

# Green finance, sustainability disclosure and economic implications

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The emerging  
areas of green  
finance

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## Abstract

**Purpose** – In this study, the authors provide a systematic literature review of articles in the emerging areas of green finance and discuss the status and challenges in sustainability disclosure, which is crucial for the efficiency of green financial instruments. The authors then review the literature on the economic implications of green finance and outline future research directions.

**Design/methodology/approach** – The authors use the analytical framework – Search, Appraisal, Synthesis, and Analysis (SALSA) to conduct the systematic review of the literature.

**Findings** – Increasing public attention to the environment motivates the use of green finance to fund environmentally sustainable projects, and the rise of green finance intensifies the demand for environmental disclosure. Literature has documented tremendous growth in sustainability reporting over time and around the globe, as well as raised concerns about how such reporting lack consistency, comparability, and assurance. Despite these challenges, the authors find that in general, the literature agrees that a firm's green practice is positively associated with its financial performance and negatively related to a firm's cost of capital. Green finance is also found to bring about enhanced risk management and economic development.

**Originality/value** – The authors provide one of the first reviews of green finance, sustainability disclosure and the impact of green finance on financial performance, capital market and economic development.

**Keywords** Green finance, Sustainability disclosure, Sustainable investing, Green bond

**Paper type** Literature review

## 1. Introduction

As the world economy recovers from the impacts of COVID-19, the “green recovery” approach was proposed, making it a critical time to review existing research on green finance. In this paper, we follow G20's definition and consider green finance as the financial instruments (such as green bonds), arrangements, mechanisms, and environmentally friendly operational practices, and the disclosure of these arrangements toward reducing carbon emissions and developing climate-resilient and environmentally sustainable infrastructure [1], [2].

While some scholars believe that the green path leads to a more sustainable, resilient and urgent recovery as financial services are well-positioned to contribute to the transformation needed for sustainable recovery (e.g. [Crona, Folke, & Galaz, 2021](#); [Navickas, Kontautienė, Stravinskienė, & Bilan, 2021](#)), others view the green approach as confusing or counterproductive (e.g. [Bebchuk & Tallarita, 2022](#)). Therefore, a comprehensive review of the literature is critical for a balanced view and understanding of green finance and its real economic impact.

In this paper, we first provide some background and context for green financial instruments such as green bonds and green debt and discuss the motives for green finance. An indispensable aspect of green finance is the corporate disclosure of environmental



performance to the capital market and other stakeholders of companies. Therefore, we next review the literature in the area of sustainability disclosure to summarize its trend, enabler and value. In line with the rise of green financial instruments directing resources to more environmentally sustainable businesses/projects, the literature has found that the corporate reporting of sustainability grows tremendously over the past decades and around the globe.

Current literature assures the value of green finance and sustainability disclosure; however, some controversies are identified. Due to the lack of one generally accepted set of standards that guide the reporting of sustainability and the lagged development of third-party assurance, the main challenges for sustainability reporting are its reliability, consistency and comparability. These issues further confound the effectiveness of green financial instruments and raise concerns about the potential opportunistic use of the proceeds (i.e. greenwashing). Mindful of the challenges, we then review the literature to examine the economic consequences of green finance and green practice.

In general, the literature agrees that green finance leads to green results such as emission reduction and energy saving. Overall, a firm's green practice [3] is positively associated with its financial performance measured by stock market valuation and accounting-based measurements and negatively related to a firm's cost of capital. Our review suggests that there are primarily three channels. First, the green practice lowers a company's real and perceived risk of environmental violation and the associated potential financial and reputational costs. Second, green practice is consistent with the general sentiment of environmental concerns and is favored by capital market participants as they see the green practice as consistent with their personal beliefs or as a way for them to make an impact through investment. Third, green firms may see improved cash flow as green practices are supported by national and regional governments in the form of government procurement, subsidy and tax credit. As a result, the literature has also documented that green financial instruments contribute to firms' access to capital and innovation related to environmental efforts. In addition, we also find a positive association between green finance and poverty alleviation and economic development.

Our literature review on green finance and sustainability disclosure can find theoretical underpinnings in stakeholder theory, agency theory and others. The stakeholders' theory (Freeman, 1984; Hill & Jones, 1992) emphasizes that economic and financial performance should not be the only goal of firms and that company actions do have an impact on various groups of stakeholders, the environment and society at large. Agency theory (Jensen & Meckling, 1976) addresses the agency problem that stems from the separation of ownership and management and provides theoretical support for monitoring management actions through various mechanisms including transparent information environment. Information economics theories, which can be applied to sustainability reporting, suggest that voluntary disclosure (in addition to mandatory reports) helps reduce information asymmetry and enhance information environment. Accountability to stakeholders, the pursuit of positive socio-environmental impacts and demand for information (to alleviate the agency problem and information asymmetry) together contribute to underpinning the importance of green finance, green practice, and enhanced transparency in sustainability initiatives and outcomes.

Our review offers three key contributions. First, we summarize extant research in green finance and sustainability disclosure to enhance the understanding of the emerging lines of research. The multidisciplinary review aims to lay a foundation for the future query of knowledge. Second, we provide one of the first comprehensive reviews of green finance, sustainability disclosure and the economic implications, offering a big-picture framework to study the impact of green finance on economic development and recovery. Finally, we outline future research agendas for scholars in accounting and finance areas. The integration of multidisciplinary knowledge can serve as a platform for future interdependent research that investigates new phenomena, leveraging theories from across disciplines and with new datasets and methodologies.

## 2. Methodology and research design

To conduct the systematic literature review, we use a framework of Search, Appraisal, Synthesis, and Analysis (SALSA). The SALSA framework is a commonly used method to conduct systematic research review and synthesis to find trustworthy answers to specific review questions and to identify gaps in the literature that requires further research (Booth, Sutton, Clowes, & Martyn-St James, 2021).

As the first step of the review process, we identified the research topic as green finance and sustainability disclosure and their economic impact. Then we searched all relevant studies, starting from peer-reviewed journal articles, books and book chapters from EBSCO, ProQuest, Web of Science and Google Scholar. Primary keywords included green finance, sustainable finance, climate finance, carbon finance, green bond, sustainable investing, sustainability disclosure and carbon accounting. In the preliminary search, we choose not to limit ourselves to specific journals or years such that we could explore the field's entire development rather than a narrower presentation of findings from a particular academic domain or journal type. We included published or in-press articles (including in conference proceedings) as well as a publicly available working paper (e.g. SSRN (social science research network)).

In the second step "Appraisal", we screened the abstracts of the selected articles and compiled a pool of articles that were reviewed, validated and if applicable used for this work. In this stage, we also conducted a reverse search technique in which additional papers were sourced from the citations in the selected articles. Through this process, we identified 199 published articles and working papers in the finance area and 77 articles in the accounting area. We then narrow down the total number of studies to 151 to be used in this study.

We then conducted step 3 "Synthesis" and step 4 "Analysis" by categorizing, summarizing and examining existing research on the tools, motivations, enablers, and impacts of green finance and sustainability disclosure. We also identified connections, contractions, and gaps in existing research, discussed controversial issues, and suggested future research directions.

Table 1 discusses the SALSA approach and steps in detail.

## 3. Background: green finance instruments, motivations and challenges

In this section, we provide some background for green financial instruments and their motivations. We also identify the demand for and gap in the disclosure of green practices.

### 3.1 Green financial instruments

Extant literature (e.g. Bai, Chu, Shen, & Wan, 2021; Falcone & Sica, 2019; Heinkel, Kraus, & Zechner, 2001; Maltais & Nykvist, 2020; Miroshnichenko & Mostovaya, 2019) has examined and defined various green financial instruments. Synthesizing these definitions, we define green financial instruments as private loans, public bonds (corporate, municipal and sovereign), private equity, public equity, investment funds and other financial instruments that fund environmental and climate-friendly projects such as renewable energy, recycling and green infrastructure that supports the net-zero carbon economy and mitigates climate change.

Surveying the trends and developments of green financial instruments, the most common and influential financial instruments are green bank loans and green bonds (Gilchrist, Yu, & Zhong, 2021). Specifically, Buchner *et al.* (2021) find that in 2021, the majority of the green finance (61%) was raised as green debt (loans and bonds), 33% was equity investment and 6% was government and institutional grants. Other common green financial instruments include green derivatives (Little, Hobday, Parslow, Davies, & Grafton, 2015), green insurance (Mills, 2012), carbon tax (O'Mahony, 2022) and carbon investing and pricing instruments (Hafner, Jones, Anger-Kraavi, & Pohl, 2020).

**Table 1.**

The methodological process of this literature review follows the SALSA approach

SALSA approach and steps	Steps and details in this paper
1. Search	– Keywords: green finance, sustainable finance, climate finance, carbon finance, green bond, sustainable investing, sustainability disclosure, and carbon accounting
– Identify keywords based on the finalized research topic	– Preliminary and full literature searches were conducted through EBSCO, ProQuest, Web of Science and Google Scholar
– Literature searches and reference management	
– Selection of articles	
– Obtain articles	
2. Appraisal	– Review literature and further screen articles
– Quality assessment	– Reverse search for additional articles
	– Review full text
	– Compile a finalized pool of studies for this project
	– Categorize papers
3. Synthesis	– Identify connections, contradictions and gaps
– Integrating previous studies	
4. Analysis	– Discuss the impacts, implications and controversial issues
– Analysis and conclusion	– Suggest for future work
<b>Source(s):</b> Own study based on (Booth <i>et al.</i> , 2021)	

In terms of the main areas of investment targets, most of the green financial instruments are used to fund renewable energy (e.g. solar and onshore wind), primarily from the private sector, with the low-carbon transport being the second largest and fastest-growing sector in attracting investment (Buchner *et al.*, 2021).

In terms of the adoption of green instruments, studies found that East Asia-Pacific countries taking the lead in promoting green instruments to support the innovation and development of publicly listed companies (Buchner *et al.*, 2021; Taghizadeh-Hesary & Yoshino, 2019). In addition, green financial instruments are adopted faster by the private sector than the public sector with private banks playing a leading role in extending green loans (Lalon, 2015). We call for policymakers to learn from more developed markets to increase green practices and encourage public sector engagement, and to do so efficiently and equitably.

3.2 Motivations of green finance practice

With the increased global and regional environmental policies, there is a significant increase in green finance practices, and the adoption of green financial instruments as investors become more sensitive to climate-related matters. Specifically, the pressure on governments, financial institutions and firms to implement environmental protection and climate change has risen after the signing of the Paris Climate Agreement in 2015 (Tolliver, Keeley, & Managi, 2020). Global and regional bodies such as United Nations, World Bank, International Monetary Fund (IMF), European Union and G20 are increasingly mounting pressure on their members and trading partners to implement green finance policies in their finance systems (Bhandary, Gallagher, & Zhang, 2021).

Due to these pressures, governments, financial institutions and firms are accepting environmentally focused reforms in the world. Therefore, we synthesize the literature and argue that there are two primary motivations for firms' adoption of green practices: (1) violating environmental policies imposes a negative consequence on firms in the form of *direct financial penalty* and (2) firms lose social capital and reputation with an increase in the actual or perceived investment risk.

Specifically, extant literature has documented declines in firms' market values following the announcement of environmental violations (e.g. [Karpoff, Lott, & Wehrly, 2005](#); [Capelle-Blancard & Laguna, 2010](#)). Similar stock market reactions to environmental problems have been documented in the global markets – in China ([Xu, Zeng, & Tam, 2012](#); [Wang, Zhang, Lu, Wang, & Song, 2019](#)), Japan ([Nakao et al., 2007](#); [Takeda & Tomozawa, 2006](#)), Korea ([Dasgupta, Hong, Laplante, & Mamingi, 2006](#)) and India ([Gupta & Goldar, 2005](#)).

As a result of the negative market reaction to environmental misconduct and violations, firms move toward green practices to capture the high social capital and mobilize community and government support, easing tension between firms and regulators and reducing compliance costs. And they use green instruments to finance their green practices.

### 3.3 Demand for disclosure

Regardless of the form of green finance, what is embedded in these green instruments is a commitment made by the issuer/borrower that the funds raised will be used toward “green projects”. The efficiency of these instruments, therefore, depends on the confidence of market participants in how the proceeds are used for their intended purpose and the actual sustainability performance of the projects funded. Taking green bonds as an example, the key difference between a green bond and a traditional bond is that the issuer of the bond would self-designate the bond as green. Such a label conveys commitment that the funds raised from the bond would be used exclusively to support low-carbon and climate-resilient investment projects.

Naturally, market participants of green finance demand standards and criteria to define what projects qualify the “green” label and standards/frameworks to regulate issuers' disclosure of the usage of bond proceeds and the environmental, social and governance (ESG) performance of the projects invested. For example, the Royal Bank of Canada (RBC) is advocating for clear standards, taxonomy and parameters for sustainable finance ([Institute for Sustainable Finance, 2019](#)). As part of its plan to reach \$100bn in sustainable financing by 2025, the RBC issued its first €500m (\$752m) green bonds in 2019 that target to fund renewable-energy projects and sustainable buildings.

Existing research provides insights into the unique nature of green instruments and how transparency regarding project selection and performance monitoring is the key to the credibility of the green finance market. [Park \(2019\)](#) discussed the earmarking process for green bonds and reviewed public regulation as well as private governance of the green bond market in relation to establishing standards and guidelines to define green bonds and monitor the issuers' use of proceeds. [Sartzetakis \(2021\)](#) reviewed the Green Bond Principles (GBP), which is the first and most recognized set of voluntary guidelines for green bonds issued by the International Capital Market Association (ICMA), and other similar guidelines developed by different countries and/or issuing authorities. Not surprisingly, all these guidelines provide frameworks that cover the definition of “green” projects, transparency regarding project selection and fund allocation, as well as subsequent reporting to the public regarding the use of the proceeds and the environmental performance of the projects funded. While disclosure about project selection and fund allocation occurs at the early stage and is most likely one-time, subsequent reporting of the environmental outcome of the use of proceeds is ongoing and the quality of which is crucial to ensure the integrity of the financial instrument.

We would therefore in the next section provide a review of research on corporate sustainability reporting. Understanding the current status of sustainability reporting helps one evaluate the benefits and limitations of green finance. Insights into the value of sustainability reporting and mechanisms to enhance such disclosure help one identify directions for further development and regulation of the green financial market.

#### 4. Sustainability reporting: trend and determinants

An indispensable aspect of green finance is the disclosure of environmental impacts of business operations, green initiatives and performance and environmental risk management practices to the stakeholders of companies. As green finance directs investment toward environmentally sustainable businesses, demand rises for business entities to provide transparent information about their green initiatives and sustainability performance to the public in order to facilitate investment decisions and hold the business entities accountable. In this section of the paper, we review the literature in the area of sustainability reporting and summarize the current trend, factors that affect the reporting of sustainability and the impact of such reporting on firm performance.

##### *4.1 The trend of sustainability reporting and assurance*

*4.1.1 Sustainability reporting.* Sustainability reporting started as voluntary disclosures. As this trend increases, some countries established regulations that require mandatory disclosure. Corporate disclosure of sustainability benefits the reporting entities and leads to “improved reputation, better risk management, and increased customer and employee loyalty” (Schooley & English, 2015). As green finance gains popularity, the capital market demands high-quality information reported by participating companies to guide the allocation of resources toward sustainable business projects and models.

The literature documents an increase in environmental disclosure over the past few decades around the globe and the environmentally sensitive industries tend to be the ones that see the most reports (Alali & Romero, 2012; Deegan, 2002; Deegan & Gordon, 1996). The growing demand and supply of sustainability reports call for a set of standards that govern the reporting practice. Multiple standards co-exist at the current stage. One example is the Global Reporting Initiative (GRI), which came into being in 1997 with the goal of developing global standards for sustainability reporting. Another example is the Sustainability Accounting Standards Board (SASB) in the US, established in 2011 to develop a framework to guide publicly listed companies in terms of sustainability accounting and reporting.

Quantifying the impact of environmental initiatives is an important task in sustainability reporting. Jeffers (2007, 2008) discusses what should be considered when developing a framework to measure green initiatives and notes the importance to identify and estimate relevant variables in translating environmental initiatives into quantifiable financial data. Gray (2006) offers critiques about sustainability reporting by demonstrating the tension that such reports, especially the high-quality ones, would simply show how incompatible prevailing economic goals are with environmental and social goals. Adams (2020) revisits Gray’s (2006) study incorporating recent developments in sustainability reporting standard setting and suggests that the development of GRI standards has brought positive changes.

*4.1.2 Carbon accounting.* One aspect of quantifying the environmental impact of decision-making is measuring greenhouse gas (GHG) emissions. Carbon accounting as the name suggests specifically focuses on the recognition and measurement of GHG emissions. Through a systematic review of existing literature, Stechemesser and Guenther (2012) derive a definition of carbon accounting as follows: “carbon accounting comprises the recognition, the non-monetary and monetary evaluation and the monitoring of greenhouse gas emissions on all levels of the value chain and the recognition, evaluation, and monitoring of the effects of these emissions on the carbon cycle of ecosystems.”

Based on Stechemesser and Guenther (2012)’s definition, Marlowe and Clarke (2022) review the carbon accounting literature focusing on the business organization level as well as city-level quantification of GHG emissions. They identify a global trend of increasing emissions and conclude that quantifying carbon emissions involves significant measurement



uncertainty and lack of comparability. They thus call for policies, procedures and academic work to improve the reporting of carbon accounting.

*4.1.3 The assurance of sustainability reporting.* Like financial reporting and disclosure, sustainability reporting provides information for decision-making. The efficiency of resource allocation hinges on the quality of information reported by business entities. As sustainability reporting and the use of information in sustainability reports grow, there is a call for independent assurance of such reporting by third parties. [Junior, Best, and Cotter \(2014\)](#) review the literature and analyze the Fortune Global 500 companies to provide comparative and trend analyses of sustainability reporting and assurance of these reports. They find that while an increasing percentage of organizations issue sustainability reports over time, there is no such trend in the practice of having the sustainability reports assured.

A recent study by [Alsahali and Malagueño \(2021\)](#) provides an updated overview of sustainability assurance practices based on a sample of 13,000 companies around the world. The period that they focus on is the recent decade to match the emergence of countries mandating sustainability reports. The study addresses the following aspects of sustainability assurance. First, they examine the trend of sustainability assurance and find that even though significant growth in assurance is observed from 2012 onward, it lagged behind the growth of the sustainability reports. Second, they examine three types of assurance providers, i.e. accounting, engineering and consulting firms, and find that while accounting firms have the largest market share, the most growth is seen in engineering firms. Considering the existence of multiple assurance standards, e.g. the International Standard for Assurance Engagements (ISAE 3000) and the AA1000 AccountAbility Standard (AA1000 AS), the study investigates the choices of standards and finds that different types of assurance providers have different preferences, which raises the concern of inconsistency in the assurance practice. Third, they examine the incidence of companies changing assurance providers from one type to another and find more switches toward engineering and consulting firms than toward accounting firms.

#### *4.2 Determinants of sustainability reporting*

In this subsection, we discuss and summarize factors found to have an impact on the practice of sustainability reporting, including firm characteristics, monitoring of stakeholders and regulatory changes.

*4.2.1 Firm-level determinants of sustainability reporting.* [Hahn and Kühnen \(2013\)](#) review existing literature from 1999 to 2011 on determinants of sustainability reporting and disentangle factors that have received consistent evidence regarding their impact on sustainability reporting from other factors around which evidence is inconsistent and ambiguous. Company size is the only internal factor found to have a positive influence on sustainability reporting, whereas evidence is mixed regarding the impact of financial performance and social and environmental performance. Among the external factors, the literature generates consistent results on how media exposure as a proxy for visibility is positively associated with sustainability reporting and that companies from industries with more significant environmental impacts tend to engage more in sustainability reporting. At the time of this review, very limited research has examined the impact of regulation even though countries such as Denmark, Norway and Sweden already started to impose policies and legislation to require companies to make sustainability disclosure.

*4.2.2 Regulation, governance, and sustainability reporting.* The European Union (EU) Emission Trading Scheme introduced in 2005 represents a significant movement toward governing and incentivizing low-carbon initiatives. Based on a “cap and trade” principle, companies must keep their carbon emission under the cap and at the same time can buy or receive emission allowances to trade with one another.

In terms of regulation of sustainability disclosure, the EU adopted [Directive 2014/95/EU](#), also called the Non-Financial Reporting Directive (NFRD), which was then incorporated by member states into their legislation requiring large European companies to publish regular reports on the social and environmental impacts of their activities. [Jackson, Bartosch, Avetisyan, Kinderman, and Knudsen \(2020\)](#) investigate the effectiveness of mandatory non-financial disclosure requirements and found that firms in countries with such mandates adopt more socially responsible activities without reducing socially irresponsible activities.

Evidence from outside of the EU suggests a positive impact of mandatory disclosure requirements. [Ioannou and Serafeim \(2017\)](#) study the effect of mandatory sustainability reporting by looking at companies in mandating countries including China, Denmark, Malaysia and South Africa surrounding the passage of related regulations. They find that firms not only increasingly provide sustainability disclosure in response to the regulation but also increasingly have their reports assured on a voluntary basis to signal the quality of their reports. The regulation-driven disclosure of sustainability is also found to have a positive association with firm value as proxied by Tobin's Q. [Ren, Huang, Liu, and Yan \(2023\)](#) test whether the mandatory corporate social responsibility (CSR) reporting requirement in China leads to improved environmental practices and find that firms bound by this mandate show increased green innovation and that such effects are positively moderated by local enforcement intensity, state ownership, and media coverage.

Internal and external governance mechanisms have also been found to promote information disclosure. Using a global sample of 1,047 companies, [Fernandez-Feijoo et al. \(2013\)](#) find evidence that the pressure of stakeholders leads to improved transparency of sustainability reports. Recent literature has provided consistent results on the influence of corporate governance on sustainability reporting around the globe. For instance, [Masud, Kaium, Nurunnabi, and Bae \(2018\)](#) document that in their sample of South Asian countries companies with foreign and institutional ownership, more independent and larger boards tend to have better sustainability reporting performance. Based on a sample of Australian resources companies, [Ong and Djajadikerta \(2020\)](#) show that more independent boards, multiple directorships and representation of female directors are positively associated with the extent of sustainability disclosure, proxied by [Ong et al.'s \(2016\)](#) index. [Gallego-Alvarez and Ortas \(2017\)](#) find evidence consistent with the stakeholder theory in the governance literature in that corporate sustainability reporting practices are responsive to stakeholders' demands, which in turn are influenced by the cultural environment.

#### 4.3 The value of sustainability disclosure

**4.3.1 Sustainability disclosure and firm performance.** Early evidence on how sustainability translates into company value has been mixed ([Romero, Lin, Jeffers, & DeGaetano, 2014](#)). While research has found a positive association between sustainability initiatives and corporate value (e.g. [Burnett, Skousen, & Wright, 2011](#); [Clark & Allen, 2012](#)), other studies find no significant stock market impact imposed by sustainability reports ([Guidry & Patten, 2010](#)) or even negative association between corporate social performance and financial performance ([Lee, Faff, & Langfield-Smith, 2009](#)).

More recent research provides evidence on the positive side. [Alshehhi, Nobanee, and Khare \(2018\)](#) analyze the literature on the relationship between corporate sustainability practices and financial performance. Reviewing 132 research papers shows the majority of evidence of the positive relationship between the two. International evidence suggests largely consistent results. [Lo and Sheu \(2007\)](#) examine US companies and find a positive relationship between corporate sustainability and firm value as proxied by Tobin's q. Similar results are found among listed companies in Singapore ([Loh, Thomas, & Wang, 2017](#)). [Kuzey and Uyar \(2017\)](#) examine a sample of Turkish public companies and document a growth of



sustainability reporting in the country and find evidence that sustainability is value relevant. [Bachoo Tan and Wilson \(2013\)](#) add Australian evidence to the literature and find that high-quality sustainability reporting reduces the cost of capital and enhances the market's expectation of future firm performance.

Consistently, carbon accounting research suggests that GHG emission has a negative impact on firm valuation. [Griffin, Lont, and Sun \(2017\)](#) document a negative pricing impact of GHG emission and quantify such impact to be a \$79 price discount per ton of GHG emission. [Matsumura, Prakash, and Vera-Munoz \(2014\)](#) examine the effect of carbon emissions on firm valuation and document a negative impact in the magnitude of a \$212,000 decrease in firm value for every thousand incremental metric tons of carbon emissions. Further, they find that companies that voluntarily disclose carbon emissions receive a valuation benefit compared to the companies that do not disclose such information.

Most existing research excludes financial institutions from their sample due to the unique feature of the financial industry. [Buallay \(2019\)](#) however specifically study 342 financial institutions from 20 different countries and associate their ESG score with firm performance. The findings show a positive impact of sustainability on market valuation whereas a negative impact on financial and operational performance. The evidence offers insights from the financial industry and suggests that the long-term and short-term effects of sustainability efforts can be different.

*4.3.2 Sustainability disclosure and value relevance.* A set of research specifically investigates the impact of sustainability reporting on how the market evaluates financial statement metrics, that is, value relevance. [Lourenço, Callen, Branco, and Curto \(2014\)](#) refer to the inclusion of the company in the Dow Jones Sustainability United States Index as a proxy for sustainability reputation. They find that the index companies' financial data have higher value relevance, suggesting that sustainability reputation is valued by the market. Comparing a set of Indonesian companies that received the Sustainability Report Award with their counterparts, [Sutopo, Kot, Adiati, and Ardila \(2018\)](#) find that the value relevance of award-winning companies is higher, suggesting that high-quality sustainability reporting increases the perceived value of financial statement data. [Berthelot, Coulmont, and Serret \(2012\)](#) provide Canadian evidence that the capital market positively values the reporting of corporate sustainability even when it is voluntary.

Evidence on value relevance points to the capital market benefits of sustainability reporting, which by enhancing transparency and firm reputation improves the market perception of financial reporting. Sustainability as non-financial disclosure has a spillover effect on the efficiency of the capital market while incorporating information contained in financial disclosure into the market valuation.

## 5. Challenges in green finance and sustainability disclosure

The main challenges in the areas of green finance and sustainability disclosure center around the measurement of the green effects and the reliability and comparability of the reported corporate environmental performance data.

Due to the lack of one generally accepted set of standards that guide the reporting of sustainability and the lag of growth in the third-party assurance of such reporting, the main challenges for sustainability reporting are its reliability, consistency and comparability. [Dragomir \(2012\)](#) examines the corporate sustainability reports of the largest five European energy companies for assessment of their reporting quality in terms of corporate environmental performance and finds that the reports lack clarity and consistency in the methodologies used, suggesting that research based on cross-sectional data drawn from corporate sustainability reports can be risky due to incomparability of such data.

Similar concerns and challenges apply to carbon accounting. [Wegener, Labelle, and Jerman \(2019\)](#) examine the GHG emissions reports across corporations and document the lack

of comparability in these facility-level quantified emissions data and that therefore relying on such information can mislead the readers. [Bowen and Wittneben \(2011\)](#) show that the challenges carbon accounting faces are a result of tension and negotiation between different goals, such as accuracy, consistency and certainty, across different reporting levels.

The measurement issue then leads to concerns about the legitimacy of using sustainability indicators in contracts such as executive compensation. [Bebchuk and Tallarita \(2022\)](#) find that in almost all cases in which S&P 100 companies use ESG metrics, it is difficult if not impossible for outside observers to assess whether this use provides valuable incentives or rather merely lines the chief executive officer's pockets with performance-insensitive pay. They, therefore, conclude that the current ESG metrics likely serve the interests of executives, not of stakeholders and that the expansion of ESG metrics should not be supported even by those who care deeply about stakeholder welfare.

Lack of reliable and comparable sustainability disclosure further confounds the effectiveness of green financial instruments, in view of the potential opportunistic use of the proceeds (i.e. greenwashing). Greenwashing is the practice of marketing products, services and financial instruments as "green," "sustainable," "carbon neutral" or "net zero" when in fact they do not meet basic environmental, climate, or sustainability standards of verifiability or credibility ([Schumacher, 2022](#)). Green bonds present an incentive for companies to raise funds with potentially lower financing costs under the name of green. [Wang, Chen, Li, Yu, and Zhong \(2020\)](#) document a higher pricing premium for corporate green bonds in China, as reflected by a lower yield spread, compared to their conventional counterparties. The favorable pricing, thus lower financing costs, accompanies the boom of the green bonds market in China around 2019 as well as an exponential growth of green bonds globally in over 20 countries. As more issuers race for the low-cost financing tool, the potential for greenwashing draws the attention of researchers and regulators. Inconsistency of the definition of green bonds, lax restriction on the eligible use of proceeds and divergence of the transparency requirements all contribute to the potential opportunistic use of green bonds with proceeds from such investment being "green-washed" ([Zhang, 2020; Xu, Lu, & Tong, 2022](#)). Research thus calls for strengthened oversight and regulation over the green bond market for the integrity and success of green investments ([Banahan, 2018; Zhang, 2020](#)).

With economic recovery from the impact of COVID-19 an eminent task around the globe, the incentive for companies to fund various projects through the use of green bonds may be intensified. A challenge is therefore posed for the governments and self-regulating bodies to improve the existing policies, regulations and guidelines for clarity, transparency, consistency and accountability.

Mindful of the challenges, a natural question arises regarding the effectiveness of green financial instruments and green practice in general. We will therefore review existing research on the economic implications of green finance in the next section, without a directional association expected *ex ante*.

## 6. Economic implications of green finance

### 6.1 Relationship between green instruments and green results

To better understand the economic implications of green finance, we first examine whether and through what channel green finance leads to green results such as emission reduction and energy saving. Several tools exist to measure the green results, such as carbon emission reduction, qualitative sustainability, benchmarking standards, and survey-based approaches ([Truant, Corazza, & Scagnelli, 2017](#)). Using data from 30 Chinese provinces from 2005 and 2018, [Chen and Chen \(2021\)](#) find that the development of green financial instruments contributes to carbon emission reduction, and this has a spatial spillover effect of not only reducing the emissions of a local region but also inhibiting the emission of adjacent areas. The

authors argue that this is because the development of green finance leads to a decrease in carbon emissions by reducing financing constraints and boosting green technology innovation. Similarly, [Khan, Riaz, Ahmed, and Saeed \(2022\)](#) find that green finance reduced the ecological footprints in the Asia and Pacific area, and the findings are robust to using alternative measures and estimation strategies.

We next examine the literature on the mechanisms through which green finance is associated with green results. Synthesizing the literature, we argue that green finance can penetrate environmental protection through two mechanisms of funding: fund orientation and policy guidance.

The funding-oriented mechanism presents an increase in the financing constraints of high-polluting enterprises and guides funding (in the form of debt or equity) towards low-emission and low-polluting industries ([Wang & Zhi, 2016](#)). Meanwhile, the funds into green firms and industries force the transformation and upgrading of high-polluting firms, leading to positive impacts on carbon emission reduction ([Liang, Yu, & Ke, 2021](#)). The funding-oriented mechanism improves access to capital and reduces the cost of capital for green firms.

The policy-guidance mechanism argues that government and other regulatory bodies' green finance policies support the development of green industries through government procurement, financial support, tax reduction, fee reduction, etc. For instance, [Flammer \(2018\)](#) finds that the firms that use green bonds usually improve green innovation and are more likely to win government procurement contracts. Also, it will ultimately guide the improvement and attainment of a greener industrial structure and infrastructure. This mechanism improves the cash flow of green firms, boosting the profitability and competitiveness of green firms and industries ([Hu, Jiang, & Zhong, 2020](#)). Furthermore, with the resources from national policies, it will effectively reduce carbon emissions as well as speed up the transformation and improvement of high-pollution industrial structures.

As green projects usually require significant capital investment with long-term effects ([Edmans, 2023](#)), the presence of funding-oriented and policy-guidance mechanisms, along with the reputation gain of being green, reduces the overall risks of the projects. This will force firms to consider environmental factors in production, operation and innovation activities, and it can reduce social and reputational risks caused by climate change, environmental pollution and other environmental damage. In addition, society's long-term view of green projects, available funding and policy support encourages firms to be more innovative in their financing and operational efforts. Studies find that green loans fund green innovation, supporting firms to develop innovative products ([Díaz-García, González-Moreno, & Sáez-Martínez, 2015](#)) and making them more competitive, particularly among high-tech companies ([Chen, Huang, Drakeford, & Failler, 2019](#)). Therefore, [Andreeva, Vovchenko, Ivanova, and Kostoglodova \(2018\)](#) highlight the importance of green finance and the need for innovative financial tools for funding the green economy.

## 6.2 Firm financial performance and corporate responses

**6.2.1 Firm financial performance.** In this subsection, we review literature that examines the relationship between a firm's financial performance and its green finance practices.

In general, the literature tends to find a positive relationship between green practices and financial performance, although there is disagreement in existing studies. In [Alshehhi et al. \(2018\)](#)'s review paper, 78% of the 132 articles reviewed report a positive relationship between green practice and financial performance, 6% report a negative relationship, and 7% report a no-impact relationship.

We examine the literature and argue that three factors could have contributed to the differing results. First, the variation in the results is attributed to the measurement of financial performance as well as that of green practice. Overall, firm financial performance is

measured by (1) the stock market returns, (2) market-based measures such as Tobin's Q, Price to Earnings (P/E) ratio and market valuation or (3) accounting-based measures such as the return on assets (ROA), return on equity (ROE) and earnings per share (EPS). Different choices of measures could have led to different results. In terms of measuring green practice, there is significant disagreement (Berg, Koelbel, & Rigobon, 2022; Zhang Zhang, & Managi, 2019) as to which factors and green practices are relevant, how to assess them, and the relative weight to put on each. The measurement issue we discussed earlier in relation to sustainability reporting also confounds the research of green finance. As researchers utilize data collected from corporate reports, the lack of consistent standards and framework that govern such disclosure leads to concerns about the credibility of research findings. For example, Cornell and Damodaran (2020) build a framework to examine how being socially responsible can manifest in the tangible ingredients of value and look at the evidence for whether being socially responsible is creating value for companies and investors. The authors argue that findings of a positive relationship between ESG and financial performance are sensitive to both how ESG and profitability are measured.

Second, extant studies use different research methodologies and study designs, which further exacerbates the problem of inconclusive literature when it comes to the relationship between green practice and financial performance. Commonly used methodologies include regression analysis, survey, content analysis, wavelet analysis, and event study. The positive relationship documented by most studies can be contributed to the mechanisms discussed in subsection 6.1. In addition, Chang, Fu, Jin, and Liem (2022) find that green practice increases firm value by motivating employees, strengthening relationships with suppliers, boosting long-term growth, increasing dividends and reducing financing costs. Nevertheless, this could also be an endogeneity issue, with firms doing well financially being more likely to initiate green efforts.

Third, differences in firm size, industry, market examined and time period also contribute to the differing results. For instance, the negative relationship between green practice and financial performance, in particular stock return, is usually documented in earlier studies. This calls for research to examine the role of moderating variables such as firm size, economy and institutional background, and industry type, in order to identify potential groupings along the lines of those variables. This also calls for granularity in research that looks at various institutional settings and situations, as we may not have a "one-size-fits-all" result.

*6.2.2 The cost of capital.* Another way to study the impact on firm performance, in line with the valuation category, is to examine the cost of capital associated with green financial instruments and firms' green practices. Studies have in general agreed that investors and lenders require a higher return from firms with environmental concerns and that companies with green practices tend to have a lower cost of capital.

In particular, Chava (2014) shows that firms with significant environmental concerns pay a higher interest rate on loans (20% higher loan interest rate, approximately 25 bps) and has a higher cost of equity (approximately 7% higher) and that these firms have fewer banks participate in their loan syndicate and have lower institutional ownership. Similarly, Jung, Herbohn, and Clarkson (2018) find a higher cost of debt associated with firms failing to disclose carbon emissions in the carbon disclosure project survey, with a one standard deviation increase in carbon risk associated with a 38-62 bps increase in the cost of debt. Bolton and Kacperczyk (2021) document that high carbon emission firms face a higher cost of capital for both the US and international stocks. Kim, Wan, Wang, and Yang (2019) find a negative relationship between institutional ownership and toxic release from facilities to which institutions are geographically proximate.

Overall, the price impact of investors' preferences for green assets has been broadly documented in the literature with the findings that companies with a high environmental performance benefit from a lower cost of capital. Hasan, Hoi, Wu, and Zhang (2017) find that

firms with environmental commitment face lower bank loan and bond spreads and less restrictive non-pricing loan terms. [Hachenberg and Schiereck \(2018\)](#) and [Zerbib \(2019\)](#) both document a small negative premium (−1 bps to −2 bps) between green bonds and conventional bonds, and [Chen et al. \(2019\)](#) find less-demanding collateral associated with green loans. Authors mainly attribute this negative yield differential to a financial reality: [intangible asset](#) creation (e.g. [Flammer, 2015](#)) as well as better risk management and mitigation ([Bauer & Hann, 2014](#)). These findings are consistent with previous studies that highlight the long-term view of socially responsible firms and an associated reduced level of risk of violation and damaged reputation ([El Ghoul, Guedhami, Kwok, & Mishra, 2011](#)). Also, green loans strengthen the capital structure of small businesses to sustain them from financial distress by extending loans to small businesses at lower interest rates and extended repayment periods ([Cullen, 2018](#)).

Other studies examine stock response upon green bond announcement. For instance, [Zhou and Cui \(2019\)](#) find that green bond issuance has a positive impact on firms' stock prices, profitability, operational performance, and innovation capacity. [Tang and Zhang \(2020\)](#) show that the positive stock returns around green bond announcements are associated with an increase in institutional ownership and stock liquidity. Similarly, [Wang et al. \(2020\)](#) find positive abnormal stock returns after the issuance of green bonds consistent with the stakeholder value maximization theory. Specifically, the authors document a significant pricing premium of corporate green bonds relative to matched conventional bonds and that the economic magnitude of this premium is more pronounced for issuers with better performance in corporate social responsibility.

These studies emphasize the relationship between green bonds and equity performance and value creation. However, as discussed in [Section 5](#), we do not suggest a causal relationship between green bond issuance and firm performance, as green bond issuance can be *perceived* as a signal of green practice without delivering direct green results.

**6.2.3 Implications for investors.** With findings on the reduced cost of capital and hence enhanced firm value associated with firms with green practices, a strand of literature examines the green investing practice (also called “sustainable investing”).

Overall, the popularity of green investing is attributed to two motives. The first motive is to change firm behavior in improving their green practice, thus creating more positive externalities. This second motive can be achieved through two channels of exit by divesting from nongreen companies ([Edmans, 2023](#)) and voice that involves engaging with a company through voting, private meetings, and public activism to cut its carbon footprint ([Edmans, 2023](#); [Hoepner, Oikonomou, Sautner, Starks, & Zhou, 2022](#)).

The second motive for green investing is better risk-adjusted returns associated with green stocks. In particular, the asset pricing literature has now included sustainability as a risk factor with [Zerbib \(2022\)](#) developing a sustainable capital asset pricing model (S-CAPM) and [Dimson, Karakas, and Li \(2015\)](#) demonstrating the value-enhancing effects of shareholder engagement in environmental issues.

A common green investing strategy is to overweight (underweight) assets with low (high) environmental footprints ([Krosinsky & Purdom, 2016](#); [Coqueret, 2022](#)). These practices are supported by studies that find “green” firms outperform “brown” firms (not environmentally friendly). Examples include [Aswani, Raghunandan, and Rajgopal \(2022\)](#), [Bolton and Kacperczyk \(2021, 2022\)](#), [Garvey, Iyer, and Nash \(2018\)](#), [Görge et al. \(2020\)](#), [In, Park, and Monk \(2017\)](#), and [Hsu, Li, and Tsou \(2022\)](#). In addition, [Hartzmark and Sussman \(2019\)](#) suggest that sustainability is viewed as positively predicting future performance, and [Pástor, Stambaugh, and Taylor \(2022\)](#) find that green assets outperform brown assets in particular as climate concerns strengthened.

Investors have recognized the environmental risks and priced them into their investment decisions ([Krueger, Sautner, & Starks, 2020](#); [Shen, LaPlante, & Rubtsov, 2019](#)). According to

Engle, Giglio, Kelly, Lee, and Stroebe (2020), stock investors can hedge against climate risk by forming dynamic portfolios that are long on the winners of climate change and short on the losers. Additionally, Choi, Gao, and Jiang (2020) offer more direct evidence of investor attention to global warming by showing that the Google search volume index, an indicator of retail investor attention, increases with abnormal local temperature jumps while stocks of carbon-intensive firms underperform firms with low carbon emissions in abnormally warm weather.

As the economy recovers from COVID-19, researchers have uncovered the diversification potential of green investing in the face of crises. The literature on spillover, flight-to-quality cross-market interdependence, and hedging opportunities across assets and financial markets has attracted a lot of attention since the subprime crisis of 2007 and now during COVID-19 and its recovery period. Specifically, studies find that investors started shifting toward sustainable avenues of investment during the COVID-19 period, which is in line with the common parlance that investors shift their preferences toward a broader and holistic perspective during times of crises, using green instruments to hedge against downside risks, especially in the backdrop of a crisis (Naeem, Mbarki, Alharthi, Omri, & Shahzad, 2021; Sharma, Tiwari, Talan, & Jain, 2021, 2022; Talan & Sharma, 2020; Umar Gubareva, Tran, and Teplova, 2021).

In summary, our study of the literature shows that green financial instruments provide an option that improves investors' returns and supports the financial markets during and post the COVID-19 period.

*6.2.4 Implications for companies.* While equity investors hedge the environmental risks by creating portfolios, corporate managers make strategic firm-level decisions in consideration of the climate and related risks. For instance, Flammer (2013) documents a cushioned stock market reaction to negative corporate environmental news for firms with high *ex ante* environmental performance, suggesting environmental practice as a way to reduce firm risks. Lemoine and Rudik (2017) suggest firms should respond to the carbon tax by delaying reducing emissions and cumulating greater emissions to take advantage of the climate systems' inertia. Liu (2018) finds board gender diversity reduces environmental infringement. Bai *et al.* (2021) show that firms tend to manage climate change risk induced by sea-level rise (SLR) by acquiring firms that are unlikely to be directly affected by SLR. Similarly, Xiong, Lam, Hu, Yee, and Blome (2021) find that firms mitigate the negative impacts of environmental violations with improved environmental transparency and supply chain diversity. Also, Li, Lin, and Lin (2021) find that firms manage the country-level climate vulnerability risk they face through corporate innovation in climate change mitigation technologies, exploitative patents and global collaborative patents in innovations and promote international strategic alliances. In addition, as discussed in Section 4.2 of the paper, extant literature also documented that firms strategically choose corporate board composition and provide disclosure of green innovation and sustainability practices.

### *6.3 The impact of green finance on economic development and recovery*

Various authors have also studied the impact of green finance on poverty alleviation and economic development. For instance, Jiang *et al.* (2020) study 25 Chinese provinces from 2004 to 2017 and show a significant positive correlation between green finance and poverty alleviation. Therefore, the authors suggest that poverty can be better alleviated by improving the level of green finance development, financial asset level, and economic development level. Similarly, Liu, Liu, Xia, Ren and Liang (2020) find a strong relationship between green finance and the green economic development of 30 Chinese provinces for the period 2007–2016. Koengkan, Fuinhas, and Kazemzadeh (2022) document the positive impact of financial incentive policies for renewable energy development and consumption of green energy on



economic growth with data from 17 countries in Latin America and the Caribbean from 1990 to 2016. Using more recent data between 2008 and 2019 collected from the central banks of all the Association of Southeast Asian Nation (ASEAN) countries, [Ngo, Tran, and Tran \(2022\)](#) find that green finance along with capital formation and government educational expenditures have a positive association with the economic development of ASEAN countries.

[Akomea-Frimpong, Adeabah, Ofori, and Tenakwah \(2021\)](#) argue that green investment ensures that firms have adequate finance to tackle the economic challenges among the minorities, accompanying old age (pension), ensure social cohesion and integration, sound corporate governance and improve labor relations.

The COVID-19 pandemic has changed the priorities of countries, which motivates researchers to examine the issue further. [Cheema-Fox, LaPerla, Wang, and Serafeim \(2021\)](#) find that companies scoring high on a “crisis response” based on ESG measures were associated with higher returns, suggesting a buffering effect of better ESG performance. Similarly, [Tu et al. \(2021\)](#) argue that green finance policies such as carbon pricing and green credit can provide low-cost finances and counteract the adverse effects of COVID-19. [Sharma, Sarker, Rao, Talan, and Jain \(2022\)](#)’s findings suggest that investors will not lose on risk-adjusted returns if they chose to go green and that investors and fund managers subtly shift their focus toward sustainable indexes post-COVID-19.

Studies have also argued for the necessity of considering total sustainability (the aggregate of economic, environmental, and social dimensions) to achieve sound strategic decisions. [Alshehhi et al. \(2018\)](#) find that the literature started moving towards consolidating a holistic sustainability approach to corporate performance with a social–environmental combination. In particular, the problem with this combination approach is that it overlooks economical sustainability while closely resembling CSR, which underplays environmental sustainability.

Although extant studies are consistent on the impact of green finance and regional economic development, the results are valid only in specific countries or regions and the research investigation lacks generalizability as there are underlying differences and drivers in the world’s vast economies. Although investment in green energy fuels a sustainable green economy, its effectiveness varies from country to country ([Zhang Mohsin, Rasheed, Chang, and Taghizadeh-Hesary, 2021](#)). This is similar to the discussion on differing results in [subsection 6.2.1](#). This calls for a standard scale to evaluate the impacts of green financial development.

## 7. Conclusion and future research direction

### 7.1 Summary of key findings

This paper reviews green financial instruments, sustainability disclosure practices and the impact of green finance on firm performance and economic development.

We first provide background for green financial instruments. Literature suggests two primary motivations for firms’ adoption of green practices: (1) violating environmental policies imposes a negative consequence on firms in the form of *direct financial penalty* and (2) firms lose social capital and reputation with an increase in the actual or perceived investment risk.

Increasing public attention to the environment and the rise of green finance intensify the demand for environmental disclosure. Literature has found consistent evidence that sustainability reporting grow tremendously over the past decades and around the globe although the adoption of third-party assurance is found to lag. Along with critics and concerns about how such reporting lack consistency, comparability and assurance, efforts are being made in terms of developing generally accepted standards for reporting and government regulations that mandate sustainability disclosure for large companies.

We find that in general literature agrees that a firm's green practice is positively associated with its financial performance and negatively related to a firm's cost of capital. Moreover, green financial instruments contribute to firms' access to capital and innovation related to environmental efforts. As a response, equity investors hedge the environmental risks by creating portfolios including green companies and corporate managers make strategic firm-level decisions in consideration of the climate and related risks.

## 7.2 Future research direction

*7.2.1 Green finance and sustainability disclosure in the traditional framework of finance, accounting, and economics.* As the first research direction, we suggest applying traditional finance, accounting and economics theories and techniques to examining green finance and sustainability disclosure.

For instance, [Edmans \(2023\)](#) posit that insights from mainstream finance and economics can be applied to ESG, as ESG "is economically no different to other intangible assets that create long-term financial and social value." The same applies to green finance. The rich literature on corporate finance research has examined how to create long-term financial values and how to value investments, and research on asset pricing has explored how the stock market prices risks. Abundant economic research has looked at how to investigate externalities and enhance social welfare. We, therefore, suggest looking at green practices with short-term costs and long-term benefits and examining their relationship with the cost of capital, and firm value impact.

In the area of risk management, in general, green finance is accompanied by potential losses, especially with the long-term nature of investment in green projects ([Chen et al., 2019](#)). We suggest that future studies and framing of policies examine the robustness of the risk management models and embrace more responsible financial conduct with environmental viewpoints.

Similarly, sustainability reporting as one type of information disclosure can benefit from situating related research work in the theoretical framework of information asymmetry, disclosure, efficient market, contract theory and agency theory. Future research providing theoretical underpinnings for the demand and supply of sustainability disclosure and thus guidance for the current development of reporting standards and regulations is expected to be valuable.

*7.2.2 Data, model and methodology.* To the best of our knowledge, there have not been a generally accepted set of green measures that apply to all major countries, both developing and developed countries. It is not easily accessible to get data on green finance as there is still no consensus on the measure of greenness ([Cui, Geobey, Weber, & Lin, 2018](#)). Researchers must build practical models on and institutionalize reliable data on green finance. Further research addressing performance indicators and disclosures and their implications is needed.

As a developing concept, green finance is limited in the scope of issues covered and the dimensions of study. The relevant issues on green finance products in the broader green finance spectrum are unclear. Also, there is an overlap of the issues relating to the products and concepts surrounding green finance and scholars, and practitioners are not clear about these issues. Existing studies have shown and discussed a limited number of issues (social, environmental, legal, technological and others) that affect green finance. These issues remain distinctively presented and analyzed with unclear themes. Another area of concern is the ambiguity and unexplored issues surrounding the dimensional approaches of green finance.

In addition, further research can be conducted on identifying the enablers and the challenges to green finance using the quantitative approach. Statistical techniques need to be applied to study the relationship between the variables. The statistical analysis of the enablers will support policymakers in undertaking strategic initiatives based on the comparative advantage of the country or region. The challenges and barriers should be

studied for getting more holistic information on the concept of green finance. Lastly, green investment is the main objective of green financing so further studies can be conducted on quantitatively measuring green investment and its progress.

Research on sustainability reporting suffers from endogeneity issues as the practice of sustainability reporting is a result driven by numerous factors, including firm-level characteristics and external economic factors, which are inevitably associated with variables that are the subject matter of research, such as firm performance. Due to endogeneity, it is hard for research studies to rule out spurious relationships and establish causal inferences. There is an imminent call for rigorous empirical design that addresses endogeneity through statistical methods or natural experiment settings for conclusive evidence on the causes and consequences of sustainability reporting.

*7.2.3 Long-term and short-term economic implications of green finance and practices.* Our review has identified the scarcity of studies that investigate the long-term vs short-term economic implications of green finance and green practices. An example is [Diaye, Ho, and Oueghlissi \(2021\)](#) who examine 29 Organisation for Economic Co-operation and Development countries during the 1996–2014 period and find that while there is a positive relationship between ESG and gross domestic product per capita in the long run, such a relationship does not exist in the short run. It has been a long-lasting concern whether economic and environmental pursuits are compatible ([Gray, 2006](#)). The tension likely intensifies in light of the current economic environment where prioritizing the two imminent tasks, economic recovery and moving toward the carbon-neutral goal, becomes ever more challenging. Future research sheds light on the trade-off of long-term and short-term economic effects of sustainable business pursuits and green investment and thus provides insights into balancing economic and environmental goals at different stages of the economic cycle is expected to be highly valuable.

*7.2.4 Policy implications.* Our literature review has emphasized the importance of further support of public policy and regulation. First, our studies have shown that green finance is associated with reduced environmental impacts through proper regulation. However, the magnitude and the mechanisms differ in various countries, markets and industries. This calls for policy to be specific to different regions and industries, with consideration of differences in economic development status. Second, more studies on green finance issues from developing and developed countries' perspectives would be useful to regulators and policymakers to align different policy goals and develop well-defined policy objectives.

## Notes

1. The G20 [Green Finance Study Group \(2016\)](#) defines green finance as “*financing of investment that provides environmental benefits in the broader context of environmentally sustainable development [...] for example, reduction in air, water, and land pollution, reduction in greenhouse gas (GHG) emissions, improved energy efficiency while utilizing existing natural resources, as well as mitigation of and adaption to climate change and their co-benefits*” (p. 5).
2. Various terms are often used interchangeably to green finance are climate finance, carbon finance, environment finance and sustainable finance. In this paper, we use the term “green finance” as a general term to cover all of the terms.
3. For brevity, we use the term “green practice” to refer to firms’ decision to issue green financial instruments such as green bond and firms’ practice to reduce its environmental footprint such as emission reduction, recycling, waste management, energy consumption and use of renewable energy.

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