. phenomenon—it holds true for non-U.S. firms as well, providing further evidence of common institutional norm and ethical universalism. In sum, formal and informal institutions around a company influence its corporate environmental-emission decisions.

The remainder of this paper proceeds as follows. The following section discusses the related literature and develops our hypotheses on the relation between firm internationalization and emissions reduction. The next section presents our sample and research design, followed by a section on empirical results. The last sections present discussions and our conclusion.

Literature Review and Hypotheses Development

Institutional Theory

Institutional theory is a theory that connects group characteristics to the behaviors of agents rooted within the group. Institutional theory claims that institutions are necessary to explanations of organizational actions and organizational structures. While institutions have long been the object of study, contemporary interest in institutions as determinants of organizational actions and structures traces its origins to the seminal work during the last century of Meyer and Rowan (1977), DiMagio and Powell (1983), and Friedland and Alford (1991). Meyer and Rowan (1977) argued that organizations exist in an institutionalized environment of professions, programs and technologies that embody rules that serve as powerful myths. Organizations align themselves with these institutional rules, and by doing so they come to be seen as legitimate and worthy, they strengthen their support and stability, they increase their resources and survival capabilities, and they secure their success. Following the lead of Meyer and Rowan (1977), DiMagio and Powell (1983) maintained that when organizations align themselves with their institutional environment, they tend to become similar or "isomorphic" with each other. DiMagio and Powell identified three kinds of institutional pressures that lead to organizational isomorphism: coercive pressures exercised by other organizations and society's culture, mimetic pressures when organizations cope with uncertainty by imitating other successful organizations, and normative pressures when organizations hire professionals with similar training, socialization, and professional norms.

Unlike DiMagio and Powell, however, Friedland and Alford (1991) subsequently turned away from trying to explain how similar institutional pressures can lead to similar organizational responses, and explored, instead, how institutional differences can impose conflicting pressures on organizations. Friedland and Alford argued that the main institutions of contemporary Western societies—capitalism, family, bureaucratic state, and democracy—each have a distinct "institutional logic." They suggest that different institutions with their distinct institutional logics could affect organizations in different, even contradictory ways, by placing conflicting demands on them.

Matten and Moon (2008) assert that institutional differences can describe the differences in the level and kind of corporate social responsibility (CSR) decisions made by firms in different regions, whereas mimetic, coercive, and normative pressures account for their similarities or "isomorphism." Avetisyan and Ferrary (2013) maintain that institutional differences and similarities in terms of their respective national and international regulatory regimes, CSR rating groups, and other stakeholder groups could account for the differences and similarities in how the firms in each country engage in CSR. Institutional behaviors, including environmental engagement or the way corporations aims to reduce emission, are therefore affected by the socio-economical institutions in which firms operate (Aguilera, Rupp, Williams, & Ganapathi, 2007; Hall & Soskice, 2001; Matten & Moon, 2008).

In sum, formal and informal institutions around a company influence its environmental decisions. The lesson of institutional theory (Aguilera, Rupp, Williams, & Ganapathi, 2007; DeMagio and Powell, 1983; DiMaggio & Powell, 1991; Friedland and Alford, 1991; Hall & Soskice, 2001; Lawrence & Suddaby, 2006; Matten & Moon, 2008; Meyer and Rowan, 1977; Schneiberg & Clemens, 2006), then, is that the institutions surrounding a company influence the corporate decisions it makes. We are therefore led to expect that firm internationalization will also influence corporate decisions on emission reductions. Institutional theory leads us to anticipate that the pressures exerted by a region's environmental situation will influence the corporate emission-treatment decisions of companies surrounded by those institutions.

Globalism and Environmental Sustainability: Universal Ethics Concern?

In addition to institutional theory, there are two competing ethical views concerning globalization. First, although "universalism" has various definitions and interpretations (Fisher and Lovell 2006; DesJardins 2009; Demuijnck 2015; Velasquez 2000, 2018), global universalism generally states that there is a set of universally valid moral standards such that environmental legitimacy can be used to evaluate behaviors in all tribes or countries. Note that by "universally valid," we do not mean standards that everyone everywhere recognizes and accepts. Universalism does not claim that there are some moral standards that people everywhere accept or follow. Rather, standards are said to be universally valid when there is a justification—a compelling set of reasoned, rational statements—that all people everywhere ought to recognize, even though not everyone may do so.[2]

[2] According to Kant (1996 [1785], p. 421), a certain justified guiding principle of an action is universal; that is, there exists a principle that can become a universal law, which is the criterion by which to judge whether it is morally acceptable. That is, the notion of universalizability is a litmus test of the moral validity of the principles that underlie our actions.

An example of universally valid standards outside the field of morality is the foundational principles of logic, which are universally valid because everyone ought to recognize these principles in their reasoning processes, although cognitive psychologists suggest that many people, when engaged in reasoning, do not actually follow them. The view of global universalism is that there is a set of moral and ethical standards that are universally valid and that the behaviors of people in all cultures should be consistent with these standards or should be judged to be immoral or unethical (Velasquez 2018).[3]

One can suppose that without an institutional scheme correcting for externality (e.g., carbon pricing), firms that are purely guided by economic values are unlikely to assign high significance to public goods such as the environment. The notion that the pursuit of self-interest often occurs at the expense of societal interests has been widely documented (Ferraro et al. 2005). Fontrodona and Sison (2006) and Racko (2019) maintain that self-interest by corporate managers and shareholders can deteriorate their desire to develop a moral community of relationships that preserves the intrinsic worth and dignity of its members. For example, self-interested managers may create a moral hazard when they shirk their tasks or transfer the costs of their actions onto shareholders or other stakeholders including employees, customers, suppliers, creditors, communities, and the general public (Hill and Jones 1992).

In fact, stewardship theory prescribes that managers should act as responsible stewards of the corporate resources they control for the good of their stakeholders, including the community (Davis et al. 1997). To the extent that self-interest can lead to ethnocentric economic nationality, it is plausible that self-interest maximization is closer to ethical

[3] William Nordhaus, the 2018 Nobel laureate in economics, integrates climate change into models of economic growth and provides a roadmap for a future where the world's economic health is directly linked to the environment (Keohane 2018).

relativism than to ethical universalism.[4] We do not take a stance on this question, however, because there is no basis, or need, to assume that international firms are more moralistic (less self-interest oriented) than domestic firms. All that is necessary for our purpose is that international firms, because of their global operations, are more exposed to heterogeneous global norms and practices than are single-country firms that may be guided by national norms and practices.

There is no full and universal agreement about either ethical philosophy. However, some environmental events (e.g., a series of earthquakes in the Pacific Rim, BP oil spills, plastic inundation in ocean) force us to question the wisdom of ethical relativism or economic nationalism in most if not all environmental issues (Mele and Sanchez-Runde 2013; Velasquez 2018). Thus, globalists, including most in international business, agree with the “universally valid” view that there should be certain common actions to combat environmental degradation. Globalized firms are more exposed to this globalist thinking than domestic firms.

Together with institutional theory, this leads to our first hypothesis that firm internationalization is positively associated with higher emissions reduction activities for environmental sustainability independent of whether this is good for shareholder value (we examine the effect on firm value later).

> **H1**: The degree of firm internationalization is positively associated with emissions reduction activities.

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[4] Ethical relativism suggests that morality is relative to the norms of one's culture (Velasquez 2000, 2018). That is, whether an action is right or wrong depends on the moral norms of the society in which it occurs. The same action may be morally right in one society but morally wrong in another. For the ethical relativist, there are no moral standards that can be universally applied to all peoples at all times. The only moral standards against which a society’s practices can be judged are their own. If ethical relativism is correct, there can be no common framework for resolving moral disputes or for reaching agreement on ethical matters across members of different societies. Fisher and Lovell (2006, p. 122) use “ethical egoism” instead of “ethical relativism.”

Advocates of ethical relativism (or national "partiality" or "parochialism") argue that the interests of the members of a particular community (be it circle of friends, family, tribe, or country) can legitimately override the concerns of universal moral principles (Williams 1981).[5] Thus, the ethical relativism view does not agree with the argument that globalized firms should engage in emissions reduction activities if these activities are inconsistent with the objectives or norms of the country to which the firm or its domestic stakeholders belong. Therefore, ethical relativism does not oppose a national policy that permits a certain level of CO_2 and other harmful emissions.

However, emission reduction efforts globally are not simply determined by ethical consideration. Indeed, global efforts to reduce emission for sustainability are much more than universal ethics, but rather Mother Nature's survival issue, and therefore, mediated by specific country's institutional arrangement such as environmental regulation and/or global communities' informal institutional arrangement including joint efforts to combat against global warming and climate change issues by further reducing global emissions. Without environmental sustainability, the firm's existence and continuity cannot be guaranteed.

To avoid the devastating effects of climate change and global warming, countries need to strive for environmental preservation. The pollution haven effect, in particular, posits that polluting industries will relocate to jurisdictions with less stringent environmental regulations. Thus, effectively designed environmental regulations raise the cost of key inputs to goods with pollution-intensive production, and reduce jurisdiction's comparative advantage in those goods (Becker & Henderson, 2000; Greenstone, 2002). Countries should collaborate together to limit

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[5] In this view, each social group has its own moral traditions and values, and as such, members adhere to the traditions and values that hold their group together (Fisher and Lovell 2006). One important example of such ethical relativism relates to impersonal goods associated with the growth and sustainability of one's own nation. This may differ from ethical relativism toward each other within the national community.

pollution and keep global warming to under 1.5 degrees Celcius. Because of this greening effort to make Mother Earth sustainable, we first consider US environmental regulation to reduce emission activities, and then global efforts through Kyoto Protocol to reduce emission because countries differ in their approaches towards environmental regulation. The idea of pollution-haven hypothesis, therefore, raises the importance of environmental regulation and that regulation affects the relation between globalization and emission reduction. Thus, we expect the following;

> **H2**: The globalization-emission reduction linkage is amplified by environmental regulations and/or global joint efforts to combat emission.

Now, we consider an eco-centric ethical relativism because the environment is not only an ethical issue but also an economics one. We maintain that the economic, social, and environmental pillars (commonly known as triple bottom line) are interconnected within a nested system. If so, the economy is part of the society, which in turn is part of a larger ecological system. The complex dimensions of sustainability should include an appropriate balance among environmental, social, and economic values and challenges, which has been sufficiently discussed by Markman et al. (2016). An underlying thread in the literature on CER strategy is that through a complex web of stakeholder constituents (such as customers, shareholders, investors, employees, environmental activists, or other stakeholders including the community), environmentalism is being transformed from something external to the market to something that is internal, consistent with the core objective of the firm.

Recently, environmental issues have received much attention in terms of the market's attitude toward corporate social responsibility (CSR) (Klassen and McLaughlin 1996; Kassinis and Vafeas 2006; Bird et al. 2007; Welford et al. 2007; Wahba 2008; Cai and He 2014; Jo et al. 2015; Cai et al. 2016). Klassen and McLaughlin (1996), in particular, suggest that improved financial performance can result from environmental performance. Similarly, Kassinis and Vafeas (2006) and Welford et al. (2007) find that stakeholders are concerned about the environment. Wahba (2008) suggests that CER can strengthen the effect of institutional ownership on firm performance.

Another benefit of CER is that it can enhance firm legitimacy. Proponents argue that firms can improve performance by increasing investments in CER (see a survey of the literature by Weber et al. 2008). Critics maintain that firms waste valuable resources through CER; hence, a reduction in CER, not an increase, improves firm performance (Brammer et al. 2006).[6] However, Cai et al. (2016) report that CER by U.S. firms actually reduced firm risk during 1991–2012, which supports the value enhancement hypothesis. Overall, as Kim and Statman (2012) argue, it is plausible that there exists an optimal level of CER investments that is consistent with maximizing financial performance.[7]

Regarding the effect of international operations, Attig et al. (2016) find that firm internationalization is positively related to a firm's CSR rating. This finding, combined with Cai et al.'s (2016) findings on reduced firm risk, leads us to hypothesize that managers' pursuit of CER can improve the firm's ability to create shareholder value. Specifically, we posit that firm internationalization increases the effect of emissions reduction activities on firm value.

> **H3**: Firm value is positively associated with the degree of firm internationalization interacted with emissions reduction activities.

Data and Variables

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[6] Brammer et al. (2006) maintain that environmentally responsible firms underperform if their environmental responsibilities are considered. Karnani (2012) similarly argues that in circumstances in which financial performance and social welfare are in conflict with each other, CSR (or CER) is ineffective because senior managers are unlikely to act voluntarily against shareholder interests.

[7] There is a growing body of literature examining the reasons companies engage in CER and how it influences firm value (Berchicci and King 2007; Etzion 2007; Ambec and Lanoie 2008; Cai and He 2014; Jo et al. 2015; Cai et al. 2016).

Data

To construct our sample, we first collect firm-level data for emissions reduction ratings over 2002–2014 from the ASSET4 database provided by Thomson Reuters. Next, we merge the data for emissions reduction with financial information from all U.S. firms listed on the New York Stock Exchange (NYSE), American Stock Exchange (AMEX), and NASDAQ, obtained from the Compustat. Later, we merge this sample with data for geographic segments retrieved from the Compustat Segments file and obtain a sample of 985 companies and 6,847 firm-year observations. For non-US sample, we combine the ASSET4 and Worldscope databases.

Variables

We first focus on the normalized ASSET4 ratings of firms' emissions reduction to measure their environmental commitment. And then, to examine the relation between emission reduction and firm globalization, we employ eight measures of firm internationalization. Firm value is measured by Tobin's Q and the market-to-book ratio (MTB). In the regression analyses, we include control variables following Attig et al. (2016) and Cai et al (2016). Definitions of variables are provided in Appendix C and their construction is detailed as follows.

Emissions Reduction

We employ the ASSET4 ESG ratings on emissions reduction (EMREDUC) to measure firms' overall activities of reducing emissions. Those ratings are solely based on transparent information collected by over 125 research analysts from publicly available sources, such as annual reports, CSR reports, and NGO websites. Each company's emissions reduction is evaluated by 41 data point questions, answers to which are rigorously verified.[8] The rating scores are normalized between 0 and 100%, indicating how many units of standard deviation each firm's emissions reduction rating deviates from the sample mean. In our study, we convert those rating scores into decimal numbers, a higher value of EMREDUC corresponding to greater responsibility for emissions reduction.

Internationalization Variables

Following the literature (e.g., Hitt et al. 1997; Sanders and Carpenter 1998; Black et al. 2014; Attig et al. 2016), we construct eight variables based on geographic segment data to measure firms' internationalization. These internationalization variables comprise two dummy variables indicating whether a firm has foreign sales (D(FS)) or assets (D(FA)), the ratio of foreign sales to total sales (FS/S), the sales Herfindahl index (Herfindahl_S), the sales entropy index (Entropy_S), the ratio of foreign assets to total assets (FA/A), the assets Herfindahl index (Herfindahl_A), and the assets entropy index (Entropy_A). All of these variables are consistent with the notion that firm internationalization involves the process "through which a firm expands the sales of its goods or services across the borders of global regions and countries into different geographic locations or markets" (Hitt et al. 2007 p.251).

These internationalization measures are constructed as follows. After obtaining geographic segments data for U.S. companies from the Compustat Segments file, we identify firms' domestic and foreign segments by their Geographic Segment Type (GEOTP). Specifically, a domestic company reports data for only one domestic segment (i.e., GEOTP = 1), whereas a multinational company reports financial data for both domestic (i.e., GEOTP =

[8] See Appendix B for details of the 41 data point questions provided by Thomson Reuter's data collection and rating methodology published in 2012.

2) and foreign (i.e., GEOTP = 3) segments.[9] It is thus straightforward to denote two dummy variables, D(FS) and D(FA), as indicating whether a firm has nonzero foreign sales or assets. Furthermore, we compute a firm's total sales and identifiable assets by summing them across all geographic segments and thus arrive the ratio of FS/S or FA/A, respectively, as foreign sales or assets over total sales or assets. Note that FA/A has fewer observations than FS/S because some firms have more missing data for assets in foreign segments. These two foreign ratios capture an MNC's overall dependence on foreign consumer markets and foreign resources.[10]

In addition, we construct the Herfindahl index and entropy index to describe how a firm's sales or assets are distributed across different geographic segments. Suppose that a firm has N geographic segments and that segment i generates sales s_i or possesses identifiable assets a_i; sales- and asset-based indices are computed as follows:

$$\text{Herfindahl(S)} = \sum_{i=1}^{N}\left(s_i / \sum_{i=1}^{N} s_i\right)^2 \quad (1)$$

$$\text{Entropy(S)} = -\sum_{i=1}^{N}\left(s_i / \sum_{i=1}^{N} s_i\right) \cdot \ln\left(s_i / \sum_{i=1}^{N} s_i\right) \quad (2)$$

$$\text{Herfindahl(A)} = \sum_{i=1}^{N}\left(a_i / \sum_{i=1}^{N} a_i\right)^2 \quad (3)$$

$$\text{Entropy(A)} = -\sum_{i=1}^{N}\left(a_i / \sum_{i=1}^{N} a_i\right) \cdot \ln\left(a_i / \sum_{i=1}^{N} a_i\right). \quad (4)$$

By definition, a more internationalized company exhibits a lower Herfindahl index value and a higher entropy index value, whereas a purely domestic company has a Herfindahl index of 1 and an entropy index of 0.

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[9] In the Compustat Segments file, an MNC reports at least one foreign segment whose GEOTP number is 3. When an MNC has multiple foreign segments, we sum sales or assets across all foreign segments to measure its total amount of foreign sales or assets.

[10] According to Sanders and Carpenter (1998), foreign assets proxy for foreign stock holdings, whereas foreign sales proxy for firms' sales to foreign markets.

Firm Value Variables

A widely applied measure of firm value is Tobin's Q, which is the preset value of a firm's future cash flows divided by its replacement costs of tangible assets. Following Lang and Stulz (1994), we compute Tobin's Q as the sum of market value of common equity, book value of debt, and preferred stock divided by book value of total assets. Another popular measure of firms' equity value is MTB, the ratio of market value of equity over book value of equity.

Control Variables

To address the potential impact of firms' attributes on relations among internationalization, emissions reduction, and firm value, we control for several firm characteristics. Following Cai et al. (2016) and Jo et al. (2015), our control variables are firm size (Ln(at)), leverage (Lev), market-to-book ratio (MTB), profitability (ROA), capital expenditures (Capex), free cash flows (FCF, computed as income before extraordinary items plus depreciation), R&D intensity (RD/S), advertising expenses (AD/S), long-term assets (PPE, indicating property, plant, and equipment), and cash holdings (Cash).

Empirical Results

Univariate Analysis

Panel A of Table I provides summary statistics for the variables employed in our study. All continuous variables are winsorized at the 1st and 99th percentiles. The emissions reduction index, EMREDUC, has a mean of 0.426, standard deviation of 0.309, and it ranges from 0.081 to 0.963, exhibiting substantial variation across firms. In terms of firm internationalization variables, D(FS) and D(FA) , respectively, define 72.4% and 23.5% of firm-year observations as MNCs. Continuous measures of internationalization based on foreign sales, FS/S, Herfindahl(S), and Entropy(S), have means of 0.302, 0.61, and 0.741 and standard deviations of 0.279, 0.297, and 0.607, respectively. Although the three measures based on foreign assets have fewer observations because of missing data for foreign assets, FA/A, Herfindahl(A), and Entropy(A) are distributed in reasonable ranges, with means of 0.424, 0.716, and 0.512 and standard deviations of 0.262, 0.286, and 0.538, respectively. Turning to firm value variables, Tobin's Q and MTB ratio have means of 2.013 and 3.718 and standard deviations of 1.145 and 3.838, respectively. Taken together, the summary statistics suggest that our sample consists of a wide cross-section of firms, particularly for the emissions reduction, internationalization, and firm value variables.

Panel B of Table I reports bivariate correlations of the key variables. The emissions reduction index is strongly associated with all internationalization variables, suggesting that MNCs take more responsibility for environmental concerns than do local companies and that more internationalized MNCs contribute more to reducing hazardous emissions. Furthermore, emissions reduction activities are related to firm size, leverage ratio, and capital expenditures, indicating that larger, highly levered, and investment-oriented, firms do a better job at reducing emissions. Moreover, the internationalization variables are strongly linked to the firm value variables, suggesting that more internationalized firms maintain higher firm value.

[Table I about here]

Multivariate Analysis

Baseline Regression Results

To examine the relation between internationalization and emissions reduction, we conduct the following baseline regression model, regressing the emission reduction index (EMREDUC) on the internationalization variables while controlling for the potential impact of firms' characteristics, such as the logarithm of total assets, leverage, MTB ratio, ROA, capital expenditure, free cash flow, R&D-to-sales ratio, advertisement-to-sales ratio, Ratio of property, plant, and equipment divided by total assets (PPE), and cash-to-total-assets ratio. We also include year dummies to control for changing economic conditions and industry dummies to control for industry-specific effects. We adjust *t*-statistics using White's (1980) heteroskedasticity-consistent standard errors.

$$\text{EMREDUC} = \alpha + \beta * \text{internationalization} + \sum \gamma_j * \text{control}_j + \varepsilon. \quad (5)$$

We report the regression results in Table II, including four internationalization measures based on foreign sales. In the first column, the coefficient estimate of D(FS) is 0.089 (t = 11.759). The positive coefficient suggests that multinational companies do more to reduce hazardous emissions than do local companies. In the second column, the coefficient estimate of FS/S is 0.156 (t = 10.922), suggesting that a one-standard-deviation increase in FS/S is associated with a 4.35% (= 0.156*0.279) average increase in emissions reduction. Similar results are found with Herfindahl(S) and Entropy(S). In the third column, the negative coefficient of −0.198 (t = 15.532) for Herfindahl(S) is consistent with the positive association between internationalization and emissions reduction, as a more internationalized firm maintains a lower Herfindahl index value. In the fourth column, the coefficient estimate of Entropy(S) is 0.093 (t = 14.962).[11] Taken together, these results suggest that firms are more committed to emissions reduction activities as they become more globalized, which supports H1.

[Table II about here]

Different Estimation Methods

To ensure that the estimate of β in equation (5) is robust to different estimation methods,

[11] Although we do not report regression results for the asset-based internationalization variables, we continue to find a positive relation between internationalization and emissions reduction.

we conduct a two-way clustering regression (clustered by firm and year), panel regression with firm fixed and random effects, Fama–MacBeth (1973) regression, Prais–Winsten (1954) regression taking care of serial correlation, and generalized method of moments (GMM) estimation (Hall 2005). We report the results for FS/S using different estimation methods in Table III.[12] The coefficient of FS/S remains positive and significant under each estimation method. For instance, a one-standard-deviation increase in the FS/S ratio is associated with a 6.78% (= 0.243*0.279) average increase in emissions reduction under the two-way clustering regression method. Results in Table III suggest that the positive relation between internationalization and emissions reduction is robust to omitted variables, unobservable firm characteristics, and cross-sectional and serial dependence of the data, and the relation is statistically and economically significant.

[Table III about here]

Test on Environmental Regulation

So far, our baseline tests are designed to examine the institutional theory and to determine the relative importance between the ethical universalism view and the ethical relativism view. It may be that regardless of ethical standpoint, the empirical association between firm internationalization and emissions reduction comes from some other factor, such as regulation, i.e.., our first example of informal institution. We first verify whether some US environmental regulation could be the main factor that drives the positive firm internationalization–emission reduction association.

Within our sample period, we find that on July 27, 2005, the Bush Administration announced the formation of a six-nation Asian Pacific Partnership on Clean Development and Climate (APP). The goal of the APP meeting is “national pollution reduction, Energy security

[12] Results of other internationalization variables are qualitatively identical and available upon request.

and climate change concerns, consistent with the principles of the U.N. Framework Convention on Climate Change" (UNFCCC). The APP regulation was implemented later in 2005. Thus, we subdivide the full sample into pre-APP (2002~2005) and post-APP (2006~2014) subsamples and run the previous regression model (5) with each subsample.

Table IV presents the results, the pre-APP results in Panel A and the post-APP results in Panel B. As anticipated, we find that the significance of the coefficients on firm internationalization measures is stronger after the post-APP period than the pre-APP one, lending support for the proposition that regulation affects emissions reduction. However, all coefficients on the firm internationalization variables from both panels are, in general, significant and consistent with our main findings regardless of the APP regulation. Thus, we conclude that although regulation does affect the firm internationalization–emissions reduction linkage, it does not preclude the impact of universal ethics on our main premise.

In addition, Panel C reports the *F statistics* of Chow test for any structural break in the coefficients of internationalization variable between the two subsample periods, before and after the APP. The results suggest that the regulation indeed intensifies the relationship between firm internationalization and emissions reduction, supporting H2.

[Table IV about here]

Furthermore, we consider the Kyoto Protocol as an exogenous shock and our second measure of informal institution, and examine how the relation between firm globalization and emission reduction varies with the implementation of the Kyoto Protocol. Specifically, we create a dummy variable, KP, which is equivalent to one after the Kyoto Protocol was enacted in year 2005 and zero otherwise. We then run the following regression model including the interactive term of globalization and KP dummy:

$$\text{EMREDUC} = \alpha + \beta * globalization + \delta * KP + \lambda * (globalization * KP) + \sum \gamma_j * control_j + \varepsilon \quad (6)$$

where the dependent variable is the emission reduction (EMREDUC), and globalization is measured by four sales-based globalization variables, which are D(FS), FS/S, Herfindahl(S), and Entropy(S). Controlling variables are the same as in equation (5). We also control for the year-fixed and industry-fixed effect. We adjust t-statistics by robust standard errors.

Table V presents the regression results of equation (6). Specifically, model (1) shows that the interactive term between D_(FS) and KP is estimated as 0.090 (t=6.241), suggesting that the enactment of Kyoto Protocol widens the gap of emission reduction between MNCs and domestic companies. In models (2) to (4), the coefficients on the three interactive terms between firm globalization and Kyoto Protocol dummy are all significant. The coefficients and significance are 0.202 (t=5.627) on the interactive term of FS/S and KP, -0.071 (t=-3.037) on the interactive term of Herfindahl(S) and KP, and 0.037 (t=3.064) on the interactive term of Entropy(S) and KP, respectively. These results suggest that the implementation of the Kyoto Protocol, in general, tends to strengthen the relationship between environmental regulation and firm globalization-emission reduction linkage, further supporting H2.

[Table V about here]

Difference-in-Difference Analysis

To address endogeneity concerns due to reverse causality, we conduct a difference-in-difference analysis based on two quasi-natural experiments. The first is the extreme temperature disaster (ETD), the summer 2006 North American heat wave. The heat wave that hit North America from July 15, 2006 to August 27, 2006 was severe and affected most of the United States and Canada, killing at least 225 people.[13] Such a natural disaster might involve

[13] Temperatures hit 118°F (48℃) on July 21, 2006 in Phoenix, making it the hottest day since 1995 and one of the 11 hottest since 1895, when temperature records were first kept in the city. California temperatures began reaching record levels by July 22. In one section of Los Angeles, Woodland Hills, the temperature reached 119℉ (49℃), making it the highest recorded temperature in the county, and within the city border it broke the old record of 118°F in Canoga Park. The unusual daytime heat resulted in extremely high overnight temperatures. Needles,

significant firm internationalization activities to reduce hazardous gas emissions. We thus employ the ETD as an exogenous shock to determine how the disaster affected the relation between firm internationalization and emissions reduction.

The second quasi-natural experiment is the BP oil spill (BPOS), also referred to as Deepwater Horizon oil spill, an industrial disaster in the petroleum industry that began in April 2010. The spill directly affected 68,000 square miles of ocean and reached many distant coasts, raising concerns about further underwater contamination. It spurred tremendous efforts to resolve the oil spill, which might have also triggered firm internationalization activities toward environmental protection. Consequently, the BPOS is regarded an ideal quasi-natural experiment to study the relation between firm internationalization and emissions reduction.

Our difference-in-difference analysis proceeds as follows. First, we create two dummy variables, corresponding to the two quasi-natural experiments. Specifically, to explore how the relation between firm internationalization and emissions reduction changed before and after the ETD in 2006, we create a dummy variable, denoted ETD, which equals 1 after North American heat wave in 2006 and 0 otherwise. Similarly, to examine how the relation between firm internationalization and emissions reduction changed around the BPOS, we create a dummy variable, denoted BPOS, which equals 1 after the BP Oil Spill in 2010 and 0 otherwise. Second, we run the following regression model by including the interactive term of internationalization and ETD or BPOS dummy:

California recorded a low temperature of 100°F at 5 am on July 23, and in the LA basin the same night, Burbank recorded an overnight low of 77°F (25°C). The California heat wave broke local records. According to some reports, it was “hotter for longer than ever before, and the weather patterns that caused the scorching temperatures were positively freakish.” Fresno, in the central California valley, had six consecutive days of 110°F-plus temperatures. Beginning July 31 and into early August, the Midwest, Ontario, Canada, and Atlantic states also began experiencing the heat. Temperatures approached the 100°F mark in Rochester, New York on August 1 and were coupled with the highest dew points the area has experienced in over 51 years. The heat index reached 110°F that day. La Guardia Airport in New York City recorded three consecutive days above 100°F. The temperature peaked at 102°F on August 2. Colonial Downs, a horse track in New Kent County, Virginia, canceled horse racing because of the 100°F heat. The Saratoga Race Course, north of Albany, canceled horse racing for the first time in its history on August 2. By August 8, the heat wave had passed for most areas, but persisted in the South and Southeast, with continued reports of mortality in Oklahoma.

$$\text{EMREDUC} = \alpha + \beta\text{*internationalization} + \delta\text{*ETD or BPOS} +$$
$$\lambda * (\text{internationalization*ETD or BPOS}) + \sum \gamma_j\text{*control}_j + \varepsilon. \qquad (6)$$

Table VI presents the regression results based on three measures of firm internationalization: FS/S, Herfindahl(S), and Entropy(S). In Panel A, when ETD is employed as an exogenous shock, the coefficient on ETD is positive and significant in three models, suggesting that firms' emissions reduction performance was significantly improved after the ETD disaster. In model (1), the interactive term between FS/S and ETD has a coefficient of 0.066 (t = 1.668). Even stronger results are found in models (2) and (3), as the interactive term between ETD and Herfindahl(S) has an estimate of −0.096 (t = 2.67) and the interactive term between ETD and Entropy(S) has an estimate of 0.046 (t = 2.616). Results in Panel A suggest that firms' internationalization improved emissions reduction activities after the ETD disaster.

[Table VI about here]

In Panel B of Table VI, similar results are observed for the BP oil spill (BPOS) experiment. The BPOS dummy is positive and significant in three models (models (4) to (6)), indicating that firms were committed to reducing a larger amount of emissions after the oil spill. The three interactive terms, FS/S*BPOS, Herfindahl(S)*BPOS, and Entropy(S)*BPOS, are all significant, and their estimates are 0.067 (t = 2.394), −0.064 (t = 2.478), and 0.027 (t = 2.14), respectively. Once again, the results imply that firms' internationalization significantly increased emissions reduction performance after the BPOS disaster.

Impact on Firm Value

It still is not clear whether managers' pursuit of desired emissions reduction activities can increase their firms' ability to create shareholder value. We now examine whether firm internationalization, in conjunction with emissions reduction activities, enhances or deteriorates firm value by running the following regression:

$$\text{Value} = \alpha + \beta\text{*internationalization} + \delta\text{*EMREDUC}$$

$$+ \lambda\text{*internationalization*EMREDUC} + \sum \gamma_j \text{*control}_j + \varepsilon, \qquad (7)$$

where firm value is measured by Tobin's Q and the MTB ratio, and the internationalization variable is proxied by FS/S. We control for the logarithm of total assets, leverage, and capital expenditure.

Table VII reports the regression results. Tobin's Q results show that the interactive term between FS/S and EMREDUC is positive and significant under the two-way clustering estimation in model (1), and under the ordinary least squares (OLS) estimation controlling for year and industry fixed effects and adjusting *t*-statistics by firm- and year-clustered standard errors. When the MTB ratio is the dependent variable, the interactive term between FS/S and EMREDUC continues to be significant and positive under the two estimation methods. Together, these results indicate that more internationalized firms consider their long-term firm value important while contributing to emissions reduction, supporting H3.

[Table VII about here]

Evidence from Non-U.S. Countries

We provide further evidence using a cross-country data set of all non-U.S. countries. The non-U.S. sample is constructed as follows. First, we collect the emissions reduction ratings of all non-U.S. firms from the ASSET4 database. Next, with the International Securities Identification Number (ISIN) identifiers of those firms, we are able to download the internationalization variable, the ratio of foreign sales over total sales, together with other financial variables from the Worldscope database. After merging the emissions reduction ratings with the financial variables, we require each country to have at least five firms over 2002–2014. To achieve a broad coverage of firms, we set the missing FS/S ratio to zero. Our final sample of non-U.S. firms consists of 15,728 observations from 45 countries: Australia, Austria, Belgium, Hong Kong, Brazil, Canada, Switzerland, Chile, Germany, Denmark, Egypt, Spain, Finland, France, United Kingdom, Greece, China, Indonesia, Ireland, Israel, Italy, Jersey, Japan, South Korea, Luxembourg, Mexico, Malaysia, Netherlands, Norway, New Zealand, Philippines, Poland, Portugal, Russia, Saudi Arabia, Singapore, Sweden, Thailand, Turkey, Taiwan, and South Africa.

We run regression model (5) with the non-U.S. data under different estimation methods and present results in Table VIII. In the first column, the OLS estimate on FS/S is 0.058 (t = 8.646), suggesting that a one-standard-deviation increase in FS/S increases EMREDUC by 2% (= 0.058*0.344). In the second column, the two-way clustered estimate is 0.062 (t = 4.776). In the third and fourth columns, the estimates of the fixed and random effects in the panel regressions are 0.053 (t = 3.983) and 0.051 (t = 5.038), respectively. In the last two columns, the Fama–MacBeth (1973) and Prais–Winsten (1954) estimates are 0.051 (t = 5.359) and 0.044 (t = 5.501), respectively. The results in Table VIII suggest that the positive relation between firm internationalization and emissions reduction is pervasive among non-U.S. firms. We also examine whether the same relation is pervasive in other country such as Japan. In our un-tabulated results, we find the same positive firm internationalization-emission reduction relation in Japan

[Table VIII about here]

Evidence from Alternative Database

In addition to the ASSET4 database, the Kinder, Lydenberg, and Domini (KLD) Stats database is an alternative popular source for firm's environmental activities. The KLD Stats database provides an inclusive social rating, which covers approximately 80 strengths and concerns across seven major qualitative issue areas, including community, corporate governance, diversity, employee relations, environment, human rights, and product. It covers approximately 650 firms from either the S&P 500 index or the Domini 400 Social Index before 2001. Afterwards, the KLD's ratings cover approximately 1,100 to 3,100 firms from the S&P

500 index, Domini 400 Social Index, and Russell 1000 (Russell 3000) index. As the KLD's ratings were updated in 2002 by incorporating human rights, we collect the ratings from 2002 to 2014 and follow Harjoto, Jo, and Kim (2017) to construct an index aggregating each individual rating. The Environmental index (Environmental FF12 Index) is thus calculated as:

$$Environmental\ Index\ for\ firm\ i\ in\ year\ t = \frac{(Environment_{i,t}\ net\ count\ for\ firm\ i\ at\ year\ t - Min.Environment_{i,t}\ net\ count\ firm\ i's\ industry\ at\ year\ t)}{(Max.Environment_{i,t}\ net\ count\ for\ firm\ i's\ industry\ at\ year\ t - Min.Environment_{i,t}\ net\ count\ for\ firm\ i's\ industry\ at\ year\ t)}$$

$$Environmental\ FF12\ index\ for\ firm\ i\ in\ year\ t = \frac{(Environment_{i,t}\ net\ count\ for\ firm\ i\ at\ year\ t - Min.Environment_{i,t}\ net\ count\ firm\ i's\ at\ year\ t)}{(Max.Environment_{i,t}\ net\ count\ for\ firm\ i's\ at\ year\ t - Min.Environment_{i,t}\ net\ count\ for\ firm\ i's\ at\ year\ t)}$$

With the Environmental Index (Environmental FF12 index) as the dependent variable, we run the regression model (5). The regression results are presented in Table IX, including four internationalization measures based on foreign sales. We consistently find a positive relationship between firm internationalization and the environmental index. Specifically, in the first column, the coefficient on FS/S is 0.017 (t = 3.818). In the second column, the negative coefficient of −0.009 (t = -2.128) for Herfindahl(S) is consistent with the positive association between internationalization and Environmental Index, as a more internationalized firm maintains a lower Herfindahl index value. In the third column, the coefficient of Entropy(S) is estimated 0.006 (t = 2.358).[14] In sum, we obtain similar results by an alternative measure, the Environmental FF12 index constructed by data from the KLD database. The results consistently suggest that firms are more committed to emission reduction as they become more internationalized.

[14] Although we do not report regression results for the asset-based internationalization variables, we continue to find a positive relation between internationalization and emissions reduction.

[Table IX about here]

Discussion

Our study makes several contributions. The first is to the organization behavior, international business, and finance literature. Our study shows that the choices managers make with respect to firm internationalization influence emissions reduction. Specifically, one of the factors underlying managerial emissions reduction decisions is the degree of firm internationalization, a factor that has been examined infrequently in the literature on business ethics, international business, and finance.

Our second contribution is related to environmental sustainability. A company's environmental policies are generally seen in the literature as part of its CSR (Mitchell et al. 1997; Kaler 2002; Crane and Matten 2004; Cai et al. 2016). Our study shows that emissions reduction consideration is influenced by a firm's globalization stance, because internationalization is one of the factors that plays a key role in managerial decisions to invest in environmental initiatives and sustainability.

Our study has a few limitations. First, it considers only the influence of firm internationalization on the decision to reduce emissions. There are clearly other factors influencing this decision, such as economic considerations including the availability of capital to fund emissions reduction initiatives, social and political factors, and legal considerations. All of these factors undoubtedly exert some influence, and some may even exert influence that cannot be ignored. Our study is confined to a limited portion of the wide-ranging factors that can influence and motivate a firm's decision to reduce emissions.

Second, our study mainly looks at U.S. firms and examines non-U.S. sample only as a robustness check. Because the United States is different from other countries in its culture, legal framework, and political sensibility, as well as being the preeminent economy, comparative studies of how firm internationalization and emissions reduction decisions interact remain fruitful areas for future work. One area that might also be interesting to examine is how the emissions reduction decision in specific regions, for example, North America, Europe, Asia, and other part of the world, is affected by firm internationalization.

Overall, despite these limitations, we consider our main empirical findings of a positive association between firm internationalization and emissions reduction initiatives to be an important first step in understanding how the internationalization–emissions reduction nexus affects organization, environment, and the economy.

Conclusion

Over the past several decades, environmental responsibility and sustainability has drawn considerable interest from academics, practitioners, and regulators because managers increasingly internalize environmental concerns as part of their private business computations. Despite the increase in environmental concerns and the growing global demand for environmental protection, there has been little research into the measurable economic consequences of the relation between firm internationalization and emissions reduction activities.

In this article, we examine the empirical influence of firm internationalization on emissions reduction for a comprehensive sample of U.S. firms from 2002 to 2014. We find that emissions reduction is positively associated with firm internationalization after controlling for various firm characteristics. This positive association holds even after using alternative internationalization measures and various econometric techniques to address potential endogeneity. The results we obtain are consistent with the institutional theory and ethical universalism theory over ethical relativism. Beyond ethical consideration, we also find that environmental regulations positively influence the relation between firm globalization and emission reduction.

Our study demonstrates that emissions reduction initiatives are generally associated with higher levels of firm internationalization for firms, a stance that scholars of organization behavior, international business, finance, and environmental studies might see as a positive influence. This positive impact of firm internationalization provides alternative evidence to the premise of what we call the "shareholder wealth maximization" view. Because emissions reduction initiatives typically require initial investments that do not offer a short-term payoff and are not likely to have a positive return even in the long run, the popular notion is that firms will not invest in emissions-reduction initiatives unless legally required to do so. Contrary to this profit-based intuition, our results suggest that investors, financial managers, and other stakeholders, including policy makers dealing with emissions reduction initiatives, should pursue environment-oriented initiatives. Our evidence shows that firms achieve value gains from international business (and, by implication, from exposure to a universal ethics paradigm), provided that they consistently engage in emissions-reduction initiatives.

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Appendix A. A list of the abbreviations used

NGO: nongovernmental organizations
MNC: multinational corporations
CO_2: carbon dioxide
SOx: sulfur oxides
NOx: nitrogen oxides
CER: corporate environmental responsibility
R&D: research and development
CSR: corporate social responsibility
NYSE: New York Stock Exchange
AMEX: American Stock Exchange
GEOTP: Geographic Segment Type
GMM: generalized method of moments
ETD: Extreme Temperature Disaster
OLS: ordinary least squares
APP: Asian Pacific Partnership on Clean Development and Climate
ISIN: International Securities Identification Number

Appendix B. A list of the data point questions for ASSET4 ratings on emissions reduction

Indicators	Definition
Emissions	Does the company describe, claim to have or mention processes in place to improve emission reduction?
Emissions	Has the company set targets or objectives to be achieved on emission reduction?
Biodiversity Impact Reduction	Does the company report on its impact on biodiversity or on activities to reduce its impact on the native ecosystems and species, as well as the biodiversity of protected and sensitive areas?
CO2 Equivalents Emission Total	Total CO2 and CO2 equivalents emission in tonnes.
CO2 Equivalents Emission Direct	Direct CO2 and CO2 equivalents emission in tonnes.
CO2 Equivalents Emission Indirect	Indirect of CO2 and CO2 equivalents emission in tonnes.
Flaring Gases	Total direct flaring or venting of natural gas emissions in tonnes.
Cement CO2 Equivalents Emission	Total CO2 and CO2 equivalents emission in tonnes per tonne of cement produced.
Ozone-Depleting Substances	Total amount of ozone depleting (CFC-11 equivalents) substances emitted in tonnes.
NOx and SOx Emissions Reduction	Does the company report on initiatives to reduce, reuse, recycle, substitute, or phase out SOx (sulfur oxides) or NOx (nitrogen oxides) emissions?
NOx Emissions	Total amount of NOx emissions emitted in tonnes.
SOx Emissions	Total amount of SOx emissions emitted in tonnes.
VOC Emissions Reduction	Does the company report on initiatives to reduce, substitute, or phase out volatile organic compounds (VOC)?
Particulate Matter Emissions Reduction	Does the company report on initiatives to reduce, substitute, or phase out particulate matter less than ten microns in diameter (PM10)?
VOC Emissions	Total amount of volatile organic compounds (VOC) emissions in tonnes.
Waste Total	Total amount of waste produced in tonnes.
Non-Hazardous Waste	Total amount of non-hazardous waste produced in tonnes.
Waste Recycled Total	Total recycled and reused waste produced in tonnes.
Hazardous Waste	Total amount of hazardous waste produced in tonnes.
Water Discharged	Total volume of water discharged in cubic meters.
Water Pollutant Emissions	Total weight of water pollutant emissions in tonnes.
Waste Reduction Total	Does the company report on initiatives to recycle, reduce, reuse, substitute, treat or phase out total waste?
e-Waste Reduction	Does the company report on initiatives to recycle, reduce, reuse, substitute, treat or phase out e-waste?
Emissions Trading	Does the company report on its participation in any emissions trading initiative?
Environmental Partnerships	Does the company report on partnerships or initiatives with specialized NGOs, industry organizations, governmental or supra-governmental organizations, which are focused on improving environmental issues?
ISO 14000	Does the company claim to have an ISO 14000 certification?
Environmental Management System Certified Percent	The percentage of company sites or subsidiaries that are certified with any environmental management system.
Environmental Restoration Initiatives	Does the company report or provide information on company-generated initiatives to restore the environment?
Staff Transportation Impact Reduction	Does the company report on initiatives to reduce the environmental impact of transportation used for its staff?
Accidental Spills	Direct and accidental oil and other hydrocarbon spills in thousands of barrels (kbls).
Commercial Risks and/or Opportunities Due to Climate Change	Is the company aware that climate change can represent commercial risks and/or opportunities?
Environmental Expenditures	Total amount of environmental expenditures.
Environmental Provisions	Environmental provisions as reported within the balance sheet.
Environmental Investments Initiatives	Does the company report on making proactive environmental investments or expenditures to reduce future risks or increase future opportunities?
CO2 Equivalent Indirect Emissions, Scope Three	Total CO2 and CO2 Scope Three equivalent emission in tonnes.
Carbon Offsets/Credits	The equivalent of the CO2 offsets, credits and allowances in tonnes purchased and/or produced by the company during the fiscal year.
Waste Recycling Ratio	The waste recycling ratio as reported by the company.
Self-Reported Environmental Fines	Environmental fines as reported by the company
Estimated CO2 Equivalents Emission Total	The estimated total CO2 and CO2 equivalents emission in tonnes.
CO2 estimation method	CO2 estimate method
TRBC used for Median Calculation	TRBC code used to calculate estimate if the Median model is used

Appendix C. Variable description and data sources

Variable	Description	Source
Emissions reduction		
EMREDUC	Emissions reduction index indicates firms' efforts to reduce emissions such as carbon dioxide (CO_2), sulfur oxides (SOx), and nitrogen oxides (NOx).	Thomson Reuters ASSET4
Internationalization variables		
D(FS)	Dummy variable equal to 1 if firms have nonzero foreign sales, and 0 otherwise.	Compustat
D(FA)	Dummy variable equal to 1 if firms have nonzero foreign assets, and 0 otherwise.	Compustat
FS/S	Ratio of foreign sales to total sales, where foreign sales is defined as the sum of sales of all foreign segments	Compustat
Herfindahl (S)	For a firm with *N* geographic segments, the sales Herfindahl index is defined as $\sum_{i=1}^{N}(s_i/\sum_{i=1}^{N}s_i)^2$, where s_i stands for sales in geographic segment i.	Compustat
Entropy(S)	For a firm with *N* geographic segments, the sales entropy index is defined as $-\sum_{i=1}^{N}(s_i/\sum_{i=1}^{N}s_i)\cdot\ln(s_i/\sum_{i=1}^{N}s_i)$, where s_i stands for sales in geographic segment i.	Compustat
FA/A	Ratio of foreign assets to total assets, where foreign assets is defined as the sum of assets of all foreign segments.	Compustat
Herfindahl (A)	For a firm with *N* geographic segments, the assets Herfindahl index is defined as $\sum_{i=1}^{N}(a_i/\sum_{i=1}^{N}a_i)^2$, where a_i stands for assets in geographic segment i.	Compustat
Entropy(A)	For a firm with *N* geographic segments, the assets entropy index is defined as $-\sum_{i=1}^{N}(a_i/\sum_{i=1}^{N}a_i)\cdot\ln(a_i/\sum_{i=1}^{N}a_i)$, where a_i stands for assets in geographic segment i.	Compustat
Firm value variables		
Tobin's Q	(Total assets – total common equity+ market capitalization) divided by total assets.	Compustat
MTB	Ratio of market value of equity to book value of equity.	Compustat
Control variables		
Ln(at)	Logarithm of total assets.	Compustat
Lev	Ratio of book value of debt to total assets.	Compustat
ROA	Ratio of net income divided by total assets.	Compustat
Capex	Ratio of capital expenditure divided by total assets.	Compustat
FCF	Ratio of cash flow divided by lag of total assets.	Compustat
R&D/S	Ratio of research and development expense divided by total sales.	Compustat
AD/S	Ratio of advertising expense divided by total sales.	Compustat
PPE	Ratio of property, plant, and equipment divided by total assets.	Compustat
Cash	Ratio of cash and short-term investment divided by total assets.	Compustat

Table I. Descriptive Statistics and Bivariate Correlations

Panel A. Descriptive Statistics

Variable	Obs.	Mean	Std. dev.	Min	Q1	Median	Q3	Max
Emissions reduction								
EMREDUC	6,847	0.426	0.309	0.081	0.156	0.279	0.749	0.963
Firm internationalization								
D(FS)	6,847	0.724	0.447	0	0	1	1	1
D(FA)	6,847	0.235	0.424	0	0	0	0	1
FS/S	6,847	0.302	0.279	0	0	0.271	0.512	1
Herfindahl(S)	6,847	0.61	0.297	0.151	0.343	0.531	1	1
Entropy(S)	6,847	0.741	0.607	0	0	0.692	1.234	2.125
FA/A	1,612	0.424	0.262	0.011	0.217	0.396	0.591	1
Herfindahl(A)	2,942	0.716	0.286	0.196	0.442	0.748	1	1
Entropy(A)	2,942	0.512	0.538	0	0	0.445	0.963	1.781
Firm value								
Tobin Q	6,845	2.013	1.145	0.805	1.228	1.644	2.389	6.915
MTB	6,579	3.718	3.838	0.622	1.684	2.649	4.233	27.756
Other characteristics								
Ln(at)	6,845	8.88	1.28	6.36	7.94	8.71	9.715	12.527
Lev	6,845	0.239	0.169	0	0.113	0.226	0.342	0.738
ROA	6,845	0.056	0.077	-0.316	0.025	0.056	0.096	0.247
Capex	6,748	0.054	0.056	0	0.02	0.038	0.066	0.341
FCF	6,787	0.107	0.086	-0.212	0.062	0.103	0.154	0.363
RD/S	6,847	0.04	0.078	0	0	0	0.035	0.415
AD/S	6,847	0.013	0.027	0	0	0	0.013	0.148
PPE	6,776	0.277	0.233	0.003	0.091	0.197	0.415	0.88
Cash	6,758	0.142	0.144	0.001	0.035	0.092	0.2	0.67

Panel B: Bivariate correlations

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) EMREDUC	1										
(2) D(FS)	0.1566**	1									
(3) D(FA)	0.1283**	0.3333**	1								
(4) FS/S	0.1801**	0.6672**	0.1827**	1							
(5) Herfindahl(S)	-0.2418**	-0.7322**	-0.3116**	-0.7976**	1						
(6) Entropy(S)	0.2539**	0.6806**	0.3193**	0.7637**	-0.9772**	1					
(7) FA/A	0.0923**	0.1279**	0.0880**	0.7661**	-0.3645**	0.3526**	1				
(8) Herfindahl(A)	-0.2733**	-0.7435**	-0.7289**	-0.6974**	0.8986**	-0.8786**	-0.3122**	1			
(9) Entropy(A)	0.2828**	0.7042**	0.6943**	0.6833**	-0.8814**	0.8800**	0.2970**	-0.9853**	1		
(10) Tobin Q	-0.0989**	0.1259**	-0.0043	0.1322**	-0.0996**	0.0775**	0.1102**	-0.0931**	0.0718**	1	
(11) MTB	-0.0240	0.0624**	0.0742**	0.0655**	-0.0505**	0.0342**	0.0936**	-0.0811**	0.0663**	0.6222**	1
(12) Ln(at)	0.4664**	-0.0416**	0.1004**	-0.0640**	0.0080	0.0190	-0.0319	-0.1058**	0.1259**	-0.3408**	-0.1555**
(13) Lev	0.0897**	-0.1339**	0.0890**	-0.1638**	0.1067**	-0.0997**	-0.0243	0.0659**	-0.0685**	-0.1975**	0.1419**
(14) Capex	0.0277**	-0.1664**	0.0294**	-0.1303**	0.1559**	-0.1336**	-0.0074	0.1001**	-0.0845**	0.0676**	0.0203
(15) FCF	0.0085	0.0819**	0.0345**	0.0847**	-0.0651**	0.0661**	0.1330**	-0.0619**	0.0525**	0.5024**	0.2662**
(16) RD/S	-0.0014	0.2180**	-0.1546**	0.3327**	-0.2563**	0.2278**	-0.0740**	-0.0448**	0.0395**	0.2780**	0.1028**
(17) AD/S	0.0212	0.0742**	0.1154**	0.0345**	-0.0458**	0.0232	0.1221**	-0.0596**	0.0385**	0.1739**	0.1565**
(18) PPE	0.1893**	-0.2837**	0.0533**	-0.2465**	0.2482**	-0.2104**	-0.0487	0.1684**	-0.1487**	-0.1718**	-0.0914**
(19) Cash	-0.1265**	0.1746**	-0.1064**	0.2808**	-0.2070**	0.1797**	0.0172	-0.0486**	0.0396**	0.4480**	0.1872**

	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
(12) Ln(at)	1							
(13) Lev	0.1520**	1						
(14) Capex	-0.0328**	0.0163	1					
(15) FCF	-0.1467**	-0.1997**	0.2979**	1				
(16) RD/S	-0.1962**	-0.2090**	-0.1354**	-0.1144**	1			
(17) AD/S	0.0227	0.0022	-0.0682**	0.1042**	-0.0279**	1		
(18) PPE	0.1269**	0.2487**	0.6595**	0.0677**	-0.2836**	-0.1292**	1	
(19) Cash	-0.3084**	-0.3304**	-0.1706**	0.1072**	0.5567**	0.0704**	-0.4024**	1

Panel A reports summary statistics for U.S. firms' environmental emissions reduction, firm internationalization, firm value, and firm characteristic variables over 2002–2014. The environmental variable is EMREDUC. Firm internationalization variables are D(FS), D(FA), FS/S, Herfindahl(S), Entropy(S), FA/A, Herfindahl(A), and Entropy(A). Firm value is proxied by Tobin Q and MTB. Other characteristics variables are Ln(at), Lev, Capex, FCF, RD/S, AD/S, PPE, and Cash. Variables are defined in Appendix C. All continuous variables are winsorized at the 1st and 99th percentiles.

Panel B reports bivariate correlations between firm internationalization, emissions reduction, firm value, and other variables over 2002–2014. All continuous variables are winsorized at the 1st and 99th percentiles. ** indicates statistical significance above the 5% level.

Table II. Baseline regressions of emissions reduction on firm internationalization

	Dependent variable: EMREDUC			
Variable	(1)	(2)	(3)	(4)
D(FS)	0.089***			
	[11.759]			
FS/S		0.156***		
		[10.922]		
Herfindahl(S)			-0.198***	
			[-15.532]	
Entropy(S)				0.093***
				[14.962]
Ln(at)	0.135***	0.134***	0.131***	0.130***
	[51.208]	[50.881]	[48.983]	[48.344]
Lev	-0.064***	-0.058**	-0.068***	-0.064***
	[-2.649]	[-2.419]	[-2.889]	[-2.729]
MTB	0.003***	0.003***	0.003***	0.003***
	[3.090]	[3.074]	[3.422]	[3.510]
ROA	0.279***	0.255**	0.251**	0.259**
	[2.681]	[2.466]	[2.471]	[2.548]
Capex	-0.351***	-0.362***	-0.318***	-0.316***
	[-4.207]	[-4.347]	[-3.841]	[-3.817]
FCF	-0.021	-0.009	-0.022	-0.029
	[-0.215]	[-0.090]	[-0.222]	[-0.303]
RD/S	0.369***	0.323***	0.307***	0.315***
	[6.839]	[5.979]	[5.782]	[5.921]
AD/S	0.03	0.062	0.037	0.101
	[0.238]	[0.496]	[0.304]	[0.826]
PPE	0.315***	0.291***	0.309***	0.301***
	[14.356]	[13.281]	[14.253]	[13.824]
Cash	0.092***	0.072**	0.071**	0.071**
	[3.138]	[2.494]	[2.494]	[2.493]
Constant	-0.897***	-0.854***	-0.667***	-0.856***
	[-30.284]	[-29.004]	[-20.309]	[-29.238]
Obs.	6,486	6,486	6,486	6,486
Adj. R^2	0.397	0.398	0.41	0.409
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

This table reports regression results of emissions reduction on firm internationalization variables and control variables over 2002–2014. The dependent variable is EMREDUC. Firm internationalization variables are D(FS), FS/S, Herfindahl(S), and Entropy(S). Control variables are Ln(at), Lev, MTB, ROA, Capex, FCF, RD/S, AD/S, PPE, and Cash. Variables are defined in Appendix C. All continuous variables are winsorized at the 1st and 99th percentiles. Robust *t*-statistics adjusted by White's (1980) standard errors are reported in brackets. Industry and year dummies are not reported for brevity. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table III. Alternative estimation methods

	Dependent Variable: EMREDUC					
Variable	2-way clustering	Firm FE	Firm RE	Fama–MacBeth	Prais–Winsten	GMM
FS/S	0.243***	0.120**	0.065**	0.154***	0.085***	1.263***
	[9.844]	[2.316]	[2.241]	[16.486]	[3.766]	[5.077]
Ln(at)	0.116***	0.156***	0.114***	0.132***	0.117***	-0.048
	[19.310]	[11.422]	[18.604]	[23.452]	[24.126]	[-1.242]
Lev	0.041	0.096	0.001	-0.075**	-0.071**	-0.175
	[0.830]	[1.534]	[0.025]	[-2.799]	[-2.410]	[-1.142]
MTB	0.002	0.002	0.003**	0.002**	0.003***	0.010**
	[1.263]	[1.078]	[2.137]	[2.389]	[2.814]	[2.428]
ROA	0.586***	0.452***	0.220**	0.265	0.191***	-0.291
	[3.455]	[4.005]	[2.204]	[1.714]	[2.762]	[-1.138]
Capex	-0.595***	-0.049	-0.067	-0.421***	-0.020	-0.184
	[-5.206]	[-0.399]	[-0.634]	[-4.454]	[-0.244]	[-0.465]
FCF	-0.185	-0.409***	-0.140	0.032	-0.189***	0.550*
	[-1.146]	[-3.333]	[-1.339]	[0.255]	[-2.602]	[1.842]
RD/S	0.397***	-0.063	0.167*	0.336***	0.087	3.685***
	[4.221]	[-0.383]	[1.693]	[6.931]	[1.381]	[3.581]
AD/S	0.205	-0.419	-0.134	0.120	0.035	11.981***
	[0.777]	[-0.650]	[-0.480]	[1.228]	[0.167]	[4.080]
PPE	0.378***	0.042	0.158***	0.301***	0.229***	-1.769***
	[9.086]	[0.339]	[3.142]	[9.046]	[6.698]	[-4.316]
Cash	-0.034	0.215***	0.117***	0.041	0.100***	-0.116
	[-0.681]	[3.664]	[2.859]	[1.270]	[3.560]	[-0.642]
Constant	-0.789***	-1.033***	-0.688***	-0.789***	-0.664***	
	[-14.593]	[-7.463]	[-11.145]	[-14.741]	[-13.217]	
Obs.	6,486	6,486	6,486	6,486	6,486	4579
Adj. R^2	0.325	0.098	0.380	0.385	0.142	

This table reports regression results of environmental emissions reduction on firm internationalization and controls over 2002–2014 under alternative estimation methods. Estimation methods are ordinary least squares (OLS) regression controlling for industry and year fixed effects, two-way clustering (by firm and year), firm fixed effects (FE), firm random effects (RE), Fama–MacBeth (1973) regression, Prais–Winsten (1954) regression, and generalized method of moments (GMM) regression. The dependent variable is EMREDUC. The firm internationalization variable is FS/S. Control variables are Ln(at), Lev, MTB, ROA, Capex, FCF, RD/S, AD/S, PPE, and Cash. Variables are defined in Appendix C. All continuous variables are winsorized at the 1st and 99th percentiles. Robust *t*-statistics (*z*-statistics for GMM estimates) are reported in brackets. Industry and year dummies are not reported for brevity. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table IV. Subperiod analysis: Firm internationalization and emissions reduction

Panel A: Pre-APP subperiod analysis

	Dependent variable: EMREDUC			
Variable	(1)	(2)	(3)	(4)
D(FS)	0.113***			
	[5.205]			
FS/S		0.197***		
		[6.628]		
Herfindahl(S)			-0.177***	
			[-5.721]	
Entropy(S)				0.0810***
				[5.259]
Ln(at)	0.107***	0.108***	0.106***	0.105***
	[8.531]	[8.647]	[8.545]	[8.469]
Lev	-0.0976*	-0.0921*	-0.0976*	-0.0959*
	[-1.741]	[-1.652]	[-1.802]	[-1.767]
MTB	0.005**	0.004***	0.004**	0.004**
	[2.456]	[2.611]	[2.549]	[2.467]
ROA	0.164	0.179*	0.169*	0.164
	[1.364]	[1.692]	[1.646]	[1.577]
Capex	-0.249***	-0.250***	-0.245**	-0.255***
	[-2.648]	[-2.672]	[-2.536]	[-2.634]
FCF	0.138**	0.125**	0.124**	0.131**
	[2.415]	[2.475]	[2.337]	[2.313]
RD/S	1.548***	1.418***	1.448***	1.501***
	[5.148]	[4.833]	[4.959]	[5.177]
AD/S	0.125	0.117	0.0723	0.102
	[0.479]	[0.425]	[0.262]	[0.374]
PPE	0.348***	0.319***	0.327***	0.320***
	[7.693]	[6.806]	[7.147]	[6.918]
Cash	-0.0572	-0.0976*	-0.0786	-0.0823
	[-0.980]	[-1.751]	[-1.375]	[-1.471]
Obs.	1,529	1,529	1,529	1,529
Adj. R^2	0.301	0.299	0.301	0.298

Panel B: Post-APP subperiod analysis

	Dependent variable: EMREDUC			
Variable	(1)	(2)	(3)	(4)
D(FS)	0.129***			
	[7.765]			
FS/S		0.217***		
		[7.781]		
Herfindahl (S)			-0.265***	
			[-10.350]	
Entropy (S)				0.123***
				[10.030]
Ln(at)	0.123***	0.122***	0.120***	0.118***
	[20.790]	[20.570]	[20.850]	[20.350]
Lev	0.124**	0.121**	0.0989**	0.104**
	[2.540]	[2.433]	[2.151]	[2.255]
MTB	-0.001	-0.000	-0.000	-0.000
	[-0.415]	[-0.183]	[-0.062]	[-0.0153]
ROA	0.751***	0.711***	0.694***	0.698***
	[4.042]	[3.894]	[3.922]	[3.811]
Capex	-0.353***	-0.382***	-0.333***	-0.338***
	[-3.116]	[-3.476]	[-2.852]	[-2.906]
FCF	-0.149	-0.129	-0.139	-0.145
	[-1.196]	[-1.057]	[-1.172]	[-1.151]
RD/S	1.575***	1.354***	1.358***	1.392***
	[7.594]	[6.173]	[6.577]	[6.700]
AD/S	0.658*	0.709**	0.724**	0.770**
	[1.905]	[2.120]	[2.297]	[2.454]
PPE	0.378***	0.359***	0.378***	0.365***
	[9.077]	[8.512]	[9.354]	[9.032]
Cash	-0.009	-0.0445	-0.0346	-0.0351
	[-0.164]	[-0.761]	[-0.595]	[-0.606]
Obs.	4,951	4,951	4,951	4,951
Adj. R^2	0.347	0.349	0.372	0.369

Panel C. Chow tests for structural break between pre- and post-APP subperiods

Variables	F-stat	p-value
FS/S	26.26	<0.0001
Herfindahl(S)	31.99	<0.0001
Entropy(S)	31.49	<0.0001

This table reports the results from regressing the emissions reduction index on internationalization and controls in two subperiods: before (2002~2005, in Panel A) and after the Asia-Pacific Partnership on Clean Development and Climate (APP) (2006~2014, in Panel B), the goal of which was national pollution reduction, energy security, and climate change concerns, consistent with the principles of the U.N. Framework Convention on Climate Change (UNFCCC). The dependent variable is EMREDUC. Firm internationalization variables are D(FS), FS/S, Herfindahl(S), and Entropy(S). Control variables are Ln(at), Lev, MTB, ROA, Capex, FCF, RD/S, AD/S, PPE, and Cash. Those variables are defined in Appendix C. All continuous variables are winsorized at the 1st and 99th percentiles. Robust *t*-statistics adjusted by firm clustered standard errors are reported in brackets. Control variables, constant terms, and year dummies are not reported for brevity. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively. Panel C reports the *F statistics* of Chow test for any structural break in the coefficients of internationalization variables in Panels A and B.

Table V. The impact of the Kyoto Protocol on the relationship between environmental emission reduction and firm globalization

	Dependent Variable: EMREDUC			
Model	(1)	(2)	(3)	(4)
KP	0.011	0.016	0.063***	-0.007
	[0.567]	[0.882]	[2.721]	[-0.382]
D_FS	0.077***			
	[6.029]			
D_FS*KP	0.090***			
	[6.241]			
FS/S		0.154***		
		[6.167]		
FS/S*KP		0.202***		
		[3.081]		
Herfindahl_S			-0.143***	
			[-6.573]	
Herfindahl_S*KP			-0.071***	
			[-3.037]	
Entropy_S				0.064***
				[5.742]
Entropy_S*KP				0.037***
				[3.064]
Controls	YES	YES	YES	YES
Obs.	6,486	6,486	6,486	6,486
Adj. R^2	0.397	0.398	0.41	0.409
Industry FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

This table reports the impact of the Kyoto Protocol on the relationship between environmental emission reduction and firm globalization over the sample period of 2002-2014. KP is a dummy variable, equivalent to one after the Kyoto Protocol was enacted in year 2005 and zero otherwise. The dependent variable is the ASSET4 ESG ratings on firms' emission reduction (EMREDUC), which reveals firms' efforts to reduce emissions, such as carbon dioxide (CO2), sulfur oxides (SOx), and nitrogen oxides (NOx). Firm globalization is measured by D(FS), FS/S, Herfindahl(S), and Entropy(S). Control variables include Ln(at), Lev, MTB, ROA, Capex, FCF, RD/S, AD/S, PPE, and Cash. Those variables are defined as in the caption of Table 1. All variables are winsorized at 1%. Robust *t*-statistics adjusted by firm clustered standard errors are reported in brackets. Control variables, constant terms, industry, and year dummies are not reported for brevity. ***, **, * indicates statistical significance at the 1%, 5%, and 10% levels, respectively.

Table VI. Quasi-natural experiments: The extreme temperature disaster and BP oil spill

Dependent variable: EMREDUC						
	Panel A: ETD			Panel B: BPOS		
Variable	(1)	(2)	(3)	(4)	(5)	(6)
ETD (BPOS)	0.116***	0.193***	0.100***	0.114***	0.172***	0.113***
	(5.019)	(6.563)	(4.247)	(5.287)	(6.717)	(5.242)
FS/S	0.009			0.030		
	(0.219)			(0.946)		
FS/S*ETD (BPOS)	0.066*			0.067**		
	(1.668)			(2.394)		
Herfindahl(S)		-0.029			-0.072**	
		(-0.742)			(-2.395)	
Herfindahl(S)*ETD (BPOS)		-0.096***			-0.064**	
		(-2.670)			(-2.478)	
Entropy(S)			0.014			0.038**
			(0.719)			(2.523)
Entropy(S)*ETD (BPOS)			0.046***			0.027**
			(2.616)			(2.140)
Observations	6,486	6,486	6,486	6,486	6,486	6,486
Adj. R^2	0.378	0.391	0.391	0.378	0.390	0.390
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

This table reports the impacts of the extreme temperature disaster (Panel A) and BP oil spill (Panel B) on the relation between firm internationalization and environmental emissions reduction over 2002–2014. ETD is a dummy variable equal to 1 after the North American heat wave in 2006 and 0 otherwise. BPOS is a dummy variable equal to 1 after the BP oil spill in 2010 and 0 otherwise. The dependent variable is EMREDUC. Firm internationalization variables are FS/S, Herfindahl(S), and Entropy(S). Control variables are Ln(at), Lev, MTB, ROA, Capex, FCF, RD/S, AD/S, PPE, and Cash. Variables are defined in Appendix C. All continuous variables are winsorized at the 1st and 99th percentiles. Robust *t*-statistics adjusted by firm-clustered standard errors are reported in brackets. Control variables, constant terms, and year dummies are not reported for brevity. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table VII. Effect of internationalization and emissions reduction on firm value

	Dependent var.: Tobin Q		Dependent var.: MTB	
Variable	(1)	(2)	(3)	(4)
FS/S*EMREDUC	1.101***	0.521***	3.364***	1.386**
	(3.735)	(3.516)	(3.173)	(2.518)
FS/S	-0.136	0.0862	-0.349	0.139
	(-0.780)	(0.956)	(-0.691)	(0.469)
EMREDUC	-0.188*	0.129**	-0.642	0.346
	(-1.749)	(2.207)	(-1.470)	(1.375)
Ln(at)	-0.298***	-0.281***	-0.628***	-0.575***
	(-9.338)	(-20.11)	(-6.800)	(-11.42)
Lev	-0.951***	-0.762***	4.739***	5.203***
	(-3.923)	(-7.429)	(5.476)	(10.29)
Capex	1.379**	3.698***	1.076	7.285***
	(2.399)	(11.19)	(0.670)	(6.622)
Constant	4.788***	4.550***	8.040***	7.577***
	(14.28)	(32.59)	(9.047)	(14.74)
Observations	6,748	6,748	6,569	6,569
Adj. R^2	0.155	0.257	0.069	0.124
Industry FE	No	Yes	No	Yes
Year FE	No	Yes	No	Yes
Two-way clustered Standard error	Yes	No	Yes	No
White's standard error	No	Yes	No	Yes

This table reports the regression results of firm value on firm internationalization, environmental emissions reduction, and their interactive terms over 2002–2014. Dependent variables are Tobin's Q (models (1) and (2)) and MTB (models (3) and (4)). Environmental emission reduction, EMREDUC, reveals firms' efforts to reduce emissions, such as carbon dioxide (CO2), sulfur oxides (SOx), and nitrogen oxides (NOx). Internationalization is proxied by FS/S, a ratio of foreign sales to total sales. FS/S*EMREDUC is an interactive term between FS/S and environmental emissions reduction. Control variables are Ln(at), Lev, and Capex. These variables are defined in Appendix C. All continuous variables are winsorized at the 1st and 99th percentiles. Robust *t*-statistics are reported in brackets, adjusted either by firm- and year-clustered standard errors in models (1) and (3) or by White's (1980) standard error in models (2) and (4). ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table VIII. Firm internationalization and emissions reduction in non-U.S. countries

	Dependent variable: EMREDUC					
Variable	OLS	2-way clustering	Firm FE	Firm RE	Fama–MacBeth	Prais–Winsten
FS/S	0.058***	0.062***	0.053***	0.051***	0.051***	0.044***
	[8.646]	[4.776]	[3.983]	[5.038]	[5.359]	[5.501]
Ln(at)	0.110***	0.109***	0.101***	0.085***	0.109***	0.085***
	[67.777]	[32.198]	[14.186]	[24.179]	[37.214]	[30.001]
Lev	0.001	-0.003	-0.062**	0.021	-0.013	0.031*
	[0.071]	[-0.107]	[-2.074]	[0.967]	[-0.903]	[1.846]
MTB	3.257***	1.785	-1.133	2.450***	2.158	1.127
	[3.933]	[1.330]	[-1.084]	[2.645]	[1.395]	[1.543]
ROA	0.118***	0.074	-0.081**	0.031	0.116**	0.022
	[4.239]	[1.533]	[-2.296]	[0.988]	[2.793]	[1.017]
Capex	0.205***	0.179**	-0.066	0.023	0.221***	0.034
	[4.473]	[2.495]	[-1.035]	[0.419]	[5.701]	[0.868]
PPE	0.088***	0.089***	-0.057*	0.007	0.104***	0.031**
	[7.700]	[3.444]	[-1.776]	[0.318]	[5.582]	[1.981]
Cash	-0.023	-0.008	-0.002	-0.059**	0.012	-0.033*
	[-1.273]	[-0.222]	[-0.048]	[-2.152]	[0.456]	[-1.672]
Constant	-1.214***	-1.176***	-0.960***	-0.850***	-1.187***	-0.823***
	[-43.631]	[-22.407]	[-8.660]	[-15.374]	[-21.616]	[-17.940]
Obs.	15,728	15,728	15,728	15,728	15,728	15,728
Adj. R^2	0.423	0.417	0.070	0.303	0.413	0.145
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes

This table presents regression results of emissions reduction on firm internationalization using firms in 45 non-U.S. countries (Australia, Austria, Belgium, Hong Kong, Brazil, Canada, Switzerland, Chile, Germany, Denmark, Egypt, Spain, Finland, France, United Kingdom, Greece, China, Indonesia, Ireland, Israel, Italy, Jersey, Japan, South Korea, Luxembourg, Mexico, Malaysia, Netherlands, Norway, New Zealand, Philippines, Poland, Portugal, Russia, Saudi Arabia, Singapore, Sweden, Thailand, Turkey, Taiwan, and South Africa). Each country is required to have at least five firms from 2002 to 2014. Estimation methods are ordinary least squares (OLS) regression controlling for industry and year fixed effects, two-way clustering (by firm and year), firm fixed effects (FE), firm random effects (RE), Fama–MacBeth (1973) regression, and Prais–Winsten (1954) regression. The dependent variable is the emissions reduction index (EMREDUC) of non-U.S. firms obtained from the ASSET4 database. The firm internationalization variable is FS/S, obtained from the Worldscope database. Control variables are Ln(at), Lev, MTB, ROA, Capex, PPE, and Cash, also obtained from the Worldscope database. Variables are defined in Appendix C. All continuous variables are winsorized at the 1st and 99th percentiles. Robust *t*-statistics adjusted by firm-clustered standard errors are reported in brackets. Control variables, constant terms, industry, year and country dummies are not reported for brevity. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table IX. Regressions of KLD environment index score on firm internationalization

	Environmental Index			Environmental FF12 Index		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
FS/S	0.017***			0.037***		
	(3.818)			(4.739)		
Herfindahl(S)		-0.009**			-0.017**	
		(-2.128)			(-2.310)	
Entropy(S)			0.006**			0.009**
			(2.358)			(2.376)
Ln(at)	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(-1.159)	(-1.041)	(-1.107)	(-0.746)	(-0.509)	(-0.534)
Lev	0.011**	0.011**	0.011**	0.008	0.007	0.008
	(2.336)	(2.270)	(2.280)	(0.873)	(0.777)	(0.781)
MTB	-0.000	-0.000	-0.000	0.000	0.000	0.000
	(-0.476)	(-0.480)	(-0.468)	(0.431)	(0.431)	(0.441)
ROA	0.014***	0.014***	0.014***	0.035***	0.035***	0.036***
	(3.294)	(3.294)	(3.303)	(3.303)	(3.298)	(3.302)
Capex	0.000	0.000	0.000	0.000	0.000	0.000
	(0.389)	(0.296)	(0.323)	(1.422)	(1.330)	(1.338)
FCF	-0.001	-0.001	-0.001	-0.010	-0.009	-0.009
	(-0.714)	(-0.631)	(-0.652)	(-1.519)	(-1.438)	(-1.445)
RD/S	0.002*	0.002*	0.002*	0.004	0.004	0.004
	(1.746)	(1.724)	(1.740)	(1.462)	(1.391)	(1.383)
AD/S	0.088***	0.086**	0.087***	0.238***	0.234***	0.236***
	(2.616)	(2.571)	(2.606)	(3.697)	(3.624)	(3.652)
PPE	0.004	0.004	0.004	0.019*	0.018*	0.018
	(0.688)	(0.646)	(0.644)	(1.743)	(1.651)	(1.635)
Cash	0.011***	0.011***	0.011***	-0.006	-0.004	-0.004
	(2.800)	(2.936)	(2.920)	(-0.701)	(-0.514)	(-0.523)
Constant	0.554***	0.563***	0.554***	0.485***	0.501***	0.484***
	(56.944)	(52.510)	(56.985)	(27.937)	(26.673)	(27.977)
Observations	27,001	27,001	27,001	26,991	26,991	26,991
Adj.R^2	0.508	0.508	0.507	0.423	0.422	0.422
Year FE	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES

This table reports regression results of the Kinder, Lydenberg, and Domini (KLD) environment index score and the Environmental FF12 Index on firm internationalization variables and control variables over 2002–2014. The dependent variable are respectively environment index score and Environmental FF12 Index, constructed by data from the KLD database. Firm internationalization variables are FS/S, Herfindahl(S), and Entropy(S). Control variables are Ln(at), Lev, MTB, ROA, Capex, FCF, RD/S, AD/S, PPE, and Cash. Variables are defined in Appendix C. All continuous variables are winsorized at the 1st and 99th percentiles. . Robust *t*-statistics adjusted by firm-clustered standard errors are reported in brackets. Industry and year dummies are not reported for brevity. ***, **, * indicate statistical significance at the 1%, 5%, and 10%.