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Fang Chen, Thomas Ngniatedema, Suhong Li,

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A cross-country comparison of green initiatives, green performance and financial performance

Cross-country
comparison
of green
initiatives

Fang Chen

Department of Finance, University of New Haven, New Haven, Connecticut, USA

Thomas Ngniatedema

*Department of Information Sciences and Systems, Morgan State University,
Baltimore, Maryland, USA, and*

Suhong Li

*Department of Computer Information Systems, Bryant University, Smithfield,
Rhode Island, USA*

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Abstract

Purpose – The purpose of this paper is to investigate the relationship between green initiatives, green performance, and a firm's financial performance in the world. The existing literature on environmental initiatives and their impacts is limited to the context of a particular country. This gap points to a lack of clarification of variations in environmental regulation and in economic disparity which may affect the impact of green initiatives on green performance and on financial performance.

Design/methodology/approach – Data on the world top 500 publicly traded companies are collected from Compustat, a database of financial, statistical and market information on global companies, and from Newsweek, an information gatekeeper that enables consumers to access a list of environmentally friendly companies. The paper adopts linear regression to test the relationships between variables.

Findings – The results show that green initiatives have a positive impact on green performance, which in turn has a positive impact on financial performance. However, the impact of green initiatives varies by country. The study revealed that companies in European countries and Canada lead in the green initiatives and green performance, followed by the USA and Japan. China and Hong Kong lag behind compared to other countries.

Research limitations/implications – The small sample size in some of the countries used in this study may impact the validity of the results.

Practical implications – This study suggests that companies that seek financial benefits of pursuing green initiatives should have a long-term orientation when implementing these initiatives and should consider the country where they operate.

Originality/value – The current study provides a global understanding of the relationship between green initiatives, green performance, and financial performance, and contributes to the literature by highlighting variation among countries and by year.

Keywords Sustainable development, Green policy, Green performance, Sustainability themed committee

Paper type Research paper

Introduction

In recent years, environmental concerns have put pressure on practitioners to adopt various environmental initiatives. This trend has motivated a considerable body of research to examine the relationship between green initiatives, green performance, and business performance (Aragon-Correa, 1998; Klingenberg and Geurts, 2009; Li *et al.*, 2017; Miroshnychenko *et al.*, 2017; Ngniatedema and Li, 2012; Rothenberg *et al.*, 2001; Seroka-Stolka, 2016). In their early work related to green initiatives, scholars have mostly focused on issues such as green product and process development, lean and green operations management, remanufacturing, logistics and closed-loop supply chains (Angell and Klassen, 1999; Klingenberg and Geurts, 2009). The majority of empirical studies in these early works have focused on the manufacturing



sector in the USA (Kassinis and Soteriou, 2003; Klassen and McLaughlin, 1996; Kleindorfer *et al.*, 2005) with very few on the service sector (Foster *et al.*, 2000; Goodman, 2000; Judge and Douglas, 1998). Of these studies, very few found significant evidence that green practices are related to a firm's financial performance.

Besides studies that focus on green practices and sustainability performance of firms based in the USA (see e.g. Li *et al.*, 2017; Seroka-Stolka, 2016), researchers have begun to look beyond US firms (Christmann and Taylor, 2002). This observation in itself demonstrates the rapidly increasing importance of these topics on a global scale and may justify the synthesis of the literature by Goyal *et al.* (2013) on environmental-related studies for a 19 years' span (1992-2011). For the study period 1992-2010, the maximum number of articles related to sustainability issues is based in the USA, the UK, Spain, and Germany, and in other developing countries such as India (Goyal *et al.*, 2013).

In the literature, there is some discussion on the links between green initiatives, green performance, and financial performance within the context of corporate social responsibility (CSR), in which the authors use data from firms based in a particular country. Several examples can be found in early works, such as Aras *et al.* (2010) investigated the Istanbul Stock Exchange 100 index companies and their CSR policy, which is measured by the extent of social and environmental disclosures, and financial indicators. They did not find significant evidence on the CSR-financial performance link for Turkish firms. In examining the link between CSR and firm value, Lima Crisóstomo *et al.* (2011) found a significant negative impact of environmental action on firm value for companies based in Brazil. A similar study was conducted by Usman and Amran (2015) using data from 68 companies listed on the Nigeria Stock Exchange. They found that disclosure of environmental impact information could destroy the value of a firm. Montabon *et al.*'s (2007) study used a small sample of 45 US and international firms and found a positive relationship between environmental management practices and performance measures of the firm. A study by Flammer (2013) investigated the stock market reaction to the eco-friendly initiatives for all US publicly traded companies from the years 1980 to 2009, which reported a significantly positive increase of the stock price. The results from Flammer's (2013) study suggested that as more eco-friendly initiatives are adopted, the positive stock market reaction erodes steadily, implying decreasing marginal returns from environmental initiatives. In his 2015 paper, Flammer conducted a similar study which revealed a stronger marginal effect for companies belonging to industry sectors where CSR efforts are higher. Recently, Tuppura *et al.* (2016) examined the CSR-corporate financial performance link using sample data from US firms in four different industries sectors. In examining the effect of causality between these two variables, they found a bi-directional relationship between them in the apparel industry, energy, food, and forestry.

Most of the recent discussion on the relationships between green initiatives, CSR, green performance, and/or financial performance is limited to the context of a particular country, and the majority of the studies are based on US firms. Few studies have compared the impact of green practices on green performance and/or financial performance across multiple countries. Two groups of the authors conducted meta-analytic reviews of the green performance-financial performance literature (Dixon-Fowler *et al.*, 2013; Orlitzky *et al.*, 2003). Both authors came to a similar conclusion that green performance positively impacts financial performance. In examining the green performance-financial performance link, Dixon-Fowler *et al.* (2013) compared the US-based firms to their international counterparts. They found that green performance has the strongest impact on financial performance for US firms compared to their international counterparts.

However, in other national contexts, variations in environmental regulation and in economic disparity may lead to difference in resource scarcity, which in turn may affect green initiatives and their economic outcomes (Dixon-Fowler *et al.*, 2013; Zhu *et al.*, 2007).

As a result, the findings from the previous literature based on US firms raise questions of generalization to other countries. Hence, there is a need for further research to better understand the relationship between green performance and financial performance (Dixon-Fowler *et al.*, 2013).

This gap prompts us to investigate not only the green initiatives-financial performance relationship but also the green initiatives-green performance and green performance-financial performance relationships in Global 500 companies, which have so far received little attention in the literature. The Global 500 companies under consideration span 34 countries, providing an opportunity to conduct a cross-country comparison when assessing these relationships on a global scale.

This paper is organized as follows. First, we review the literature on the concepts of green initiatives, green performance, and financial performance, and from this discussion we raise our research questions. Then, we present our theoretical framework to explain the links between green initiatives, green performance, and a firm's financial performance. Next, we use data collected from Compustat, which is a database of financial, statistical, and market information on global companies, and Newsweek, an information gatekeeper which provides free access to a list of environmentally friendly companies, to test the relationships under study. The study proceeds with the methodology and analysis, followed by the interpretation of the findings. The paper ends with concluding remarks, the implications from the results obtained, and the presentation of future research opportunities.

Theory and hypotheses

Definition and conceptualization of green initiatives

During the last few decades, environmental issues have been of particular interest in scholarly research. Previous studies have examined corporate practices that embrace environmental management, environmental disclosure, and green performance. The term corporate environmental management (CEM), championed by Albertini (2013), is used to conceptualize these practices. Because cultivating CEM is an important aspiration, the concept of "green initiatives" has emerged in the literature (Li *et al.*, 2017). This term is used to describe the set of actions adopted by a firm to minimize the negative environmental effects associated with the entire life cycle of its products (Nicholls and Kang, 2012; Zhu and Sarkis, 2004). The development of metrics to assess the green performance of a firm has led many practitioners to adopt environmental friendly practices. These developments provide managers with a framework that can be used as guidelines when assessing their environmental efforts as well as the impact of their green initiatives (Golicic *et al.*, 2010). A number of research teams have contributed in the development of these metrics. They include, Morgan Stanley Capital International Environmental, Social and Governance Research, Newsweek, Trucost, and CorporateRegister.com (Li *et al.*, 2017). These research teams score companies based on their performance on eight specific indicators, which lead to a company's overall score as a weighted average of these key performance indicators (KPIs). To describe some of these eight KPIs, the research team adopted terms such as "Pay Link," "Sustainability Themed Committee," and "Audit." This study uses these first three KPIs to measure green initiatives. The remaining KPIs are tied to the set of variables used to measure green performance. Table I contains these variables.

Definition and conceptualization of green performance

Green performance is defined as positive consequences of green initiatives on the natural environment inside and outside the firm (Zsidisin and Siferd, 2001). A subset of the Newsweek's eight KPIs and the green management variables described in Molina-Azorín *et al.* (2009)

Variables	Definitions
Green initiatives:	set of actions undertaken by a firm to minimize the negative environmental effects associated with the entire life cycle of its products or services
Pay link	Whether or not at least one senior officer has his/her pay linked to sustainability
Audit	Situation in which a company provides evidence that the latest reported environmental metrics were audited by a third party
Sustainability themed committee	Existence of a committee at the Board of Directors level whose mandate coincides with the sustainability of the company, including but not limited to environmental matters
Green performance:	positive consequences of green initiatives on the natural environment inside and outside the firm
Green revenue	Revenue tied to each line of business reported by the company multiplied by its associated "Industry Segment Green Rating"
Water productivity	Sales (US\$) divided by total water use (cubic meters)
Waste productivity	Sales (US\$) divided by total waste produced (tons)
Energy productivity	Sales (US\$) divided by total direct and indirect energy consumption (gigajoules) (GJ)
Carbon productivity	Sales (US\$) divided by total CO ₂ and CO ₂ equivalents emissions (tones) (GHG)
Financial performance:	meta-construct emphasizing the profitability of a firm using three broad categories of measures: market-based (investor returns), accounting-based (accounting returns), and organizational
Debt ratio	Total debt divided by total assets
Profit margin	Net income divided by the total sales
Market to book ratio	Market price divided by the book value
Return on assets	The net income divided by the total assets
Assets turnover	Ratio of cost of goods sold to average inventory

Table I.
Analysis variable definitions

are used to measure green performance. As described in Table I, these measures include energy productivity, carbon productivity, water productivity, waste productivity, and green revenue (corporate knights' capital).

Definition and conceptualization of financial performance

Commonly financial performance measure emphasizes return on sales (ROS), return on assets (ROA), return on equity (ROE), and return on invested capital (ROIC). Past research has used these variables when assessing the interests of various stakeholders in the market place (Hart and Ahuja, 1996; Hiroki and Keisuke, 2010; Klingenberg and Geurts, 2009; Sarkis and Cordeiro, 2001). To model capital borrowed by stockholders from creditors and investors as well as their equity capital contribution, other variables have been used to measure financial performance. They include the ROA, Tobin's $q-1$, ROS, ROE, and return on capital employed (Konar and Cohen, 2001; Russo and Fouts, 1997; Elsayed and Paton, 2005; Estampe *et al.*, 2013; Nakao *et al.*, 2007; Ngniatedema and Li, 2012; King and Lenox, 2002). Because management often prefer to offer their perceptions rather than providing accurate quantitative data, several researchers have conceptualized the firm financial performance variable using subjective perceptions of managers (Judge and Douglas, 1998; Correa *et al.*, 2008; Sharma and Vredenburg, 1998).

We adopt the list of variables used in Li *et al.* (2017) by emphasizing firm's financial performance relative to the market and its competition. These variables are debt ratio (DR), profit margin (PM), return on total assets (RTA), market to book ratio (MBR), and assets turnover (AT). They are recognized as important dimensions to firm's financial performance (Slywotzky *et al.*, 2000). These variables are defined in Table I.

Green initiatives-green performance relationship

According to Peglau, since 1996 more than 88,800 facilities around the world have adopted green initiatives and environmental management systems that are ISO 14001 certified. A large

body of research has focused on green initiatives adoption that impacts firm performance. In the green initiatives adoption literature, Annandale *et al.*, Madsen and Ulhøi, Melnyk *et al.* (2003), and Zhu and Sarkis (2004) noted that green initiatives adoption leads to better green performance. Fraj *et al.* (2013) also noted the positive impact of green initiatives on financial performance. However, they explain that this relationship is mediated by the firm's superior green performance.

A study by Dangelico (2015) suggested a positive impact of a sustainability themed committee on a firm's green performance and reputation. Florida and Davison (2001) explained that the adoption of a sustainability themed committee led to improved green performance. Winston (2009) also showed that having a sustainability themed committee can be beneficial because of one of its missions is to keep people motivated thereby leading to superior green performance.

Because cultivating environmental concern is an important aspiration, many researchers emphasize that companies should reward their executives for environmental actions that lead to improved performance. Berrone and Gomez-Mejia (2009) demonstrated the strength of the Pay Link-green performance relationship, when a firm has adopted an environmental pay policy and an environmental committee within its board of directors. The study of this Pay Link-green performance relationship is well documented in the literature (Coombes and Gilley, 2005; Russo and Harrison, 2005; Stanwick and Stanwick, 2001).

In the context of other countries, a study by Edwards (1998) examined the link between environmental practices and green performance for UK firms. Another paper by Link and Naveh (2006) also examined the relationship between environmental practices and green performance for companies in Israel. Hitchens *et al.* (2005) studied the impact of environmental initiatives on green performance for SMEs in the context of Europe. For Hong Kong, Studer *et al.* (2006) studied a causal relationship between green initiatives and green performance. Using SMEs in the Philippines, Rao *et al.*'s (2006) study found that a correlation between green initiatives and green performance. Jabbour *et al.* (2013) tested the sustainability themed committee-green performance relationship on companies based in Brazil. They found that a more proactive and advanced environmental management approach is associated with a more intense use of a sustainability themed committee. Trumpp *et al.* (2015) presented other relevant literature on the link between green initiatives and green performance relative to other countries. The results from these studies confirm that companies which place emphasis on sustainability practices see an improvement on their green performance.

Therefore, we hypothesize that:

- H1a.* The higher the level of green initiatives, the higher the level of green performance on a global scale.
- H1b.* The impact of green initiatives on green performance varies by country.

Green performance-financial performance relationship

There are number of papers discussing the link between green performance and corporate profitability in the literature. However, the existing literature is inconclusive and incomplete in assessing this relationship (Darnall *et al.*, 2008; Khanna and Anton, 2002). For example, Elsayed and Paton (2005) elaborated on the green performance-financial performance link. They suggested that green performance has a neutral impact on financial performance. Other streams of research found a positive association between green performance and financial performance (Hart and Ahuja, 1996; Li and Ngñiatedema, 2013; Ngñiatedema *et al.*, 2014; Ngñiatedema and Li, 2014; Ngñiatedema and Li, 2012; Li *et al.*, 2017; Russo and Fouts, 1997; Stanwick and Stanwick, 2001; Yadav *et al.*, 2016). In their cross-industry study,

Kiernan (2001) and Derwall *et al.* (2005) found that firms with better green performance generate superior financial performance. In the auto industry, Kushwaha and Sharma's (2016) study led to a similar conclusion. Dixon-Fowler *et al.* (2013) provided a meta-analytic review of the literature on this topic. They suggested that small firms outperform large firms financially in examining the green performance-financial performance relationship. In his study, Salama (2005) found that the relationship between these two variables to be strong. Salama (2005) used the corporate reputation index of Britain's most reputable companies as a proxy measure of green performance. Because of this, it is reasonable to credit Dangelico's (2015) argument that environmental reputation is one of the most important factors which impact financial performance.

Although various academicians have examined the link between green performance and financial performance among US firms (see e.g. Ambec and Lanoie, 2008; Baker and Sinkula, 2005; Christmann, 2000; Clarkson *et al.*, 2008; Coombs and Gilley, 2005; Li *et al.*, 2017), a number of researchers have studied the association between green performance and financial performance in the context of other countries. Bansal (2005) studied the link between these two variables based on Canadian firms in the oil and gas, mining, and forestry industries from 1986 to 1995. Menguc and Ozanne (2005) conducted a similar study based on Australian manufacturing firms. Judge and Elenkov used data on Bulgarian firms to investigate the same green performance-financial performance relationship. Most of the findings in these studies coincide with the results in the meta-analysis studies by Dixon-Fowler *et al.* (2013) and Orlitzky *et al.* (2003) that "it pays to be green." However, Wagner (2005) and Wagner *et al.* (2002) used data on firms based in Germany, Italy, the Netherlands, and the UK, and they found that a negative relationship between green performance and financial performance. A more comprehensive review of the literature on the relationship between green performance and financial performance in other countries can be found in Molina-Azorin *et al.* (2009).

Because the majority of previous research suggests a positive relationship between green initiatives and financial performance across countries, we hypothesize that:

H2a. The higher the level of green performance, the higher the level of financial performance on a global scale.

H2b. The impact of green performance on financial performance varies by country.

Green initiatives-financial performance relationship

Research on the relationship between green initiatives and financial performance has been the focus of numerous studies, and much of the early findings remain inconclusive, fostering an ongoing debate in the literature (Russo and Fouts, 1997; Derwall *et al.*, 2005). One stream of research finds that green initiatives are positively related to financial performance (e.g. Albertini, 2013; Hart and Dowell, 2011; Klassen and McLaughlin, 1996; Li *et al.*, 2017; Montabon *et al.*, 2007). The findings from a small number of papers suggest that green initiatives are negatively related to financial performance (Blacconiere and Patten, 1994; Jaggi and Freedman, 1992). Other scholars argue that the nature of the relationship between green initiatives and financial performance is inconclusive and incomplete, because it is difficult to measure the impact of green initiatives on profitability (Lorraine *et al.*, 2004; King and Lenox, 2001; Murray *et al.*, 2006). A detailed literature review on the link between green initiatives and financial performance can be found in Albertini (2013); and a similar and more recent study focusing on a process aspect of green initiatives in the auto industry can be found in Kushwaha and Sharma (2016).

Luoma and Goodstein (1999) and Winston (2009) showed that the adoption of a sustainability themed committee provides economic advantage. Ambec and Lanoie (2008)

and Molina-Azorin *et al.* (2009) also highlighted that the adoption of a sustainability themed committee can contribute to costs savings.

Because research on executive compensation traditionally takes into account financial performance (Barkema and Gomez-Mejia, 1998; Gomez-Mejia and Wiseman, 1997), some scholars have analyzed the “Pay Link”-financial performance relationship. Berrone and Gomez-Mejia (2009), for example, highlighted that firms either reward their managers for successful green initiatives or penalize them for poor green performance. Their study led to a finding that “Pay Link” is positively related to financial performance. An event study methodology was used by Klassen and McLaughlin (1996) to gauge investor reactions to news about green performance awards and environmental crises. Their study revealed that firms with strong green initiatives generate positive returns whereas firms with weak green initiatives perform poorly in terms of financial returns. Dowell *et al.* (2000) found that large companies that adopt strict green initiatives generate higher stock market performance.

Environmental auditing is also gaining popularity in the research community. It helps in assessing the accuracy and fairness of the disclosed information by the practitioners (Welford, 1993). A number of researchers have established a link between environmental auditing and financial performance (see e.g. Akerlof, 1970; Enofe *et al.*, 2013; Mgbame and Ilaboya, 2013). In their analyses, Razeed (2009) and Montabon *et al.* (2007) argued that the profitability of a firm is critical in decisions regarding environmental disclosure.

The above studies investigated the relationship between green initiatives and financial performance using data on firms based in the USA (see e.g. Ambec and Lanoie, 2008; Dixon-Fowler *et al.*, 2013; Baker and Sinkula, 2005; Christmann, 2000; Clarkson *et al.*, 2008; Coombs and Gilley, 2005; Gama Boaventura *et al.*, 2012; Molina-Azorin *et al.*, 2009; Orlitzky *et al.*, 2003), where most studies support a generally positive relationship between these two variables (Li *et al.*, 2017). However, researchers have begun to look beyond US firms when examining this relationship (Birth *et al.*, 2006; Miroshnychenko *et al.*, 2017). Dixon-Fowler *et al.* (2013), for example, found that US-based firms benefit more from green initiatives than their international counterparts. Ameer and Othman (2012) also examined the link between green initiatives and financial performance using data from global companies. They found a positive relationship between these two variables. A study by Miroshnychenko *et al.* (2017) revealed that green practices are major drivers for financial performance. Interested readers can refer to Molina-Azorin *et al.* (2009) and Gama Boaventura *et al.* (2012) for more comprehensive reviews of the literature on the green initiatives-financial performance link in other countries.

The above discussion leads to:

H3a. The higher the level of green initiatives, the higher the level of financial performance.

H3b. The impact of green initiatives on financial performance varies by country.

Research model

Figure 1 schematically represents the research model and Table I summarizes the definitions of the variables used in this study. This paper builds on Li *et al.*'s (2017) study

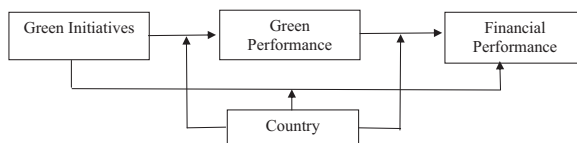


Figure 1.
Research model

Cross-country
comparison
of green
initiatives

which examined the relationships between green initiatives, green performance, and a financial performance using multidimensional constructs based on environmental and financial indicators. Li *et al.* (2017) used top 500 publicly traded companies in the USA. Our work is different from Li *et al.* (2017) in that we use the top 500 publicly traded companies in the world to assess the strength of the green initiatives, green performance, and financial performance relationships. Our study also examines the moderating effects of a country on the impact of those relationships. A cross-country comparison is performed in this study to identify high performers in regard to green initiatives, green performance, and financial returns. Other potential factors that may impact firm-level performance are not included in this study due to the limitation of the data.

Methodology

The target population for this research is Global 500. Each company's green initiatives score was obtained from the February 2017 data published by Newsweek. The country location as well as the industry sector of each company was also reported in this data. Although the green metrics data were published in 2016, each company was evaluated based on the 2014 data. Therefore, the sample data for the year 2014 were used as measures for green initiatives and green performance. Each company's financial performance data were obtained from Compustat for the years 2014 and 2015. A total of 14 companies were dropped because of missing values in Compustat, reducing the sample size to 486.

The sample data were drawn from companies in 34 countries (see Table II). From the companies sampled, the US accounts for 40 percent of them (201 companies), followed by China with 9.2 percent (46 companies). Japan, the UK, and France represent 7.2 percent (36), 6.0 percent (30), and 5.0 percent (25) of all the companies, respectively. Other countries only have one company representation in the sample data used, such as Qatar, Israel, South Africa, UEA, and Macau. This study will focus on the top 10 countries based on the companies' representation in the list of global 500 and they are USA, China, Japan, the UK, France, Germany, Canada, Switzerland, Hong Kong, and India. The majority of companies (89 percent) in Global 500 belong to developed countries, while the remaining (11 percent) belong to developing countries (China and India).

Country	No. of firms (number)	No. of firms (%)	Pay link (number)	Pay link (%)	Sustainability themed committee (number)	Sustainability themed committee (%)	Audit (number)	Audit (%)
USA	201	40.2	131	65.2	122	60.7	120	59.7
China	46	9.2	4	8.7	17	37.0	21	45.7
Japan	36	7.2	26	72.2	29	80.6	20	55.6
UK	30	6.0	27	90.0	27	90.0	27	90.0
France	25	5.0	22	88.0	21	84.0	24	96.0
Germany	20	4.0	16	80.0	18	90.0	17	85.0
Canada	16	3.2	15	93.8	14	87.5	13	81.3
Switzerland	15	3.0	12	80.0	12	80.0	14	93.3
Hong Kong, SAR	15	3.0	2	13.3	4	26.7	6	40.0
India	12	2.4	3	25.0	9	75.0	8	66.7
Other	84	16.8	51	60.7	45	53.6	57	67.9
Total	500	100	309	61.8	318	63.6	327	65.4

Notes: Others include the following 24 countries: Sweden(9), Australia(8), Italy(7), the Netherlands(6), Spain(5), Russia(5), Brazil(4), Venezuela(4), Ireland(4), Singapore(4), Denmark(3), Taiwan(3), South Korea(3), Mexico(3), Saudi Arabia(3), Indonesia(2), Finland(2), Belgium(2), Norway(2), Qatar(1), Israel(1), South Africa(1), UAE(1), Macau(1)

Table II.
Green initiatives of
Global 500 by country

Analysis and discussion

In this section, we first present an overview of green initiatives, green performance, and financial performance in the top 10 countries of Global 500, followed by *t*-tests to assess the impact of each green initiatives variable on green performance for the whole sample and for the top 10 countries. A series of regression analysis is then used to test the impact of green initiatives and green performance on financial performance for the whole sample and for each of the top 10 countries.

Cross-country comparison of green initiatives

Overview of green initiatives of global 500

Table II shows that on average about two thirds of Global 500 companies have adopted various green initiatives. About 62 percent of them have linked their senior executives pay to the green performance targets and about 64 percent of these companies have a sustainability themed committee. In addition, about 65 percent of these companies have their environmental metrics audited by a third party.

Table II and Figure 2 show that companies in European countries (the UK, France, Germany, and Switzerland) and Canada lead in the implementation green initiatives. Among these companies, more than 80 percent are implementing each of three green initiatives components. In contrast, Hong Kong and China are lagging behind in green initiatives. Less than half of the companies in these countries are implementing green initiatives. Only 8.7 percent of companies in China and 13.3 percent of the companies in Hong Kong have linked their senior executives pay to green performance. The companies in the USA and Japan are in the mid-range regarding the implementation of green initiatives. The proportion of the companies implementing green initiatives in the USA and Japan ranges from 55.6 to 80.6 percent. Interestingly, India has a moderate score on sustainability themed committee (75 percent) and audit (66.7 percent); however, India performs poorly in regard to pay link with score of only 25 percent.

Overview of green performance of Global 500

Table III shows the green performance metrics of the Global 500 companies. Overall, the results indicate that the Global 500 companies have a higher score on Green Revenue (0.56) and Carbon Productivity (0.43) and a lower score on water productivity (0.29), energy productivity (0.28) and waste productivity (0.25).

Table III and Figure 3 show that European countries and Canada have the highest scores in green performance, followed by the USA and Japan. In contrast, companies in Hong Kong,

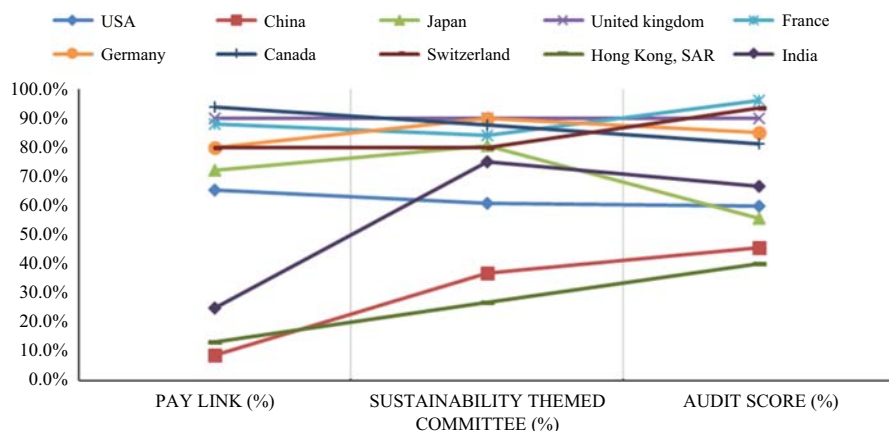


Figure 2.
Green initiatives of top 10 countries

Table III.
Green performance of
Global 500 by country

Country	No. of firms	Energy productivity	Carbon productivity	Water productivity	Waste productivity	Green revenue
USA	201	0.25	0.40	0.27	0.22	0.58
China	46	0.08	0.24	0.06	0.00	0.54
Japan	36	0.16	0.36	0.27	0.32	0.58
UK	30	0.45	0.52	0.52	0.43	0.52
France	25	0.54	0.64	0.45	0.46	0.57
Germany	20	0.43	0.49	0.41	0.29	0.58
Canada	16	0.29	0.50	0.40	0.39	0.50
Switzerland	15	0.52	0.62	0.43	0.28	0.64
Hong Kong, SAR	15	0.08	0.33	0.11	0.08	0.58
India	12	0.10	0.30	0.04	0.03	0.46
Other	84	0.36	0.51	0.33	0.30	0.54
Total	500	0.28	0.43	0.29	0.25	0.56

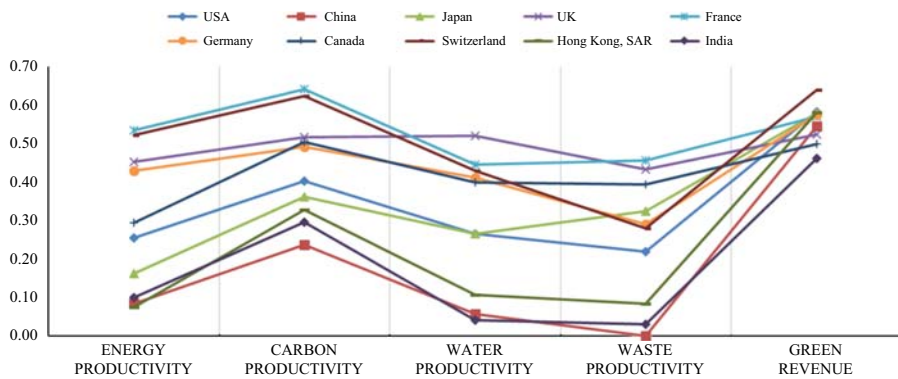


Figure 3.
Green performance of
top 10 countries

China, and India received the lowest scores on green performance. This pattern is very similar to what we observed on the green initiatives measures. Based on the above results, it can be inferred that green initiatives most likely will have a positive impact on green performance.

Overview of financial performance of Global 500 in 2014 and 2015

Table IV shows that companies in Hong Kong, China, and India have higher PM than companies in other countries in both the years 2014 and 2015. In contrast, Germany, France, the UK, and Japan have a lower PM than other countries. For the ROA measure, India has the highest scores of 12 percent in 2014 and 11 percent in 2015, and Canada has the lowest scores of 3.5 percent in 2014 and 1.7 percent in 2015. Regarding the AT, the USA has the highest score of more than 70 percent in both 2014 and 2015, followed by Germany and India. Hong Kong has the lowest score on AT for both years.

Table IV also shows that India, the UK, and the USA have a higher MBR, while China and Hong Kong have a lower score on this metric. In addition, regarding the DR variable, the USA, the UK, and Canada have higher scores than other countries, while India and Hong Kong have lower scores.

Results of H1a (the impact of green initiatives on green performance)

A series of *t*-tests were used to investigate the impact of each of the green initiatives measures on green performance. The results are depicted in Table V. Based on the results,

Cross-country
comparison
of green
initiatives

	Year 2014					Year 2015				
	Debt ratio	Profit margin	Return on assets	Market to book ratio	Assets turnover	Debt ratio	Profit margin	Return on assets	Market to book ratio	Assets turnover
USA	0.267	12.995	0.068	4.738	0.762	0.296	13.392	0.061	5.324	0.701
China	0.234	18.002	0.039	1.163	0.422	0.231	18.198	0.040	1.706	0.403
Japan	0.185	10.167	0.045	2.194	0.594	0.178	10.304	0.048	2.033	0.585
UK	0.266	9.826	0.059	4.561	0.549	0.275	13.416	0.052	5.543	0.484
France	0.205	6.844	0.048	2.134	0.484	0.198	9.374	0.037	2.105	0.489
Germany	0.236	6.960	0.048	2.131	0.677	0.233	7.143	0.045	1.908	0.678
Canada	0.241	13.461	0.035	2.075	0.482	0.252	13.329	0.017	2.333	0.402
Switzerland	0.192	12.273	0.062	2.956	0.464	0.200	11.971	0.054	3.076	0.434
Hong Kong, SAR	0.132	35.141	0.059	1.654	0.210	0.141	28.671	0.041	1.677	0.198
India	0.144	16.668	0.120	6.677	0.697	0.151	17.985	0.114	7.581	0.677
Other	0.234	13.150	0.060	2.834	0.511	0.235	13.892	0.055	2.665	0.499
Total	0.239	13.174	0.060	3.520	0.614	0.251	13.682	0.054	3.836	0.577

Table IV.
Financial
performance of
Global 500 by country
in 2014 and 2015

Green performance	Sustainability themed								
	Pay link			committee			Audit		
	Yes (303) Mean	No (183) Mean	<i>t</i> -value	Yes (314) Mean	No (172) Mean	<i>t</i> -value	Yes (322) Mean	No (164) Mean	<i>t</i> -value
Energy productivity	0.36	0.15	7.90**	0.36	0.15	7.52**	0.37	0.12	9.11**
Carbon productivity	0.46	0.37	3.86**	0.47	0.35	5.26**	0.47	0.36	4.42**
Water productivity	0.37	0.15	8.34**	0.38	0.13	9.40**	0.38	0.12	9.64**
Waste productivity	0.34	0.10	9.17**	0.33	0.11	8.16**	0.33	0.08	9.43**
Green revenue	0.55	0.59	-1.75*	0.55	0.60	-2.60*	0.55	0.59	-1.89*

Table V.
t-Tests – the impact of
green initiatives on
green performance
(Global 500)

Notes: *,**Significant at 0.10 and 0.05 levels, respectively

green initiatives positively impact green performance, hence supporting our *H1a*. Companies that link their top executive pay to green performance, to sustainability themed committee and audit have a better performance in energy productivity, carbon productivity, water productivity, and waste productivity. The results also show that each green initiatives measure is negatively related to green revenue at a significant level of 0.10. This may be explained by the measurement of green revenue. Since green revenue is based on a segment of the green rating of a company, this finding shows that companies that belong to less green industry/segment (low score in green revenue) are more likely to adopt green initiatives.

Results of H1b (the impact of green initiatives on green performance by country)

To assess whether the impact of green initiatives on green performance varies by country, a series of *t*-tests were conducted in selected countries. In our analysis, we selected the top four countries (the USA, China, Japan, and the UK) based on their ranking in the Global 500 companies. We stratified the sample by combining the fifth to eighth of top 10 countries (France, Germany, Canada, and Switzerland) into one group which we labeled "FGCS." We excluded other countries that have a sample size smaller than 15. The results are shown in Tables VI-VIII.

Table VI shows how the impact of linking top executives pay to green performance varies by country. In the USA, pay link has a positive impact on energy productivity,

Table VI.
t-Tests – the impact
of pay link on green
performance by
country (Global 500)

Green performance	USA (131)		China (41)		Japan (10)		UK (27)		France, Germany, Canada, and Switzerland (FGCS) (62)	
	Mean	<i>t</i> -value	Mean	<i>t</i> -value	Mean	<i>t</i> -value	Mean	<i>t</i> -value	Mean	<i>t</i> -value
Energy productivity	0.30	3.34***	0.15	0.80	0.20	0.08	0.47	0.49	0.48	1.63
Carbon productivity	0.41	0.36	0.17	0.25	0.36	0.35	0.15	0.79	0.57	0.86
Water productivity	0.33	4.50***	0.51	0.60	0.31	0.16	1.40	0.46	0.44	0.77
Waste productivity	0.28	4.33***	0.01	0.00	0.38	0.17	1.56	0.32	0.37	0.68
Green Revenue	0.56	0.58	0.25	0.57	0.56	0.62	-0.99	0.49	0.57	-0.35

Notes: ***,**,*Significant at 0.10 and 0.05 levels, respectively

Green performance	Sustainability themed committee													
	USA		China		Japan		UK		France, Germany, Canada, and Switzerland (FGCS)					
	Yes (122) Mean	No (78) Mean	Yes (17) Mean	No (28) Mean	Yes (29) Mean	No (7) Mean	Yes (27) Mean	No (2) Mean	Yes (63) Mean	No (10) Mean	Yes (63) Mean	No (10) Mean	<i>t</i> -value	<i>t</i> -value
Energy Productivity	0.33	0.14	0.17	0.07	0.18	0.82	1.14	0.47	0.48	0.49	0.26	0.26	2.80**	
Carbon Productivity	0.44	0.34	0.32	0.20	0.37	0.34	0.36	0.51	0.79	0.58	0.44	0.44	1.93*	
Water Productivity	0.37	0.11	0.11	0.03	0.31	0.09	1.94*	0.54	0.46	0.45	0.28	0.28	1.78*	
Waste Productivity	0.30	0.10	0.01	0.00	0.37	0.13	1.60	0.46	0.33	0.37	0.32	0.32	0.57	
Green Revenue	0.56	0.61	-1.77*	0.51	0.55	0.68	-1.72*	0.54	0.49	0.57	0.56	0.56	0.20	

Notes: *,**Significant at 0.10 and 0.05 levels, respectively

Cross-country
comparison
of green
initiatives

Table VII.
t-Tests – the impact of sustainability themed committee on green performance by country (Global 500)

Table VIII.
t-Tests – the impact of
audit on green
performance by
country (Global 500)

	USA		China		Japan		UK		France, Germany, Canada, and Switzerland (FGCS)	
	Yes (120) Mean	No (80) Mean	Yes (21) Mean	No (24) Mean	Yes (20) Mean	No (16) Mean	Yes (27) Mean	No (2) Mean	Yes (63) Mean	No (10) Mean
Green performance	0.34	0.013	0.17	0.01	0.20	0.12	0.47	0.48	0.50	0.13
Energy productivity	0.43	0.37	0.25	0.23	0.33	0.40	0.51	0.91	0.59	0.34
Carbon productivity	0.38	0.10	0.11	0.01	0.37	0.13	0.54	0.46	0.46	0.16
Water productivity	0.32	0.07	0.01	0.00	0.43	0.18	0.46	0.32	0.38	0.19
Green revenue	0.56	0.61	0.54	0.55	0.57	0.60	0.54	0.49	0.56	0.64
			<i>t</i> -value	<i>t</i> -value	<i>t</i> -value	<i>t</i> -value	<i>t</i> -value	<i>t</i> -value	<i>t</i> -value	<i>t</i> -value
			5.32**	2.35**	2.35**	1.18	1.18	0.06	0.06	4.02**
			1.87*	0.31	0.31	-0.92	-1.53	-1.53	-1.53	2.91**
			7.07**	2.02**	2.02**	2.74**	2.74**	0.43	0.43	2.88**
			6.24**	1.07	1.07	2.15**	2.15**	0.61	0.61	1.72*
			-1.58	-0.05	-0.05	-0.55	-0.55	0.30	0.30	-1.13

Notes: *, **, Significant at 0.10 and 0.05 levels, respectively

water productivity, and waste productivity. In China, pay link has a negative impact on green revenue, suggesting that Chinese companies in less green industries are more likely to link their top executives pay to green performance. However, pay link does not have a significant impact on other green performance metrics (energy productivity, carbon productivity, water productivity, and waste productivity). In regards to Japan, pay link has a positive impact on energy productivity and does not impact other green performance measures. Table VI also shows that no significant impact exists from pay link to green performance in the UK and FGCS.

Table VII also shows that the impact of sustainability themed committee on green performance varies by country. In the USA, sustainability themed committee has a positive impact on energy productivity, carbon productivity, water productivity, and waste productivity, and a negative impact on green revenue. In the case of China, sustainability themed committee has a positive impact on carbon productivity, and when it comes to Japan, sustainability themed committee has a positive impact on water productivity and a negative impact on green revenue. In addition, in FGCS, sustainability themed committee has a positive impact on energy productivity, carbon productivity, and water productivity. Table VII also shows that sustainability themed committee has no significant impact on green performance in the UK.

Table VIII shows that the impact of audit on green performance varies by country. In the USA, audit has a positive impact on energy productivity, carbon productivity, water productivity, and waste productivity. In China, audit has a positive impact on energy productivity and water productivity. For FGCS, audit has a positive impact on energy productivity, carbon productivity, water productivity, and waste productivity. Again, there is no significant impact of audit on green performance in the UK.

In sum, these results support our *H1b* that states the impact of green initiatives on green performance varies by country. The findings show that adopting green initiatives has the most significant impact on a firm's green performance in the USA, since each green initiatives measure has a positive impact on most dimensions of green performance, which is consistent with previous findings of Dixon-Fowler *et al.* (2013). Green initiatives have the least impact in the UK given that the majority of the companies (27/29) in this country have already adopted such green practices. In the case of other countries, it can be inferred that sustainability themed committee and audit are more important in improving green performance as pay link is only significantly related to energy productivity in Japan. The results also show that companies in the top 3 countries (the USA, China, and Japan) are more likely to adopt green initiatives if they belong to less green industry/segment as the analysis revealed a negative relationship between green initiatives (either pay link or sustainability themed committee) and green revenue in those countries.

Results of H2a and H3a (the impact of green initiatives and green performance on financial performance)

H2a and *H3a* were tested using regression analysis to assess how green initiatives and green performance impact financial performance. Five regression analyses were conducted using energy productivity, carbon productivity, water productivity, waste productivity, green revenue, pay link, sustainability themed committee, and audit as independent variables; and each financial indicator (DR, PM, RTA, MBR, and AT) as dependent variable. The results are depicted in Table IX.

The results of this study partially support *H2a*, which proposed a positive impact of green performance on financial performance. Table IX shows that DR is positively related to water productivity and negatively related to green revenue in both 2014 and 2015. The impact is stronger in 2015 than in 2014 based on the regression coefficients. In addition, the results also show that no significant impact exists from green revenue to PM, ROA, and

	Year 2014					Year 2015				
	Debt ratio	Profit margin	Return on assets	Market to book ratio	Assets turnover	Debt ratio	Profit margin	Return on assets	Market to book ratio	Assets turnover
Energy productivity										
Carbon productivity										
Water productivity	0.11*					0.13**				
Waste productivity			0.14**							
Green revenue	-0.08*				-0.12**	-0.10**	0.09**	0.10**	0.08*	
Pay link Sustainability themed committee		-0.13**								
Audit					-0.12**		-0.11*			-0.10*

Table IX. Regression analysis of impact of green initiative and green performance on financial performance in Global 500 in 2014 and 2015

Notes: *,**Significant at 0.10 and 0.05 levels, respectively

MBR in 2014. However, these relationships become significant in 2015. This result may suggest that the impact of green performance on financial performance is not immediate and it may take more than one year to mature in companies.

Table IX also shows that the relationship between green initiatives and financial performance is weak and negative. Pay link has a negative impact on PM in 2014 whereas sustainability themed committee has a negative impact on PM in 2015. Audit has a negative impact on AT in both 2014 and 2015. These results do not support our *H3a*, which suggested a positive relationship between green initiatives and financial performance. This result may indicate that the impact of green initiatives on financial performance is not direct, but this impact is mediated through green performance.

H2b and H3b (the impact of green initiatives and green performance on financial performance by country)

It is likely that the impact of green initiatives and green performance on financial performance varies by country. To assess this likelihood, a series of regression analysis in selected countries was conducted to investigate such impacts and the results are depicted in Table X.

In the USA, water productivity has a positive impact on ROA and AT in both 2014 and 2015, and the impacts are stronger for the year 2015. Green revenue has a negative impact on AT in 2014 and the negative impact disappears in 2015. Green revenue has no impact on PM in 2014 but the impact becomes significant in 2015. In addition, audit has no impact on DR in 2014 and it has a positive impact on DR in 2015. These results lead to a conclusion that for companies based in the USA, green performance has a positive impact on financial performance. These impacts are stronger in 2015 than in 2014.

In China, there is a negative impact of sustainability themed committee on ROA. No other impacts are significant. The negative relationship may indicate that Chinese companies take a reactive approach for green initiatives. When their financial performance is low, they are more likely to adopt green initiatives. This may imply a reverse relationship linking financial performance to green initiatives in the case of Chinese companies.

The results are mixed in the case of Japan. Table X shows that energy productivity is negatively related to ROA in 2014 and 2015. Water productivity is negatively related to ROA and AT in 2014 and 2015. In contrast, waste productivity is positively related to ROA and AT in both years. This implies that the practices aiming at improving waste

Country	Year 2014				Year 2015					
	Debt ratio	Profit margin	Return on assets	Market to book ratio	Assets turnover	Debt ratio	Profit margin	Return on assets	Market to book ratio	Assets turnover
<i>USA</i>										
Energy productivity			0.16**		0.18**			0.21**		0.19**
Carbon productivity										
Water productivity										
Waste productivity					-0.18**		0.12*			
Green revenue										
Pay link										
Sustainability committee										
Audit						0.19**				
<i>China</i>										
Energy productivity										
Carbon productivity										
Water productivity										
Waste productivity										
Green revenue										
Pay link										
Sustainability committee								-0.34*		
Audit										
<i>Japan</i>										
Energy productivity			-0.42**					-0.35*		
Carbon productivity										
Water productivity			-0.42**		-0.35*			-0.46**		-0.37*
Waste productivity			0.43*		0.49**			0.40*		0.52**
Green revenue										
Pay link									-0.55**	

(continued)

Cross-country
comparison
of green
initiatives

Table X.
Regression analysis
by country in 2014
and 2015

Table X.

Country	Year 2014				Year 2015					
	Debt ratio	Profit margin	Return on assets	Market to book ratio	Assets turnover	Debt ratio	Profit margin	Return on assets	Market to book ratio	Assets turnover
<i>Sustainability committee</i>										
<i>Audit</i>		-0.45**								
<i>UK</i>										
<i>Energy productivity</i>					0.76**					0.65*
<i>Carbon productivity</i>					-0.58**					-0.54*
<i>Water productivity</i>		0.43*	0.67**	0.61**				0.68**	0.48**	
<i>Waste productivity</i>										
<i>Green revenue</i>										
<i>Pay link</i>										
<i>Sustainability committee</i>										
<i>Audit</i>										
<i>France, Germany, Canada, and Switzerland</i>										
<i>Energy productivity</i>				0.32*	0.34*			0.43**		0.34*
<i>Carbon productivity</i>					-0.32**					-0.30**
<i>Water productivity</i>										
<i>Waste productivity</i>							0.25*			
<i>Green revenue</i>										
<i>Pay link</i>										
<i>Sustainability committee</i>										
<i>Audit</i>										

Notes: *, **Significant at 0.10 and 0.05 levels, respectively

recycle/reuse in Japan may be more effective in improving financial performance. The results also show that pay link is negative related to MBR in both years and audit is negatively related to PM in 2014. Similar to China, this may indicate that a reverse relationship exists between green initiatives and green performance.

In the case of the UK, carbon productivity is positively related to AT in the years 2014 and 2015. Waste productivity is positively related to PM, ROA in both years. Water productivity is negatively related to AT. It appears that the case of green performance that has a more direct external environmental impact (such as carbon and waste reduction vs energy and water productivity) is related to higher financial performance. In addition, there is no direct relationship between green initiatives and green performance in the UK.

In FGCS, energy productivity has a positive impact on MBR and AT in the years 2014 and 2015. Waste productivity has a positive impact on PM, and green revenue has a positive impact on ROA in 2015. Carbon productivity has a negative impact on AT in 2014 and 2015. Again, the analysis revealed no significant relationship between green initiatives and green performance.

In sum, the results show that the impacts of green initiatives and green performance vary by country, which supported our *H2b*. Green performance will have a positive impact on financial performance, especially for those performances aiming at improving environmental protection such as carbon and waste reduction. A firm's green performance not only impacts its financial performance in that particular year but also in the year that follows. The results also suggest the existence of a possible reverse relationship from financial performance leading to green initiatives.

In addition, the results show that green initiatives have very limited or no impact on financial performance on selected countries, which only partially supports our *H3b*. It may suggest that the impact of green initiatives on financial performance may not be direct, since most of relationships between them are insignificant.

Conclusion and implication

This study investigated the influence of green initiatives and green performance on financial performance for the top 500 publicly traded companies in the world. The study revealed that companies in European countries and Canada lead in the green initiatives and green performance, followed by the USA and Japan. China and Hong Kong lag behind compared to other countries.

The results show that green initiatives have a positive impact on green performance. However, green initiatives have a weak and negative impact on financial performance. In addition, it is found that green performance has a positive impact on financial performance. Therefore, it can be inferred that the impact of green initiatives on financial performance is not direct. Green initiatives will likely have a direct positive impact on green performance, which in turn has a positive impact on financial performance.

The results also show that the impact of green initiatives on green performance varies by country. The adoption of green initiatives which includes pay link, sustainability themed committee, and audit has the strongest impact on green performance for companies based in the USA and for FGCS countries. The impact of green initiatives on green performance is moderate for companies based in China and Japan and non-existent for companies based in the UK. Among all green initiatives measures, sustainability themed committee and audit were more likely to impact green performance than pay link.

The study suggested that green performance will have a positive impact on financial performance, especially for those green practices aiming at improving environmental protection such as carbon and waste reduction. The results also indicate a possible reverse relationship from financial performance leading to green initiatives. This observation presents an opportunity for future research.

Our results also indicate that green revenue is negatively related to each green initiatives measure (pay link, sustainability themed committee, and audit), implying that companies in a less green industry are more likely to adopt green initiatives than those in a greener industry. The implications from these results are that companies take a reactive, not proactive approach in the implementation of green initiatives. This finding is consistent with previous studies (Montabon *et al.*, 2007). These authors explained that although some firms may become environmentally proactive in anticipation of more efficient utilization of resources and improved reputation, many firms are reluctant to take a more aggressive and proactive approach to environmental initiatives due to a perceived lack of evidence that the benefits exceed the costs of pursuing these initiatives.

Our findings also suggest that a firm's green performance not only impacts its financial performance in a particular year but also in the year that follows. In addition, for some performance measures, their impacts on financial performance are not immediate and may take more than one year for companies to see the impact. Therefore, companies should have a long-term orientation when implementing green initiatives and green policy. Future studies should investigate the impact of green initiatives using multi-year data to capture the full impacts of such initiatives.

One limitation of this study is the small sample size in some of countries used in our study which may impact the validity of the results. Future studies can be conducted to extend this study by increasing the sample size in each country. Further research endeavors may also incorporate other contextual variables (such as national culture, environmental law/regulation, economy level, etc.) to further assess and explain in detail the variability of the studied relationships among countries. A longitudinal study may also be conducted to investigate how the changes in green initiatives affect the changes in financial performance.

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Corresponding author

Thomas Ngniatedema can be contacted at: thomas.ngniatedema@morgan.edu