ESG and corporate financial performance: the mediating role of green innovation: UK common law versus Germany civil law

Salim Chouaibi and Jamel Chouaibi
University of Sfax, Sfax, Tunisia, and
Matteo Rossi
DEMM, University of Sannio, Benevento, Italy

Abstract

Purpose – The purpose of this paper is to investigate the direct and indirect links between environmental, social and governance (ESG) practices and financial performance using the mediate role of green innovation.

Design/methodology/approach – To test the current study hypotheses, the authors applied linear regressions with a panel data using the Thomson Reuters ASSET4 and Bloomberg database from a sample of 115 UK and 90 Germany companies selected from the ESG index over the period 2005–2019.

Findings – The results show that the strengths ESG increase the firm value and the weaknesses decrease it. In addition, the authors find that green innovation fully mediates the relationship between ESG practices and financial performance in UK and Germany.

Practical implications – The findings provide interesting implications to academics practitioners and regulators who are interested in discovering ESG score, financial performance and green innovation. The results also provide insights to regulators and the board of directors on future growth opportunities for the company and the country.

Originality/value – This study is unique in examining the mediation effect of green innovation on the relationship between ESG practices and financial performance.

Keywords Financial performance, Green innovation, Environmental, social and governance (ESG)

Paper type Research paper

1. Introduction

In the new global economy, corporate financial performance has become a central issue for shareholders and stakeholders. In this context, the literature on corporate value has been growing as new aspects are gradually added because of the multidisciplinary nature of the subject (Battisti *et al.*, 2019; Buallay *et al.*, 2020). There are wide interest and concern over the extent, determinants and consequences of corporate performance and environmental, social and governance (ESG) practices.

In recent years, there has been an increasing interest in the relationship between ESG practices and firm value. In fact, ESG practices protect the interests of the shareholders, ensuring the separation of decision management and control in an organization. Specifically, behavioral science continues to increase the available research in the area of management's free will. The relationship between corporate social responsibility (CSR) and financial performance has been studied extensively since the 1960s. According to Fatemi *et al.* (2018), there has been increasing interest about CSR practices and ESG strengths. This type of CSR practices is becoming increasingly important in recognizing the impact that ESG issues have on corporate image reputation, competitive advantage and investment decision-making

(Di Bella and Al-Fayoumi, 2016; Battisti *et al.*, 2019; Baalouch *et al.*, 2019; Wong *et al.*, 2020; Do and Kim, 2020; Murashima, 2020). ESG is captured in this paper as an index used as a proxy of firms' engagement on CSR activities (Fatemi *et al.*, 2018; Wong *et al.*, 2020), which is provided by ASSET4® database of DataStream, by Thomson Reuters. The index of ESG firms is objectively and consistently defined as measures permitting like-for-like measurement of firm-specific ESG activities.

Likewise, in recent years, green innovation has attracted increasing attention due to its contributions to the conservation of resources and environmental protection and financial performance creation. Green innovation is one of the most proactive ways of achieving the benefits of environmental development. Green innovative firms are increasingly introducing changes into the market. Buisson and Silberzahn (2010) stated that innovation goes beyond technology, green innovation incorporates technological improvements that save energy, prevent pollution or enable waste recycling and can include green product design. Thus, with the rapid development of the economy, environmental problems have become increasingly prominent. Environmental pollution and degradation have become global problems.

Alternatively, ESG practices may impair firm value if investors view such engagement as "cheap talk". Previous studies have reported that firm's strengths with regard to ESG factors influence its financial performance (Battisti *et al.*, 2019; Baalouch *et al.*, 2019; Wong *et al.*, 2020; Murashima, 2020). ESG strengths increase firm value and weaknesses decrease it (Fatemi *et al.*, 2018). In the same vein, Auer and Schuhmacher (2016) emphasized the characteristics of the ESG firms and show that in the Asia–Pacific region and in the United States, investors concentrating on ethical utility derived from their portfolio choice can follow an ESG-based investment style and still obtain a performance similar to the broad market. Garcia *et al.* (2017) show that given the rising interest in CSR globally, the financial profile of a firm is associated with superior ESG performance. Climate change requires that we create a strategy that respects societal, financial and environmental value. The seminal work by Dietz and Porter (2012) on strategy and its link to value creation was further developed to explain how strategic implementation was critical to value creation. A CSR strategy was not new. Sheehy (2015) reviewed the existing literature on CSR strategic implementation to further define and potentially find consistency. Thus, CSR was the addition of a societal, financial and environmental focus throughout strategic implementation (Marques *et al.*, 2019; Kraus *et al.*, 2020).

However, the question of how the financial performance may be jointly affected by ESG activities and the intensity of green innovation remains largely unexplored. Thus, we hypothesize that the association between a firm's ESG activities and its financial performance mediates by its green innovation related to those activities. One might expect a positive effect insofar as green innovation helps investors better understand the firm's ESG strengths or weaknesses. This discussion prompts asking the following questions: does green innovation foster or hinder (mediate role) the relationship between ESG practices and financial performance?

The main objective of this study was to investigate the mediating effects of green innovation on the relationship between ESG factors and the financial performance of firms in common law (UK companies) and civil law (German companies). Common law is the legal system used in England and Wales. It is mainly based on the concept of precedent: when the court makes a judgment on a case, the judgment becomes part of the national law (La Porta *et al.*, 1998; Salhi *et al.*, 2019). The judge looks at past cases and precedents to resolve cases. Therefore, in the common law system, there are courts with universal jurisdiction. However, civil law is based on legislation. In this legal system, the judge's decision does not affect the laws of a country. The system is code-based and covers different legal topics (La Porta *et al.*, 1998; Salhi *et al.*, 2019).

In addition, green innovations require good framework conditions for innovations in general. Unless some level of sophistication is reached with regard to technological readiness

and innovation capabilities, specific policy strategies will not be successful (Walz *et al.*, 2017). Thus, we include indicators about governance. The general capabilities necessary for good governance are often based on indices of corruption and good governance. Germany or the United Kingdom, as developed countries voluntarily, engages to respect the rules of good governance and human rights.

Given the extant findings, we expect a positive association between the firm's ESG practices and its financial performance. The empirical results indicate a growing interest in ESG practices and green innovation over the past decade. We expect a positive relationship between ESG strengths and firm financial performance. Our findings reveal that firms with ESG concerns benefit from green innovation and increase its financial performance. This study highlights the importance of cultivating and promoting a culture of ESG and green innovation to positively impact CSR performance, which, in turn, can improve other aspects of company performance, in particular financial performance. Hence, this research provides incentives for managers to invest in ESG and green innovation in their quest for sustainable performance.

The paper contributes to the existing literature in several ways. First, despite theoretical support, the relationship between ESG practices, financial performance and the mediating role of green innovation is still vastly unexplored in the literature. This study aimed to bridge this gap in literature by analyzing the impact of ESG practices on the financial performance and the green innovation. Our results show that integrating ESG practices into corporate strategy is an asset that ensures value creation. It also contributes to the literature on value creation strategies and green innovation, especially in the context of ESG companies, by examining how and to what extent companies use practices related to social responsibility and environmental behavior to improve financial performance. Second, practically, this work serves to promote the implementation of ESG relating strategies, enabling to protect shareholders and their environment through a high-green innovation.

This paper is structured as follows: Section 2 presents the literature and the research hypotheses. Section 3 presents the research design, which takes into account a description of the sample, definitions of the variables and the analyses adopted. The main empirical results are presented and discussed in section 4. Finally, concluding remarks are given in section 5.

2. Literature review and hypothesis development

This study is more extensive in that it examines ESG characteristics which the research literature suggests might be explanatory variables in determining corporate performance. These are some of the important questions, which researchers are trying to explore in the recent literature of corporate value. In this context, we investigate ESG corporate firms in order to provide new evidence on how ESG practices influence financial performance.

2.1 Relationship between ESG practices and financial performance

Firm performance has been primarily focused on commercial goals and there has been a lack of consideration for ecological and societal aspects which have not been sufficiently recognized as having great potential. Aluchna *et al.* (2009) and Reverte *et al.* (2016) defined CSR as a concept whereby companies integrate the three elements of ESG, social, environmental and economic concerns into their business operations and in their interaction with stakeholders.

The question of how ESG factors affect a firm's financial performance and, ultimately, its value has been the subject of contentious debate. The empirical literature dealing with ESG's effects on financial performance and on firm value does not produce unequivocal results either (Fatemi *et al.*, 2018). In recent years, numerous studies have attempted to measure the impact of ESG factors in performance and firm's valuation (Battisti *et al.*, 2019; Baalouch *et al.*, 2019). The question of how ESG factors may affect a firm's financial performance and its

value has been extensively investigated. In early contributions, it was mostly taken as a given that environmental investments or social responsibility activities that exceeded the environmental goal and would thus affect firm value (Ioannou et al., 2016; Fatemi et al., 2018; Khan, 2019). Fatemi et al. (2018) show that extant empirical research has failed to document a consistent relationship between the extent of a firm's ESG disclosure and its financial performance or valuation. It has been argued that socially responsible behavior may have a net positive impact on performance and firm value (Fatemi et al., 2015; Malik, 2015). In this volume, the integration of ESG practices is defined as "the explicit and systematic incorporation of ESG factors into investment analysis and investment decisions". It is a holistic approach to investment analysis in which relevant ESG factors and traditional financial factors are identified and assessed in order to make an investment decision. On the empirical front, a large body of literature has also dealt with the effects of ESG factors. Various studies document a positive association between ESG practices and nonfinancial performance, including process efficiency and reduced material and energy consumption (Aras and Crowther, 2008). The investors are also integrating ESG factors into their relative ranking tools of companies. ESG entails the practice of social and environmental activities. These activities focus mainly on improving the company's relations with its stakeholders, who include shareholders, charities and community workers, suppliers, customers and the environment. It is therefore in this context that this investment adopts the concept of ESG which consists of two aspects of social and environmental sustainability. Practitioners assess the impact of material financial and ESG factors on the corporate and investment performance of a company, sector, country and/or portfolio. This can lead to adjustments to their forecasted financials, valuation-model variables, valuation multiples, forecasted financial ratios, internal credit assessments and/or portfolio weightings. Another key component of ESG integration is the environment. Shareholders assess all material factors traditional financial factors as well as ESG factors to identify investment risks and opportunities that are considered highly likely to affect corporate performance and investment performance. Environmental issues affect share prices and corporate bond yields.

Typically, ESG practitioners apply qualitative ESG analysis to inform investment decisions. They use internal and third-party research to create individual proprietary scores for environmental issues, social issues and governance issues, which are also weighted to create an aggregate ESG score for each company in the portfolio and in the investible universe (Fatemi et al., 2018; Murashima, 2020). Several ESG practitioners hold regular ESG-dedicated meetings to discuss these proprietary scores and their accompanying analysis to assess the potential impact of ESG issues on corporate performance and investment performance of companies and sectors. Thereby, ESG analysis may be given more advantage (Fatemi et al., 2015; Malik, 2015; Ioannou et al., 2016). If traditional financial and ESG factors are analyzed and found to be material, an assessment of their impact is carried out. El Ghoul and Karoui (2020) evaluate the relationship between ESG performance and firm value in 53 countries and find ESG performance to be positively related to firm value, especially in countries with weaker market-supporting institutions. Although they find a positive influence of environmental performance on economic performance, they do not find a significant impact of economic performance on environmental performance.

In terms of financial performance, Fatemi et al. (2018) state that strategic asset allocation strategies factor in ESG objectives and analysis to progressively mitigate the ESG risks and enhance financial performance. In this respect, practitioners who are long-term investors are likely to integrate ESG factors more regularly than short-term investors, as ESG factors tend to be low-frequency, high-impact factors that drive long-term performance. Consequently, a firm with a positive ESG performance may deliberately opt for a higher level of ESG disclosure and realizes a higher firm value (Battisti et al., 2019; Wong et al., 2020; Murashima, 2020). The literature on environmental accounting indicate that there is a strong requirement

for sustainable firm performance in the current environment but this can only be achieved where the approach is embedded in the core business, by leaders who can apply the concepts of value creation through a strong CSR culture (Di Bella and Al-Fayoumi, 2016; Garcia *et al.*, 2017; Kraus *et al.*, 2020).

Empirical evidence on the association between financial performance and environmental practices is inconclusive. A number of studies (Blacconiere and Patten, 1994; Barth *et al.*, 1997; Li and McConomy, 1999; Wong *et al.*, 2020; Do and Kim, 2020; Murashima, 2020) report a positive association between environmental practices and financial performance. Future performance is important in this case because most of the impacts resulting from the current environmental performance of a firm are felt in the future. A key component of ESG integration is lowering risk and/or enhancing returns. Practitioners apply ESG integration techniques to uncover hidden risks that might remain undiscovered without the analysis of ESG information and ESG trends. ESG practitioners also look for investment opportunities to enhance returns. If a company or country is viewed poorly based on its ESG performance and on its valuation assessment, it could lead to a negative signal. The ESG analysis can influence the maturity of the bond that an investor purchases.

Another example is practitioners who invest in companies with strong ESG management that are likely to outperform their competitors in the long run. The ESG analysis can be the deciding factor between otherwise identical companies or countries (Heimann and Lobre-Lebraty, 2018). If all other factors are equal, the practitioner will choose the company or country that performs better on its ESG analysis. In this respect, ESG data are included in their investment processes and could result in upward or downward adjustments to the weights of securities (Battisti *et al.*, 2019; Baalouch *et al.*, 2019).

The theory of legitimacy also has some ideas to offer regarding environmental reputation and the effect of socially responsible engagement on the financial performance (Bansal and Clelland, 2004). This theory can be considered as a systemic approach that considers businesses as part of a larger social system (Retief *et al.*, 2016). The current low adoption of ESG integration by company is due in part to the lack of understanding of how to integrate ESG issues into financial performance and firm's strategy. The lack of understanding may be exacerbated by the difficulties expressed by shareholders with sourcing ESG data on company as compared to countries data. This makes it more difficult for shareholders to assess the absolute and relative ESG performance of a company (Battisti *et al.*, 2019; Wong *et al.*, 2020).

Despite these challenges, practitioners are integrating ESG issues into their analysis and that they also integrate ESG factors into their portfolio construction techniques. The majority is making qualitative assessments of ESG issues through the use of third-party research and internal research. These assessments then inform their investment decisions. Terms such as sustainable investing, ESG investing, socially responsible investing (SRI), green investing, ethical investing and impact investing are often used interchangeably. This argument is supported by Cahan *et al.* (2016), who find that good ESG performance generates favorable publicity, and that firm with good ESG performance realizes a higher firm value if they also have favorable media coverage.

Accordingly, shareholders require modern-day businesses to improve their business processes and remove the environmental hazards caused by their business operations. Thus, the company engages in win-win logic and considers that ESG practices are a sustainable competitive advantage in a turbulent environment. Based on these arguments, the hypotheses are proposed as follows:

H1a. Environmental practices are positively associated with financial performance.

H1b. Social practices are positively associated with financial performance.

H1c. Governance practices are positively associated with financial performance.

2.2 Relationship between green innovation and financial performance
Today's competitive world, green innovation attracts increased attention of companies which aim high market ratios and competitive advantage. Green innovation has attracted increasing attention due to its contributions to the conservation of resources and environmental protection. Companies are generally considered as the main cause of environmental problems and are subject to enormous pressure of environmental legitimacy from various stakeholders (Bansal and Clelland, 2004). This innovation aims generally, decrease of pollution, energy productivity, decrease of waste, substitution of limited resources with sustainable resources and recycling (Harel *et al.*, 2020). However, in the process of exploring green innovation, the allocation of resources and the direction of green innovation are often the financial performance and value creation. It is a key factor in its strategy to ensure its competitiveness and profitability (Delgado Ceballos *et al.*, 2012; Michelino *et al.*, 2014). Green innovation has been increasingly emphasized by policy makers and academics alike as a mechanism for effectively solving environmental problems (Kiviima, 2008) and enhancing firm sustainability (Kallio and Nordberg, 2006). Thus, firms have begun to pay more attention to the impact of their decision-making and management behaviors on the environment and to promote green innovation (Cui *et al.*, 2017; Safari *et al.*, 2018).

Green innovation has also become the focus of academic research. Studies have indicated that green innovation introduces the ecological idea into the development process to eliminate or reduce the harm caused to the environment (Gunasekaran and Spalanzani, 2012). Thus, a positive synergy occurs between the objectives of the firm and the objectives of its environment. From different perspectives, green innovation develops not only environmental performance of company but also provides competitive advantage. Therefore, over the past decade, socially responsible investment (SRI) has become a major trend in the ESG firms and a key topic in financial research all around the world. In this vein, green innovation has been recognized as one of the key factors affecting financial growth, environmental sustainability and quality of life (Dangelico and Pujari, 2010; Yu and Ramanathan, 2016).

There are several studies in the literature on the relationship of business performance in eco-innovation with their environmental performance (Harel and Kaufmann, 2016; Harel *et al.*, 2020). According to these studies, green product and process innovation performance of a company has a positive effect on competitive advantage (Chen *et al.*, 2006; Chang, 2011). Some literature supports the hypothesis that green innovation positively affects financial performance while others do not. Compared with other types of innovation, green innovation has significant externalities because it can lead to a cleaner world. Thus, green innovation is an important decision to achieving sustainable development.

Aguilera-Caracuel and Ortiz-de-Mandojana (2013) aim to identify the effect of green innovation on environmental company performance, which includes environmental performance and competitive advantage of a company. The results of this study show that environmental practices prevent green innovative firms from taking financial advantage of the benefits of green innovation. This type of innovation also contributes to business sustainability because it potentially has a positive effect on financial, social and environmental outcomes.

Indeed, Esty and Winston (2006) find that firms that do not increase their environmental sensitivity will face the risk of losing their upside opportunities in a market shaped by environmental factors. Company performance, is effected from several factors. Thus, the greater the stringency of the environmental regulations in a country, the probability that green innovation will lead to better firm-level financial performance improvement. The researchers divide green innovator's performance into two dimensions, environmental performance and financial performance. Green innovation facilities play a key role in company's environmental performance results and comprehensive environmental sustainability realization (Rave *et al.*, 2011).

Some studies argue that green innovation only slightly contributes to firm innovation portfolios (Cormier and Magnan, 2015; Bi *et al.*, 2016). Although, depending on applied innovation type, green innovation tends to come out when environmental pressures exist (Huber, 2008). According to another study, making conscious of green innovation affects environmental performance positively and also green innovation has an effect on financial performance and competitive advantage (Chiou *et al.*, 2011). Consequently, green innovation effects environmentally sensitive company performance positively (Lin *et al.*, 2013). In focusing on green innovative firms, we note that the intensity of green innovation is positively related to firm profitability. Thus, green innovation facilities are defined as development of environmental quality or optimum usage of natural resources (Rave *et al.*, 2011). These outputs can be economical result such as profit margin, increase of income and new investments.

Thus, green innovation is an important decision to achieving sustainable development. Miozzo *et al.* (2016) find that innovative firms are those who choose to develop a strategy based on their productive resources in order to have a monopoly situation by manufacturing a new product at a competitive cost. Similarly, Gueguen and Isckia (2011) finds that in certain cases, innovation can lead the company to a monopoly situation that allows it to have an "over-profit" situation and consequently an improvement in its stock market value. Therefore, investors concentrating on ethical utility derived from their portfolio choice can follow an ESG-based investment style and still obtain a performance similar to the broad market. ESG firms are able to improve their products and internal processes and reduce their operation costs through green innovation. Therefore, green innovation is one of the most proactive ways of achieving the benefits of environmental development. Green innovative firms are increasingly introducing changes into the market. These effects will be greater for high-intensity ESG firms because they reflect the firms' commitment to environmental issues and the relative influence of those issues on innovation activities. Innovation is one the fundamental factors to create distinctive competitive advantage for organizations (Calantone *et al.*, 2002; Knight and Cavusgil, 2004; Xie *et al.*, 2018). Gueguen and Isckia (2011) advocated that innovative capability can help an organization to get competitive advantage.

Therefore, we propose that the greater the level of green innovation intensity within an ESG firm, the greater the positive effect on its corporate financial performance.

H2. A high level of green innovation intensity is positively related to firm-level financial performance improvement.

2.3 Relationship between ESG practices and the degree of green innovation intensity
Some researchers pay greater attention to the study of the influencing factors of green innovation and the impact of green innovation on the economic and social performances of companies (El-Kassar and Singh, 2019). Prior studies find that ESG strengths increase the degree of green innovation intensity and that weaknesses decrease it (Chen *et al.*, 2006; Hashemi *et al.*, 2015; Liu *et al.*, 2017; Li *et al.*, 2018). However, due to the different characteristics of the industry and the firm itself, it is difficult to apply these research conclusions to provide reference models for green innovation for firms, especially emerging firms, to follow. Especially, representative firms of ESG practices exploring green innovation channels can obtain useful experience to optimize the utilization of resources. Thus, the specific effect of green innovation on these outcomes can be highly influenced by the ESG practices and national context in which firms develop their activities. Today's competitive world, green innovation attracts increased attention of companies which aim high market ratios and competitive advantage. Specially, companies with ESG practices focus on new product designs that enable lower energy consumption during its usage by consumer, minimum waste after consumption or no hazardous material including. These all examples

show tendency of companies regarding environmental care and protection strengthens with ESG practices (Du Rietz, 2014; Radhouane *et al.*, 2018). Several papers have investigated the relationship between environmental reporting, ESG practices and green innovation (Ahrens and Chapman, 2007; Clarkson *et al.*, 2013; Plumlee *et al.*, 2015; Qiu *et al.*, 2016). Companies also pay attention to their processes in terms of environmental respect. They seek any solutions to decrease material and energy usage during production phase or recycling of used material and decreasing waste and disposals material after production activities.

The importance of green innovation management is growing both in practice and in academia with the ESG factors. A current overview of the existing body of literature in the field of green innovations, identifying the most active scholars, institutions and relevant publications also contributes to a clarification of the concept "green innovation". The review explains that three different notions of green innovation, ESG are used largely synonymously, while the notion of sustainable innovation broadens the concept and includes a social and environmental dimension (Dangelico, 2016).

Indeed, given the rising interest in social responsibility and ESG practices globally, Garcia *et al.* (2017) investigates whether the financial profile of a firm is associated with superior ESG performance. The results suggest that companies in sensitive industries present superior environmental performance and that ESG practices contributes to research and in the practice of sustainability management in firms in developing countries. In sum, the review of the literature suggests the existence of relationship between ESG practices and the degree of green innovation (Fatemi *et al.*, 2015; Malik, 2015; Jackson *et al.*, 2016; Siva *et al.*, 2016; Yang *et al.*, 2017).

Therefore, we do expect ESG practices to be capable of increasing the investment returns of green innovation. Hence, we formulate the following generic hypothesis:

H3a. Environmental practices are positively associated with green innovation.

H3b. Social practices are positively associated with green innovation.

H3c. Governance practices are positively associated with green innovation.

2.4 ESG practices and financial performance: the mediation role of green innovation
Our tests are investigating whether firms with high ESG practices have a higher financial performance.

Many studies have supported the positive relationship between ESG practices and financial performance (Ioannou *et al.*, 2016; Fatemi *et al.*, 2018; Khan, 2019). If ESG practices can influence green innovation of a firm, then green innovation has a positive impact on financial performance (Liu *et al.*, 2017; El-Kassar and Singh, 2019). We know that firms with ESG practices identify and judge the demands of different stakeholders. The result is an increase in efficient corporate governance, leading to adaptation and to organizational changes, i.e. a successful change in the management process.

The above discussion indicates that ESG practices positively affect green innovation, which, in turn, positively affects financial performance.

H4. Green innovation mediates the relation between ESG practices and financial performance.

3. Research design
This section details the proposed empirical research methods for this study. These include the sample selection and the justification for such selection. The empirical model specification, variable measurements and the model estimation method are also discussed here.

3.1 Sample construction and data collection

To test the developed hypotheses, our study focused on socially responsible companies that are part of the ASSET4 database. We obtained detailed information from the ASSET4 database (DataStream) and other data sources, such as the Bloomberg in two developed countries: The UK and Germany. We use a sample comprised of 115 British companies and 90 Germany companies during the 2005–2019 period. The UK and Germany are two typical countries in such a comparative study between common law and civil law legal systems. We chose these two countries for several reasons. The UK and Germany have different cultures and traditions. The UK, as an Anglo-American country, has a common-law accounting system. On the other hand, Germany is a European country and has a civil law accounting system. The final sample consists of 205 ESG firms (3,075 firm-year observations). In fact, firms missing data were excluded from the sample. Banks, insurers and other financial firms are excluded because they are subject to specific accounting standards. Table 1 presents the distribution of the listed firms of our sample. Determining the sample and its distribution by sectors is summarized in thus table (Table 1). Panel A describes the sample selection, Panel B provides the distributional properties of the full sample by country and Panel C presents sample distribution by industry.

3.2 Variables measures

Our methodological approach is realized by the measurement of the variables, which will be followed by a models presentation to test the study hypotheses.

3.2.1 Variables of interest. 3.2.1.1 Financial performance. Much accounting and financial ratios: market-to-book value (MTBV), return on assets (ROA), asset turnover (ATO), return on equity (ROE) and Tobin's q (TOBINQ) were used as the indicators of business performance (Appuhami, 2007; Zeghal and Maaloul, 2010; Maditinos *et al.*, 2011). In this study, financial performance is our variable of interest. In a fairly traditional way, one retains the Tobin's q (TOBINQ) to measure the financial performance of ESG companies. Tobin's q is computed as the market value of equity plus the book value of total assets minus the book value of equity over the book value of total assets (Servaes and Tamayo, 2013).

3.2.1.2 Green innovation. As discussed in the literature review, most studies decompose green innovation into green technology innovation (GTI) and green management innovation (GMI). As to GTI, most previous studies employed green patents as a proxy (Brunnermeier and Cohen, 2003; Cormier and Magnan, 2015). In this study, we will adopt a measure developed by ASSET4 to measure the degree of green innovation «GRE_INN». Thus, ASSET4 determines the degree of green or responsible innovation intensity according to the R&D responsibility which is defined as the number of controversies published in the media related to how to conduct or publish research, tests and the development of products and services in an ethical and responsible manner.

3.2.1.3 Environmental, social and governance score. Archival researchers have measured ESG using a variety of datasets and methods. The most prominent ESG dataset used in the accounting literature and elsewhere is MSCI ESG STATS (KLD). MSCI analysts rate firms using binary scores. Thomson Reuters ESG Research Data (formerly known as ASSET4) is another popular CSR dataset. This dataset began with the Russell 1,000 firms in 2002 and now contains ratings for over 4,000 companies globally on over 500 variables (Virtanen *et al.*, 2013). As part of our analysis, it is proposed to measure the ESG engagement of the companies in our sample by as scores determined and calculated by the rating agency ASSET4 to ensure comparability between companies.

3.2.2 Control variables. The link between societal and ethical practices and firm value may be influenced by several other variables that we need to control for. Several studies have incorporated one or more control variables to eliminate or mitigate their effects on the

Sample	No. of firms	No. of observations
Panel A: sample selection		
Initial sample	362	5,430
– Companies with total lack of data	(64)	(960)
– Firms with missing data	(76)	(1,140)
– Banks and financial institutions	(17)	(255)
Final sample	205	3,075

Country name	No. of firms	No. of observations	%
Panel B: Sample distribution by country			
Germany	90	1,350	43.90
UK	115	1725	56.10
Total	205	3,075	100

Industry	No. of observations	%
Panel C: Sample distribution by industry		
Aerospace and Defense	60	1.95
Alternative Energy	32	1.04
Automobiles and Parts	58	1.89
Equity Investment Instruments	90	2.93
Forestry and Paper	112	3.64
Mobile Telecommunications	90	2.93
Beverages	61	1.98
Chemicals	85	2.76
General Industrials	143	4.65
Real Estate Investment and Services	127	4.13
Construction and Materials	63	2.05
Tobacco	105	3.41
Electricity	105	3.41
Electronic and Electrical Equipment	75	2.44
Fixed Line Telecommunications	150	4.88
Food and Drug Retailers	140	4.55
Food Producers	137	4.46
Gas, Water and Multiutilities	107	3.48
General Retailers	73	2.37
Health Care Equipment and Services	64	2.08
Household Goods and Home Construction	72	2.34
Industrial Engineering	45	1.46
Industrial Metals and Mining	59	1.92
Industrial Transportation	75	2.44
Leisure Goods	60	1.95
Media	75	2.44
Mining	73	2.37
Oil and Gas Producers	45	1.46
Oil Equipment and Services	85	2.76
Personal Goods	165	5.37
Pharmaceuticals and Biotechnology	109	3.54
Real Estate Investment Trusts	42	1.37
Software and Computer Services	85	2.76
Support Services	43	1.40
Technology Hardware and Equipment	83	2.70
Travel and Leisure	82	2.67
Total	3,075	100

Note(s): Panel A describes the sample selection, Panel B provides the distributional properties of the full sample by country, and Panel C presents sample distribution by industry. Observations: the is total of firm-years observations by country and by industry

dependent variable. Thus, following previous researches, we included several control variables, which are related to the characteristics of the company and its environment in our model.

(1) Environmental disclosure (E_DISC): We partnered with Bloomberg to analyze the transparency of environmental disclosure. The information in these figures comes from the analysis of Bloomberg's environmental disclosure scores, which are based on publicly available data.

(2) Firm size (SIZE) is measured as the natural log of total assets. On prior research organizational size has been shown to be an important determinant of firm-level environmental conduct (Aragon-Correa, 1998). Furthermore, economies of scale are one of the structural determinants of corporate outcomes (Christmann, 2004; Mafrolla *et al.*, 2016). We find that larger firms are likely to be more performance and more innovative than smaller firms.

(3) Leverage (LEV) is measured as total debt divided by total equity, is included as a control variable as firms that have higher debt-to-equity ratios are not efficient at creating value. Companies with high financial leverage will force to take measures such as green innovation to meet the requirements of stakeholders for sustainable development (Gupta and Newberry, 1997).

Table 2 shows the dependent, independent and control variables 'measurements.

3.3 Research methodology
To test the mediating effect of green innovation on the relationship between ESG practices and financial performance, we use the approach provided by Baron and Kenny (1986). Kenny *et al.* (1998), who define a mediator as a variable to the extent that it accounts for the relation between the independent variable and the outcome variable. According to Baron and

Variables			Measurement	Source
TOBINQ			Tobin's q [[Book value of assets - book value of equity - deferred taxes + market value of equity) / Book value of assets]	Thomson Reuters ASSET4 (Datastream)
GRE_INN			Measured by a score developed and determined by the "ASSET4" database	Thomson Reuters ASSET4 (Datastream)
ESG score	ENV_SCO		It is a score that consists of a series of items that count the company's performance in environmental practices developed by ASSET4	Thomson Reuters ASSET4 (Datastream)
	SOC_SCO		It is a score developed by ASSET4 which consists of a series of items that represent the CSR practices of companies	Thomson Reuters ASSET4 (Datastream)
	GOV_SCO		A score determined and calculated by the rating agency ASSET4 to ensure comparability between companies	Thomson Reuters ASSET4 (Datastream)
E_DISC			This variable is as an indicator of Environmental transparency Environmental disclosure = (Environmental disclosure score/100)	Bloomberg database
SIZE			This variable is measured as natural logarithm of total assets	Thomson Reuters ASSET4 (Datastream)
LEV			Leverage (total debt to market value of equity)	Thomson Reuters ASSET4 (Datastream)
Note(s): This table reports the definitions of the variables used in our study				

Table 2.
Variable definitions
and data sources

Kenny (1986), to establish mediation, the independent variable must affect the mediator in the first equation. In the second equation, the independent variable must be shown to affect the dependent variable and the mediator must affect the dependent variable in the third equation.

If these conditions all hold in the predicted direction, then the effect of the independent variable on the dependent variable must be less in the third equation than in the second (Salhi *et al.*, 2019). In other words, Kenny *et al.* (1998) cited by Salhi *et al.* (2019) and Koubaa and Jarboui (2017) have discussed four steps in establishing mediation:

(1) Step 1: Show that the initial variable is correlated with the outcome (Model Y = X).

(2) Step 2: Show that the initial variable is correlated with the mediator (Model M = X).

(3) Step 3: Show that the mediator affects the outcome variable (Model Y = M X).

(4) Step 4: To establish that M completely mediates the XY relationship, the effect of X on Y controlling for M should be zero (estimate and test path c').

In this study, the variables X, M and Y are as follows:

(1) X: ESG practices;

(2) M: Green innovation; and

(3) Y: Financial performance (TOBINQ).

Panel regression analysis (using STATA 13 as a statistical software package) was employed to estimate Models 1–3 testing the direct and indirect relationship between ESG practices and financial performance:

$$TOBINQ_{it} = \beta_0 + \beta_1 ENV\_SCO_{it} + \beta_2 SOC\_SCO_{it} + \beta_3 GOV\_SCO_{it} + \beta_4 E\_DISC_{it}$$
$$+ \beta_5 SIZE_{it} + \beta_6 LEV_{it} + \sum_{j=7}^{21} \beta_j YEAR_{it} + \sum_{l=22}^{56} \beta_K INDUSTRY_{it} + \varepsilon_{it}$$

(Model 1)

$$TOBINQ_{it} = \beta_0 + \beta_1 GRE\_INN_{it} + \beta_2 E\_DISC_{it} + \beta_3 SIZE_{it} + \beta_4 LEV_{it}$$
$$+ \sum_{j=5}^{19} \beta_j YEAR_{it} + \sum_{l=20}^{54} \beta_K INDUSTRY_{it} + \varepsilon_{it}$$

(Model 2)

$$GRE\_INN_{it} = \beta_0 + \beta_1 ENV\_SCO_{it} + \beta_2 SOC\_SCO_{it} + \beta_3 GOV\_SCO_{it} + \beta_4 E\_DISC_{it}$$
$$+ \beta_5 SIZE_{it} + \beta_6 LEV_{it} + \sum_{j=7}^{21} \beta_j YEAR_{it} + \sum_{l=22}^{56} \beta_K INDUSTRY_{it} + \varepsilon_{it}$$

(Model 3)

$$TOBINQ_{it} = \beta_0 + \beta_1 ENV\_SCO_{it} + \beta_2 SOC\_SCO_{it} + \beta_3 GOV\_SCO_{it} + \beta_4 GRE\_INN_{it}$$
$$+ \beta_5 E\_DISC_{it} + \beta_6 SIZE_{it} + \beta_7 LEV_{it} + + \sum_{j=8}^{22} \beta_j YEAR_{it}$$
$$+ \sum_{l=23}^{57} \beta_K INDUSTRY_{it} + \varepsilon_{it}$$

(Model 4)

Where: All the variables are defined previously in Table 2. YEAR and INDUSTRY stand respectively for year and industry fixed effects; ε is the error term and the indices i and t represent respectively the companies and the year.

3.3.1 Model graphic. Figure 1 presents the effect of ESG practices on financial performance (a', b', c') through a role of green innovation "mediation" (efg; d'). The relation (a, b, c) represents the direct effect of ESG practices on financial performance. The relation (d) represents the direct effect of green innovation on financial performance. The mediating variables' role generates a decomposition of the total effect (a, b, c) of the independent variables (X: ESG practices) on the dependent variable (Y: financial performance) into a direct effect (a', b', c') and an indirect effect (efg; d').

4. Empirical results

4.1 Descriptive and correlation analysis

Table 3 shows the summary statistics for the dependent variable, the independent variable and the mediating variable. Table 3 provides summary statistics for financial performance, ESG practices and green innovation.

The mean value of green innovation in UK firms is 0.524 and 0.612 for the governance responsible. For Germany firms (Table 3), we see that green innovation in Germany firms spans from a minimum of 0.236 to a maximum of 0.879 with mean value of governance responsible of 0.662. Corporate governance varies widely across countries and across firms. The financial performance in Germany varies from 1.005 until 2.547 with a mean of 1.1597 and a standard deviation of 0.169 that is very small compared to the average. As can be seen from Table 3 (Panel A), the average level of the environmental disclosure in UK firms (E_DISC) is equal to 0.556 with a relatively small standard deviation (0.261), which corresponds to an acceptable level of environmental transparency ESG firms in UK. Our results are in line with those found by Ismail *et al.* (2018), who found a difference in the disclosure of environmental information between companies and countries. In short, Germany and UK firms in the sample are involved in the ESG process through the adoption of practices and regulations aiming to enhance financial performance.

4.2 Correlation analysis

Correlations among independent variables related to our regression model are provided in Table 4. Pearson correlations among independent variables are, in general, weak. We have, for example, a significant correlation of 0.562 between the environmental information disclosures and the score of responsible governance. However, the highest value (0.672) corresponds to the correlation coefficient between the degree of green innovation intensity
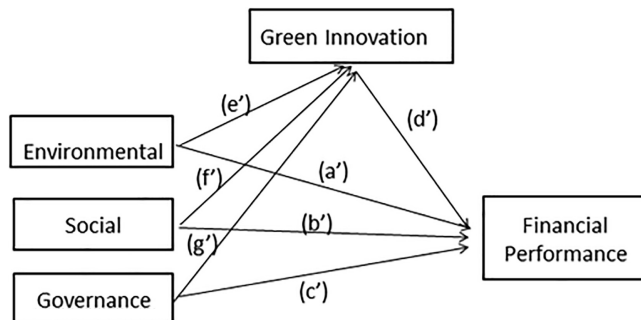

Figure 1.
The mediating effect of green innovation on the relation between ESG practices and financial performance

Variables	Mean	Q1	Min	Q2	Max	Sd
TOBINQ						
UK	1.8819	1.318	1.247	2.153	2.358	1.001
GR	1.1597	1.296	1.005	2.228	2.547	1.169
GRE_INN						
UK	0.524	0.265	0.236	0.319	0.724	0.356
GR	0.621	0.319	0.236	0.657	0.879	0.330
ESG score						
ENV_SCO						
UK	0.519	0.341	0.04	0.682	0.734	0.290
GR	0.501	0.3669	0.15	0.610	0.792	0.279
SOC_SCO						
UK	0.581	0.291	0.047	0.784	0.964	0.255
GR	0.699	0.384	0.039	0.893	0.988	0.276
GOV_SCO						
UK	0.612	0.254	0.017	0.710	0.979	0.254
GR	0.662	0.418	0.025	0.825	0.956	0.224
E_DISC						
UK	0.556	0.415	0.089	0.734	0.966	0.261
GR	0.689	0.341	0.089	0.910	0.971	0.296
SIZE						
UK	6.947	4.406	3.831	7.713	8.419	1.653
GR	7.115	4.263	4.232	5.231	7.260	1.155
LEV						
UK	0.451	0.103	0.076	0.591	0.782	0.598
GR	0.396	0.085	0.014	0.557	0.670	0.140

Note(s): This table reports descriptive statistics. Variables definitions are provided in Table 2

Table 3.
Summary statistics of
the sample: panel A
(UK firms) and panel B
(Germany firms)

Variables	1	2	3	4	5	6	7	8
1. TOBINQ	1							
2. GRE_INN	0.326***	1						
3. ENV_SCO	0. 087**	0.023**	1					
4. SOC_SCO	0.395***	0.017*	0.109***	1				
5. GOV_SCO	0. 239**	0.672***	0.264***	−0.058*	1			
6. E_DISC	0.085*	0.039	0. 534***	−0.232***	0.562**	1		
7. SIZE	0.067	0.251*	0.034*	0.263*	0.197**	0. 033*	1	
8. LEV	−0.037**	0.226	0.196	0.079	−0.268**	0.492	−0.064	1
VIF	1.03	2.14	1.69	1.08	1.72	1.08	1.22	1.19

Note(s): This table presents the correlation matrix between the variables used in the study. Variables are defined in Table 2. ***p-value < 0.01; **p-value < 0.05; *p-value < 0.1

Table 4.
Pairwise correlation
matrix of variables and
VIF values

and responsible governance score. The variance inflation factor (VIF) is weak suggesting the absence of multicollinearity between the independent variables of our model.

Table 5 presents the distributional statistics and uni-variate difference of variables for the UK and Germany samples. There is a significant difference in the ESG practices (ESG score), the degree of green innovation intensity and financial performance between the two samples.

Variables	Mean	*t*-test	Sig	Average difference
TOBINQ		1.872	0.084	6.493
UK	1.8819			
GR	1.1597			
GRE_INN		0.811	0.041	5.750
UK	0.524			
GR	0.621			
ESG score				
ENV_SCO		1.982	0.058	9.202
UK	0.519			
GR	0.501			
SOC_SCO		3.592	0.000	4.572
UK	0.581			
GR	0.699			
GOV_SCO		1.914	0.042	8.651
UK	0.612			
GR	0.662			
E_DISC		1.860	0.079	6.357
UK	0.556			
GR	0.689			
SIZE		4.99	0.000	5.961
UK	6.947			
GR	7.115			
LEV		2.06	0.043	3.896
UK	0.451			
GR	0.396			

Note(s): Variables are defined in Table 2

Table 5.
Distributional statistics and univariate difference of variables: panel A (UK firms) and panel B (Germany firms)

4.3 Selection of fixed or random effect

The decision of fixed and random effect lies on the result of Hausman's test. A Hausman test has been typically used to determine the consistency of the GLS estimator in static models with pooled cross-section-time-series data. This test when run for the data of present study gave significant result which proves the use of fixed effect regression analysis so for our model before regression analysis Hausman's test was run and for almost all model fixed effect was applied as per the results of Hausman's test.

Table 6 presents the decision of fixed effect lies on the result of Hausman's test:

4.4 Results of structural equation model

Step1: check the relationship between ESG practices and financial performance:

	$\chi^2(k)$	*p-value*	*FE/RE****
M1	*129.38*	*0.000*	*EF*
M2	*26.15*	*0.0005*	*EF*
M3	*46.12*	*0.000*	*EF*
M4	*16.38*	*0.0219*	*EF*

Note(s): ** FE/RE: fixed or random effect; $\chi^2(k) > \chi^2$(Hausman) RE ; $\chi^2(k) < \chi^2$(Hausman) FE

Table 6.
Hausman's test

It was hypothesized that there is a positive association between ESG practices and financial performance. Table 7 presents the results of the estimating Eqn (1) to test our a; b; c.

The results of regression analysis showed that ESG practices (ENV_SCO; SOC_SCO; GOV_SCO) positively influences financial performance in the both samples of UK firms. As can be seen in the table, the decision to adopt an environmental social behavior leads to higher financial performance. This can be one of the major objectives of a responsible organization. Therefore, the positive effect of ESG practices on financial performance is a key role of the UK and Germany corporate. Similarly, the regression results demonstrate the positive effect of good governance practice on financial performance. This can be explained by the fact that the boards are responsible for leading the organization toward environmentally friendly actions through such financial performance. Thus, the regression results prove that the coefficient of good governance index is positive and statistically significant at the level of 1%.

With respect to the control variables introduced in our models, the results show that all the variables are statistically significant in the explanation of the studied phenomenon. Table 7 presents the explanatory power of the model, the beta coefficients, the *t*-statistic, the *F* statistic and its meaning as well as a summary of the results of the regression relative to all explanatory variables of the model.

Step 2: check the relationship between the degree of green innovation intensity and financial performance:

Table 7 presents the results of estimating Model 2 to test our H2. To define the role of "degree of green innovation intensity", the regression of financial performance "TOBINQ" as a dependent variable is depicted in Table 7. The results of the panel regression analysis are reported in this Table. Our findings highlight a positive and significant relationship between an ESG firm's level of degree of green innovation intensity and its financial performance, confirming the research hypothesis. We therefore find evidence that a superior level of degree of green innovation intensity can provide a better access to financial resources and a higher financial performance. The regression outcomes concerning control variables in the model allow us to make considerations on the robustness of the dependent variable. Our findings are in line with those of prior studies highlighting that the financial performance is positively influenced by company practices and its localization or the legal system.

Table 7 presents the summary of the results of the regression relative to all explanatory variables of the model.

Step 3: check the relationship between ESG practices and the degree of green innovation intensity:

Step 3 is to show a significant relationship between ESG practices and the degree of green innovation intensity. Table 7 presents the results of estimating Model 3 to test our hypotheses H3a, H3b and H3c. Our findings highlight a positive and significant relationship between an ESG firm's level of ESG practices and the degree of green innovation intensity. Our findings are in line with those of prior studies and confirming the research hypothesis. We therefore find evidence that a superior level of degree of green innovation intensity is necessary depend to ESG practices. The regression outcomes concerning control variables in the model allow us to make considerations on the robustness of the dependent variable.

Step 4: check the mediating effect of the degree of green innovation intensity on the relationship between ESG practices and financial performance:

In step 4, we need to evaluate the direct effects (a; b; c) and (a'; b'; c') as illustrated in Figure 1. In fact, this step allows us to test the relationship between ESG practices and financial performance by adding the mediator variable, namely, the degree of green innovation intensity.

	Panel A (UK firms)				Panel B (Germany firms)			
	TOBINQ Model 1	TOBINQ Model 2	GRE_INN Model 3	TOBINQ Model 4	TOBINQ Model 1	TOBINQ Model 2	GRE_INN Model 3	TOBINQ Model 4
Constant	5.523 *** (10.22)	4.217*** (11.96)	5.926*** (34.87)	9.647*** (23.56)	8.952*** (22.14)	13.804*** (28.54)	4,324*** (10.15)	2.016*** (9.43)
ENV_SCO	0.0014 *** (5.96)		0.047 *** (4.333)	0.0046*** (8.90)	0.0051*** (11.93)		0.2014*** (12.88)	0.0035*** (5.45)
SOC_SCO	0.0006 (6.56)		0.01* (1.708)	0.3753*** (35.59)	0.0268*** (6.85)		0.1511*** (6.97)	0.0457 * (2.34)
GOV_SCO	0.0037 *** (5.63)		0.016*** (8.922)	0.1677*** (9.29)	0.0250*** (7.12)		0.0178*** (4.58)	0.034** (2.234)
GRE_INN		0.016*** (4.396)		0.1603*** (19.01)		0.8398*** (40.10)		0.088 *** (6.023)
E_DISC	0.0154 *** (5.00)	0.115*** (17.709)	0.026*** (11.752)	0.3520*** (6.85)	0.0128*** (6.79)	0.0185** (6.24)	0.1987*** (11.28)	0.135*** (13.079)
SIZE	2.2563*** (4.01)	0.159 *** (13.484)	0.01* (1.708)	0.3698*** (35.75)	4.571*** (17.10)	0.0210*** (9.36)	0.0268*** (6.85)	0.167*** (6.526)
LEV	−1.7481* (2.43)	−0.006 (−0.305)	−0.259*** (−25.457)	−0.0013 (−1.27)	−0.0004 (−1.57)	−0.0009 (−0.9)	−0.0014 (1.28)	−0.3445*** (−9.16)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.4051	0.3561	0.3742	0.4775	0.3833	0.3247	0.5211	0.4218
F Value	38.57 ($p < 0.01$)	35.20 ($p < 0.01$)	35.85 ($p < 0.01$)	36.08 ($p < 0.01$)	35.73 ($p < 0.01$)	35.09 ($p < 0.01$)	35.97 ($p < 0.01$)	38.44 ($p < 0.01$)
N-obs	3,075	3,075	3,075	3,075	3,075	3,075	3,075	3,075

Note(s): Table 7 presents the results of regression estimation that includes fixed effects for fiscal year and industry. Year and industry indicators are included in our models, but their coefficients are not shown in this Table. *, **, *** significance at $p < 0.01$; $p < 0.05$ and $p < 0.10$, respectively

Model VII was generated based on Model 1, 2 and 3 by introducing the interactive items of independent variable and the mediating effect. The results indicated that the degree of green innovation intensity have mediating effects on the relationship between ESG practices and financial performance. Thus, according to Table 7, the degree of green innovation intensity "GRE_INN" of companies engaged in the ESG index has a positive and statistically mediating effect in UK firms (0.1603 and $p = 0.000$) and Germany firms (0.088 and $p = 0.000$), confirming our initial expectation.

Table 7 presents the summary of the results of the regression relative to all explanatory variables of the model.

4.5 Robustness test
To check the robustness of our main results, we verify whether the mediated role of green innovative remains intact if we replace the financial performance (which is measured by TOBINQ) with the businesses' market valuation (which is measured by market-to-book value (MTBV)). Thus, we re-estimate regressions (1)–(2) and (4) using the MTBV as a proxy for the businesses' market valuation. Table 8 shows that the results are similar to those previously reported, as displayed in Table 7.

4.6 Discussion of findings
The purpose of the study is to examine the mediating effect of green innovative on the relationship between ESG practices and financial performance. In other terms, we investigate how the degree of green innovation intensity affects the relationship between ESG practices and financial performance by exploring the effect of the ESG practices on financial performance in two different legal systems (common law versus civil law). We found that ESG firms that exhibit a high level of green innovation intensity are able to enhance their corporate financial performance. This finding may be because, through green innovation, these firms are able to improve their financial performance through both cost leadership and product differentiation.

The findings of the study indicate that there is a positive relationship between ESG practices and financial performance in the two samples. The evidence is in line with the signal theory, indicating that ESG practices are associated with financial performance.

Furthermore, according to Hashemi *et al.* (2015), green innovation also contributes to sustainable business development as it can have a positive impact on a company's financial, social and environmental performance. However, it is difficult to provide guidance and reference for relevant companies due to the lack of research on green innovation practices of companies. The particular impact of green innovation on these outcomes may be highly dependent on ESG practices and the national context in which companies develop their operations. Green innovation is a specific tool to achieve sustainable development. At this level, green innovation according to ethical principles is considered as a major solution for companies wishing to be more competitive. It is an opportunity to reduce conflicts of interest, improve the trust of the information user and enhance the social legitimacy of the company. This is explained by the fact that innovation intensity is a determining factor of the company's strategy because of its effects on the company's performance and financial results. Our results align with the results of Atalaya *et al.* (2013), in a previous study find that in a changing environment, the future financial position of the company depends not only on the normal activity but also on the presence of the innovation which is strongly associated with the competitiveness of the company. Our results emphasize the importance of integrating research and development practices with social responsibility as a determinant of business performance.

If we introduced green innovative as a mediator variable, the results indicate that degree of green innovation fully mediates the relationship between ESG practices and financial

	Panel A (UK firms)				Panel B (Germany firms)			
	MTBV Model 1	MTBV Model 2	GRE_INN Model 3	MTBV Model 4	MTBV Model 1	MTBV Model 2	GRE_INN Model 3	MTBV Model 4
Constant	4.7548*** (6.22)	4.217*** (11.96)	5.926*** (34.87)	5.8398*** (40.10)	8.952*** (22.14)	13.804*** (28.54)	4.324*** (10.15)	2.016*** (9.43)
ENV_SCO	0.0200*** (3.54)		0.047 *** (4.333)	0.0046*** (8.90)	0.0051*** (11.93)		0.2014*** (12.88)	−0.0676*** (−4.08)
SOC_SCO	0.0379* (1.71)		0.01* (1.708)	−0.1192*** (−2.88)	−0.1925*** (−4.37)		0.1511*** (6.97)	0.0457 * (2.234)
GOV_SCO	0.0017** (2.33)		0.016*** (8.922)	0.1192*** (2.88)	0.167 *** (6.526)		0.0178** (4.58)	0.034** (2.234)
GRE_INN		0.1543** (2.02)		0.0035*** (5.45)		0.3698*** (35.75)		0.0250** (7.12)
E_DISC	2.5680*** (3.11)	0.115*** (17.709)	0.026*** (11.752)	2.2563*** (4.01)	0.0128*** (6.79)	0.3520*** (6.85)	0.1987*** (11.28)	0.1603*** (19.01)
SIZE	0.135*** (13.079)	0.1192*** (2.88)	0.01* (1.708)	0.088 *** (6.023)	4.571*** (17.10)	0.0210*** (9.36)	0.0268*** (6.85)	0.0185** (6.24)
LEV	−0.0019*** (−2.95)	−0.0434* (−1.94)	−0.259*** (−25.457)	−0.1543*** (−2.02)	−0.1925*** (−4.37)	−0.0676*** (−4.08)	−0.0014 (1.28)	−0.0284** (−2.49)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.4131	0.5609	0.5426	0.4785	0.5478	0.4226	0.5211	0.5218
F Value	45.67 ($p < 0.01$)	40.81 ($p < 0.01$)	40.37 ($p < 0.01$)	32.71 ($p < 0.01$)	41.93 ($p < 0.01$)	37.9 ($p < 0.01$)	43.47 ($p < 0.01$)	43.58 ($p < 0.01$)
N-obs	3,075	3,075	3,075	3,075	3,075	3,075	3,075	3,075

Note(s): Variables are defined in Table 2. MTBV it is the ratio between the stock market value of the company and its book value

Table 8.
Robustness analysis: MTBV, ESG practices and green innovation: panel A (UK firms) and panel B (Germany firms)

performance in UK and Germany firms. This is explained by the fact that innovation intensity is a determining factor of the company's strategy because of its effects on the company's performance and financial results. ESG engagement is a strategic investment for the firm, which aims to benefit not only from its involvement in financial activities but also from its social responsibility engagement regarding to external stakeholders.

In general, our findings support the conclusions of previous studies. The distinctive features of ESG firms as compared with other firms seem to influence not only with their ESG practices but also with the effectiveness of green innovation, which play a merely mediator role in this category of firms (Kim and Lyon, 2015; Ioannou *et al.*, 2016; Fatemi *et al.*, 2018).

Going beyond the agency paradigm, stakeholder theory can provide a solid framework for understanding how ESG practices may help firms achieve good financial performance (Dimitropoulos *et al.*, 2019). This theory asserts that a firm can be viewed as a set of interdependent relationships among stakeholders, which comprise not only shareholders but all environmental and social groups who can affect or be affected by the company's activities (Clarkson, 1995). According to this approach, firms need to address the interests of not only shareholders but also all the stakeholders who can affect or be affected by the achievement of the environmental and social objectives

5. Conclusion
This paper attempted to fill the gap in the literature by theoretically and empirical investigating the mediate role of green innovation in the logically plausible relationship between ESG practices and financial performance. For a more reliable estimate of the quality of the results, measures proposed by ASSET4 were used. Data for this study were collected from the Thomson Reuters ASSET4 (Datastream), 115 UK companies and 90 Germany companies during 2005–2019.

Over the course of the last two decades many firms, especially large multinational ones, have intensified their efforts to report on ESG matters in order to legitimate their behavior and improve their reputation. ESG is captured in this paper as an index used as a proxy of firms' engagement on CSR activities. The index of ESG firms is objectively and consistently defined measures permitting like-for-like measurement of firm-specific social and environmental activities. Numerous studies have attempted to measure the performance and valuation impact of ESG factors. A stream of this literature has also addressed the determinants of financial performance and the possible valuation effects of ESG engagements. This work is conceived as an extension of this research topic by attempting to document and formulate a conclusion on the fundamental role of ESG practices in improving the financial performance. As our results indicate, a higher commitment to socially responsible practices and greater use of ethical behavior seems to contribute to more effective financial performance. Companies selected from the ESG index are more likely to create more financial performance, with significant differences in financial performance found between different legal systems. Empirical findings in the third model indicate that with the rapid growth of the economy, the environment is deteriorating daily. Frequent environmental problems have sounded alarm bells for human society. As an important part of society, companies are exploring green innovation to improve their competitiveness and achieve green development.

The paper contributes to the existing literature in several ways. Our research enables the information user to better assess the future growth opportunities in a context where the approach of ESG occupies a central position in business valuation. This work serves to promote the implementation of ESG relating strategies, enabling to protect shareholders and its environment through high-green innovation.

Concluding, although the entire process of research is as rigorous as possible, there are still some limitations. First, the primary limit to our study is linked to the nature of our sample, which only includes companies operating in developed countries. More specifically, our sample is heterogeneous and encompasses several lines of business and several research contexts in which the measurement of ESG practices differs. Second, the data obtained in this study only cover English languages. Some of the company data published in other languages are not analyzed. This shortcoming represents a valuable starting point for future research. In addition, as a future research perspective, we could examine other factors affecting the market. In the future, we can attempt to obtain data from other third-party platforms and involve more samples with different languages.

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About the authors

Dr. Salim Chouaibi is currently the contractual assistant of accounting at the University of Sfax and a researcher at laboratory of research in information technology, governance and entrepreneurship

"LARTIGE". He holds a PhD degree in accounting from the University of Sfax (Tunisia). His research works focus on financial and accounting information, corporate governance, corporate social responsibility and voluntary disclosure. His most recent articles are published in refereed journals such as Corporate Governance: The International Journal of Business in Society, Accounting and Management Information Systems, EuroMed Journal of Business and Review of Economics and Finance. Salim Chouaibi is the corresponding author and can be contacted at: chouaibi.salim@ gmail.com

Jamel Chouaibi holds a PhD degree from the University of Sfax in Tunisia. He is currently the associate professor of accounting at the faculty of economic sciences and management of Sfax (Tunisia) and a researcher at laboratory of research in information technology, governance and entrepreneurship "LARTIGE". His research works focus on financial and accounting information, corporate governance, standards and accounting principles and corporate social responsibility. He has published several papers in various refereed journals such as International Journal of Law and Management, Journal of the Knowledge Economy, Journal of Economics Finance and Administrative Science, International Journal of Managerial and Financial Accounting, Accounting and Management Information Systems and EuroMed Journal of Business.

Matteo Rossi is an associate professor of corporate finance at the University of Sannio, Benevento, Italy, where he received the PhD degree in management. He is also a research assistant professor at Wyzsza Szkoła Bankowa w Poznaniu - WSB University, Poznan, Poland. Dr Rossi is the editor-in-chief for the International Journal of Managerial and Financial Accounting and for the Intenrational Journal of Behavioural Accounting and Finance.