

The Effect of Green Innovation on Corporate ESG Performance: Evidence from Chinese Listed Enterprises

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Abstract

Purpose - This study was aimed to investigate whether the outcomes of green innovation brought positive effects to Chinese firms' ESG performance.

Design/methodology/approach - Green innovation patents and ESG performance data of Chinese listed firms were empirically analyzed using panel data fix-effect linear estimations.

Findings - The study found that green innovation performance enhanced Chinese firms' ESG performance. Also, the results showed that corporate social responsibility decoupling weakened this relationship and state ownership positively moderated this relationship, whereas corporate philanthropic giving did not have significant impact.

Research implications or Originality - The findings indicated that green innovation was beneficial to enhancing corporate sustainability performance. In addition, the study highlighted the role of CSR communications and state ownership in interacting the positive effect that green innovation performance brings to corporate ESG performance.

Keywords: CSR decoupling, Emerging market, ESG performance, Green innovation, State ownership

JEL Classifications: F2, M1

I. Introduction

In the face of global warming and the COVID-19 pandemic, stakeholders have been paying more attention to the long-term impact of firms' operations on human society and natural environment. Correspondingly, issues related to environmental (E), social (S), and governance (G) (ESG) are fast becoming a significant focus for both managers and investors (Velte, 2017). Additionally, organizations around the world are increasingly making efforts to improve global sustainability, which increased the public awareness of ESG concept (Jason, 2020). Under this context, corporate ESG efforts not only reflect a firm's behavior in social responsibility but also are motivated by potential economic interests. Thus, recent attentions to ESG have highlighted the need for understanding effective tools to improve corporate ESG outcomes.

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For enterprises, achieving sustainable green transformation and green economic growth is inextricably linked to their ability to innovate. A rising number of firms have realized that investing in green innovation is helpful to their long-term sustainability (Fen et al., 2020). Recent evidence suggested that green innovation performance brings positive effect to corporate competitive advantages (Chen, Lai and Wen, 2006). For instance, firms that are environmentally friendly often build good reputations through the media, pioneer in product revolution, and attract additional financial investments from domestic and global investors (Liu and Hamori, 2020). However, little attention has been paid to how green innovation affects corporate ESG performance (Xu, Liu and Shang, 2020). Green innovation contributes to improving resource efficiency, reducing energy usage, and mitigating environmental pollutions. A firm's capability in green innovation is a precondition to execute sustainable management practices. Specifically, green technologies help a firm reduce environmental damages during the production process and save resources and energy by launching eco-friendly products (Singh et al., 2020; Yusliza et al., 2020). As such, a firm's green innovation capacity is closely related to a firm's environmental and social impacts. Hence, in this study, we argue that a firm's green innovation performance can bring forth a firm's outperformance in ESG scores.

To date, the majority of research on how firms enhance ESG performance has been conducted in the context of developed economies (Jason, 2020). Emerging markets such as China have yet to establish a distinct footprint in the literature on ESG performance. As a latecomer, China caused significant amounts of unsustainable environmental damages in its early modern history. But in recent years, the Chinese government established environmentally friendly development as one of the nation's major development priorities (Xu, Liu and Shang, 2020). Its investment in renewable technologies and energy contributed to roughly 30% of worldwide volume from 2009 to 2018 (Song and Wang, 2018). Despite increased focus on green innovation and carbon neutrality, Chinese firms are challenged with the task of green technology transformation and upgrading (Zhu et al., 2021). Thus, the Chinese market provides a suitable setting for our study of the relationship between green innovation and ESG performance.

This study analyzed Chinese listed firms using a fixed-effect panel model. Our results showed that green innovation was positively correlated with Chinese firms' ESG performance, and that this relationship was negatively moderated by corporate social responsibility (CSR) decoupling and positively moderated by state ownership. The findings imply that, for emerging-market firms, investing in green innovation promotes the development of the firms' sustainability, which helps boost their non-economic performance. In addition, keeping consistency between reporting and performance in CSR increases information transparency and communication efficiency, thus enhances the firms' accountability in the eyes of ESG evaluators. Furthermore, in emerging markets, state ownership offers privileges and helps the firms appropriate the value of green innovation. The study offers insights into the natural resource-based view literature by exploring green innovation as an important capability to increase corporate sustainability outcomes.

The remainder of this paper is structured as follows. In the next section, we briefly review the theories regarding to the key concepts in our study. In the third section, we develop our hypotheses. We then explain our method in the fourth section and perform the empirical analysis results in the fifth section. The last section is devoted to the conclusions of our findings with discussions and suggestions for future research.

II. Literature Review

1. Green Innovation

The resource-based view fundamentally holds that a firm's competitive advantage resides in heterogeneous resources that have the distinguishing traits of being valuable, rare, costly to mimic, and non-substitutable (VRIN) (Barney, 1991; Hart, 1995). Based on the resource-based paradigm, Hart (1995) established the natural resource-based view and argued that, taking the limits and possibilities from the natural environment into considerations, a sustainable competitive advantage may be obtained through VRIN resources. Further development of the natural resource-based viewpoint emphasized the linkages between environmental initiatives, green capabilities, and a firm's competitiveness (Hart and Dowell, 2011). Accordingly, firms must possess resources and core competencies with a long-term pursuit rather than a short-term focus on profits at the expense of the environment (Lee and Min, 2015). The most important way for firms to secure sustainable competitive advantages is through innovation (March, 1991). Green innovation is defined as a firm's "formation or large improvement in goods, operations, advertising strategies, organizational structures, and institutional structures that reduce environmental risks, pollutant emissions, and the detrimental consequences of natural resource consumption" (UNCTAD, 2005). Policymakers and organizations have prioritized green innovation as a strategy for efficiently tackling environmental challenges and strengthening business sustainability (Kallio and Nordberg, 2006).

Factors found to be influencing green innovation have been investigated in several studies. The outcome of green innovation is correlate with factors including a firm's internal dynamic capacities, market and customer pressure as well as government environmental regulations (Albort-Morant et al., 2016; Huang et al., 2016; Tang, Qiu and Zhou, 2020). However, the research to date has tended to focus on the antecedents of green innovation performance rather than the impact of it on firm sustainability development. Although some research has been carried out on the effect of green innovation on increasing firm financial performance (Chen et al., 2006; Kūçūkođlu and P i nar, 2015), there have been very few empirical studies on how green innovation performance affect a firm's non-economic performance (Zailani et al., 2015). The beneficial impact of green innovation on a firm's sustainable performance is still a puzzle to many business managers (Asadi et al., 2020). Green innovation includes innovation and productivity efficiency of product, process and organization (Triguero, Moreno-Mondéjar and Davia, 2013). It helps a firm to achieve eco-targets and reduce the environmental impact of production (Wong et al., 2014). Hence, we argue that green innovation is essential to facilitate the building of corporate long-term development.

2. ESG Performance

ESG indicators were introduced in 2004 to describe how businesses incorporate environmental, social, and governance considerations into their operations (Gillan, Koch and Starks, 2021). ESG usually covers a wide variety of topics that aren't covered in regular financial reports, including issues like how corporations react to climate change, how corporations treat their labor force, and if corporations have a business culture that fosters innovation (Kell, 2018). Based on stakeholder theory (Freeman, 1984), socially responsible actions better benefit ex-

ternal stakeholders than other types of actions and lead to more efficient contracting and new avenues for development and risk mitigation (Fatemi and Fooladi, 2013). Firms collaborate with a wide range of stakeholders to create shared value (Bapuji et al., 2018). Thus, firms that create many kinds of value are more sustainable than those that produce fewer kinds (Harrison, Bosse and Phillips, 2010). Nowadays, stakeholders are becoming increasingly active in influencing firms with the notion that higher ESG performance can protect a firm's survival (Xu, Liu and Shang, 2020). Hence, ESG performance is an essential component of business strategy since it indicates a firm's capacity to maintain good relationships with its numerous stakeholders (Friede, Busch and Bassen, 2015). Accordingly, which factors or strategies can increase a firm's ESG performance are important in order to provide the firm a sustainable competitive edge.

This study intends to explore whether green innovation is an effective way to promote a firm's ESG performance. We argue that a number of beneficial effects from green innovation fit with the dimensions of ESG. For instance, the introduction of green products and green manufacturing can reduce environmental pollutions and save natural resources and energy. At the same time, green innovations in production processes can reduce wastes that are harmful to workers and save their working hours, thus provide social and internal governance benefits (Lambertini and Mantovani, 2009).

3. CSR Communication

The efficiency and consistency of communication are crucial to convey corporate transparency and confidentiality, thus directly affect the perceived performance in the eyes of outsiders. A firm's efforts in enhancing information transparency and reducing information asymmetry mainly focus on the disclosures of non-financial information about its CSR and sustainability performance. To demonstrate that stakeholders' expectations for social and environmental accountability are adequately handled, a firm uses numerous approaches to disclose its commitments to the society (Gray, Kouhy and Lavers, 1995).

One of the essential approaches is through issuing corporate CSR reports. CSR reporting refers to a firm's judgments of its own CSR performance being made public. Firms issue their CSR reports to convey their CSR performance to their stakeholders (Crilly, Zollo and Hansen, 2012). However, prior studies have highlighted the existence of CSR decoupling, which is described as the gap or difference between promised communication and actually implemented actions (Crilly, Zollo and Hansen, 2012; Jamali, Lund-Thomsen and Khara, 2017; Siano et al., 2017). In fact, many firms involve in CSR decoupling by inflating their actions (Delmas and Burbano, 2011), either inflating their activities in these disclosures (Delmas and Burbano, 2011) or selectively revealing good environmental operations while hiding negative ones to generate a misleadingly optimistic perception of the overall CSR performance (Marquis, Toffel and Zhou, 2016). CSR reports simply reflect the propensity to engage in CSR activities, not the actual implementation. As a result, a firm's CSR discourse is often "inexpensive, superficial, deceptive and disingenuous" (Christense, Morsing and Thyssen, 2013: 374). Especially, CSR decoupling is more likely to occur in loosely connected organizational sectors, which are characterized by unpredictability, multiple conflicting expectations and low efficiency (Graafland and Smid, 2019). CSR decoupling not only hurts the trust and expectations from stakeholders and the public but also is detrimental to a firm's long-term development.

Another approach to convey a firm's CSR initiative is through corporate philanthropic giving

(CPG). CPG refers to the actions of a firm voluntarily transferring resources to other actors to promote public benefits. According to previous studies, charitable actions increase firms' social reputations (Muller and Kräussl, 2011) and help them create and maintain strong relationships with stakeholders (Wang and Qian, 2011). Also, CPG is used by firms to respond to government rules and obtain social legitimacy (Wang and Qian, 2011). By engaging in philanthropic giving, firms can gain confidence and financial prosperity, as well as increase their capacity to endure the impact of catastrophic situations. Thus, developing CPGs is one of the strategic actions of managers aimed at improving a firm's long-term success (Wu et al., 2020).

4. State Ownership of Emerging-Market Firms

Government can utilize guidelines or rules to “regulate enterprises in the interests of the nation” and “establish norms and rules of legitimacy for enterprises” (Freeman, 1984: 13). Similarly, government has the right to provide resources, validate public projects and provide property protection. To achieve political legitimacy, firms engage in acts that are congruent with government norms and standards (Hillman and Wan, 2005). For long-term survival and management, firms must adhere to government rules and standards (Khalid, Sharma and Dubey, 2021).

Ownership can affect managers' decision-making. Different types of ownership entities have different priorities (Khalid, Sharma and Dubey, 2021). State-owned enterprises (SOEs) are directly owned by the government or strongly subject to its influence. SOEs are a distinctive feature of emerging markets like China (Li, Song and Wu, 2015), where the government has high control over all critical resources and firms in key industries (Wu et al., 2020). Greater political ties and government connections may affect SOEs' decision making. In particular, Chinese SOEs are staunch supporters of the government's decision-making. China has submitted a set of plans to reduce its carbon emissions in 2015 Paris Conference (Dou et al., 2017), which indicates that Chinese SOEs are likely to pay more attention to social and environmental goals beyond merely profitability.

SOEs are vastly different from non-SOEs in terms of internal governance, risk attitude and resource availability (Khalid, Sharma and Dubey, 2021). Non-SOEs are profit-driven and likely to pursue a profit for the short-term. SOEs, on the contrary, are often guided by political strategies and engage in actions that benefit the society (Estrin, Nielsen and Nielsen, 2017). Thus, compared to privately-owned firms, SOEs tend to incorporate more non-profit-driven objectives. As a result, SOEs are shown to carry out social activities in accordance with national policy. The government may impact these firms' social strategies by participating in the decision-making and incorporating public social policy. Based on the different objectives and characteristics of SOEs and Non-SOEs, this study argues that it is necessary to distinguish between government-owned and general firms to compare whether there is a difference between these two in interacting with the role of green innovation on ESG performance.

III. Hypothesis Development

1. Green Innovation and ESG Performance

The motives and objectives of green innovation are compatible with those of ESG management. Both are derived from stakeholder requirements to implement environmental management and CSR initiatives (Yu, Ramanathan and Nath, 2017; Garcia et al., 2019). Green innovation provides positive effect on a firm's sustainability (Chouaibi, Chouaibi and Rossi, 2021). Green product and process innovation have a beneficial influence on a firm's competitiveness (Chen et al., 2006). Green practices involve promoting resource efficiency, reducing production waste and energy usage, and mitigating environmental damages, which are connected to a firm's future market value and long-term profitability.

Especially in both environmental and social aspects, green innovation plays an important role in corporate sustainable development. First, green innovation is closely related to a firm's performance in environmental protection. This is because green innovation mainly focuses on the environmental technology improvements for product and production process from raw materials, production processes to pollution emissions in order to reduce the environmental impact (Singh et al., 2020). Second, green innovation can also facilitate a firm's social benefits. This social benefit is mainly achieved through the resource and energy saving as well as the well-being of employees, customers and stakeholders as a result of green product and process practices (Weng, Chen and Chen, 2015; Yusliza et al., 2020). Thus, we argue that a firm's green innovation capacity is necessary for its ultimate achievement of sustainable development, especially in regard to environmental and social outcomes.

Emerging economies such as China are facing great environmental challenges (Hao et al., 2019). The government has implemented a series of regulations to encourage green business transformation. Thus, it is vital for emerging-market firms to enhance both environmental and social profits via green innovation. In such context, emerging-market firms face greater pressure from stakeholders on engaging in environmental transformation and social responsibility initiatives. Hence, the positive effect of green innovation in enhancing ESG performance will be salient for emerging-market firms.

H1 Green innovation performance has a positive effect on the ESG performance of Chinese enterprises.

2. The Moderating Role of CSR Decoupling and Philanthropic Giving

CSR decoupling, which happens when firms engage in deceptive conducts and convey false information, can increase the information asymmetry between firms and the public and decrease firm accountability. The revelation of CSR decoupling is harmful to firms' value and reputation and can undermine a firm's legitimacy (Tashman, Marano and Kostova, 2019). Hence, CSR decoupling impedes a firm's long-term development and acts against its sustainable objectives. Unlike the mature institutionalization in developed economies, institutions in emerging markets are woefully inadequate. Institutional voids are formed as a result of weaker institutional pressures and weaker enforcement mechanisms against socially irresponsible behaviors (Campbell, 2007). Consequently, CSR decoupling is more likely to occur and impedes corporate

sustainability due to dysfunctional institutions in emerging economies (Tashman, Marano and Kostova, 2019).

Prior studies have shown that inconsistent information increases stakeholders' perceptions of a firm's hypocrisy, such that CSR disclosures can be counterproductive (Wagner, Lutz and Weitz, 2009). Indeed, credibility and accountability are the basic prerequisites for a firm to communicate information to the public. A firm's behavior of communicating distinctive information can directly and negatively shift the attitudes and perceptions of consumers and investors towards the firm (Wagner, Lutz and Weitz, 2009; Ioannou, Kassinis and Papagiannakis, 2018). When a firm conveys mixed or misleading messages to the public, outsiders may question the firm's overall competence in other areas as well (Anderson, 1971).

When a firm is being monitored, it is likely to adapt substantive CSR actions (Marquis and Qian, 2014). But due to the existence of CSR decoupling, these CSR actions do not necessarily bring about good ESG valuation. Discrepancies between CSR reporting and performance reduce the credibility of a firm and damage the perception of the firm by outsiders. This negative perception can spillover to a firm's ESG evaluation. More specifically, we argue that when CSR decoupling happens, ESG evaluators may regard the firm as being lack of accountability in CSR reports and lack of capability to exert real societal impact. This negative perception caused by CSR decoupling can damage the valuation of the performance in the "S"(social) aspect. Thus, failure in conveying accountable and consistent CSR information to the evaluators can decrease the ESG evaluation and alleviate the positive impact that green innovation brings to the firm's ESG outcomes.

H2 CSR decoupling negatively moderates the relationship between green innovation and ESG performance of Chinese enterprises.

As a particular form of CSR engagement, many firms are driven to give monetary donations as a signal of their endeavors to commit to the society, especially in the time of crisis or natural disasters (Sauerwald and Su, 2019). For example, the COVID-19 pandemic has raised firms' interests in CPG, compelling them to pursue social welfare other than maximizing financial profits (Manuel and Herron, 2020). Corporate philanthropic activities can increase a firm's moral capital among its stakeholders and serve as an intangible asset that promotes long-term stakeholder wealth (Godfrey, 2005).

CPG may have spillover effects beyond direct effect of donation (Shapira, 2012). The act of charitable donation can signal that a firm has sufficient organizational slack resources, which can also support the firm's innovating activities and sustainability initiatives. In addition, philanthropic giving tend to be prominently featured in corporate publicity (Useem, 1988), which can be used a marketing tool and improve corporate image. Many media collaborate with the authorities to rank enterprises based on their charitable contributions. Hence, firms frequently make donations in order to boost their reputations and convey their sufficient financial status to the stakeholders (Lin, Li and Bu, 2015). Such positive spillover effects may affect ESG evaluators' perception as well, which may amplify the perceived contributions of the donating firms' other social and environmental inputs.

H3 Corporate philanthropic giving positively moderates the relationship between green innovation and ESG performance of Chinese enterprises.

3. The Moderating Effect of State Ownership

Governments can make guidelines and policies to regulate firms to pursue social and national interests (Freeman, 1984). Environmental policies enacted by the government affect the production activities of businesses. Specifically, as an essential institutional factor in emerging markets (Lee and Zhou, 2012), state ownership affects emerging-market firms' business objectives and decision-making. In emerging markets, SOEs have a specific administrative function as the government's representative actors (Yang, 2020). Additionally, with the government as the majority owner, SOEs face more pressures and expectations from the public to achieve societal common values. Under higher institutional pressures and legitimacy, state-owned firms have more incentives to conform to regulatory environments and develop innovation (Yi et al., 2017). Hence, state ownership requires SOEs to implement more social responsibilities (Tang, Yang and Yang, 2020).

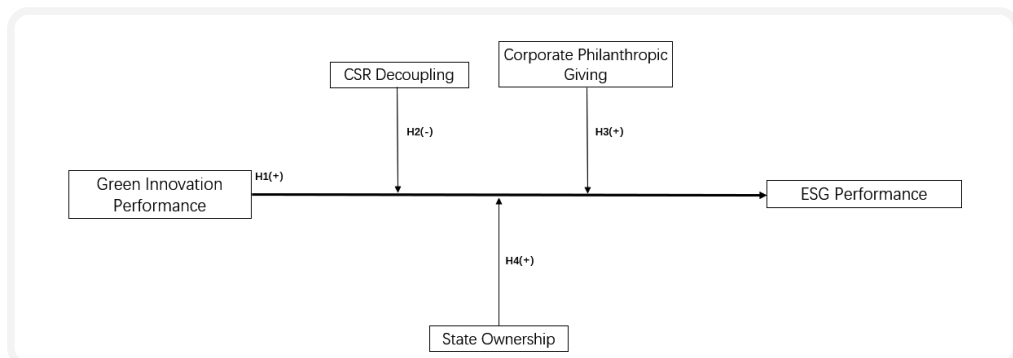
In emerging markets, state ownership often provides firms with advantages in terms of innovation. On one hand, state-owned firms have access to policy information, government support, financial capitals and scarce resources, which become their natural advantages for fostering innovation (Zhou, Gao and Zhao, 2017). On the other hand, state ownership can protect a firm with favorable treatment and stronger protection of IPRs, which guarantees SOEs to appropriate the value of innovation (Yi et al., 2017). These privileges enable SOEs to develop innovation and pursue non-economic strategies (Hermelo and Vassolo, 2010).

Under the general trend that governments in emerging countries are actively promoting energy conservation, environmental protection and sustainable development, the Chinese government has pledged to reduce carbon emissions by 60-65% by 2030 (Dou et al., 2017). Considering this background, we posit that SOEs, which pursue social value, will face more pressure and motivation to respond to institutional norms in environmental regulations. At the same time, SOEs have more capital, resources and policy incentives to develop green innovation in order to achieve better social responsibility outcomes.

H4 State ownership positively moderates the relationship between green innovation and ESG performance of Chinese enterprises.

The research model of this study is presented in (Fig. 1).

Fig. 1. Research Model



IV. Methodology

1. Data and Method

This study used green innovation patent dataset from Chinese listed firms to test our hypotheses. After merging firm data with ESG score data, we identified a total number of 1,271 firms during period 2017-2019. After filtering 123 financial firms and 194 firms with special financial treatment (*ST), the final sample size was 954 firms. Green innovation was measured by the number of patent applications. All the independent variables were lagged by one year. STATA 15.0 was used to conduct the regression analysis. The results of Hausman tests show that fixed-effect model is appropriate for our panel data estimations ($p < 0.05$).

2. Variables and Measures

The dependent variable ESG performance was obtained from the Wind database (Wind Information Technology Co., Ltd). Wind database contains various types of information, such as stocks, investment funds, foreign exchange, derivatives, commodities, macroeconomics and financial news. Firms' ESG scores range from 0 to 10. The independent variable green innovation was obtained from the CSMAR database. CSMAR database was based on OECD data and International Patent Classification codes developed by the World Intellectual Property Organization (Johnstone, Hascic and Popp, 2010). According to prior studies (Noaily and Ryfisch, 2015), green technology patents in 25 categories¹⁾ were analyzed to investigate the factors that influence green technology transfer. Patents are substantially connected with other indications of inventive activities, such as R and D spendings and new product sales, thus are closely linked to innovation (Noaily and Ryfisch, 2015).

CSR decoupling was measured according to Tashman, Marano and Kostova (2019)'s approach, by subtracting the standardized values of CSR performance from the standardized values of CSR reporting score each year. Specifically, CSR reporting was taken from the RKS (Runlin Rankings) database. The RKS system includes four sub-indicators: Macrocism (M), content (C), technology (T), and industry (I). CSR performance was measured by Hexun CSR Score, ranging from 0 to 100, including 3 dimensions (C, S, R) and 50 categories²⁾. Using the Spearman correlation study, previous findings have shown that RKS score is more suited for analyzing the quality of CSR information disclosure, whereas Hexun score is better suited for monitoring CSR performance (Zhong et al., 2019). Notice that for CSR decoupling, a total number of 135 firms were matched from both sources of CSR data. CPG was obtained from the CSMAR database. It was calculated through dividing donated amounts by total sales. As for state ownership, we used a dummy variable that was set to 1 if the firm is an SOE and 0 otherwise.

Several control variables were included in our models to control firm heterogeneity. Firm size was measured by the natural logarithm of total assets. The size of an organization has been demonstrated to be a significant driver of environmental behavior (Aragón-Correa, 1998).

1) The technologies include air pollution management, energy-saving lighting, electric and hybrid vehicles, cement manufacturing, heating, insulation, renewable energy, energy-efficient and fossil-fuel electricity production, storage technologies.

2) For more information, see <http://www.hexun.com>

Firm age was measured by taking the natural logarithm of the number of years (plus one) elapsed since the year of the firm's foundation. ROA was defined as net profits divided by total assets. We used two industrial dummies to control industrial variations. Because carbon emissions have the greatest impact on manufacturing industries, the first industry dummy takes value 1 if the firm was in manufacturing industry and 0 otherwise. In regard to non-manufacturing industries, we controlled industries that are likely to have environmental impact. So the second industry dummy takes value 1 if the firm was in extractive industries (such as coal mining, oil and gas extraction), construction industries (such as housing, railway and power station construction) or water, gas and electricity supply industries. Tobin Q was calculated as market value divided by net assets (Servaes and Tamayo, 2013). Unabsorbed slack was measured as current assets divided by current liabilities. Absorbed slack was defined as SG and A divided by total assets. Independent board members was defined as the number of independent board members divided by total number of board members. A summary of all the variables and measures are illustrated in (Table 1).

Table 1. Summary of Variables and Measures

Variable	Label	Measure
Green Innovation	GI	Number of green patents/total patents
ESG Performance	ESG	ESG score
CSR Decoupling	CSR D	Subtracting the standardized values of CSR performance from the standardized values of CSR reporting score
CPG	CPG	Donation amounts/total sales
SOE	SOE	Dummy variable: SOEs are 0, non-SOEs are 1
Firm Size	SIZE	The natural logarithm of total assets
Firm Age	AGE	The natural logarithm of the number of years (plus one) elapsed since the year of the firm's foundation
ROA	ROA	Net profit/total assets
Industry Dummy1	IND1	1 if the firm is in manufacturing industries, 0 otherwise
Industry Dummy2	IND2	1 if the firm is in extractive industrie, construction industries or water, gas and electricity supply industries, 0 otherwise
Tobin Q	TOBINQ	Market value/net assets
Unabsorbed Slack	UNSLACK	Current assets/current liabilities
Absorbed Slack	ABSLACK	SG and A/total assets
Independent Board	INDEP	Independent board members/total board members

V. Results

1. Descriptive Statistics and Correlation Results

(Table 2) reports the means, standard deviations, and correlation coefficients for all variables used in this study. The mean of ESG performance was 0.59 with standard deviation 1.85, while the mean of green innovation performance was 0.17 with standard deviation 0.23.

Table 2. Descriptive Statistics and Correlations

Variables	Mean	S.D.	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) ESG	.594	1.853	1.000													
(2) GI	.168	.23	0.179*	1.000												
(3) CSRD	-.842	1.384	0.347*	0.156	1.000											
(4) CPG	.391	24.148	-0.030	-0.066	0.025	1.000										
(5) SOE	.345	.475	0.335*	0.110	0.181*	0.108	1.000									
(6) SIZE	22.118	1.298	0.620*	0.244*	0.363*	0.029	0.453*	1.000								
(7) AGE	2.836	.371	0.404*	0.175*	0.295*	-0.107	-0.071	0.286*	1.000							
(8) ROA	.047	.06	0.015	-0.004	-0.235*	-0.056	-0.209*	-0.059	-0.125	1.000						
(9) IND1	.61	.488	-0.298*	-0.074	-0.179*	-0.171*	-0.127	-0.401*	-0.209*	0.037	1.000					
(10) IND2	.079	.27	0.151	0.253*	0.117	-0.036	0.082	0.221*	0.181*	-0.056	-0.547*	1.000				
(11) TOBINQ	2.054	1.429	-0.192*	-0.102	-0.334*	-0.061	-0.183*	-0.280*	-0.166	0.395*	0.090	-0.042	1.000			
(12) UNSLACK	.31	13.003	-0.024	-0.197*	-0.076	-0.087	-0.262*	-0.330*	-0.183*	0.081	0.261*	-0.252*	0.153	1.000		
(13) ABSLACK	1.072	2.913	-0.130	-0.111	-0.261*	-0.031	0.029	-0.329*	-0.315*	0.329*	0.154	0.120	0.250*	0.196*	1.000	
(14) INDEP	.375	.053	0.057	-0.067	0.160	-0.073	-0.017	-0.012	0.198*	-0.108	0.007	0.168	0.047	-0.016	-0.011	1.000

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

2. Results Analysis

(Table 3) presents the results of fixed-effect linear regressions. Model 1 showed the main effect with all control variables. Hypothesis 1 posited that green innovation and ESG performance are positively correlated in Chinese enterprises. The coefficient was positive and statistically significant ($\beta = 0.972$, $p < 0.01$), which indicates that H1 was supported. Model 2 measured CSR decoupling’s interaction effect. H2 predicted that CSR decoupling plays a negative role between green innovation and ESG performance. The coefficient of CSR decoupling in model 2 was negative and significant ($\beta = -1.225$, $p < 0.05$), which conforms to H2. Model 3 measured corporate philanthropic giving’s interaction effect, H3 predicted that CPG positively moderates the relationship between green innovation and ESG performance. However, from model 3, the coefficient of CPG was positive but insignificant ($\beta = 1.784$, $p > 0.1$). Hence, H3 was not supported. H4 posited that state ownership positively moderates the relationship between green innovation and ESG performance. Model 4 presented state ownership’s interacting effect. The coefficient of state ownership was positive and significant ($\beta = 2.633$, $p < 0.05$). Thus, H4 was supported.

Table 3. Regression Results

DV: ESG	Model 1	Model 2	Model 3	Model 4
SIZE	1.315*** (-6.3)	1.989*** (-5.67)	1.318*** (-6.27)	1.238*** (-6.23)
AGE	-1.317 (-2.11)	-13.454*** (-5.31)	-1.333 (-2.17)	-1.05 (-1.80)
ROA	0.628 (-0.63)	2.152 (-0.65)	0.646 (-0.64)	0.905 (-0.97)
TOBINQ	0.035 (-0.82)	0.517* (-2.92)	0.035 (-0.81)	0.03 (-0.67)
UNSLACK	-0.074 (-0.13)	-2.605 (-0.56)	-0.068 (-0.12)	0.04 (-0.06)
ABSLACK	0.016 (-0.78)	0.127 (-1.14)	0.016 (-0.77)	0.013 (-0.69)
INDEP	1.35 (-1.98)	17.719** (-3.76)	1.372 (-1.98)	1.585 (-2.1)
IND1	0.587 (-1.97)	1.024*** (-5.51)	0.561 (-2.02)	0.593 (-1.96)
IND2	-1.082* (-2.50)	-0.388* (-2.35)	-1.094* (-2.49)	-0.882 (-2.14)

Main Effect				
GI	0.972** (-3.26)	2.685* (-2.32)	1.001* (-3.14)	0.440* (-2.55)
Interaction Effects				
CSRD		-0.003 (-0.10)		
GI*CSRD		-1.255* (-2.41)		
CPG			0.067 (-0.63)	
GI*CPG			1.784 (-1.75)	
SOE				0.872* (-2.39)
GI*SOE				2.633* (-2.63)
_cons	-25.652*** (-7.28)	-21.204** (-4.06)	-25.675*** (-7.18)	-24.833*** (-7.15)
Adj. R square	0.275	0.6177	0.2761	0.3002
Model F	84.46***	346.00***	101.68***	1121.36***
N	954	135	952	954

Standard errors are in the parentheses.

*p<0.05, **p<0.01, ***p <0.001

VI. Discussion and Conclusion

In this study, we focus on whether a firm's green innovation performance can have a positive effect on ESG performance of Chinese firms. The results showed that green innovation was positively correlated with ESG performance. Our findings implied that green innovation is critical to finding a win-win strategy through which economic growth is achieved in a sustainable way. Although the development of green technology projects is costly and difficult, it is beneficial for firms' long-term competitiveness.

This study also highlighted two firm-specific boundary conditions. First, CSR decoupling negatively affected the relationship between green innovation and ESG performance, which indicates CSR decoupling is harmful to ESG outcomes because inconsistent information increases information asymmetry and evaluators' perceptions of firm hypocrisy. Second, government ownership was shown to positively moderate the relationship between green innovation and ESG performance, which indicates that firms with government properties and non-profit drives have advantages in developing innovation to establish long-term competitiveness. Taken together, these findings imply that firms' ability to increase the consistency of CSR communication and ownership characteristics have significant impacts on the benefit that green innovation performance brings to ESG performance. Contrary to expectations, CPG did not show to have significant moderating effect on the relationship between green innovation and ESG performance. One reason for this could be that innovation is generally costly and risky (Xu, Liu and Shang, 2020), whereas most of the benefits of philanthropic giving are intangible and can only emerge in a long term. Especially due to weak institutions, when emerging-market firms engage in CPG, it creases doubts on firm managers' real intent (Masulis and Reza, 2015).

Our study provides the following contributions. First, there is a lack of research on the effects of green innovation performance on corporate sustainability and social responsibility performance in prior studies. In this study, we argued that green innovation, as an irreplace-

able, valuable resource and dynamic capability of a firm, can contribute to the improvement of sustainable business performance, especially in environmental and social aspects. Second, most studies on ESG have focused on the impact of ESG performance on firm value, while relatively little research has been conducted on how to effectively improve corporate ESG performance. In the context of increasing attentions to corporate sustainable management, we explored an effective way to improve corporate ESG performance, that is, through green innovation. Third, we emphasized the importance of external information communication through social responsibility reports. When there is opaque or inconsistent information on corporate social responsibility, it may have negative spillover effects on the performance of other social sustainability aspects of a firm. Lastly, for rapidly growing emerging markets, we considered the particular role of government ownership in emerging-market firms and confirmed that government ownership can reinforce the positive effects of green innovation development on ESG performance.

Our findings provide several managerial implications for emerging-market firms. Green innovation is an important strategic asset to improve firms' ESG performance and their long-term competitive advantage. Thus, managers should pursue green innovation as a crucial tool to help improve the firm's overall performance in sustainability. In addition, because misleading CSR disclosures can damage the overall perception of a firm's efforts in environmental and social commitment, firms should 'walk the talk' by conveying consistent information in regard to CSR performance and closing the gap between promised responsibilities and actually implemented actions.

This study is subjected to several limitations and provides insights for future avenues. First, this study's sample size was relatively small and the diversity of measurement methods were limited. The time span in our study covered only three years. This was due to the limitation of ESG performance data. This dataset was created in 2017 and updated through 2020. Thus, it is necessary to expand the sample size and diversify the measurement methods in future research. Second, this study only used samples of emerging-market firms in Chinese market. These results may not be applicable to other contexts. Hence, it is necessary to investigate other emerging markets and enhance the generalizability of our findings. Besides, due to the limitation of data, we could not separate ESG performance into three segments. Therefore, it would be interesting to assess the effects of green innovation on corporate performance in E, S, G aspects and compare the results.

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