Do green innovation and CRS improve corporate investors' firm performance? Towards net zero emissions

ABSTRACT

This paper presents the first detailed analysis of the impact of greenhouse gas (GHG) emission reduction on corporate venture capital (CVC) investments in the US over 18 years between 2002 and 2019. The study considers the three scopes of GHG emissions by CVC firms. Additionally, patents, citations, and weighted citations are analyzed to present an in-depth discussion of the impact of green innovation by CVC firms on their financial outcomes. The results show the isolated and combined effects of GHG emission reduction and green innovation on the firm performance of CVC firms. The results indicate that emission reductions give firms a financial advantage over time and that corporate investors are interested in driving green innovation. Furthermore, the results investigate the mediating role of CSR on CVC firms' environmental and financial performance. The results outlined in this paper have important implications for research and practice and illustrate the importance for corporate investors of including ecological considerations in their overall business strategies to create a competitive advantage. These findings contribute to the ongoing debate on corporations' role in reaching net-zero emissions.

Keywords:

Corporate venture capital; environmental performance; firm performance; green Innovation; greenhouse gas emissions; CSR

INTRODUCTION

The worsening climate crisis has come to dominate political discussions in recent years (IPCC, 2022). Researchers are increasingly sounding the alarm and urging governments and policymakers to take immediate action to limit the devastating effects of rising global surface temperatures (O'Garra & Fouquet, 2022; Sun et al., 2022)(O'Garra & Fouquet, 2022; Sun et al., 2022). The main driver of global warming is the accumulation of GHG emissions in the atmosphere (Su & Ang, 2017). The world demand is going toward appreciating energy efficient processes and products and less pollution. Under the Kyoto Protocol, there is pressure on firms to develop innovations that will lead to 'offset' the additional costs of regulatory compliance and to reduce carbon emissions (Porter & Linde, 1995). The environmental pressures from the marketplace and government are increasing, and the firms meet sustainability hurdles to harbor powerful eco-innovation capacities (Dangelico & Pujari, 2010). Well-planned environmental laws may improve economic and environmental performance, advance environmental actions, and inspire environmental innovation. These actions are known as "the Porter Hypothesis". Porter and van der Linde (1995) advocate that organizational problems and incomplete information will lead firms to miss cost-saving opportunities, such as material and energy savings, and not recognize environmental and technological innovation. Firms are forced to economically realize the beneficial environmental innovation due to the environmental regulatory legislation (Porter & Linde, 1995). Porter and van der Linde (1995) argue that rigorous yet flexible environmental laws and well-planned environmental measures can "trigger innovation that may partially or more than fully offset the costs of complying with them (p. 98)."

In order to cope with this increasing pressure, Battisti et al. (2022) show that CVC investments may play a crucial role for corporations in acquiring the necessary resources for a sustainable competitive advantage. They suggest that CVC investments may be more efficient compared to the slow process of developing capabilities purely internally. For the sake of this paper, stakeholder theories focusing on corporate sustainability and corporate social responsibility (CSR) provide a point of reference. Weng et al. (2015), for example, examine the relationship between green innovation, environmental, and financial performance, based on the stakeholder theory. Further relevant studies showing the importance of considering the different stakeholders in light of decisions referring to corporate sustainability include the works of Hörisch et al. (2014), Schaltegger et al. (2019), and Freudenreich et al. (2020).

While a few scholars already considered the relationship between GHG emissions, green innovation, and financial performance in different circumstances, this is the first paper applying and combining these topics in the context of CVC investments. CVC refers to established corporations making venture capital investments, that is direct minority equity investments in privately held entrepreneurial ventures (Wadhwa et al., 2016). Typically, the aim of CVC investments is the acquisition of knowledge and technological innovations (Da Gbadji et al., 2015). The dedicated view on corporate investors is of particular interest for several reasons. In the past, scholars and practitioners agreed that the performance of corporations is mainly dependent on traditional resources such as physical, human, or organizational capital resources. Battisti et al. (2022) add that corporate investors, compared to other firms, have an extraordinary ability to acquire such social or ecological aspects through their investments. While many corporate investors face societal pressure from their stakeholders to consider their ecological footprint, they can use investments as a tool to acquire knowledge and technologies, allowing them to significantly improve their environmental performance and reduce GHG emissions (Battisti et al., 2022).

Encountered with continuous and extreme changes in the environment (Antonioli and Mazzanti, 2017; Appolloni et al., 2022; Sun et al., 2022), CVC investments to build linkages to environmental performance and pursue green innovations to achieve corporate performance strategies. CVC program plays a role in power building that could improve the performance of the firm (Dushnitsky & Lenox, 2005b). Particularly, firms usually invest in CVC to acquire the key to knowledge and ideas that can help their innovation activities (Chemmanur et al., 2014; Shuwaikh & Dubocage, 2022) and support their competitive standings in making those capabilities that enhance organizational performance (Dushnitsky & Lenox, 2006b). This paper aims to examine the impacts of GHG emission and green innovation by CVC firms on their financial outcomes. Although CVC firms intensified reporting information on GHG emissions as well as their green innovation especially during the past two decades, little is known about the effect of these two factors on firm performance. Accordingly, this article tries to fill this gap by investigating the relationships between environmental performance, green innovation and firm performance in the context of CVC investments. The aim is to help the parent (investor) company generate higher short-term financial returns and improve long-term strategic performance. In the hypothesis development below, we build on these ideas to

contribute to the substantive theory of CVC investments, environmental performance and green innovation. Despite these contributions to the literature, there remain two shortcomings. First, neither the effect of green innovation on financial performance nor the relationship between environmental performance and green innovation has been researched in the specific context of CVC investments. Second, the literature has not yet specifically addressed the combined effect of GHG emissions and green innovation on the financial performance of firms.

This paper presents the first detailed analysis of the impact of GHG emission reduction on CVC investments in the US. The sample comprises 133 corporate investors over an 18-year period between 2002 and 2019. CVC investing is a suitable setting for our research for the following motives. First, CVC investment is a mechanism the firms can use to obtain a window into new technology and a channel through which it can absorb knowledge and access intelligent devices reflecting technological discontinuity (Maula et al., 2013). Battisti et al. (2022) and Wadhwa et al. (2016) demonstrate that CVC investments are an important source of knowledge and innovation for investors. Second, CVCs play a role in funding digital technologies, examining their financial plans for helping new, pioneering, and disruptive firms (Rossi et al., 2020). Corporate venturing develops unique strategies for leading innovation actions. It is embraced across many sectors and allows incumbent firms to balance corporate strategy (Rossi et al., 2020). Rossi, Festa, Papa, et al. (2020) show that CVCs manage to invest in sectors related to their core business, are legible with their strategic intent and are more oriented with knowledge management methods for accumulating intellectual capital. CVCs adopt specific strategies to finance innovation and value creation for venture-backed companies. Furthermore, CVC programs represent organizations' innovation strategies in the fourth wave of CVC (Cumming, 2012). Third, scholars have explained the robust impact of CVC funding on enhancing corporate performance (Dushnitsky and Lenox, 2005b). For example, Dushnitsky and Lenox (2006) with Wadhwa and Kotha (2006) find that CVC investment improves valuation performance through citations in addition to patent production and drives higher market valuation. Battisti et al. (2022) show that CVC activity positively affects corporate investors' CSR performance in terms of social and environmental performance. This enhanced CSR performance is a driver for a sustainable competitive advantage (Battisti et al., 2022).

In doing so, this paper makes significant contributions to both research and practice. To date, this is the first paper to evaluate the effect of green innovation, rather than innovation in general, as well as the effect of GHG emissions on the financial performance of corporate

investors. Therefore, the results are based on combined research on corporate investors' financial performance (e.g. Baierl et al., 2016; Battisti et al., 2022; Dushnitsky & Lenox, 2006a), on the relationship with GHG emissions or, more generally, between environmental performance and corporate financial performance (e.g. Busch & Hoffmann, 2011; Ganda & Milondzo, 2018; Russo et al., 2021), as well as on the impact of green innovation on financial performance (e.g. Aguilera-Caracuel & Ortiz-de-Mandojana, 2013; J. Przychodzen & Przychodzen, 2015; Scarpellini et al., 2019). A second contribution is that the empirical results clearly show that environmental performance and green innovation should be integral parts of corporate investors' investment strategies. This evidence therefore adds to the findings of Battisti et al. (2022) who indicate that CVC investments have a positive impact on the investors' environmental and social performance by showing that enhanced environmental performance and green innovation of corporate investors positively affect financial performance. Thirdly, analyzing the combined effect of GHG emissions and green innovation on corporate investors' financial performance suggests that reducing GHG emissions and increasing sustainability-based innovation simultaneously has a positive influence on financial performance. While Lee and Min (2015a) as well as Q. Ma et al. (2021) elaborate on the relationship between innovation and carbon emissions, our study confirms their results and, in addition, demonstrates their effect on corporate financial performance. This highlights the relevance of the interrelationship between GHG emissions and green innovation to corporate investors' financial performance.

The remainder of this paper is structured as follows. The literature review is presented in Section 1. Data selection and methodology are described in Section 2. Empirical results as well as their discussion are reported in Section 3. Finally, conclusions are drawn in Section 4, along with their implications for research and practice as well as their limitations.

THEORETICAL BACKGROUND AND LITERATURE REVIEW

Theoretical Framework

The resource-based view (RBV) theory (Barney, 1991) can be used to examining companies' social and environmental activities and, precisely, their climate change matters. To achieve their goals in gaining a competitive advantage, companies improve these activities compared to their less ethical competitors. The positive reactions to environmental and ethical practices assessed by the stakeholders, investors, the market, and the society, lead over time to sustainable competitive advantage. The environmental commitment positively impacts the business strategy of these firms. Hart (1997) addresses that generating clean production

manners can admit competitive advantages and significant environmental benefits. Companies' environmental strategies and actions are the capabilities and resources that can provide a unique advantage to tend to protect and preserve the ecosystem. Peteraf and Barney (2003) defined this competitive advantage as the marginal economic value that the company enjoys once achieving it higher than its competitors.

The scene of the environmental strategy is a competitive resource by rethinking business models, processes, technologies, and products. While discussing such a scenario, we should mention the first authors who empirically analyze this theory by applying firm-level data on environmental and accounting profitability. Russo and Fouts (1997) and Sharma and Vredenburg (1998) find that companies achieve higher financial performance linked to their higher environmental performance. Sharma and Vredenburg (1998) suggest that investments in a corporate beyond pollution control as an environmental strategy improve firm-specific capacities. According to Nidumolu et al. (2009), following the scenario of the environmental strategy, particularly those firms that execute sustainability as a purpose, will attain a competitive advantage in the future. Notwithstanding observing a direction approaching environmental sustainability and preservation, it is essential to perceive that the primary purpose of any firm is to maximize its profit (Friedman, 1962). One of the objectives of improving environmental strategies is to obtain the discussed competitive advantage to create a considerable corporate performance.

The natural resource-based view (NRBV) provide an appropriate theoretical basis for discussing the contribution and the relationships among resources, capabilities, and performance (Cristina De Stefano et al., 2016; Dangelico and Pujari, 2010; Menguc and Ozanne, 2005). Regarding the stakeholder influence, market pressure, and currently changing institutional regulations linked to the natural environment, the RBV has apparent shortcomings in demonstrating how to enhance business performance associating with the natural environment. The RBV is reprimanded for not displaying how to marshal resources to deliver a competitive advantage within a dynamic external environment (Hart, 1995). The RBV has disregarded the captivity inflicted by the natural environment, and "given the growing magnitude of ecological problems this omission has rendered existing theory inadequate as a basis for identifying important emerging sources of competitive advantage (Hart, 1995, p. 987)."

The NRBV of a firm (Hart, 1995) presents a framework to investigate the various kinds of technological innovations that the company can use to deal with environmental pressures. This framework is proposed to boost the RBV (Barney, 1991; Wernerfelt, 1984).

The RBV enlightens the significance of non-substitutable, inimitable, rare, and valuable resources as essentials for the competitive advantage of the firm but failed to catch the constraints dictated by the natural environment (Hart, 1995). Therefore, the NRBV grants a connection between the capabilities and resources of the firm and the natural environment. The NRBV (Hart, 1995; Hart and Dowell, 2011) demonstrates that there are three critical strategic capacities for facing natural environmental constraints: pollution prevention, product stewardship, and sustainable development . Each has a distinct origin of competitive advantage, makes upon several essential resources, and has various environmental driving powers (Hart & Dowell, 2011). According to the NRBV, firms require to perform long-term success and react to the natural environment. To do so, firms oblige to accumulate resources and control capabilities with a longer-term focus rather than a short-term focus on profits at the expense of the environment to reach long-term success and react to the natural environment. To acquire a competitive advantage of the firm in the market, envision sustainable products and technologies are needed. Further elaboration of the NRBV highlighted the links between competitiveness, green capabilities, and environmental strategies at a firm level (Hart & Dowell, 2011).

Corporate Venture Capital Context

CVC context is an appropriate setting to test this paper's hypotheses and analyze the assumptions. Dushnitsky and Lenox (2005b) as well as Battisti et al. (2022) and Wadhwa et al. (2016) demonstrate that CVC investments serve as an important source of knowledge and innovation for investors. Corporate investors are constantly leveraging their resources in order to create a sustainable competitive advantage. Accordingly, Battisti et al. (2022) take a view on resources and capabilities that have an effect on types of performance other than purely financial, including social and environmental performance. They prove that CVC programs, in addition to improving corporate innovativeness, have the potential to enhance investors' environmental and social performance (Battisti et al., 2022). By acquiring resources and capabilities from their portfolio companies, corporate investors may increase their CSR performance which, in turn, can serve as a driver for a sustainable competitive advantage. The authors, therefore, expand the traditional RBV, claiming that the acquisition of innovation and know-how by corporate investors are tools for achieving CSR objectives (Battisti et al., 2022). That way, CVC investments may be an efficient tool to cope with the initially described economic pressure exerted by governments and stakeholders and can ultimately become part of firms' overall corporate strategies (Battisti et al., 2022).

Changing the perspective away from the resource acquisition by corporate investors towards actual outcomes resulting from CVC investments, Dushnitsky and Lenox (2005a) find a statistically significant positive relationship between such investments and patenting outcomes of the investing firms. Therefore, CVC activities are substantially contributing to firms' innovation capabilities. In a later study, Wadhwa et al. (2016) confirm that portfolio diversity and the depth of knowledge in the portfolio affect corporate investors' innovativeness. Chemmanur et al. (2014b) take a different approach and study the innovativeness of CVC-backed enterprises. They find that these ventures exhibit higher patenting outcomes in quantity and quality which, in turn, might benefit the respective corporate investor, as Battisti et al. (2022) show. In addition to the effect on corporate innovativeness, Dushnitsky and Lenox (2006a) outline that created firm value, considering Tobin's Q, will be even greater and compensate for potentially higher costs if CVC investments are explicitly being pursued for strategic reasons and aiming at adopting novel technologies. Accordingly, Baierl et al. (2016) underline that the innovativeness of corporate investors has a positive effect on their subsequent financial performance.

Environmental Performance

In light of the growing importance of sustainable business practices, scholars are increasingly considering the relationship between GHG emissions and firm financial performance as well as firm value. The vast majority of studies finds a positive relationship between low emissions and an increase in financial performance. Busch and Hoffmann (2011), for example find a negative effect of carbon emissions on firms' ROA, ROE, and Tobin's Q. In this context, Bolton and Kacperczyk (2021) argue that investors are pricing in carbon risk. Therefore, carbon emissions persistently reduce firm value (Aggarwal & Dow, 2011). Similarly, Ganda and Milondzo (2018) show this effect with regards to ROE, ROI, and ROS. Russo et al. (2021) find that firms with strong environmental performance have a higher financial performance as they may benefit from cost reductions. Considering a mixed sample of firms as well as firms operating in clean industries, Iwata and Okada (2011) show that GHG emissions reductions positively affect financial performance. Similarly, Nishitani and Kokubu (2012a) describe the positive effect of GHG emissions reductions on firm value.

More recently, Chen and Ma (2021) find that green investment may positively influence environmental performance which, in turn, has a positive moderating effect on the impact of green innovation on financial performance. The authors find positive effects on Net Profit, ROE, and Tobin's Q, especially considering long-term performance (Chen and Ma, 2021). Ganda and Milondzo (2018) furthermore show that green investment initiatives aiming

at reducing carbon emissions may positively affect financial performance. Similarly, Lee et al. (2015) conclude that investments in green R&D can help reducing carbon emissions and, as a consequence, improve financial performance. On the other hand, the authors argue that the downside effect of high emissions outweighs the positive effect of low emissions (Lee et al., 2015).

Although many scholars agree on the positive relationship between environmental and financial performance, several studies cast doubt on the effect. Misani and Pogutz (2015), for example, find that firms with intermediate levels of carbon emissions achieve higher financial performances than firms with either low or high emissions. Most studies showing contrasting results refer to countries with low economic strength, lacking environmental regulations, or insufficient penalties applying to unsustainable business behaviors. This is mainly the case in developing countries and leads to lower incentives for reducing emissions (Rokhmawati et al., 2015, 2017). Another factor leading to ambiguous results is the choice of industries considered in the research sample. Gonenc and Scholtens (2017), for example, find mixed results for firms operating in industries such as chemicals, coal, as well as oil and gas. A negative effect of environmental on financial performance is furthermore found in the paper industry (Wagner, 2005; Wagner et al., 2002).

Hypothesis1. Corporate investors' environmental performance positively affects their respective financial performance.

Green Innovation

Literature on eco-innovation considering green patents as a measure for green innovation is relatively new. In one of the earliest studies using green patents data, Aguilera-Caracuel and Ortiz-de-Mandojana (2013) find that green innovative firms experience a positive relationship between the intensity of their green innovation and their respective financial performance. Similarly, González-Benito et al. (2016) find a positive relationship between corporate innovation activity and financial performance, not differentiating between green and non-green innovation. Earlier, Porter and van der Linde (1995) explain that innovation may offset the costs induced by environmental regulations, reducing the financial burden of environmental improvements. More recently, W. Przychodzen et al. (2020) show that green innovation may positively affect firm financial performance. Rezende et al. (2019) further suggest a positive relationship between time-lagged green innovation intensity, that is the time-lagged proportion of green patents in relation to total patents, and financial performance with no effect in the actual observation year, however. Scarpellini et al. (2019) furthermore show that green patents as well as R&D intensity, as drivers of eco-innovation,

positively affect firm performance. These findings confirm the positive effect on firm performance found by Przychodzen and Przychodzen (2015) who observe that eco-innovators exhibit higher ROA and ROE than their counterparts. Similar evidence showing the relevance of eco-innovation in determining firm performance is documented in other studies. Specifically, Marín-Vinuesa et al. (2020) find that the level of green innovation has a positive effect on corporate financial performance, building on earlier findings by Doran and Ryan (2012) who show that green innovation, unlike non-green innovation, positively affects firms' financial performance.

The positive relationship between green innovation and environmental performance, on the other hand, seems obvious. Investments in sustainable business practices and innovation should have a reducing effect on firms' GHG emissions. Lee and Min (2015a) make use of green R&D expenditures to prove the negative relationship between green innovation and carbon emissions. Additionally, the authors prove that green R&D has a positive relationship with corporate financial performance, as measured by Tobin's Q. Similarly, Q. Ma et al. (2021) prove the reducing impact of technological innovation and R&D expenses on carbon emissions in China. The effect of green innovation on environmental performance is furthermore developed by Long, Chen, Du, Oh, Han, et al. (2017) as well as Long, Chen, Du, Oh, and Han (2017). They find that the effect of green innovation behavior on environmental performance is even greater than the effect on economic performance.

Firms are more likely to pursue CVC activities as a part of their innovation strategy. Research on CVC investments as tools for knowledge acquisition makes a positive contribution to innovation in firms (Kang et al., 2022; Keil et al., 2008; Shuwaikh & Dubocage, 2022; van de Vrande et al., 2011; Wadhwa & Kotha, 2006). CVC helps firms to achieve balance in their corporate strategy (Rossi, Festa, Devalle, et al., 2020) and to boost innovation (Wadhwa et al., 2016). CVC investment is a mechanism often used by firms to obtain new technology and specialized knowledge (Maula et al., 2013). CVC develops unique strategies to lead innovation (Shuwaikh & Dubocage, 2022). Battisti et al. (2022) demonstrate that CVC investments are seen as an important source of knowledge and innovation by investors. Dushnitsky and Lenox (2006) with Wadhwa and Kotha (2006) find that CVC investment improves valuation performance through citations in addition to patent production and drives a higher market valuation.

A zero-pollution firm cannot exist as attaining net zero is impossible. Our work aims to assist firms in harnessing green innovation to reduce their pollution. Independent venture

capital (IVC) investors are examples of financial firms that made important investments in innovation in targeted sectors subject to busts and booms (Chemmanur et al., 2014). CVC investment firms pursue a "hybrid" model that merges the capabilities of their own research laboratories with those of their funded start-ups "*within a powerful system that consistently and efficiently produces new ideas*" (Lerner, 2012). The goal of CVCs varies from that of other investors (Alvarez-Garrido & Dushnitsky, 2016), such as IVCs. Green innovation demands enormous corporate investment in clean technologies to decrease GHG emissions. Which firms are best positioned to achieve green innovation?

To gain sustainable competitive advantage, many firms pursue radical innovation (B. Weber & Weber, 2007) and green innovation is one of these possible innovative dimensions. CVC is one way for corporations to achieve radical innovation (Lerner, 2012) and, consequently, competitive advantage (Keil, 2000). CVC firms have strong entrepreneurial characteristics and tend to boost innovation in the entrepreneurial activities that they sponsor (Rossi et al., 2022). We explore how CVC firms are more inclined to pursue green innovation to reduce their emissions. We also explore how green innovation helps firms cut their GHG emissions. This serves as a basis to construct hypotheses suggesting a positive impact of corporate investors' green innovation on their respective financial performance as well as a joint positive effect of environmental performance and green innovation on financial performance.

Hypothesis 2. Corporate investors with more green innovation have a higher financial performance.

CSR Performance

Previous literature analyzing the relationship between firms' CSR performance and their respective financial performance is extensive. Galbreath (2018), for example, finds an indirect link between women on boards and financial performance by showing that women on boards are linked to CSR and that CSR performance, in turn, positively affects financial performance. CSR therefore has a mediating effect on corporate financial performance (Galbreath, 2018). Torugsa et al. (2013) illustrate that firms not only consider business performance in the current market scenario but also emphasize additional aspects including social and environmental objectives. They analyze the relationship between proactive CSR and long-term financial success of SMEs and find a positive effect of both environmental and social elements of CSR on firms' subsequent financial performance (Torugsa et al., 2013). Furthermore, Cho et al. (2019) describe the positive relationship between CSR performance and profitability as well as firm value. Regarding profitability, the effect seems to be limited

to the social dimension of CSR (Cho et al., 2019), however. The study of Gregory et al. (2016) furthermore shows that CSR performance positively affects earnings multiples in the context of company valuations as well as earnings predictions and leads to greater earnings persistence. Wang and Sarkis (2017) additionally mention that the successful implementation of CSR governance to achieve positive CSR performance has an important impact on companies' financial performance. Yang et al. (2010) discover a positive effect of corporate social performance on subsequent financial performance in terms of ROA. This effect is being confirmed when controlling for R&D, as a proxy for innovation, and size. Additionally, the authors find that innovation leads to higher ROA and ROE (Yang et al., 2010). While most studies consider mixed firm samples, Feng et al. (2017) argue that CSR practices targeting different stakeholder groups as well as firms in different industrial sectors have heterogenous effects on firms' financial performance. Overall, however, the authors confirm the positive effect of CSR performance on financial performance for most industries (Feng et al., 2017).

Literature covering the relationship between CSR, environmental performance, and financial performance is scarce. Atif et al. (2021) investigate the relationship between board gender diversity and renewable energy consumption and find a positive effect. The authors furthermore find that the interaction between renewable energy consumption and board gender diversity positively affects corporate financial performance (Atif et al., 2021). The study of Purnomo and Widianingsih (2012) shows that environmental performance positively affects the financial performance in a sample of Indonesian listed firms. Additionally, the authors conclude that CSR disclosure does not significantly strengthen this relationship (Purnomo & Widianingsih, 2012). Cooper et al. (2018) furthermore find that a firm's historical CSR performance does not protect firms from negative effects of increased GHG emissions on their value. Their findings even suggest that these adverse effects increase with the firm's CSR performance (Cooper et al., 2018).

Similar to literature considering environmental performance in explaining the relationship between CSR and financial performance, studies considering green innovation as well as innovation in general are very limited. Bocquet et al. (2017) analyze the relationship between CSR and firm performance, measured by firm growth, while considering the effect of innovation. They find a positive and significant impact of innovation in determining that relationship for firms that adopt a strategic CSR behavior (Bocquet et al., 2017). Zahid et al. (2021) furthermore show that CSR activities have a positive impact on corporate financial performance and that innovation may positively moderate this relationship. Cegarra-Navarro

et al. (2016), on the contrary, find that the moderating effect of innovation on the relationship between the social dimension of CSR and financial performance is insignificant.

As Battisti et al. (2022) show, corporate investors not only consider purely financial objectives in their strategy but increasingly consult social and environmental aspects as well in evaluating their performance. They have recognized the positive effect of CSR performance in building a sustainable competitive advantage (Battisti et al., 2022). Therefore, this paper seeks to find a positive moderating effect of social and environmental performance scores on the effect of both environmental performance (H3) and green innovation (H4) on corporate investors' financial performance.

Hypothesis 3. Corporate investors' CSR performance positively moderates the effect of environmental performance on financial performance.

Hypothesis 4. Corporate investors' CSR performance positively moderates the effect of green innovation on financial performance.

DATA AND METHODOLOGY

Sample Selection and Variables

The selected sample comprises longitudinal data on U.S. firms between 2002-2019, based on the Thomson VentureXpert database to construct the main sample of firms that make at least one CVC investment. Financial and accounting data are collected from Standard and Poor's Compustat database. GHG emissions data is retrieved from Refinitiv Eikon. The target period between 2002-2019 is chosen as GHG emissions data is only available on Eikon for firms starting in 2002. To combine the Thomson VentureXpert data with the Compustat and Eikon databases, the names and ticker symbols of the firms are manually checked. If applicable, the ultimate parent firm at the time of the CVC investment is being considered. In a first step, after merging Thomson VentureXpert with Compustat data, a sample of 248 unique firms remains for which financial data is available. In a second step, the sample is being matched with the Eikon database, and only firms for which both financial and environmental data are available are being kept. The final sample comprises 133 corporate investors and 2,394 observations after the removal of missing variables and records that do not disclose the firm's name. Green patent data is furthermore retrieved from the PATSTAT database[1]. In order to match the firms from the sample with firms in PATSTAT, the matching methodology is based on the description by Tarasconi and Menon (2017). For the citation count, citations have been counted by filing year for each patent.

[1] PATSTAT – EPO patent statistic database – version autumn 2021.

Dependent variables. In this paper, three different measures of financial performance (*FINPER*) are introduced as dependent variables, namely Net Profit, ROE, and Tobin's Q. Net Profit and ROE are used as short-term measures with Net Profit indicating the profitability of a firm and ROE the return with respect to equity. Tobin's Q, as a measure that reflects both short- and long-term financial performance, is the ratio of the firms' market value to their tangible assets' replacement cost, therefore measuring intangible value (Dowell et al., 2000; Konar & Cohen, 2001). Financial performance is used as the dependent variable for testing all hypotheses.

Independent variables. Environmental performance (*ENVPER*) is assessed by using GHG emissions, that is total CO2 and CO2-equivalent (CO2e) emissions (in tons), following the GHG protocol (Bhatia et al., 2004) for Scope 1 and Scope 2 GHG emissions. In addition to carbon dioxide (CO2), the GHG emissions data considers methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCS), perfluorinated compound (PFCS), sulfur hexafluoride (SF6), as well as nitrogen trifluoride (NF3). According to the GHG protocol, Scope 1 emissions cover all emissions from sources that are directly being owned or controlled by the respective company, such as company-owned vehicles and fuel combustion. Scope 2 emissions, on the other hand, relate to indirect emissions such as emissions from the consumption of purchased energy (electricity, steam, heat). As using absolute GHG emissions would entail significant tail risk, two different measures are used to assess environmental performance, being the natural logarithm of GHG emissions (*lnGHG*) and GHG emissions per unit of revenue, that is GHG emissions intensity (*GHGrev*). Emissions intensity, having GHG emissions in the numerator, is used as the results are being more comparable to *lnGHG*, in contrast to emissions productivity. The ratio of GHG emissions to revenue is commonly being used to assess environmental performance by several scholars (e.g. Bose et al., 2021; Busch & Hoffmann, 2011). Finally, in order to examine the environmental performance of firms, with lower GHG emissions corresponding to higher values for environmental performance, the input variables are multiplied with (-1), following Busch and Hoffmann (2011). This approach is followed as it facilitates the interpretation of all variables used in the empirical models by aligning the positive directions of environmental performance, green innovation, and financial performance.

The second set of independent variables is measuring green innovation. While early literature widely used R&D expenditures to measure corporate innovativeness, recent literature agrees on using patent-based variables as a tool to adequately measure the innovation output of firms (Chemmanur et al., 2014b). Following that approach, two different

patent-based measures are considered in order to assess both the quantity and the quality of green innovation. Both green innovation variables are based on the patent application year. First, the number of green patent applications by a firm in each year (*Count*) is introduced to analyze innovation quantity. Second, the number of subsequent citations of these green patents (*Citations*) is used to measure innovation quality. As the citation count is subject to a truncation bias, the variable needs to be adjusted. Patents tend to receive citations over an extended period. Following U.S. patent law, a utility patent is granted for a lifetime of 20 years. Therefore, there is a significant downward bias for more recent patents in the data. Following Hall et al. (2000, 2001, 2005), the citation truncation bias is corrected by estimating the shape of the citation-lag distribution. To further cope with the empirical properties of the variables, it is necessary to take the natural logarithm of the newly introduced variables. Additionally, to avoid losing firm-year observations with zero patents or citations per patent, one is added to the patent as well as citations count before taking the natural logarithm (Chemmanur et al., 2014b; S. Ma, 2020). Following this procedure, ln(1+*Count*) is denoted *Count* and ln(1+*Citations*) is denoted *Citations*.

Moderating variables. As moderating variables, two variables measuring CSR performance are being used. Both the environmental pillar score and the social pillar score are being retrieved from the Eikon ESG database. The environmental score (*ENV*) reflects the CSR performance relating to environmental aspects by measuring firms' impact on living and non-living natural systems. It considers a company's performance in avoiding environmental risks and taking advantage of environmental opportunities. The social score (*SOC*), on the other hand, indicates the performance relating to social aspects and reflects firms' behavior towards their workforce, customers, and society. Both variables indicate scores on a scale between 0 and 100 and therefore allow to directly measure the outcomes of firms' CSR performance relating to social and environmental aspects.

Control variables. The set of control variables considered in this paper encompasses six distinct variables. Financial leverage (*LEV*) is the ratio of total debt to total assets. Firm size (*SIZE*) is calculated as the natural logarithm of the firms' total assets. Asset structure (*AssetStr*) measures the ratio of fixed assets to total assets. The variable for independent board members (*IBM*) indicates the percentage of independent board members, as reported by the firm. Sustainability reporting (*SusRep*) is a dummy variable indicating one if the company publishes a separate CSR/H&S/sustainability report or publishes a section in its annual report about CSR/H&S/sustainability. Finally, the governance score (*GOV*) measures the performance with relation to governance as reported by Eikon.

Figure 1 presents the research design, including all dependent, independent, moderating, and control variables as well as all four hypotheses.

Insert Figure 1 about here

Empirical Model

To test the hypotheses, ordinary least squares (OLS) regressions are being used. All models are being complemented by industry (based on two-digit NAICS codes) and year fixed effects. The use of fixed effects was confirmed by a Hausman test (Hausman, 1978).

$$FINPER_{i,t+3} = \beta_0 + \beta_1 ENVPER_{i,t} + \gamma ControlVar_{i,t} + \sum INDUSTRY + \sum YEAR + \varepsilon \quad (1)$$

$$FINPER_{i,t+3} = \beta_0 + \beta_1 INNOV_{i,t} + \gamma ControlVar_{i,t} + \sum INDUSTRY + \sum YEAR + \varepsilon \quad (2)$$

$$FINPER_{i,t+3} = \beta_0 + \beta_1 ENVPER_{i,t} + \beta_2 CSR_{i,t} + \beta_3 ENVPER_{i,t} \times CSR_{i,t} + \gamma ControlVar_{i,t} + \sum INDUSTRY + \sum YEAR + \varepsilon \quad (3)$$

$$FINPER_{i,t+3} = \beta_0 + \beta_1 INNOV_{i,t} + \beta_2 CSR_{i,t} + \beta_3 INNOV_{i,t} \times CSR_{i,t} + \gamma ControlVar_{i,t} + \sum INDUSTRY + \sum YEAR + \varepsilon \quad (4)$$

Where $FINPER_{i,t}$ represents firm i's financial performance, measured as either ROA, ROE, or Tobin's Q. $ENVPER_{i,t}$ measures the environmental performance of the firm, building on its GHG emissions. $INNOV_{i,t}$ is measuring green innovation in terms of quantity (*Count*) as well as quality (*Citations*).

EMPIRICAL RESULTS AND DISCUSSION

Descriptive Statistics

The descriptive statistics for the underlying research sample are being summarized in Figure 1

Research Framework

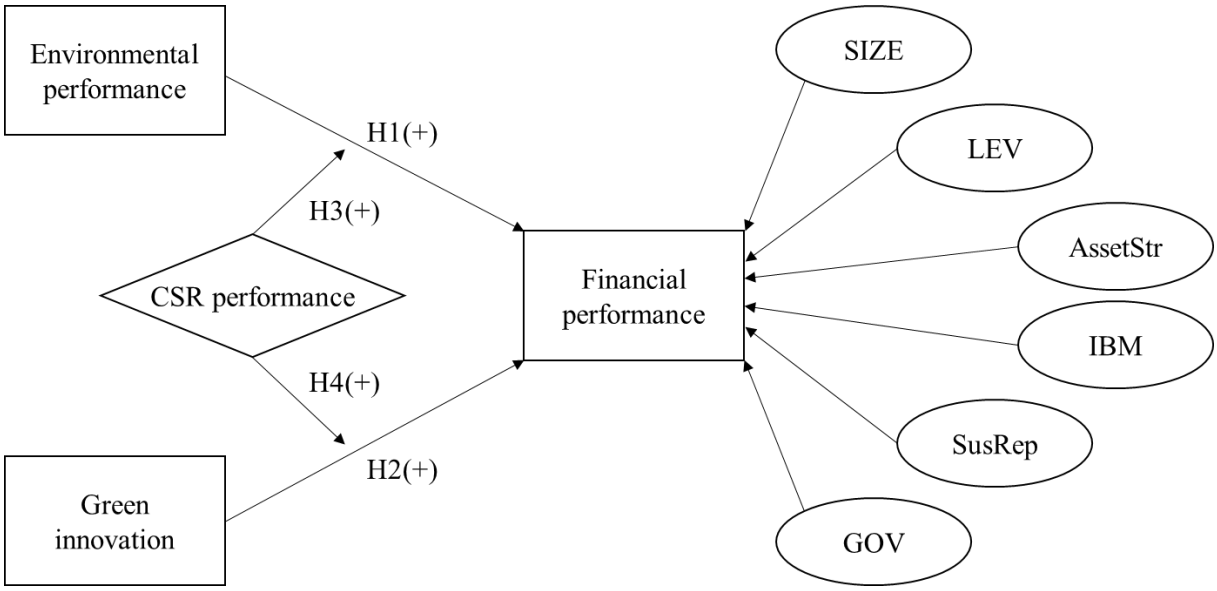
Environmental performance
H1(+)
H3(+)
CSR performance
H4(+)
Green innovation
H2(+)
Financial performance
SIZE
LEV
AssetStr
IBM
SusRep
GOV

Table 1. The firms in the sample have an average (median) Net Profit of 0.06 (0.05) with values for ROE and Tobin's Q of 0.12 (0.05) and 2.20 (1.76), respectively. Regarding the environmental performance measures, prior to inverting the values, the average (median) values for lnGHG and GHGrev are 13.61 (13.87) and 257.42 (30.56), respectively. Considering the variables measuring green innovation, Citations and Count have average (median) values of 2.64 (1.79) and 2.32 (1.10), respectively. The social and environmental performance scores are at average (median) values of 51.07 (57.37) and 58.61 (60.74), respectively. The financial leverage of the sample companies shows an average (median) of 0.24 (0.22). The values for AssetStr, IBM, SusRep, and GOV correspond to 0.18 (0.13), 78.95 (83.33), 0.61 (1.00), and 60.07 (63.04), respectively.

Insert Table 1 about here

Considering the correlations between the variables used, Table 2 shows that Net Profit has positive and statistically significant correlations with ROE, Tobin's Q, Citations, Count, and IBM at correlations of 0.26, 0.38, 0.16, 0.16, and 0.07, respectively. Net Profit is furthermore negatively related with LEV at a correlation of -0.18. ROE is positively associated with SIZE with a correlation of 0.07. The third financial performance measure, Tobin's Q, is positively related with lnGHG, GHGrev, Citations, and Count with correlations of 0.30, 0.07, 0.10, and 0.07, respectively, as well as negatively related with SIZE, LEV, AssetStr, IBM, and SusRep at -0.31, -0.10, -0.11, -0.06, and -0.10, respectively. Considering the two environmental performance variables, they are slightly positively and significantly related with a correlation of 0.08. lnGHG is negatively correlated with all remaining variables. GHGrev, on the other hand, has a positive correlation with SIZE (0.22) and is negatively related to AssetStr (-0.16). Finally, Count and Citations are both positively correlated with ENV and SIZE at the 1% significance level as well as negatively related with AssetStr at the 1% level. Furthermore, Citations has a significant positive relationship with SOC and IBM at 0.10 and 0.06, respectively. Citations and Count have a strong positive correlation of 0.97.

Insert Table 2 about here

Environmental Performance and Financial Performance

Table 3 presents the results of H1 and investigates the effect of environmental performance on 3-year lagged financial performance of corporate investors. The results show that the only positive and statistically significant effect (1%) is found between lnGHG, as a proxy for environmental performance, and Tobin's Q. This result suggests that firms with lower GHG emissions have a higher long-term financial performance.

Insert Table 3 about here

As the explanatory power of environmental performance in determining 3-year lagged financial performance seems to be limited, as results are only found for Tobin's Q, one- and two-period lagged variables are being considered in a next step in order to evaluate the different impacts of GHG emissions on shorter term financial performance. Table 4 presents the results of H1 considering one- and two-period lagged financial performance as dependent variable. The results indicate that the explanatory power increases with decreasing time lag. Considering the two-period lag case, environmental performance has a positive effect on Tobin's Q for both variables for environmental performance, lnGHG and GHGrev. A positive impact of GHG emissions intensity on one-period lagged Net Profit is furthermore found in addition to the effects on one-period lagged Tobin's Q, as previously found in the two-period scenario. The results therefore suggest that the impact of environmental performance on financial performance of corporate investors increases with decreasing time lag. For corporate investors, this implicates that reducing GHG emissions quickly pays off financially. Therefore, the results confirm H1 and are in line with the findings of Busch and Hoffmann (2011), Iwata and Okada (2011), and Ganda and Milondzo (2018).

Insert Table 4 about here

Green Innovation and Financial Performance

The results of H2 are being shown in Table 5, investigating the impact of corporate investors' green innovation on their financial performance. First, the effect of green innovation on 3-year lagged financial performance is being considered. For both measures of green innovation, Citations and Count, a positive effect on 3-period lagged financial

performance in terms of Net Profit (5%), ROE (10%), and Tobin's Q (1%) can be observed. This result indicates that corporate investors should have a strong financial interest in driving green innovation. Sustainability-linked innovation seems to pay off in the long term.

Insert Table 5 about here

Similar to the previously shown results in Table 4, Table 6 investigates the impact of green innovation on two- as well as one-period lagged financial performance. In the two-period scenario, the effect of green innovation on ROE shows to be insignificant while the effects on Net Profit and Tobin's Q are both statistically significant at the 1% level. Regarding the association between green innovation and one-period lagged financial performance, a positive and statistically significant (1%) effect exists for all three variables, therefore yielding the best results. These findings indicate that, similar to the results previously observed with regards to environmental performance, the positive impact of corporate investors' green innovation on their respective financial performance is stronger in the short term. The effect, however, seems to remain in the long term as well. These results confirm H2 and agree with the findings of Aguilera-Caracuel and Ortiz-de-Mandojana (2013), Przychodzen and Przychodzen (2015), as well as Scarpellini et al. (2019).

Insert Table 6 about here

The Moderating Effect of CSR

Environmental and financial performance. In the following, the moderating effect of CSR on the relationship between environmental and 3-year lagged financial performance is being analyzed to test H3. Table 7 and Table 8 demonstrate the results making use of lnGHG and GHGrev, respectively, as proxies for environmental performance. The results indicate a positive moderating effect of the environmental performance score, as a measure for CSR performance, in determining the effect of environmental performance on Net Profit as a financial performance measure. With regards to the social performance score as well as the remaining financial performance measures, however, no statistically significant moderating effect exists. These results suggest that only the environmental aspect of CSR improves the financial outcomes of reduced GHG emissions while the social CSR aspects are not affecting this relationship. Considering previous literature, these results indicate a similar positive

moderating effect on the relationship between environmental and financial performance, as previously discussed by Atif et al. (2021).

Insert Table 7 about here

Insert Table 8 about here

Green innovation and financial performance. In a next step, the moderating effect of CSR on the relationship between green innovation and financial performance is being analyzed in order to test H4. Table 9 and Table 10 make use of Citations and Count, respectively, to test the hypotheses. The results demonstrate the positive moderating effect of both ENV and SOC, as CSR performance measures, on the relationship between green innovation and financial performance in terms of Net Profit and Tobin's Q. This means that, in contrast to the previous results relating to environmental performance, not only the environmental but also the social performance positively influences the relationship between corporate investors' green innovation and financial performance. Social performance therefore seems to positively affect the performance outcomes of increased green innovation activities. These results are generally in line with the findings of Bocquet et al. (2017) and Zahid et al. (2021), although these authors used slightly different research designs and focused on innovation in general instead of green innovation.

Insert Table 9 about here

Insert Table 10 about here

Additional Analyses and Robustness Checks

Two- and one-period lagged financial performance. Table 11 and Table 12 present the results previously shown in Table 7 and Table 8 using one- and two-period lagged financial performance variables. Table 11 uses lnGHG as a proxy for environmental performance and finds similar outcomes to the results previously presented in Table 7. A positive and statistically significant (5%) moderating effect of CSR is only found with regards

to the environmental performance score and two-period lagged Net Profit. For the one-period lag, no statistically significant result is found. Considering GHGrev as a variable for environmental performance, Table 12 finds an effect on one-period lagged Net Profit (10%) in addition to the effect on two-period lagged Net Profit (5%). Therefore, we can conclude that the moderating effect of CSR on the relationship between environmental and financial performance is stronger for increasing lags in financial performance. The effect seems to be stronger on long-term financial performance.

Insert Table 11 about here

Insert Table 12 about here

Finally, Table 13 and Table 14 consider the moderating effect of CSR performance on the relationship between green innovation and one- as well as two-year lagged financial performance. Similar to the previously discussed results regarding environmental performance, the moderating effect on green innovation is decreasing with lower time lags for financial performance. Table 13 uses Citations as a proxy for green innovation and finds significant effects of the interaction term on both two-year lagged Net Profit (1%) and Tobin's Q (5%), when considering the environmental score, and on Net Profit (1%) for the social score. In the one-period lag scenario, similar results are being found. In this case, only the significance considering the environmental score and its effect on Tobin's Q reduces to the 10% significance level. Table 14, on the other hand, applies Count as a variable for green innovation. Regarding ENV as a proxy for CSR performance, the positive and significant effects of the interaction term on both Net Profit (1%) and Tobin's Q (10%) are being confirmed for two-period lagged financial performance. Regarding SOC as well as both variables in the one-period lag case, however, only the effect on Net Profit remains (all at 1%). In conclusion, the positive moderating effects of CSR on the relationship between green innovation and financial performance decline with shorter time lags. Therefore, it seems that CSR enhances the positive effect of green innovation on corporate investors' financial performance more in the long term.

Insert Table 13 about here

Insert Table 14 about here

CONCLUSIONS

The research findings demonstrate that better environmental performance and more green innovation positively affect CVC firms' financial performance. The empirical results highlight three key points: first, environmental performance contributes significantly to financial performance. Second, green innovation has a positive impact on financial performance. Third, the combined effect of environmental performance and green innovation on the financial performance of U.S. CVC firms is strongly positive. The results indicate that the interplay between the two variables significantly affects corporate financial performance in the sample. Our results find that only the environmental aspect of CSR improves the financial outcomes of reduced GHG emissions while the social CSR aspects are not affecting this relationship. Considering previous literature, these results indicate a similar positive moderating effect on the relationship between environmental and financial performance, as previously discussed by Atif et al. (2021).

Our results have implications for managers, investors and regulators. The negative impact of GHG emissions on firm value indicates that managers need to consider emission reduction as part of their general corporate strategy to improve profitability (Nishitani & Kokubu, 2012b). Corporate managers must consider their environmental performance and the impact of GHG emissions on the financial performance when they implement standards as well as considering their impact on the community to which their firms belong (Asiaei et al., 2022). Green innovation should be considered to be a form of strategic investment (Shuwaikh et al., 2022). This reinforces the argument that firms should include emission reduction as part of their overall corporate strategy to increase profitability (Konadu et al., 2022; Matsumura et al., 2014). To encourage the adoption of green initiatives or practices, we propose recommendations to investors and governments to help firms with the transition.

Our results suggest that green innovation is an important element for corporations to consider in generating significant and sustainable competitive advantage. Making sustainability a fundamental part of a firm's innovation strategy is a good way to address the increasing pressure from stakeholders and society to reduce GHG emissions (Tirkey et al., 2022). As the cost of adopting carbon-reducing measures remains one of the major constraints for many firms (H. Wang et al., 2023), governments and policymakers need to provide the necessary financial incentives to help firms to reduce their GHG emissions. We are

experiencing increasing environmental pollution currently (Usman & Balsalobre-Lorente, 2022), so governmental institutions must ensure that corporate top management implement green practices and promote innovativeness. Regulators should also consider the positive role of corporate strategies in designing future GHG management regulations. In addition, regulators should be aware of the possible impact of environmental regulations on firm valuation (Hassan et al., 2022). This could incentivize heavily polluting firms to design better corporate strategic tools to monitor GHG reduction plans (Chen et al., 2022). Institutional forces should be more proactive in positively impacting on GHG performance. These logical links would contribute to the building of clearer rules and regulations.

In the specific case of CVC investors, societal changes may act as an additional incentive, as stakeholders increasingly demand improved performance levels in other domains other than the purely financial one (C. Weber et al., 2016). This cultural shift will continue to encourage change in corporations as society realizes the urgent need for ecological and social change (Lidskog et al., 2022). Green innovation is undoubtedly one of the key instruments in any strategy to reduce GHG emissions (Lee & Min, 2015). Therefore, further investment in new green technologies are necessary and should be supported appropriately by policymakers. In particular, policymakers should stimulate and incentivize firms to explore and develop green innovation and leverage more capital to pursue green innovation investments (Aguilera-Caracuel & Ortiz-de-Mandojana, 2013; Kraus et al., 2020). This study recommends that policymakers become more proactive in pushing firms to engage in measures to counteract climate change (Appolloni et al., 2022). Recently, firms are facing increasing pressure to be environmentally friendly and "greener" (Sezen & Çankaya, 2013). An additional reason to pursue this is that firms can enhance their financial performance by benefiting from green innovation (Xie et al., 2016). By doing so, firms will become more attractive to investors; and, consequently, will boost their market share and enhance their financial performance. Please refer to the conclusion of the updated revised version of our manuscript on how we investigated the implications of our work.

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Figure 1

Research Framework

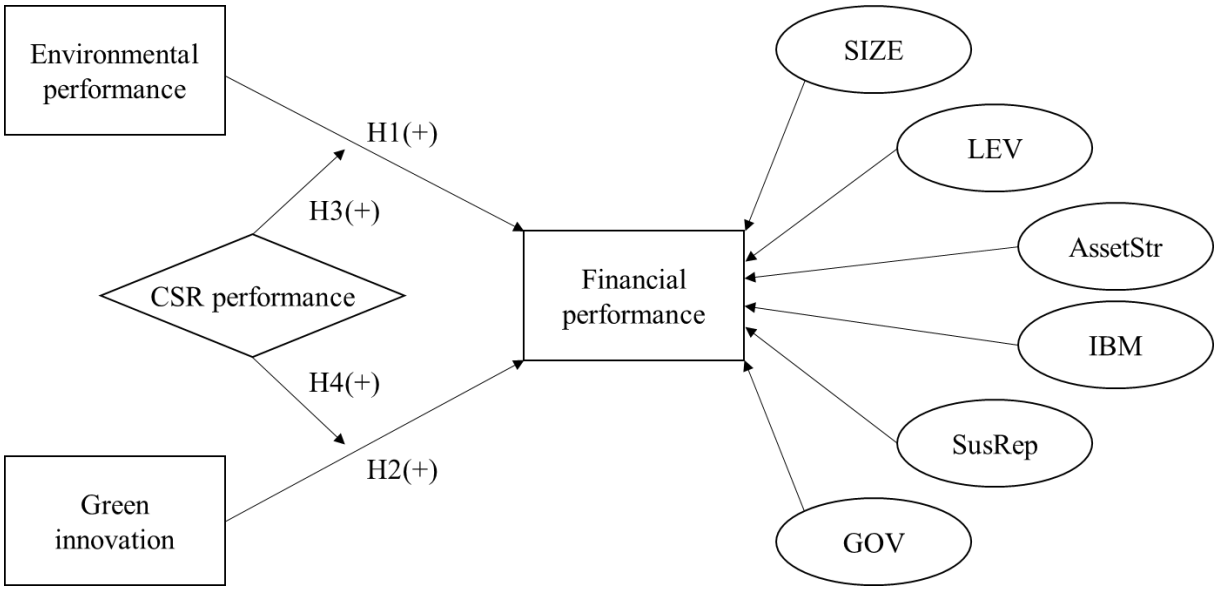
Environmental performance
H1(+)
H3(+)
CSR performance
H4(+)
Green innovation
H2(+)
Financial performance
SIZE
LEV
AssetStr
IBM
SusRep
GOV

Table 1
Summary Statistics

	Mean	Median	Std. Dev.	Min	Max	Skewness	Kurtosis
NetProfit	0.06	0.05	0.09	-1.10	0.77	-2.44	30.00
ROE	0.12	0.05	19.41	-592.71	446.45	-2.15	710.78
TobinQ	2.20	1.76	1.43	0.53	16.25	2.92	16.59
lnGHG	13.61	13.87	1.95	2.12	18.88	-0.19	3.65
GHGrev	257.42	30.56	2922.39	0.04	83600.41	25.70	688.08
Citations	2.64	1.79	2.85	0.00	10.33	0.60	2.04
Count	2.32	1.10	2.66	0.00	10.23	0.79	2.39
ENV	51.07	57.37	29.08	0.00	98.55	-0.42	1.97
SOC	58.61	60.74	22.07	3.40	97.92	-0.31	2.26
SIZE	10.09	10.15	1.69	2.77	14.71	-0.19	3.64
LEV	0.24	0.22	0.17	0.00	0.79	0.66	3.06
AssetStr	0.18	0.13	0.17	0.00	0.82	1.59	5.15
IBM	78.95	83.33	17.07	0.00	100.00	-2.51	10.53
SusRep	0.61	1.00	0.49	0.00	1.00	-0.47	1.22
GOV	60.07	63.04	21.09	0.71	98.53	-0.36	2.23

Note: GHG emissions variables are being shown prior to inversing.

Table 2
Correlation Matrix

	NetProfit	ROE	TobinQ	lnGHG	GHGrev	Citations	Count	ENV	SOC	SIZE	LEV	AssetStr	IBM	SusRep	GOV
NetProfit	1														
ROE	0.26***	1													
TobinQ	0.38***	0.01	1												
lnGHG	-0.04	0	0.30***	1											
GHGrev	0.05	0.03	0.07*	0.08**	1										
Citations	0.16***	0.03	0.10***	-0.11***	-0.02	1									
Count	0.16***	0.03	0.07*	-0.14***	-0.03	0.97***	1								
ENV	0.05	0.02	0.03	-0.26***	0.04	0.18***	0.12***	1							
SOC	0.05	-0.02	0.02	-0.22***	0.06	0.10***	0.04	0.61***	1						
SIZE	-0.05	0.07*	-0.31***	-0.50***	0.22***	0.14***	0.13***	0.33***	0.31***	1					
LEV	-0.18***	-0.04	-0.10***	-0.13***	-0.05	0.03	-0.02	0.10***	0.17***	0.07**	1				
AssetStr	0.03	0	-0.11***	-0.67***	-0.16***	-0.14***	-0.11***	0.01	0	0.01	0.05	1			
IBM	0.07**	-0.01	-0.06*	-0.11***	-0.04	0.06*	0.04	0.10***	0.11***	0.12***	-0.03	0.06*	1		
SusRep	-0.02	-0.01	-0.10***	-0.11***	-0.02	0.01	-0.05	0.42***	0.42***	0.17***	0.13***	0	0.22***	1	
GOV	0.07*	0.05	-0.04	-0.13***	0.01	0	0	0.26***	0.26***	0.13***	-0.15***	0.06*	0.33***	0.26***	1

Note: All variables are being shown without time lags.

Table 3

Environmental and Financial Performance (t+3)

	Panel A: lnGHG			*Panel B: GHGrev*		
	(1)	(2)	(3)	(4)	(5)	(6)
	NetProfit	ROE	Tobin's Q	NetProfit	ROE	Tobin's Q
Variables	(t+3)	(t+3)	(t+3)	(t+3)	(t+3)	(t+3)
ENVPER	0.00	0.34	0.13***	0.00	-0.00	0.00
	(0.00)	(0.80)	(0.04)	(0.00)	(0.00)	(0.00)
SIZE	-0.01**	2.08**	-0.29***	-0.01***	1.80***	-0.41***
	(0.00)	(0.96)	(0.05)	(0.00)	(0.63)	(0.03)
LEV	-0.07***	7.90	-0.60**	-0.07***	7.77	-0.59**
	(0.02)	(5.17)	(0.27)	(0.02)	(5.18)	(0.27)
AssetStr	0.03	0.05	-0.46	0.03	-2.67	-1.17***
	(0.03)	(7.67)	(0.39)	(0.02)	(5.89)	(0.30)
IBM	0.00	-0.07	-0.00	0.00	-0.06	-0.00
	(0.00)	(0.08)	(0.00)	(0.00)	(0.08)	(0.00)
SusRep	-0.02**	-1.75	-0.28**	-0.02**	-1.90	-0.29***
	(0.01)	(2.13)	(0.11)	(0.01)	(2.14)	(0.11)
GOV	0.00	0.02	0.01***	0.00	0.02	0.01***
	(0.00)	(0.04)	(0.00)	(0.00)	(0.04)	(0.00)
Constant	0.17***	-13.57	6.73***	0.17***	-14.93*	6.55***
	(0.03)	(9.01)	(0.46)	(0.03)	(8.94)	(0.46)
Year FE	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES
Observations	1,032	908	908	1,032	908	908
R-squared	0.17	0.10	0.43	0.17	0.09	0.42

Standard errors in parentheses

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

Table 4

Environmental and Financial Performance (t+2, t+1)

	Panel A: lnGHG			*Panel B: GHGrev*			*Panel C: lnGHG*			*Panel D: GHGrev*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	NetProfit	ROE	Tobin's Q	NetProfit	ROE	Tobin's Q	NetProfit	ROE	Tobin's Q	NetProfit	ROE	Tobin's Q
Variables	(t+2)	(t+2)	(t+2)	(t+2)	(t+2)	(t+2)	(t+1)	(t+1)	(t+1)	(t+1)	(t+1)	(t+1)
ENVPER	0.00	0.08	0.17***	0.00	0.00	0.00*	0.00	0.09	0.20***	0.00***	-0.00	0.00***
	(0.00)	(0.08)	(0.04)	(0.00)	(0.00)	(0.00)	(0.00)	(0.06)	(0.04)	(0.00)	(0.00)	(0.00)
SIZE	-0.01**	0.11	-0.22***	-0.01***	0.04	-0.39***	-0.01*	0.23***	-0.16***	-0.01***	0.16***	-0.37***
	(0.00)	(0.10)	(0.05)	(0.00)	(0.07)	(0.03)	(0.00)	(0.07)	(0.04)	(0.00)	(0.05)	(0.03)
LEV	-0.06***	0.05	-0.63**	-0.06***	0.04	-0.63**	-0.05***	0.15	-0.78***	-0.05***	0.12	-0.76***
	(0.02)	(0.55)	(0.25)	(0.02)	(0.55)	(0.25)	(0.02)	(0.38)	(0.24)	(0.02)	(0.38)	(0.25)
AssetStr	0.05*	0.39	-0.04	0.04**	-0.06	-0.99***	0.03	0.31	0.08	0.04**	-0.33	-1.08***
	(0.03)	(0.81)	(0.37)	(0.02)	(0.63)	(0.29)	(0.02)	(0.56)	(0.36)	(0.02)	(0.42)	(0.27)
IBM	0.00*	-0.01	0.00	0.00*	-0.01	-0.00	0.00***	-0.01	0.00	0.00***	-0.01	0.00
	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)
SusRep	-0.02***	0.11	-0.26**	-0.02***	0.10	-0.28**	-0.02***	-0.16	-0.14	-0.02***	-0.19	-0.15
	(0.01)	(0.24)	(0.11)	(0.01)	(0.24)	(0.11)	(0.01)	(0.17)	(0.11)	(0.01)	(0.17)	(0.11)
GOV	0.00**	0.00	0.01***	0.00**	0.00	0.01***	0.00*	0.00	0.01***	0.00*	0.00	0.01***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Constant	0.15***	0.34	6.44***	0.15***	0.21	6.19***	0.11***	-0.75	6.34***	0.12***	-1.03	6.11***
	(0.03)	(0.96)	(0.44)	(0.03)	(0.96)	(0.44)	(0.03)	(0.67)	(0.43)	(0.03)	(0.66)	(0.42)
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,142	1,005	1,005	1,142	1,005	1,005	1,256	1,107	1,107	1,256	1,107	1,107
R-squared	0.17	0.03	0.41	0.17	0.03	0.40	0.16	0.08	0.39	0.16	0.07	0.38

Standard errors in parentheses

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

Table 5

Green Innovation and Financial Performance (t+3)

	Panel A: Citations			*Panel B: Count*		
	(1)	(2)	(3)	(4)	(5)	(6)
	NetProfit	ROE	Tobin's Q	NetProfit	ROE	Tobin's Q
Variables	(t+3)	(t+3)	(t+3)	(t+3)	(t+3)	(t+3)
INNOV	0.00**	0.37*	0.06***	0.00**	0.40*	0.06***
	(0.00)	(0.21)	(0.01)	(0.00)	(0.22)	(0.01)
SIZE	-0.01***	0.73**	-0.37***	-0.01***	0.72**	-0.37***
	(0.00)	(0.37)	(0.02)	(0.00)	(0.37)	(0.02)
LEV	-0.10***	3.78	-0.55***	-0.10***	3.83	-0.55***
	(0.02)	(3.18)	(0.21)	(0.02)	(3.18)	(0.21)
AssetStr	0.06**	-0.01	-1.02***	0.06**	-0.07	-1.05***
	(0.02)	(3.62)	(0.24)	(0.02)	(3.61)	(0.24)
IBM	-0.00	-0.02	-0.00	-0.00	-0.02	-0.00
	(0.00)	(0.04)	(0.00)	(0.00)	(0.04)	(0.00)
SusRep	-0.02**	-2.24*	-0.09	-0.02**	-2.22*	-0.09
	(0.01)	(1.23)	(0.08)	(0.01)	(1.23)	(0.08)
GOV	0.00*	-0.00	0.01***	0.00*	-0.00	0.01***
	(0.00)	(0.02)	(0.00)	(0.00)	(0.02)	(0.00)
Constant	0.23***	-6.76	5.71***	0.23***	-6.59	5.72***
	(0.03)	(4.17)	(0.27)	(0.03)	(4.18)	(0.28)
Year FE	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES
Observations	1,589	1,441	1,441	1,589	1,441	1,441
R-squared	0.15	0.07	0.40	0.15	0.07	0.40

Standard errors in parentheses

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

Table 6

Green Innovation and Financial Performance (t+2, t+1)

	Panel A: Citations			*Panel B: Count*			*Panel C: Citations*			*Panel D: Count*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	NetProfit	ROE	Tobin's Q	NetProfit	ROE	Tobin's Q	NetProfit	ROE	Tobin's Q	NetProfit	ROE	Tobin's Q
Variables	(t+2)	(t+2)	(t+2)	(t+2)	(t+2)	(t+2)	(t+1)	(t+1)	(t+1)	(t+1)	(t+1)	(t+1)
INNOV	0.00***	0.03	0.07***	0.00***	0.03	0.06***	0.00***	0.05***	0.06***	0.00***	0.05***	0.06***
	(0.00)	(0.02)	(0.01)	(0.00)	(0.02)	(0.01)	(0.00)	(0.02)	(0.01)	(0.00)	(0.02)	(0.01)
SIZE	-0.01***	-0.00	-0.37***	-0.01***	-0.00	-0.37***	-0.01***	0.06**	-0.35***	-0.01***	0.06**	-0.35***
	(0.00)	(0.04)	(0.02)	(0.00)	(0.04)	(0.02)	(0.00)	(0.03)	(0.02)	(0.00)	(0.03)	(0.02)
LEV	-0.10***	-0.09	-0.68***	-0.10***	-0.09	-0.67***	-0.09***	-0.05	-0.95***	-0.09***	-0.04	-0.94***
	(0.02)	(0.36)	(0.20)	(0.02)	(0.36)	(0.20)	(0.01)	(0.26)	(0.21)	(0.01)	(0.26)	(0.21)
AssetStr	0.06***	-0.08	-1.02***	0.06***	-0.09	-1.05***	0.05***	-0.16	-1.24***	0.05***	-0.17	-1.28***
	(0.02)	(0.40)	(0.23)	(0.02)	(0.40)	(0.23)	(0.02)	(0.29)	(0.23)	(0.02)	(0.29)	(0.23)
IBM	-0.00	-0.00	-0.00*	-0.00	-0.00	-0.00*	0.00**	-0.00	-0.00	0.00**	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
SusRep	-0.01*	0.06	-0.06	-0.01*	0.06	-0.05	-0.01*	-0.21**	0.05	-0.01*	-0.21**	0.06
	(0.01)	(0.14)	(0.08)	(0.01)	(0.14)	(0.08)	(0.01)	(0.10)	(0.08)	(0.01)	(0.10)	(0.08)
GOV	0.00**	-0.00	0.01***	0.00**	-0.00	0.01***	0.00***	0.00	0.01***	0.00***	0.00	0.01***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Constant	0.21***	0.08	5.91***	0.21***	0.09	5.92***	0.12***	-0.53	5.80***	0.12***	-0.52	5.81***
	(0.02)	(0.48)	(0.27)	(0.02)	(0.48)	(0.28)	(0.02)	(0.34)	(0.28)	(0.02)	(0.35)	(0.28)
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,717	1,556	1,556	1,717	1,556	1,556	1,845	1,672	1,672	1,845	1,672	1,672
R-squared	0.16	0.02	0.39	0.16	0.02	0.39	0.15	0.06	0.37	0.15	0.06	0.37

Standard errors in parentheses

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

Table 7

Environmental Performance (lnGHG), CSR, and Financial Performance (t+3)

	lnGHG					
	Panel A: ENV			*Panel B: SOC*		
	(1)	(2)	(3)	(4)	(5)	(6)
	NetProfit	ROE	Tobin's Q	NetProfit	ROE	Tobin's Q
Variables	(t+3)	(t+3)	(t+3)	(t+3)	(t+3)	(t+3)
ENVPER	-0.02***	0.82	0.07	-0.00	1.20	0.16**
	(0.01)	(1.31)	(0.07)	(0.01)	(1.46)	(0.07)
CSR	0.00***	-0.06	0.03**	0.00	-0.16	0.00
	(0.00)	(0.25)	(0.01)	(0.00)	(0.30)	(0.02)
ENVPER*CSR	0.00***	-0.01	0.00	0.00	-0.01	-0.00
	(0.00)	(0.02)	(0.00)	(0.00)	(0.02)	(0.00)
SIZE	-0.01**	1.84*	-0.31***	-0.01**	1.92**	-0.31***
	(0.00)	(1.00)	(0.05)	(0.00)	(0.98)	(0.05)
LEV	-0.08***	8.16	-0.61**	-0.08***	7.78	-0.71***
	(0.02)	(5.19)	(0.26)	(0.02)	(5.25)	(0.27)
AssetStr	0.05	-0.28	-0.30	0.03	-1.09	-0.49
	(0.03)	(7.82)	(0.40)	(0.03)	(7.86)	(0.40)
IBM	0.00	-0.06	0.00	0.00	-0.06	-0.00
	(0.00)	(0.08)	(0.00)	(0.00)	(0.08)	(0.00)
SusRep	-0.03***	-1.84	-0.39***	-0.02***	-1.94	-0.37***
	(0.01)	(2.22)	(0.11)	(0.01)	(2.22)	(0.11)
GOV	0.00	0.01	0.01***	0.00	0.01	0.01***
	(0.00)	(0.04)	(0.00)	(0.00)	(0.04)	(0.00)
Constant	-0.05	-7.04	5.69***	0.16**	-2.24	6.98***
	(0.07)	(17.99)	(0.91)	(0.08)	(19.74)	(1.00)
Year FE	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES
Observations	1,032	908	908	1,032	908	908
R-squared	0.19	0.10	0.44	0.18	0.10	0.43

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8

Environmental Performance (GHGrev), CSR, and Financial Performance (t+3)

	GHGrev					
	Panel A: ENV			*Panel B: SOC*		
	(1)	(2)	(3)	(4)	(5)	(6)
	NetProfit	ROE	Tobin's Q	NetProfit	ROE	Tobin's Q
Variables	(t+3)	(t+3)	(t+3)	(t+3)	(t+3)	(t+3)
ENVPER	-0.00**	-0.00	-0.00	-0.00	0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)
CSR	0.00***	0.04	0.01***	0.00**	0.03	0.01***
	(0.00)	(0.04)	(0.00)	(0.00)	(0.05)	(0.00)
ENVPER*CSR	0.00***	0.00	0.00	0.00	-0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
SIZE	-0.01***	1.61**	-0.45***	-0.01***	1.69***	-0.44***
	(0.00)	(0.66)	(0.03)	(0.00)	(0.65)	(0.03)
LEV	-0.07***	7.79	-0.60**	-0.08***	7.33	-0.71***
	(0.02)	(5.19)	(0.26)	(0.02)	(5.25)	(0.27)
AssetStr	0.03	-2.64	-1.14***	0.04	-3.41	-1.23***
	(0.02)	(5.95)	(0.30)	(0.03)	(6.23)	(0.32)
IBM	0.00	-0.06	-0.00	0.00	-0.06	-0.00
	(0.00)	(0.08)	(0.00)	(0.00)	(0.08)	(0.00)
SusRep	-0.02***	-2.27	-0.37***	-0.02***	-2.30	-0.38***
	(0.01)	(2.17)	(0.11)	(0.01)	(2.21)	(0.11)
GOV	0.00	0.01	0.01***	0.00	0.01	0.01***
	(0.00)	(0.04)	(0.00)	(0.00)	(0.04)	(0.00)
Constant	0.17***	-15.19*	6.48***	0.17***	-15.22*	6.47***
	(0.03)	(8.96)	(0.46)	(0.03)	(8.96)	(0.46)
Year FE	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES
Observations	1,032	908	908	1,032	908	908
R-squared	0.18	0.10	0.43	0.18	0.10	0.43

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 9

Green Innovation (Citations), CSR, and Financial Performance (t+3)

	Citations					
	Panel A: ENV			*Panel B: SOC*		
	(1)	(2)	(3)	(4)	(5)	(6)
	NetProfit	ROE	Tobin's Q	NetProfit	ROE	Tobin's Q
Variables	(t+3)	(t+3)	(t+3)	(t+3)	(t+3)	(t+3)
INNOV	-0.00*	0.09	0.01	-0.01**	-0.03	0.00
	(0.00)	(0.37)	(0.02)	(0.00)	(0.49)	(0.03)
CSR	-0.00	-0.06	0.01***	-0.00	0.00	0.01**
	(0.00)	(0.03)	(0.00)	(0.00)	(0.03)	(0.00)
INNOV*CSR	0.00***	0.00	0.00**	0.00***	0.01	0.00**
	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)
SIZE	-0.02***	0.67*	-0.41***	-0.02***	0.65*	-0.40***
	(0.00)	(0.39)	(0.03)	(0.00)	(0.38)	(0.02)
LEV	-0.10***	3.77	-0.54***	-0.11***	3.30	-0.65***
	(0.02)	(3.18)	(0.21)	(0.02)	(3.21)	(0.21)
AssetStr	0.05**	-0.20	-1.15***	0.06**	-0.17	-1.08***
	(0.02)	(3.63)	(0.24)	(0.02)	(3.62)	(0.24)
IBM	0.00	-0.01	-0.00	-0.00	-0.01	-0.00
	(0.00)	(0.04)	(0.00)	(0.00)	(0.04)	(0.00)
SusRep	-0.02**	-2.32*	-0.21**	-0.02***	-2.47*	-0.19**
	(0.01)	(1.28)	(0.08)	(0.01)	(1.28)	(0.08)
GOV	0.00	-0.00	0.01***	0.00	-0.01	0.01***
	(0.00)	(0.02)	(0.00)	(0.00)	(0.02)	(0.00)
Constant	0.25***	-6.05	6.05***	0.26***	-5.92	5.86***
	(0.03)	(4.28)	(0.28)	(0.03)	(4.26)	(0.28)
Year FE	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES
Observations	1,589	1,441	1,441	1,589	1,441	1,441
R-squared	0.15	0.07	0.41	0.16	0.07	0.41

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 10

Green Innovation (Count), CSR, and Financial Performance (t+3)

	Count					
	Panel A: ENV			*Panel B: SOC*		
	(1)	(2)	(3)	(4)	(5)	(6)
	NetProfit	ROE	Tobin's Q	NetProfit	ROE	Tobin's Q
Variables	(t+3)	(t+3)	(t+3)	(t+3)	(t+3)	(t+3)
INNOV	-0.00*	0.09	0.01	-0.01**	-0.06	0.01
	(0.00)	(0.37)	(0.02)	(0.00)	(0.50)	(0.03)
CSR	-0.00	-0.01	0.01***	-0.00	0.00	0.01***
	(0.00)	(0.03)	(0.00)	(0.00)	(0.03)	(0.00)
INNOV*CSR	0.00***	0.01	0.00*	0.00***	0.01	0.00*
	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)
SIZE	-0.02***	0.66*	-0.41***	-0.02***	0.64*	-0.40***
	(0.00)	(0.39)	(0.03)	(0.00)	(0.38)	(0.02)
LEV	-0.10***	3.81	-0.53**	-0.11***	3.32	-0.64***
	(0.02)	(3.18)	(0.21)	(0.02)	(3.21)	(0.21)
AssetStr	0.05**	-0.24	-1.17***	0.05**	-0.22	-1.10***
	(0.02)	(3.62)	(0.24)	(0.02)	(3.61)	(0.24)
IBM	0.00	-0.01	-0.00	-0.00	-0.01	-0.00
	(0.00)	(0.04)	(0.00)	(0.00)	(0.04)	(0.00)
SusRep	-0.02**	-2.28*	-0.20**	-0.02***	-2.44*	-0.18**
	(0.01)	(1.28)	(0.08)	(0.01)	(1.28)	(0.08)
GOV	0.00	-0.00	0.01***	0.00	-0.01	0.01***
	(0.00)	(0.02)	(0.00)	(0.00)	(0.02)	(0.00)
Constant	0.25***	-5.89	6.05***	0.26***	-5.68	5.85***
	(0.03)	(4.28)	(0.28)	(0.03)	(4.26)	(0.28)
Year FE	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES
Observations	1,589	1,441	1,441	1,589	1,441	1,441
R-squared	0.15	0.07	0.41	0.15	0.07	0.41

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 11

Environmental Performance (lnGHG), CSR, and Financial Performance (t+2, t+1)

	lnGHG											
	Panel A: ENV			*Panel B: SOC*			*Panel C: ENV*			*Panel D: SOC*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	NetProfit	ROE	Tobin's Q	NetProfit	ROE	Tobin's Q	NetProfit	ROE	Tobin's Q	NetProfit	ROE	Tobin's Q
Variables	(t+2)	(t+2)	(t+2)	(t+2)	(t+2)	(t+2)	(t+1)	(t+1)	(t+1)	(t+1)	(t+1)	(t+1)
ENVPER	-0.01	0.08	0.10	0.00	0.07	0.13*	-0.00	0.14	0.14**	0.00	0.10	0.12*
	(0.00)	(0.14)	(0.06)	(0.01)	(0.16)	(0.07)	(0.00)	(0.10)	(0.06)	(0.00)	(0.11)	(0.07)
CSR	0.00**	-0.00	0.03**	0.00	-0.00	0.020	0.00	-0.01	0.03**	-0.00	-0.00	0.03**
	(0.00)	(0.03)	(0.01)	(0.00)	(0.03)	(0.01)	(0.00)	(0.02)	(0.01)	(0.00)	(0.02)	(0.01)
ENVPER*CSR	0.00**	-0.00	0.00	-0.00	0.00	0.00	0.00	-0.00	0.00	-0.00	-0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
SIZE	-0.01**	0.11	-0.25***	-0.01**	0.11	-0.24***	-0.00*	0.21***	-0.19***	-0.01**	0.23***	-0.17***
	(0.00)	(0.11)	(0.05)	(0.00)	(0.10)	(0.05)	(0.00)	(0.07)	(0.04)	(0.00)	(0.07)	(0.04)
LEV	-0.07***	0.05	-0.65**	-0.07***	0.06	-0.77***	-0.06***	0.18	-0.80***	-0.06***	0.17	-0.92***
	(0.02)	(0.56)	(0.25)	(0.02)	(0.56)	(0.25)	(0.02)	(0.38)	(0.24)	(0.02)	(0.39)	(0.24)
AssetStr	0.06**	0.38	0.15	0.05*	0.39	0.00	0.04	0.27	0.26	0.03	0.29	0.19
	(0.03)	(0.83)	(0.37)	(0.03)	(0.83)	(0.38)	(0.02)	(0.57)	(0.36)	(0.02)	(0.57)	(0.36)
IBM	0.00*	-0.01	0.00	0.00	-0.01	0.00	0.00***	-0.01	0.00	0.00***	-0.01	0.00
	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)
SusRep	-0.03***	0.11	-0.37***	-0.03***	0.12	-0.37***	-0.02***	-0.16	-0.25**	-0.02***	-0.15	-0.26**
	(0.01)	(0.24)	(0.11)	(0.01)	(0.24)	(0.11)	(0.01)	(0.17)	(0.11)	(0.01)	(0.17)	(0.11)
GOV	0.00	0.00	0.01***	0.00*	0.00	0.01***	0.00	0.00	0.00**	0.00	0.00	0.01***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Constant	0.04	0.41	5.28***	0.17**	0.30	5.72***	0.04	-0.10	5.33***	0.14**	-0.55	5.00***
	(0.06)	(1.93)	(0.87)	(0.07)	(2.12)	(0.96)	(0.06)	(1.32)	(0.84)	(0.06)	(1.48)	(0.93)
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,142	1,005	1,005	1,142	1,005	1,005	1,256	1,107	1,107	1,256	1,107	1,107
R-squared	0.17	0.03	0.43	0.17	0.03	0.42	0.16	0.08	0.41	0.16	0.08	0.40

Standard errors in parentheses

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

Table 12

Environmental Performance (GHGrev), CSR, and Financial Performance (t+2, t+1)

	GHGrev											
	Panel A: ENV			*Panel B: SOC*			*Panel C: ENV*			*Panel D: SOC*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	NetProfit	ROE	Tobin's Q	NetProfit	ROE	Tobin's Q	NetProfit	ROE	Tobin's Q	NetProfit	ROE	Tobin's Q
Variables	(t+2)	(t+2)	(t+2)	(t+2)	(t+2)	(t+2)	(t+1)	(t+1)	(t+1)	(t+1)	(t+1)	(t+1)
ENVPER	-0.00*	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
CSR	0.00	-0.00	0.01***	0.00**	-0.00	0.01***	0.00	0.00	0.01***	0.00*	-0.00	0.01***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ENVPER*CSR	0.00**	0.00	0.00	0.00	0.00	0.00	0.00*	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
SIZE	-0.01***	0.04	-0.43***	-0.01***	0.04	-0.41***	-0.01***	0.15***	-0.42***	-0.01***	0.16***	-0.40***
	(0.00)	(0.07)	(0.03)	(0.00)	(0.07)	(0.03)	(0.00)	(0.05)	(0.03)	(0.00)	(0.05)	(0.03)
LEV	-0.06***	0.04	-0.63**	-0.07***	0.05	-0.75***	-0.05***	0.12	-0.75***	-0.06***	0.12	-0.87***
	(0.02)	(0.56)	(0.25)	(0.02)	(0.56)	(0.26)	(0.02)	(0.38)	(0.24)	(0.02)	(0.39)	(0.25)
AssetStr	0.05**	-0.03	-0.95***	0.04**	0.04	-1.01***	0.04**	-0.31	-1.02***	0.04**	-0.24	-1.09***
	(0.02)	(0.64)	(0.29)	(0.02)	(0.67)	(0.31)	(0.02)	(0.43)	(0.27)	(0.02)	(0.45)	(0.29)
IBM	0.00*	-0.01	0.00	0.00	-0.01	0.00	0.00***	-0.01	0.00	0.00**	-0.01	0.00
	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)
SusRep	-0.02***	0.10	-0.36***	-0.02***	0.11	-0.38***	-0.02***	-0.21	-0.24**	-0.02***	-0.18	-0.25**
	(0.01)	(0.24)	(0.11)	(0.01)	(0.24)	(0.11)	(0.01)	(0.17)	(0.11)	(0.01)	(0.17)	(0.11)
GOV	0.00*	0.00	0.01***	0.00*	0.00	0.01***	0.00*	0.00	0.00**	0.00	0.00	0.00**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Constant	0.15***	0.20	6.14***	0.15***	0.22	6.11***	0.12***	-1.03	6.12***	0.12***	-1.03	6.04***
	(0.03)	(0.96)	(0.44)	(0.03)	(0.96)	(0.44)	(0.03)	(0.66)	(0.42)	(0.03)	(0.66)	(0.42)
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,142	1,005	1,005	1,142	1,005	1,005	1,256	1,107	1,107	1,256	1,107	1,107
R-squared	0.18	0.03	0.41	0.18	0.03	0.41	0.17	0.07	0.40	0.17	0.07	0.39

Standard errors in parentheses

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

Table 13

Green Innovation (Citations), CSR, and Financial Performance (t+2, t+1)

	Citations											
	Panel A: ENV			*Panel B: SOC*			*Panel C: ENV*			*Panel D: SOC*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	NetProfit	ROE	Tobin's Q	NetProfit	ROE	Tobin's Q	NetProfit	ROE	Tobin's Q	NetProfit	ROE	Tobin's Q
Variables	(t+2)	(t+2)	(t+2)	(t+2)	(t+2)	(t+2)	(t+1)	(t+1)	(t+1)	(t+1)	(t+1)	(t+1)
INNOV	-0.00	0.04	0.07	-0.00	0.01	0.03	-0.00	0.04	0.01	-0.00	0.00	0.04
	(0.00)	(0.04)	(0.02)	(0.00)	(0.06)	(0.03)	(0.00)	(0.03)	(0.03)	(0.00)	(0.04)	(0.03)
CSR	-0.00	-0.00	0.01***	0.00	-0.00	0.01***	-0.00	-0.00	0.01***	-0.00	-0.00	0.01***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
INNOV*CSR	0.00***	-0.00	0.00**	0.00***	0.00	0.00	0.00***	0.00	0.00*	0.00***	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
SIZE	-0.01***	0.00	-0.42***	-0.01***	0.01	-0.41***	-0.01***	0.06**	-0.40***	-0.01***	0.07**	-0.39***
	(0.00)	(0.04)	(0.02)	(0.00)	(0.04)	(0.02)	(0.00)	(0.03)	(0.02)	(0.00)	(0.03)	(0.02)
LEV	-0.10***	-0.10	-0.67***	-0.11***	-0.09	-0.77***	-0.09***	-0.05	-0.95***	-0.10***	-0.07	-1.02***
	(0.02)	(0.36)	(0.20)	(0.02)	(0.36)	(0.20)	(0.01)	(0.26)	(0.21)	(0.01)	(0.26)	(0.21)
AssetStr	0.05***	-0.06	-1.14***	0.06***	-0.06	-1.08***	0.05***	-0.16	-1.35***	0.05***	-0.15	-1.31***
	(0.02)	(0.40)	(0.23)	(0.02)	(0.40)	(0.23)	(0.02)	(0.29)	(0.23)	(0.02)	(0.29)	(0.23)
IBM	0.00	-0.00	-0.00	-0.00	-0.00	-0.00	0.00***	-0.00	-0.00	0.00**	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
SusRep	-0.01*	0.07	-0.18**	-0.02**	0.09	-0.16**	-0.01*	-0.21*	-0.06	-0.01**	-0.18*	-0.07
	(0.01)	(0.15)	(0.08)	(0.01)	(0.14)	(0.08)	(0.01)	(0.11)	(0.09)	(0.01)	(0.11)	(0.08)
GOV	0.00	0.00	0.01***	0.00	0.00	0.01***	0.00**	0.00	0.01***	0.00**	0.00	0.01***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Constant	0.22***	0.03	6.29***	0.23***	0.10	6.03***	0.13***	-0.52	6.10***	0.14***	-0.45	5.85***
	(0.02)	(0.49)	(0.28)	(0.02)	(0.49)	(0.28)	(0.02)	(0.35)	(0.28)	(0.02)	(0.35)	(0.28)
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,717	1,556	1,556	1,717	1,556	1,556	1,845	1,672	1,672	1,845	1,672	1,672
R-squared	0.17	0.02	0.41	0.17	0.02	0.40	0.16	0.06	0.38	0.16	0.06	0.38

Standard errors in parentheses

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

Table 14

Green Innovation (Count), CSR, and Financial Performance (t+2, t+1)

	Count											
	Panel A: ENV			*Panel B: SOC*			*Panel C: ENV*			*Panel D: SOC*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	NetProfit	ROE	Tobin's Q	NetProfit	ROE	Tobin's Q	NetProfit	ROE	Tobin's Q	NetProfit	ROE	Tobin's Q
Variables	(t+2)	(t+2)	(t+2)	(t+2)	(t+2)	(t+2)	(t+1)	(t+1)	(t+1)	(t+1)	(t+1)	(t+1)
INNOV	-0.00	0.03	0.01	-0.00	0.00	0.04	-0.00	0.04	0.02	-0.00	-0.01	0.06*
	(0.00)	(0.04)	(0.02)	(0.00)	(0.06)	(0.03)	(0.00)	(0.03)	(0.03)	(0.00)	(0.04)	(0.03)
CSR	-0.00	-0.00	0.01***	0.00	-0.00	0.01***	-0.00	-0.00	0.01***	-0.00	-0.00	0.01***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
INNOV*CSR	0.00***	-0.00	0.00*	0.00***	0.00	0.00	0.00***	0.00	0.00	0.00***	0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
SIZE	-0.01***	0.00	-0.42***	-0.01***	0.00	-0.40***	-0.01***	0.06**	-0.39***	-0.01***	0.07**	-0.38***
	(0.00)	(0.04)	(0.02)	(0.00)	(0.04)	(0.02)	(0.00)	(0.03)	(0.02)	(0.00)	(0.03)	(0.02)
LEV	-0.10***	-0.09	-0.66***	-0.11***	-0.09	-0.74***	-0.09***	-0.04	-0.94***	-0.10***	-0.06	-1.00***
	(0.02)	(0.36)	(0.20)	(0.02)	(0.36)	(0.20)	(0.01)	(0.26)	(0.21)	(0.01)	(0.26)	(0.21)
AssetStr	0.05***	-0.07	-1.17***	0.05***	-0.07	-1.11***	0.04***	-0.18	-1.38***	0.05***	-0.17	-1.34***
	(0.02)	(0.40)	(0.23)	(0.02)	(0.40)	(0.23)	(0.02)	(0.29)	(0.23)	(0.02)	(0.29)	(0.23)
IBM	0.00	-0.00	-0.00	-0.00	-0.00	-0.00*	0.00***	-0.00	-0.00	0.00**	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
SusRep	-0.01*	0.07	-0.18**	-0.02**	0.09	-0.16*	-0.01*	-0.20*	-0.06	-0.01**	-0.17	-0.07
	(0.01)	(0.15)	(0.08)	(0.01)	(0.14)	(0.08)	(0.01)	(0.11)	(0.09)	(0.01)	(0.11)	(0.08)
GOV	0.00	0.00	0.01***	0.00	0.00	0.01***	0.00**	0.00	0.01***	0.00**	0.00	0.01***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Constant	0.22***	0.05	6.27***	0.23***	0.12	6.00***	0.13***	-0.49	6.08***	0.14***	-0.42	5.82***
	(0.02)	(0.49)	(0.28)	(0.02)	(0.49)	(0.28)	(0.02)	(0.35)	(0.28)	(0.02)	(0.35)	(0.28)
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	1,717	1,556	1,556	1,717	1,556	1,556	1,845	1,672	1,672	1,845	1,672	1,672
R-squared	0.17	0.02	0.41	0.17	0.02	0.40	0.16	0.06	0.37	0.16	0.06	0.38

Standard errors in parentheses

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

Appendix A

Variable Descriptions

Panel A: Dependent, independent, and moderating variables		
FINPER	Financial performance	
NetProfit	Net profit	The ratio of (lagged) net income or loss to total assets
ROE	Return on equity	The (lagged) ratio of net profit to the market value of equity
TobinQ	Tobin's Q	The (lagged) sum of the market value of equity and the book value of debt divided by total assets
ENVPER	Environmental performance	
lnGHG	ln of GHG emissions	The natural logarithm of GHG emissions * (-1)
GHGrev	GHG intensity	The ratio of GHG emissions scaled by revenue * (-1)
INNOV	Green innovation	
Count	Green patent count	The natural logarithm of one plus the green patent count
Citations	Green patent citation count	The natural logarithm of one plus the green patent citation count, adjusted for truncation bias
CSR	Corporate social responsibility	
ENV	Environmental score	The environmental performance score reported by the Refinitiv Eikon database
SOC	Social score	The social performance score reported by the Refinitiv Eikon database
Panel B: Firm characteristics		
LEV	Financial leverage	The ratio of total debt to total assets
SIZE	Firm size	The natural logarithm of total assets
AssetStr	Asset structure	The ratio of fixed assets to total assets
IBM	Independent board members	The percentage of independent board members
SusRep	Sustainability reporting	Whether the company publishes a separate CSR/H&S/sustainability report or publishes a section in its annual report about CSR/H&S/sustainability
GOV	Governance score	The governance performance score reported by the Refinitiv Eikon database