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The Moderating Role of Strategic Investment in R&D and Advertising in Firms' ESG–Performance Relationship

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ABSTRACT

This paper examines the association between environmental, social, and governance (ESG) ratings and firm performance, taking into account the role of firms' strategic investments in research and development (R&D) and advertising. Drawing on resource-based view and signalling theory perspectives and employing the generalised method of moments (GMM) estimator for a sample of UK firms over the 2002–2018 period, our findings suggest a significantly positive association of firms' aggregate ESG rating with accounting and market-based measures of firm performance. Further, we find that R&D and advertising expenditures positively moderate firms' ESG–performance relationship. The moderating role of R&D and advertising persists when we analyse the three (environmental, social, governance) pillars of ESG separately. The results suggest that strategic investments in R&D and advertising complement firms' ESG efforts. The findings remain robust after using alternative measures of performance, an ESG combined score that takes both positive and negative aspects of ESG into account, propensity score matching and controlling for self-selection bias. Our findings provide useful insights for managers in the evaluation of the efficacy and disclosure of strategic investments in ESG, R&D and advertising and for policy makers and standard setters in the deliberation of sustainability standards and disclosure regulations.

1 | Introduction

There has been a growing interest from policy makers, academics and corporate managers in understanding the causes, consequences and motivation for firms' investments in, and disclosure of, environmental, social and governance (ESG) activities (see e.g., Ding et al. 2016; Manchiraju and Rajgopal 2017; Radhakrishnan et al. 2018; Lu et al. 2024; Gerged et al. 2024; Hassanein and Elsayed 2025).[1] Financial markets make an assessment of the opportunities and risks arising from a firm's ESG efforts because they are likely to affect the firm's value.

On the one hand, this has created significant demand for high-quality information on a firm's sustainability initiatives from internal (e.g., managers, employees) and external (e.g., investors, customers, suppliers, regulators, the general public) stakeholders and other providers of capital.[2] Consistent with the *resource-based view* (RBV) (Barney 1991; Branco and Rodrigues 2006; Ramchander et al. 2012) and *signalling* theory (Spence 1973; Connelly et al. 2011) perspectives, we argue that firms address these expectations of diverse stakeholders by strategically investing in ESG, research and development (R&D) and advertising in order to innovate; build a corporate image; and communicate their sustainable business initiatives to relevant stakeholders.

On the other hand, the absence of unified global sustainability disclosure standards has contributed to a lack of timely availability and an increased cost and complexity of such information for investors, regulators and other stakeholders. Further, there is no consensus in the extant literature to date on whether and how

firms' investment in ESG and their use of R&D and advertising signal their sustainable business initiatives to stakeholders, affecting their market values. Drawing on RBV and signalling theory perspectives, this study therefore examines the direct association of ESG, R&D and advertising with firms' accounting and market-based firm performance. Further, it explores whether R&D and advertising moderate the ESG to firm performance relationship. Moreover, this study investigates whether the direct and moderating roles of R&D and advertising differ across the three separate pillars of ESG, namely *environmental, social and governance*.

Emphasising the key dimensions of CSR/ESG, Carroll (1979, 500) argues that '...the social responsibility of business encompasses the economic, legal, ethical, and discretionary expectations that society has of organizations at a given point in time'. Carroll regards spending on ESG as the responsibility of organisations to give back to the society and communities in which they operate and/or their products and services are consumed.

In line with the above, businesses in the current environment are increasingly becoming conscious of their responsibilities and considering society and communities in their business and financial strategies. The inclusion of such ESG initiatives is helping firms appeal to a wide range of stakeholders' needs and expectations. For example, a prominent multinational oil and gas company, British Petroleum PLC, mentioned in their sustainability report that ' ... a sustainable approach to responsible business is inherent in our purpose – reimagining energy for people and our planet. We want to help the world reach net zero and improve people's lives and can only do this by being a safe, focused, responsible, well-governed and transparent organization' (BP Sustainability Report, 2019, 10). Similarly, acknowledging the importance of ESG, Unilever PLC states, '... We believe that the businesses putting sustainability and climate at the heart of their investment plans, in line with growing demands to do so from investors and consumers alike, will be the ones to ultimately prosper'.[3]

Consistent with the above, Fortune Global 500 firms spend around $20 billion a year on CSR/ESG activities (Meier and Cassar 2018). Moreover, an increasing number of firms are now committing to ESG initiatives and targets. For instance, Volkswagen has announced its commitment to become net CO_2 neutral by 2050, Amazon has committed to embedding human rights within its business, and Samsung has a majority of independent directors serving on its board (BMO Global Asset Management 2020).[4] Coincidentally, these firms are also among the highest spenders on R&D, with Amazon topping the list with a spending of around $22.6 billion, and Volkswagen and Samsung making the top five firms in terms of R&D spending in 2018.[5]

Firms make strategic investments in discretionary outlays such as R&D and advertising in order to produce innovative products and processes, help build awareness among customers and signal the quality of their products, brands and services to investors and other stakeholders (e.g., Wang et al. 2009; Joshi and Hanssens 2010; Servaes and Tamayo 2013; McAlister et al. 2016; Shah et al. 2021).[6] However, despite the growing literature on ESG and related issues, empirical evidence on the influence of ESG on shareholders' wealth is conflicting, with studies reporting positive (e.g., Ferrell et al. 2016), negative (e.g., Masulis and Reza 2015) and mixed or no (e.g., Di Giuli and Kostovetsky 2014; Humphrey et al. 2012) associations.

Similarly, evidence on the strategic role of investments in R&D and advertising in shaping firms' ESG to performance relationship is also largely mixed and inconclusive, with studies suggesting substitution (e.g., Ryou et al. 2022), complementary (e.g., Albuquerque et al. 2019), or no (e.g., Zou et al. 2020) effects of these discretionary outlays. We therefore argue that these mixed findings in the existing literature may be the result of ignoring the possible interaction of ESG with other important variables and the use of estimation methods that do not account for the endogenous nature of ESG in prior studies (Servaes and Tamayo 2013). This paper addresses both these concerns and employs a generalised method of moments (GMM) estimator for a sample of UK firms over the period 2002–2018 to explore whether R&D and advertising moderate the link between ESG and firm performance.

In particular, previous studies examining value relevance and the moderating role of advertising predominantly use advertising data as reported by Compustat for a sample of US firms (e.g., Servaes and Tamayo 2013; Albuquerque et al. 2019; Guo et al. 2019). In contrast, we employ a novel source of advertising data for a sample of firms from the UK, where evidence on the value relevance and moderating role of advertising is scarce due to the non-availability of reliable advertising data. Given that there is no regulation requiring UK firms to report their advertising expenditures, very few UK firms voluntarily disclose their advertising expenditures. The lack of advertising data thus restricts opportunities for empirically testing whether advertising plays a role in shaping the ESG–performance relationship. Moreover, despite the availability of R&D data consistent with the International Accounting Standard 38, evidence on the moderating role of R&D is rather limited in the UK. Our study fills these gaps and provides evidence on the moderating roles of both advertising and R&D in the ESG–performance relationship in the UK. Further, this study aims to control for all potential sources of endogeneity by employing a more robust GMM approach (Wintoki et al. 2012).

This study contributes to the relevant literature in at least four ways. First, consistent with RBV and signalling theory perspectives, our findings suggest that firms' strategic investments in ESG, R&D and advertising are positively associated with firms' accounting and market-based performance. Further, we find that both R&D and advertising positively moderate the ESG to firm performance relationship. In particular, our study relates to a stream of literature that views ESG as a differentiation strategy giving firms a competitive advantage (e.g., Siegel and Vitaliano 2007; Guzman and Davis 2017; Lloyed-Smith and An 2019; Tsang et al. 2021). Investment in sustainable business projects and disclosure of relevant ESG initiatives in sustainability reports can help differentiate a firm from its peers by creating a unique image for the firm that appeals to a diverse range of stakeholders, resulting in improved organisational performance (e.g., Hull and Rothenberg 2008; Kim et al. 2018).

Similarly, firms strategically invest in R&D to innovate and enhance efficiency, and use advertising to help create strong brand images for their products to influence existing and potential customers and investors. We, therefore, consider both R&D and advertising as two additional proxies for differentiation and argue that strategic investment in these two provides firms with a competitive advantage that results in a further strengthening of the ESG–performance association. Our findings are consistent with Albuquerque et al. (2019), who employ ESG data from MSCI's ESG research database (formerly, KLD) and an advertising measure from Compustat that includes both advertising media and promotional expenses. However, different from prior studies that typically employ US or multicountry data, our study focuses on UK firms and employs ESG scores provided by Thomson Reuters' ASSET4, and our measure of advertising expenditures consists solely of those derived from the coverage of major media and advertising expenditure by a proprietary data source.[7]

Second, while the aggregate ESG score may obscure the individual effects of the *environmental (E), social (S) and governance (G)* pillars on firms' performance, this study extends the analysis to examine the moderating effects of R&D and advertising on the relationship between the three separate ESG pillars and corporate performance, respectively. The results indicate that both advertising and R&D strengthen the positive link between firms' *E, S and G* pillars and their accounting and market-based performance, respectively.

Third, our paper is among the first few UK studies to use the ESG combined (ESGC) rating as another measure of firms' ESG commitments. ESGC takes into account whether or not a firm has been involved in ESG-related controversies that have been reported in the media. If a firm is involved in any ESG-related controversies in a fiscal year, its overall ESG score will be reduced in that period. With regard to this, the results of the study show that firms with fewer ESG-related controversies have better performance. Furthermore, advertising and R&D positively moderate the relationship between ESGC and performance.

Fourth, most of the prior studies do not specifically address endogeneity-related concerns in exploring the ESG–performance relationship. This study accounts for potential endogeneity concerns by employing a more robust system GMM estimator approach, which controls for the influence of unobservable heterogeneity, simultaneity and dynamic endogeneity (see e.g., Arellano and Bond 1991; Blundell and Bond 1998; Wintoki et al. 2012; Akbar et al. 2017).

Our study has several policy implications. For instance, it has useful implications for firms' managers in terms of planning and evaluating the efficacy of their strategic investments in sustainability targets, R&D and advertising as three key elements of differentiating and gaining a competitive advantage over their counterparts, thus positively influencing firm performance. Similarly, the results from the study also provide significant insights into the usefulness of investments in ESG, which can inform regulators and policy makers in their deliberations with regard to the development of international sustainability standards and formulating effective ESG disclosures to propel global sustainability efforts.[8]

The rest of the paper is organised as follows. The next section provides an overview of the relevant literature, theoretical perspectives and the development of the research hypotheses. The following section provides details about the research methodology, data and sample characteristics. The subsequent section discusses the results and findings. The final section concludes the study and summarises the main contributions and implications of this research.

2 | Literature Review

2.1 | Theoretical Perspectives and Hypotheses' Development

Firms' ESG-related issues have attracted interest across a wide range of disciplines, including management, marketing, economics, accounting and finance and other social sciences (see, e.g., Carroll 1979; McWilliams and Siegel 2001; Kim et al. 2012; Servaes and Tamayo 2013; Manchiraju and Rajgopal 2017; Guo et al. 2019; Minutolo et al. 2019; Gerged et al. 2024).

Theoretically, the extant literature presents two contrasting viewpoints with regard to the motivation for pursuing ESG initiatives. On the one hand, stakeholder theory (Freeman 1984) not only views a firm as responsible to its shareholders but also argues for a broader objective of firms in catering to the needs of internal and external stakeholders. Under this view, investments in CSR activities and their disclosure can be considered a signal of voluntary accession to stakeholders' oversight of managers' actions, enhancing firms' transparency and minimising the opportunity for managers to engage in self-interest. Outlays on ESG can therefore be viewed as positively influencing both accounting and market-based firm performance because these activities are beneficial for businesses (e.g., Servaes and Tamayo 2013; Ferrell et al. 2016; Hawn and Ioannou 2016; Guo et al. 2019; Albitar et al. 2020).

On the other hand, consistent with agency theory (Jensen and Meckling 1976), ESG can be viewed as an agency problem in helping serve managerial interests rather than satisfying shareholders' interests, with agents diverting limited firm resources towards ESG that may not have a direct association with financial performance, thus reducing shareholders' wealth (e.g., Friedman 1970; Deng et al. 2013; Cheng et al. 2014; Mishra and Modi 2016; Chen et al. 2018). Firms with higher spending on CSR activities are therefore likely to incur more costs, which, in turn, may result in reduced net financial performance (Barnett and Salomon 2012). Further, it is argued that firms aiming to increase their CSR performance consequently experience a shifting of resources and management's time and effort away from the core competencies of the firm, thus negatively influencing the firm's profits (Hull and Rothenberg 2008).

We argue that ESG efforts can be viewed as a business strategy for projecting positive influences of firms' operations on society. Similarly, ESG activities can be carried out in a manner consistent with the commercial, legal, ethical and other social domains of business, directed at satisfying the needs of a wider set of stakeholders (Waddock and Graves 1997; Waddock et al. 2002; Timbate and Park 2018). As a result, consideration

of ESG-related issues has become one of the central tenets of business strategy for many firms, which aim to make a real impact by changing their focus from merely serving the interests of their shareholders to encompassing a broader set of objectives required to meet the expectations of their stakeholders and enhance corporate reputation (Hassanein and Elmaghrabi 2025).

We further argue that firms could signal the quality and sustainability of their ESG efforts by promoting their promising ESG performance to differentiate themselves from their counterparts that fail to recognise the importance of such initiatives, thus reducing the potential adverse selection problem (see, e.g., Spence 1973; Milgrom 1981; Verrecchia 1983; Stiglitz 2000; Lys et al. 2015). In addition, firms with poor ESG performance may find it difficult to emulate those with good ESG profiles.

Similarly, firms in certain industries (such as the engineering, pharmaceutical and IT sectors) invest large sums in R&D in order to develop innovative products, processes and services that help them not only survive but excel in competitive markets. R&D spending has recently been recognised as a key instrument for firms' innovation, and much of the research has relied upon it as a measure of firms' innovation (see, e.g., Xiao 2013; Shah et al. 2021; Asad et al. 2023; Abdelbaky et al. 2025).

Moreover, we posit that firms with high-quality ESG initiatives may be more inclined to promote their ESG activities, targeting a wide range of objectives including, for instance, developing good relations with their internal and external stakeholders, or building a reputation and branding with high-quality, environmentally and socially sensitive products and services (Turban and Greening 1997; Ramchander et al. 2012; Montiel et al. 2012; Huang and Watson 2015; Hummel and Schlick 2016). Similarly, investment in ESG activities and their effective communication to stakeholders may help reduce the problem of information asymmetry between managers and external stakeholders (Jensen and Meckling 1976; Stiglitz 2000).

We further contend that strategic investment in discretionary R&D and advertising serves a similar purpose, in helping firms produce innovative products and differentiate them from their competitors by communicating their virtues to customers through various advertising media. Advertising thus portrays a positive image of firms' innovative products and increases the visibility of their innovation and ESG efforts (e.g., Nelson 1974; Grullon et al. 2004; McAlister et al. 2007; Shah et al. 2021).

Consistent with RBV (Barney 1991; Ramchander et al. 2012) and signalling theory perspectives (Spence 1973; Connelly et al. 2011), we thus argue that firms' engagement in ESG activities and their strategic investments in R&D and advertising form an integral part of firms' differentiation strategies and signal a more transparent, ethical, innovative and positive image of the firms to relevant stakeholders (McWilliams et al. 2006). This, in turn, helps generate an intangible value for shareholders, thus positively affecting firms' performance. We, therefore, posit the following research hypotheses:

Hypothesis H1a. *Firms' strategic investment in ESG is positively associated with their accounting and market-based performance.*

Hypothesis H1b. *Firms' strategic investment in R&D is positively associated with their accounting and market-based performance.*

Hypothesis H1c. *Firms' strategic investment in advertising is positively associated with their accounting and market-based performance.*

In line with the RBV framework, we consider ESG, R&D and advertising key strategic resources that can help firms differentiate themselves in the markets and provide them with a competitive advantage over their counterparts. Firms' strategic investment in ESG can have a positive association with firm performance if information on these outlays is communicated to the relevant stakeholders using various channels of communication such as sustainability reports, annual reports and advertising (e.g., McWilliams and Siegel 2001; Luo and de Jong 2012). We thus argue that ESG can have both a direct impact on firm performance and an indirect association with firm performance through its interaction with firms' strategic investments in R&D and advertising, respectively (Servaes and Tamayo 2013; Albuquerque et al. 2019; Lloyed-Smith and An 2019). We, therefore, posit that both R&D and advertising moderate the link between ESG and firm performance and formulate the following research hypotheses (Figure 1):

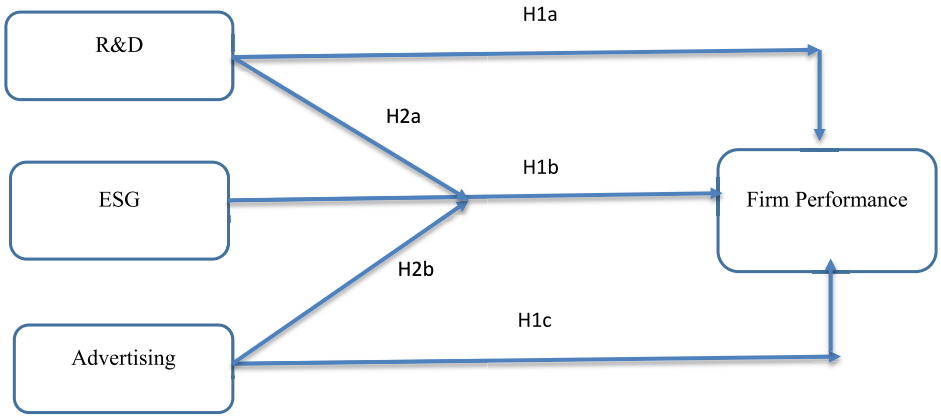

FIGURE 1 | Direct and moderating effects of R&D and Advertising on firm performance.

Hypothesis H2a. *Firms' strategic investment in R&D positively moderates the association between ESG and both accounting and market-based performance.*

Hypothesis H2b. *Firms' strategic investment in advertising positively moderates the association between ESG and both accounting and market-based performance.*

2.2 | Summary of Empirical Studies

Several studies examine the influence of ESG on firm performance, but the empirical evidence is largely inconsistent and there are conflicting findings reported in the extant literature (e.g., Di Giuli and Kostovetsky 2014; Masulis and Reza 2015; Ferrell et al. 2016; among others). Di Giuli and Kostovetsky (2014), for instance, report a significantly negative association between changes in firms' ESG and changes in their return on assets and stock returns. In contrast, Gao and Zhang (2015) and Ferrell et al. (2016) find a positive association between ESG and firm value.

Similarly, employing a sample of US firms, Albuquerque et al. (2019) show a positive and stronger association between CSR and Tobin's Q (TQ) for firms with greater advertising spending. Lloyed-Smith and An (2019), however, find that advertising and CSR-related activities are substitutes in the creation of a firm's reputation (see also Dharmapala and Khanna 2018). Interestingly, Manchiraju and Rajgopal (2017) document that firms with greater advertisement spending are less likely to be negatively affected by mandatory CSR regulation.

Another study, by Bhattacharya et al. (2020), finds that, during recessions, CSR activities give a positive signal to customers of higher brand quality, even when the authors control for both advertising and R&D spending. In contrast, Ryou et al. (2022) indicate that firms increase their advertising investment when they curtail their CSR disclosure due to an increase in product market competition. Similarly, using a sample of Chinese firms, Jia (2020) shows that firms that strategically emphasise advertising rather than R&D benefit more from their CSR initiatives, and He et al. (2024) demonstrate that the media plays a positive role in supporting ESG and validate the corporate governance effect of the media from the viewpoint of ESG. Zou et al. (2020), however, report that the financial value of being included in a socially responsible investing (SRI) index is weakened by advertising expenditure but strengthened by R&D spending.

Emphasising the importance of marketing capabilities, Mishra and Modi (2016) argue that the effects of overall CSR efforts on stock returns and idiosyncratic risk only become significant in the presence of marketing capability. Similarly, Guo et al. (2019) document that CSR activities significantly enhance the effectiveness of advertising on a firm's market value. Moreover, Hawn and Ioannou (2016) show that firms that do not communicate their internal CSR actions to key stakeholders do not attain the complete benefits of their internal CSR.

In general, there is no consensus in the relevant literature with regard to the direct association between ESG and firm performance, with some studies reporting a positive association (e.g., Ferrell et al. 2016), while others present a negative relationship (e.g., Masulis and Reza 2015). Similarly, some other studies find mixed and/or no significant association between ESG and performance (e.g., Humphrey et al. 2012; Di Giuli and Kostovetsky 2014; Manchiraju and Rajgopal 2017). In the same vein, evidence on the strategic role of investments in R&D and advertising in shaping firms' ESG to performance relationship is also largely mixed and inconclusive, with studies suggesting substitution (e.g., Ryou et al. 2022), complementary (e.g., Albuquerque et al. 2019) or no (e.g., Zou et al. 2020) effects of these discretionary outlays. Table 1 provides a summary of some relevant studies.[9]

The inconsistencies in prior studies may be attributed to a number of factors. First, most prior studies assess ESG or discretionary investments separately; few integrate them as complementary drivers. In particular, there is a lack of consideration for key variables, such as firms' strategic investments in R&D and advertising, which may be playing a role in the ESG–performance relationship. Second, the majority of existing studies employ the aggregate ESG score, which may potentially obscure the individual impact of the three separate E, S and G pillars. Third, some previous studies do not account for potential endogeneity-related concerns in the estimation models, thus casting doubts on the validity of the findings.

This study, therefore, contributes to the relevant literature by employing a sample of UK firms and a novel proprietary source of advertising data to examine the direct association of firms' strategic investments in ESG, R&D and advertising with firm performance. Further, this study examines the moderating impacts of firms' investments in R&D and advertising on firms' ESG–performance association. Moreover, our study also explores the moderating effects of R&D and advertising on the link between the three separate E, S and G pillars of ESG and firm performance, respectively. Our paper, therefore, responds to calls for further research into exploring whether and/or which of the three individual E, S and G pillars mostly affect the association between ESG and firm performance (e.g., Iazzolino et al. 2023).

Theoretically, the three separate pillars of ESG focus on significantly different aspects of firms' involvement in sustainability-related activities, ranging from environmental issues, emissions and innovation to capturing firms' human capital, community and product responsibility, as well as evaluating firms' governance mechanisms. Given that firms may be devoting more or less effort across the three separate E, S and G dimensions, the aggregate ESG score may not capture the unique individual effects of the three components on firms' performance. For instance, consistent with the *environmental* pillar, firms such as Volkswagen have devoted more attention to meeting the net carbon-neutral target by 2050. In contrast, firms such as Amazon have prioritised embedding human rights within their businesses, in line with the *social* pillar, while Samsung has focused on improving the *governance* pillar by having a majority of independent directors serving on its board (BMO Global Asset Management 2020).

Empirically, exploring the direct and moderating effects of the three separate ESG pillars on firms' performance is useful

TABLE 1 | Summary of relevant studies.

Author	Data period	Data source	Sample	Variables	Main findings
Brown et al. (2006)	1998	Fortune 500 list of firms Corporate Giving Directory Compustat, SEC filings	207 firms, 701 firm year observations	Charitable giving, net income, advertising intensity, R&D intensity, employees, firm age, corporate governance variables	Giving is positively associated with firms that advertise intensively and with regulated firms and with firms with higher levels of intangible assets.
Hull and Rothenberg (2008)	1998–2001	KLD, Compustat	69 firms each year	ROA, weighted average firm's R&D, weighted average of advertising intensity in each firm's industry, CSR, firm size, risk	CSR most strongly affects performance in low-innovation firms and in industries with little differentiation.
Servaes and Tamayo (2013)	1991–2005	KLD, Compustat	400–2000 per year	Tobin's q, log assets, advertising intensity, industry advertising intensity, Herfindahl index, R&D intensity, CSR, moderating variables	Advertising intensity positively enhances the association of CSR on firm's market value, but there is negative or insignificant relation for firms with low levels of advertising.
Mishra and Modi (2016)	2000–2009	KLD, CRSP, Compustat	1725 firms, 8017 firm year observations	CSR index, stock returns, idiosyncratic risk, relative marketing capability, leverage, earnings, cost of goods sold, market share and other variables	The effects of overall CSR efforts on stock returns and idiosyncratic risk are not significant on their own but only become so in the presence of marketing capability Only CSR efforts that have clear and verifiable benefits to key firm stakeholders positively influence shareholder value, whereas investments in corporate philanthropy and other forms of community-based efforts have no significant effect

(Continues)

TABLE 1 | (Continued)

Author	Data period	Data source	Sample	Variables	Main findings
Hawn and Ioannou (2016)	2002–2008	Thomson Reuters ASSET4 DataStream, IBES, Worldscope	1492 firms, 5958 observations in 33 countries	Tobin's *q*, external and internal actions, R&D intensity, selling general and advertising intensity, SRI index, analyst coverage, diversification, sales, sales growth, industry concentration	The sum of internal and external CSR actions is positively associated with market value, but firm that do not communicate their internal CSR actions to key stakeholders do not recognise the complete benefits of their internal CSR. Negative association between the gap between external and internal actions and market value.
Manchiraju and Rajgopal (2017)	2009–2013	Prowess, hand collected data on CSR	2120 firms, 9921 firm year observations	Total assets, sales, net income, book value of equity, market capitalization, returns	Firms with greater advertisement spending are less likely to be negatively affected by the mandatory CSR regulation.
Rahman et al. (2017)	2000–2009	KLD (MSCI RMG Research), Compustat	264 nonfinancial S&P 500 listed US firms, 2541 firm year observations	Market share, CSR, advertising intensity, leverage, R&D intensity, economic growth	CSR has a positive association with firms' market share. Advertising expenditure positively moderates the link between CSR and market share. R&D, however, had a negative association with firm's market share.
Kim et al. (2018)	2000–2005	KLD, Compustat, Factiva	113 firms, 565 firm year observations in software industry	Tobin's *q*, positive CSR, negative CSR, competitive action, advertising intensity, R&D intensity, firm size, firm age, return on asset, liquidity, leverage	The relationship between positive CSR and corporate financial performance is moderated positively by competitive actions. Negative CSR is moderated negatively by competitive actions. R&D intensity and return on assets are positively associated with Tobin's Q, whereas liquidity and firm size are negatively related to Tobin's Q.

(Continues)

TABLE 1 | (Continued)

Author	Data period	Data source	Sample	Variables	Main findings
Dharmapala and Khanna (2018)	2012–2015	Prowess, business responsibility reports of the 100 largest firms in India	13,770 firm year observations	CSR, advertising, total assets, export earnings	Some evidence of a substitution between advertising and CSR
Guo et al. (2019)	2001–2009	KLD, Compustat	644 firms, 2670 firm year observations	CSR, advertising intensity, Tobin's *q*, firm size, leverage, cash flow, market share	CSR moderates the B2B advertising effect on a firm's market value Internal CSR activities, compared with external CSR activities, more significantly enhance the advertising effectiveness on a firm's market value
Albuquerque et al. (2019)	2003–2015	KLD, Compustat, CRSP	28,578 firm year observations	CSR, advertising, R&D, Tobin's Q, firm beta, change in ROA	CSR is negatively associated with the level of systematic risk. CSR is positively associated with Tobin's Q and the relation is stronger for firms with greater product differentiation, proxied by advertising spending.
Lloyed-Smith and An (2019)	2005–2014	RepTrak survey Fortune magazine's list of 'America's Most Admired Companies' Newsweek's Green Rankings data set Thomson Reuters Datastream, ASSET4, KLD Compustat, Ad$pender (Kantar Media)	Various ranges	CSR, advertising intensity, MTB, ROA, risk, total assets, number of employees	Advertising, own-firm CSR and industry-level CSR are positively correlated with reputation. Advertising and CSR-related activities are substitutes toward the production of firm reputation.
Bhattacharya et al. (2020)	2007–2015	Young and Rubicam's Brand Asset Valuator (BAV), KLD, Compustat	137 firms, 454 firm-year observations	Brand values, CSR, firm size, leverage, liquidity, R&D and advertising spending	CSR positively associated brand value outcomes.

(Continues)

TABLE 1 | (Continued)

Author	Data period	Data source	Sample	Variables	Main findings
Jia (2020)	2009–2015	Runling agency (RKS) Chinese database China Stock Market and Accounting Research (CSMAR), company annual reports	3401 firm year observations	CSR, Tobin's q, strategic emphasis, Herfindahl index, firm size, firm age, status, sales growth, CEO duality	Firms that strategically emphasise value appropriation (advertising) rather than value creation (R&D) are found to enjoy better performance from their CSR initiatives
Zou et al. (2020)	Various periods	SRI indices in China, Brazil, South Africa, Thomson Financial DataStream Compustat Global Annual Reports	145 Chinese, 22 Brazilian, 34 South African firms listed in their respective indices	SRI index announcements, daily stock prices and market returns, advertising, R&D, firm size, ownership, ROA	The financial value of being included in an SRI index is weakened by advertising expenditures but strengthened by R&D expenditures.
Ryou et al. (2022)	1999–2011	Corporate Register, Compustat, CRSP, MCSI (formerly KLD), First Call	9774 firm-years, 1804 distinct firms	Product market competition (proxied by reduction in reduction in import tariff rates),	Firms tend to increase their spending on advertising, especially after reducing their CSR disclosure, in response to the increase in product market competition.
This Study (2025)	2002–2018	Thomson Reuters' Datastream, ASSET4, ACNielsen MEAL	967 firms with 7638 firm-year observations	ESG aggregate, ESG three separate pillars (Environmental, Social, Governance), ESGC, R&D, Advertising, Tobin's Q, ROA, Earnings/BV, Leverage, Size	Strategic investment in R&D and advertising positively moderate firms' ESG–performance relationship.

for the following reasons. First, *environmental issues* such as climate change, emissions and the outcome of innovation investments could cause significant risks to firms' survival and growth opportunities. It is therefore essential for managers to gain an insight into how adopting innovative environmentally friendly practices could lead to cost savings for the firm and also provide useful information to investors about the firms' ability to manage risks. Second, firms that prioritise *social responsibility* could aim to devote more resources to building their human and reputational capital by investing in community engagement activities, improving their employees' well-being, strengthening their human rights record and promoting an ethical image for their products and brands. These could potentially lead to increased brand value and better firm reputation. Similarly, with a better human rights record and socially responsible image, a firm could become more attractive to highly skilled labour that would contribute to improved productivity, competitiveness and the firm's current and future performance. Third, firms focusing on improving their *governance practices*, such as by offering incentive-based compensation, strengthening board independence and diversity or improving audit quality, could reduce the risk of corporate fraud and signal enhanced transparency and accountability, thus boosting existing and potential investor confidence in the firm.

In addition to the ESG aggregate score and its three separate pillars, we also use the ESGC score as an alternative measure in our analyses. The ESGC score is an overall score that takes both positive and negative ESG aspects into account and has recently been used in the existing literature (e.g., Asimakopoulos et al. 2023, 2024; Pacelli et al. 2023). There is a relative lack of evidence on the moderating roles of R&D and advertising in the association between ESGC and firm performance, especially in the UK context. Our study fills that void and provides more comprehensive evidence of the interactive effects of both R&D and advertising on the ESGC-performance relationship. Finally, the study partially overcomes shortcomings in some of the prior literature by employing the system GMM approach.

3 | Research Methodology, Data and Sample

3.1 | Data and Sample Characteristics

We employ data from three main sources, Refinitiv, Datastream/Thomson Reuters and ACNielsen MEAL for the 2002 to 2018 period. Refinitiv (previously named the Thomson Reuters ASSET4 database and recently renamed the London Stock Exchange Group–LSEG Data and Analytics) provides firm-level ESG scores and covers more than 80% of global market capitalisation. The database captures and calculates 870 company-level ESG measures, of which a subset of the 186 most comparable and material per industry are used to calculate its ESG score. The underlying measures in ASSET4 are based on considerations around comparability, impact, data availability and industry relevance that vary across each industry group. These are grouped into 10 categories that reformulate the three pillar scores and the final ESG score, which is a reflection of the company's ESG performance, commitment and effectiveness based on publicly reported information. ESG measures a company's ESG rating based on verifiable reported data in the public domain, and ranges from 0, representing the lowest level of ESG, to 100, the highest.

The ESG data from ASSET4 are based on publicly available ESG information and are relevant to our setting because disclosure is a necessary component of signalling (Lys et al. 2015). In this regard, De Villiers et al. (2022) review 285 studies using ASSET4 data published in quality academic journals and indicate that ASSET4 is arguably the largest database with comprehensive coverage in several countries and is widely used by both practitioners and academics (see also, Berg et al. 2022; Serafeim and Yoon 2022; Pacelli et al. 2023; Asimakopoulos et al. 2023; Tahat and Hassanein 2024). The methodology underlying the ASSET4 ESG data can be found on the LSEG's website.[10,11]

We combine the ESG data with accounting and market data from Datastream/Thomson Reuters, and advertising data from a proprietary data source, ACNielsen MEAL. In particular, our advertising data have the advantage that it is based on the aggregate monthly brand-level advertising media expenditure, across press, TV, radio, cinema, outdoor, direct mail and internet, for all brands belonging to a particular firm (e.g., Cohen et al. 2010; Shah et al. 2021).

Consistent with relevant literature, we only use data for non-financial UK companies as the relationship between accounting data and firm performance may not be the same across financial and non-financial firms due to the different accounting standards and conventions governing the two sets of firms. All continuous variables are winsorised at the top and bottom 1% of the distribution to minimise the effects of potential outliers. The final sample consists of 967 firms with 7638 firm-year observations over a period of 17 years.

3.2 | Research Methodology

We first estimate the following model with ESG, R&D, advertising and the interaction of ESG with R&D and advertising, respectively, as our main variables of interest and control for other relevant variables reported in the extant literature (e.g., Servaes and Tamayo 2013; Shah et al. 2013; Masulis and Reza 2015; Ferrell et al. 2016; Yu et al. 2018; Albuquerque et al. 2019).

$$\begin{aligned} Performance_{it} = {} & \alpha Performance_{i,t-1} + \beta_1 ADV_{it} + \beta_2 R\&D_{it} + \beta_3 ESG_{it} \\ & + \beta_4 ESG * Moderator_{it} + \beta_5 SIZE_{it} + \beta_6 LEV_{it} \\ & + \beta_7 ROA_{it} + u_i + \omega_{it} \end{aligned} \quad (1)$$

All variables in Model 1 along with their definitions are outlined in Table 2.

Performance is proxied by earnings plus advertising and R&D divided by the lagged book value (EARN) as a measure of accounting-based firm performance, and TQ as a market-based measure of firm performance, respectively (Servaes and Tamayo 2013; Albitar et al. 2020; Shah et al. 2021). *ESG* represents the aggregate environmental, social and governance score. Further, we replace the aggregate *ESG* rating variable with its three separate pillars, namely *environmental* (ESCORE),

TABLE 2 | Variables, definitions and sources.

Variable	Definition
(*Source:* ACNielsen MEAL)	
ADV	Advertising divided by lag book value
(*Source:* Thomson Reuters' Datastream)	
R&D	R&D divided by lag book value
ADV INT	Advertising/ total assets
R&D INT	R&D/total assets
SIZE	Natural log of total assets
LEV	Total debt/total assets
ROA	Net income/ total assets
EARN	Sum of earnings, advertising and R&D divided by lag book value
TQ	(total assets − book value − deferred tax + market value)/ total assets
(Source: Thomson Reuters' ASSET4)	
ESG	Environmental social and governance score
ESCORE	Environmental pillar score
SSCORE	Social pillar score
GSCORE	Governance pillar score
ESGC	ESGC is an overall company score based on the reported information in the environmental, social and corporate governance pillars (ESG score) with an ESG Controversies overlay.

social (SSCORE), *governance* (GSCORE) and their interactions with advertising and R&D in the model. ESCORE focuses on environmental issues with respect to resource use, emissions and innovation; SSCORE captures a company's performance with respect to its workforce, human rights, community and product responsibility; GSCORE provides the rating for a company's governance mechanisms with respect to its management, shareholders and CSR strategy.

In addition, consistent with some recent literature, this study employs a unique overall ESGC score that takes both positive and negative ESG aspects into account as an alternative proxy in our analyses (see, e.g., Pacelli et al. 2023; Asimakopoulos et al. 2023, 2024). The ESGC score is calculated based on 23 ESG controversy topics. When companies are involved in ESG controversies, the ESGC score is calculated as the weighted average of the ESG scores and ESG controversies score per fiscal period. Therefore, a higher value for ESGC indicates better overall ESG performance. During the year, if a scandal occurs, the company involved is penalised and this affects its overall ESGC score and grading. The impact of the event may still be seen in the following year if there are new developments related to the negative event, for example, lawsuits, ongoing legislation disputes or fines. All new media materials are captured as the controversy progresses. The controversies score also addresses the market cap bias from which large-cap companies suffer, as they attract more media attention than smaller-cap companies.

Similarly, our two key variables of interest, *ADV* and *R&D*, are measured as firms' media advertising and R&D expenditures, respectively. Both these measures are scaled by size proxies (lagged book value, total assets) to reduce skewness and avoid the impact of comparing firms of different sizes (e.g., Luo and de Jong 2012; Servaes and Tamayo 2013). Finally, following the existing literature, we use a number of control variables such as *size*, *leverage* and *ROA* in the estimation model.

We adopt the GMM approach in our estimation models to account for potential endogeneity-related concerns (see e.g., Arellano and Bond 1991; Wintoki et al. 2012). In market-based accounting and finance research, endogeneity has been regarded as a major concern, and ignoring it may lead to incorrect coefficient estimates and misleading conclusions. In the context of this research, advertising, R&D and ESG reporting are not exogenous random variables. Instead, they are endogenously chosen by firms to suit their own operating and information environments and the bargaining power of various stakeholders (Sila et al. 2016). Furthermore, certain time-invariant variables, such as organisational culture and managers' capabilities, are not included in the model. Nevertheless, these factors affect firm performance, and ignoring them could lead to omitted variable bias. Similarly, rather than ESG, R&D and advertising affecting corporate performance, the relationship might run in the opposite direction.

System GMM has a number of advantages over traditional methods, such as fixed effects and instrumental variable models. First, it allows the inclusion of a lagged dependent variable as a control variable to capture the effect of the previous period's performance, thus controlling for dynamic endogeneity. Second, unlike other instrumental variable approaches such as two-stage least squares (2SLS), system GMM does not require the finding of instruments from other sources, as they can be obtained from the lags of the endogenous variables. These lags can be applied in differences or levels, and the model is specified as a system of equations (Blundell and Bond 1998).

Third, GMM can control for the effects of potential simultaneity and reverse causality issues. To control for these issues,

Ammann et al. (2011) recommend the use of lagged variables as instruments for the current values of those variables. In the current study, three lags of the endogenous variables are included in the estimation as instruments. System GMM is the most popular estimation method among various GMM estimators, and it has been widely used in existing research (Azmi et al. 2021; Wintoki et al. 2012).

In order to test whether a variable is endogenous, we apply the standard Durbin–Wu–Hausman (DWH) test. Based on the results of this test, *ESG*, *ADV*, *R&D*, *ROA* and *LEV* are confirmed as endogenous variables. One of the ways to address endogeneity is to replace such variables with an exogenous external variable. However, as highlighted by Wooldridge (2002), before selecting an instrumental variable, two conditions are required to be met. First, the instrumental variable must be uncorrelated with the error term of the econometric model. Second, it should be partially correlated with one of the endogenous variables. It is, however, particularly difficult to find an instrumental variable that satisfies both these conditions, which makes this approach unsuitable to implement. System GMM overcomes this problem by drawing instruments from within the dataset, and past values of the dependent and endogenous independent variables can be used as instruments for the current values of these variables. This, therefore, eliminates the need for external instruments (Roodman 2009; Wintoki et al. 2012).

Therefore, in line with the existing literature, the 3-year lags of these variables are used as instruments in each model. Additionally, in the models where the individual pillars of ESG are used, ESCORE, SSCORE and GSCORE are used as the instruments instead of ESG. In order to account for the endogenous effect of the lagged dependent variable, the system GMM estimator makes use of the lagged differences of the dependent variable as instruments for the equation in levels as well as the lagged levels of the dependent variable as instruments for the equation in first differences (Arellano and Bover 1995).

However, the appropriateness of using internal instruments depends on the assumption that there is no serial autocorrelation and the model is not over-identified. Therefore, we carry out two post-specification tests following the GMM estimation (Arellano and Bond 1991). First, we employ the Hansen–Sargan *J*-test to test for over-identifying restrictions and to check the validity of the moment conditions (Hansen 1982; Sargan 1958). Second, we use the residual autocorrelation (AR) test to check for second-order autocorrelation. The results of these tests are reported at the bottom of each table. The Hansen test confirms that the instruments used in our models are valid and the results of the residual autocorrelation test show no signs of serial autocorrelation of the second order (AR2) in any of our models.

4 | Results and Discussion

Table 3 presents the summary descriptive statistics for the sample. The ESG aggregate score on average remains modest at 17.23, with a standard deviation of 25.25 and a maximum rating of 93.95. A similar pattern emerges for the environmental, social and governance sub-pillars. Table 4 shows high correlations among the aggregate and each of the sub-pillars of ESG. As a consequence, we estimate separate models for each sub-pillar of ESG, respectively.

TABLE 3 | Descriptive statistics.

Variable	Mean	Std. Dev.	Min	Max
ADV	0.003	0.023	0	0.66
ADV INT	0.001	0.004	0	0.027
R&D	0.036	0.102	0	0.994
R&D INT	0.017	0.046	0	0.279
ESG	17.229	25.245	0	93.95
ESCORE	15.125	25.607	0	85.53
GSCORE	18.962	28.01	0	90.18
SSCORE	17.332	26.146	0	86.44
ESGC	16.352	23.714	0	93.5
EARN	0.092	0.324	−1.938	1.978
TQ	1.522	1.025	0.022	8.062
SIZE	12.54	2.227	4.234	20.497
LEV	0.195	0.167	0	0.694
ROA	0.015	0.148	−0.801	0.31

Notes: All variables are defined in table 2.

Table 5 presents the results of the estimation models testing the direct and moderating effects of advertising and R&D on the ESG–performance relationships after controlling for other relevant variables in the models. Model 1 shows that both advertising and ESG have a significantly positive association with accounting-based firm performance. However, as we are interested in investigating the moderating role of advertising, the coefficient of interest in Model 1 is the interaction term *ESGxADV*.

The coefficient on the interaction term is positive and statistically significant at the 1% level, suggesting that advertising positively moderates the relationship between aggregate ESG score and accounting-based measure of firm performance. It is also evident that these results are economically significant. For instance, Model 1 implies that, in firms with zero advertising (the median of the distribution), increasing the ESG by one standard deviation leads to an increase in earnings of 2.74%. However, for firms with an advertising expenditure to book value of 2.3% (one standard deviation above the median), the same increase in the ESG leads to an increase of 7.75% in earnings.[12] Similarly, Model 3 shows that, in firms with zero advertising intensity (the median of the distribution), increasing the ESG by one standard deviation leads to an increase in TQ of 5.31%, but the same increase coupled with a 0.4% (one standard deviation above the median) increase in advertising intensity is associated with a 12.54% increase in TQ. These are substantial increases in the performance of firms that are brought about by the positive moderating role of advertising.

TABLE 4 | Correlation matrix.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(1) TQ	1.000													
(2) EARN	0.119*	1.000												
(3) ESG	0.034*	0.174*	1.000											
(4) ESGC	0.045*	0.179*	0.983*	1.000										
(5) ESCORE	−0.000	0.151*	0.935*	0.913*	1.000									
(6) GSCORE	0.047*	0.168*	0.928*	0.920*	0.788*	1.000								
(7) SSCORE	0.036*	0.171*	0.972*	0.954*	0.894*	0.850*	1.000							
(8) ADV	0.091*	0.050*	−0.007	−0.008	0.010	−0.020	−0.005	1.000						
(9) ADV INT	0.080*	0.023	−0.026*	−0.027*	−0.006	−0.039*	−0.023	0.725*	1.000					
(10) SIZE	−0.151*	0.223*	0.723*	0.699*	0.680*	0.668*	0.705*	−0.051*	−0.078*	1.000				
(11) R&D	0.229*	−0.045*	−0.045*	−0.049*	−0.040*	−0.046*	−0.046*	−0.023	−0.042*	−0.126*	1.000			
(12) R&D INT	0.266*	−0.149*	−0.095*	−0.096*	−0.089*	−0.092*	−0.096*	−0.034*	−0.047*	−0.208*	0.851*	1.000		
(13) LEV	−0.194*	−0.008	0.188*	0.187*	0.184*	0.153*	0.195*	0.003	−0.064*	0.359*	−0.151*	−0.234*	1.000	
(14) ROA	0.033*	0.762*	0.172*	0.178*	0.145*	0.172*	0.168*	0.031*	0.017	0.264*	−0.103*	−0.236*	−0.029*	1.000

*Significance at the 0.01 level.

TABLE 5 | Direct and moderating role of advertising and R&D on firm performance.

	EARN		TQ	
Variables	**(1)**	**(2)**	**(3)**	**(4)**
ESG	0.0001***	0.0001***	0.0032***	0.0025***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
ADV	0.2002***	0.8935***		
	(0.0001)	(0.0001)		
ESGxADV	0.0575***			
	(0.0000)			
R&D	0.3165***	0.1994***		
	(0.0001)	(0.0001)		
ESGxRD		0.0049***		
		(0.0000)		
ADV INT			4.7835***	2.8816***
			(0.0050)	(0.0090)
ESGxADVINT			0.0653***	
			(0.0001)	
R&D INT			4.6989***	4.2163***
			(0.0016)	(0.0011)
ESGxRDINT				0.0506***
				(0.0000)
SIZE	−0.0022***	−0.0037***	−0.0019***	−0.0151***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
LEV	−0.0819***	−0.0438***	−0.5895***	−0.5495***
	(0.0000)	(0.0001)	(0.0001)	(0.0003)
ROA	1.6017***	1.6075***	−0.0839***	0.0147***
	(0.0000)	(0.0000)	(0.0001)	(0.0002)
Constant	0.0715***	0.0537***	0.6423***	0.8571***
	(0.0000)	(0.0001)	(0.0003)	(0.0005)
Observations	7638	7638	7638	7638
Number of firms	967	967	967	967
Year dummies	Yes	Yes	Yes	Yes
AR1 (*p*-value)	−7.452 (0.000)	−7.483 (0.000)	−6.880 (0.000)	−6.886 (0.000)
AR2 (*p*-value)	0.0892 (0.928)	0.0656 (0.947)	2.416 (0.167)	2.406 (0.155)
J-test (*p*-value)	783.9 (0.484)	807.9 (0.260)	767.2 (0.650)	777.6 (0.547)

Note: Table 5 provides the system GMM results for the impact of advertising, R&D and its interaction with ESG on performance. Models 1 and 2 provide results for ESG and its interaction with advertising and R&D when EARN is used as the dependent variable. Models 3 and 4 provide results for ESG and its interaction with advertising and R&D intensity when TQ is used as the dependent variable. Three lags of performance are included in all specifications (to preserve space, these lagged coefficients are not reported). Firm-clustered standard errors are in parentheses. *AR (1)* and *AR (2)* are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null of no serial correlation. The Sargan–Hansen (*J*) test of overidentification is under the null that all instruments are valid. The definitions and symbols for all independent and control variables are the same as outlined in Table 2.

*Significance at the 10% level.

**Significance at the 5% level.

***Significance at the 1% level.

Table 5 also shows the results from the estimation of Models 2 and 4, which are used to examine the direct effect of ESG and the direct and moderating effects of R&D on the accounting and market-based measures of performance, respectively. It can be observed that both R&D and ESG are significantly positively associated with TQ. Furthermore, the coefficients of interest in this study, *ESGxRD* (Model 2) and *ESGxRDINT* (Model 4), are significantly positively associated with TQ. These results show

TABLE 6 | ESG pillars, advertising and earnings.

	EARN		
Variables	**(1)**	**(2)**	**(3)**
ADV	0.2133***	0.1332***	0.3887***
	(0.0012)	(0.0003)	(0.0001)
ESCORE	0.0001***		
	(0.0000)		
ESCORExADV	0.0594***		
	(0.0000)		
SSCORE		0.0000***	
		(0.0000)	
SSCORExADV		0.0598***	
		(0.0000)	
GSCORE			0.0000***
			(0.0000)
GSCORExADV			0.0685***
			(0.0000)
R&D	0.3019***	0.3073***	0.3115***
	(0.0011)	(0.0002)	(0.0001)
SIZE	−0.0033***	−0.0046***	−0.0059***
	(0.0001)	(0.0000)	(0.0000)
LEV	−0.1075***	−0.0406***	−0.0493***
	(0.0007)	(0.0002)	(0.0000)
ROA	1.6008***	1.6170***	1.6166***
	(0.0006)	(0.0001)	(0.0000)
Constant	0.0925***	0.1025***	0.0844***
	(0.0011)	(0.0003)	(0.0000)
Observations	7638	7638	7638
Number of firms	967	967	967
Year dummies	Yes	Yes	Yes
AR1 (*p*-value)	−7.440 (0.000)	−7.454 (0.000)	−7.489 (0.000)
AR2 (*p*-value)	0.111 (0.912)	0.102 (0.910)	0.138 (0.890)
J-test (*p*-value)	698.5 (0.101)	817.9 (0.187)	776.0 (0.563)

Note: Table 6 provides the system GMM results for the impact of advertising and its interaction with the three pillars of ESG (i.e., environmental, social and governance) on performance. Models 1, 2 and 3 provide results for the environmental, social and governance pillars, respectively, and their interaction with advertising when EARN is used as the dependent variable. Three lags of earnings are included in all specifications (to preserve space, these lagged coefficients are not reported). Firm-clustered standard errors are in parentheses. *AR (1)* and *AR (2)* are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null of no serial correlation. The Sargan–Hansen (*J*) test of overidentification is under the null that all instruments are valid. The definitions and symbols for all independent and control variables are the same as outlined in Table 2.

*Significance at the 10% level.
**Significance at the 5% level.
***Significance at the 1% level.

that R&D, like advertising, has a positive moderating effect on the ESG–performance relationship. Again, these results are economically significant. For instance, Model 2 implies that, in firms with zero R&D (the median of the distribution), increasing the ESG by one standard deviation leads to an increase in earnings of 2.74%. However, for firms with an R&D expenditure to book value of 10.2% (one standard deviation above the mean), the same increase in ESG leads to a 24.78% increase in earnings.[13]

TABLE 7 | ESG pillars, advertising and TQ.

	TQ		
Variables	**(4)**	**(5)**	**(6)**
ADV INT	0.9002***	3.9230***	6.1990***
	(0.0037)	(0.0042)	(0.0045)
ESCORE	0.0024***		
	(0.0000)		
ESCORExADVINT	0.0849***		
	(0.0001)		
SSCORE		0.0028***	
		(0.0000)	
SSCORExADVINT		0.0042***	
		(0.0000)	
GSCORE			0.0012***
			(0.0000)
GSCORExADVINT			0.0050***
			(0.0001)
R&D INT	4.6519***	4.6915***	4.5119***
	(0.0013)	(0.0012)	(0.0011)
SIZE	0.0028***	0.0037***	0.0044***
	(0.0000)	(0.0000)	(0.0000)
LEV	−0.6139***	−0.6183***	−0.5599***
	(0.0001)	(0.0001)	(0.0001)
ROA	−0.0894***	−0.0942***	−0.0898***
	(0.0001)	(0.0001)	(0.0001)
Constant	0.6246***	0.5630***	0.5965***
	(0.0002)	(0.0002)	(0.0002)
Observations	7638	7638	7638
Number of firms	967	967	967
Year dummies	Yes	Yes	Yes
AR1 (*p*-value)	−6.885 (0.000)	−6.888 (0.000)	−6.886 (0.000)
AR2 (*p*-value)	2.478 (0.167)	2.390 (0.170)	2.437 (0.164)
J-test (*p*-value)	767.1 (0.651)	774.0 (0.583)	774.1 (0.582)

Note: Table 7 provides the system GMM results for the impact of advertising and its interaction with the three pillars of ESG (i.e., environmental, social and governance) on performance. Models 1, 2 and 3 provide results for environmental, social and governance pillars, respectively, and their interaction with advertising when TQ is used as the dependent variable. Three lags of TQ (to preserve space, these lagged coefficients are not reported) are included in all specifications. Firm-clustered standard errors are in parentheses. *AR (1)* and *AR (2)* are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null of no serial correlation. The Sargan–Hansen (*J*) test of overidentification is under the null that all instruments are valid. The definitions and symbols for all independent and control variables are the same as outlined in Table 2.
*Significance at the 10% level.
**Significance at the 5% level.
***Significance at the 1% level.

The ESG aggregate score is composed of three pillars, that is, environmental (ESCORE), social (SSCORE) and governance (GSCORE). We, therefore, analyse whether each of these pillars affects the performance of firms differently. In addition, we document the moderating role of R&D and ADV in the relationship between each of these pillars' scores and firm performance. Table 6 provides the results when performance is measured by earnings (EARN), and Table 7 provides the results for the market-based measure of

TABLE 8 | ESG pillars, R&D and earnings.

	EARN		
Variables	**(1)**	**(2)**	**(3)**
ADV	0.8856***	0.8632***	0.4337***
	(0.0007)	(0.0001)	(0.0130)
R&D	0.2316***	0.2343***	0.1859***
	(0.0019)	(0.0003)	(0.0007)
ESCORE	0.0002***		
	(0.0000)		
ESCORExRD	0.0064***		
	(0.0000)		
SSCORE		0.0000***	
		(0.0000)	
SSCORExRD		0.0083***	
		(0.0000)	
GSCORE			0.0000*
			(0.0000)
GSCORExRD			0.0045***
			(0.0000)
SIZE	−0.0055***	−0.0069***	−0.0042***
	(0.0001)	(0.0000)	(0.0001)
LEV	−0.0631***	−0.0087***	−0.0832***
	(0.0006)	(0.0002)	(0.0004)
ROA	1.6075***	1.6198***	1.5999***
	(0.0004)	(0.0001)	(0.0003)
Constant	0.0748***	0.1231***	0.0756***
	(0.0009)	(0.0004)	(0.0013)
Observations	7638	7638	7638
Number of firms	967	967	967
Year dummies	Yes	Yes	Yes
AR1 (*p*-value)	−7.503 (0.000)	−7.516 (0.000)	−7.425 (0.000)
AR2 (*p*-value)	0.068 (0.945)	0.097 (0.922)	0.0636 (0.950)
J-test (*p*-value)	698.2 (0.102)	820.7 (0.170)	721.8 (0.291)

Note: Table 8 provides the system GMM results for the impact of R&D and its interaction with the three pillars of ESG (i.e., environmental, social and governance) on performance. Models 1, 2 and 3 provide results for environmental, social and governance pillars, respectively, and their interaction with R&D when EARN is used as the dependent variable. Three lags of Earnings are included in all specifications (to preserve space, these lagged coefficients are not reported). Firm-clustered standard errors are in parentheses. *AR (1)* and *AR (2)* are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null of no serial correlation. The Sargan–Hansen (*J*) test of overidentification is under the null that all instruments are valid. The definitions and symbols for all independent and control variables are the same as outlined in Table 2.

*Significance at the 10% level.
**Significance at the 5% level.
***Significance at the 1% level.

performance, TQ. The results in Tables 6 and 7 indicate that each of these pillars has a significantly positive effect on both EARN and TQ. Furthermore, ADV positively moderates the relationship between these pillars and firm performance. Similarly, Tables 8 and 9 provide the results for the three pillars and their interactions with R&D for earnings and TQ, respectively.

TABLE 9 | ESG pillars, R&D and TQ.

	TQ		
Variables	**(1)**	**(2)**	**(3)**
ADV INT	1.4280***	2.4726***	2.5258***
	(0.0127)	(0.0079)	(0.0120)
R&D INT	4.6016***	4.0465***	4.2696***
	(0.0011)	(0.0013)	(0.0006)
ESCORE	0.0026***		
	(0.0000)		
ESCOREXRDINT	0.0184***		
	(0.0000)		
SSCORE		0.0020***	
		(0.0000)	
SSCOREXRDINT		0.0781***	
		(0.0000)	
GSCORE		0.0007***	
		(0.0000)	
GSCOREXRDINT			0.0291***
			(0.0000)
SIZE	−0.0053***	−0.0165***	−0.0112***
	(0.0000)	(0.0000)	(0.0000)
LEV	−0.5714***	−0.5738***	−0.5172***
	(0.0002)	(0.0002)	(0.0002)
ROA	−0.0223***	−0.0051***	0.0179***
	(0.0002)	(0.0002)	(0.0003)
Constant	0.7178***	0.9046***	0.8438***
	(0.0005)	(0.0004)	(0.0004)
Observations	7638	7638	7638
Number of firms	967	967	967
Year Dummies	Yes	Yes	Yes
AR1 (p-value)	−6.896 (0.000)	−6.885 (0.000)	−6.885 (0.000)
AR2 (p-value)	2.584 (0.168)	2.390 (0.151)	2.394 (0.152)
J-Test(p-value)	779.2 (0.532)	781.9 (0.504)	785.2 (0.471)

Note: Table 9 provides the system GMM results for the impact of R&D and its interaction with the three pillars of ESG (i.e., environmental, social and governance) on TQ. Models 1, 2 and 3 provide results for the environmental, social and governance pillars, respectively, and their interaction with R&D Intensity when TQ is used as the dependent variable. Three lags of TQ are included in all specifications (to preserve space, these lagged coefficients are not reported). Firm-clustered standard errors are in parentheses. *AR (1)* and *AR (2)* are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null of no serial correlation. The Sarga–-Hansen (*J*) test of overidentification is under the null that all instruments are valid. The definitions and symbols for all independent and control variables are the same as outlined in Table 2.
*Significance at the 10% level.
**Significance at the 5% level.
***Significance at the 1% level.

TABLE 10 | Advertising, R&D, ESG combined score and performance.

	EARN		TQ	
Variables	**(1)**	**(2)**	**(3)**	**(4)**
ESGC	0.0001***	0.0000***	0.0030***	0.0025***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
ADV	0.2077***	0.8803***		
	(0.0001)	(0.0004)		
R&D	0.3188***	0.1763***		
	(0.0001)	(0.0001)		
ESGCxADV	0.0560***			
	(0.0000)			
ESGCxRD		0.0062***		
		(0.0000)		
ADV INT			7.2992***	2.1184***
			(0.0057)	(0.0109)
ESGCxADVINT			0.0893***	
			(0.0001)	
R&D INT			4.5631***	4.2011***
			(0.0012)	(0.0009)
ESGCxRDINT				0.0492***
				(0.0000)
SIZE	−0.0019***	−0.0048***	−0.0040***	−0.0216***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
LEV	−0.0298***	0.0004***	−0.5879***	−0.5631***
	(0.0001)	(0.0001)	(0.0002)	(0.0003)
ROA	1.6161***	1.6203***	−0.0832***	0.0139***
	(0.0001)	(0.0001)	(0.0002)	(0.0002)
Constant	0.0292***	0.0620***	0.6499***	0.9201***
	(0.0001)	(0.0002)	(0.0003)	(0.0005)
Observations	7638	7638	7638	7638
Number of firms	967	967	967	967
Year dummies	Yes	Yes	Yes	Yes
AR1 (*p*-value)	−7.482 (0.000)	−7.496 (0.000)	−6.880 (0.000)	−6.888 (0.000)
AR2 (*p*-value)	0.166 (0.868)	0.116 (0.907)	2.394 (0.165)	2.405 (0.154)
J-test (*p*-value)	824.3 (0.984)	840.2 (0.961)	774.4 (0.580)	782.9 (0.494)

Note: Table 10 provides the system GMM results for the impact of advertising, R&D and their interactions with the ESG combined score on performance. Models 1 and 2 provide results for ESGC and its interactions with advertising and R&D, respectively, when EAR is used as the dependent variable. Models 3 and 4 provide results for ESGC and its interactions with advertising and R&D intensity, respectively, when TQ is used as the dependent variable. Three lags of performance are included in all specifications (to preserve space, these lagged coefficients are not reported). Firm-clustered standard errors are in parentheses. *AR (1)* and *AR (2)* are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null of no serial correlation. The Sargan–Hansen (*J*) test of overidentification is under the null that all instruments are valid. The definitions and symbols for all independent and control variables are the same as outlined in Table 2.
*Significance at the 10% level.
**Significance at the 5% level.
***Significance at the 1% level.

These findings are consistent with the notion that firms' strategic investments in value appropriation, value creation and catering to the needs of stakeholders positively affect their performance (see, e.g., Mizik and Jacobson 2003; Luo and Bhattacharya 2009; Albuquerque et al. 2019). Consistent with our predicted signs, the coefficient on the interaction of advertising and aggregate ESG is also positive and statistically significant, suggesting that advertising positively moderates the ESG–performance relationship (see, e.g., Servaes and Tamayo 2013).

Our results remain robust when we replace aggregate ESG with the environmental (ESCORE), social (SSCORE) and governance (GSCORE) pillar scores. Contrary to some prior literature (e.g., McWilliams and Siegel 2000; Hull and Rothenberg 2008) indicating an insignificant effect of ESG on firms' performance when R&D is included as an additional explanatory variable, these results show that R&D significantly positively moderates the ESG–performance association. These results hold for the interaction of R&D with aggregate ESG, as well as with the ESCORE, SSCORE and GSCORE sub-pillars, respectively. Overall, we find consistent evidence of a moderating effect of both advertising and R&D on the ESG–performance relationship.[14]

TABLE 11 | Heckman self-selection model: ESG, ADV and performance.

	(1)	(2)
Variables	**EARN**	**TQ**
ESG	0.0009***	0.0057***
	(3.3300)	(6.0150)
ADV	0.6224***	18.5939***
	(4.4019)	(4.5842)
ESGxADV	0.0255***	0.7013***
	(5.0223)	(6.6168)
R&D	0.1615***	4.7051***
	(3.0662)	(10.4285)
SIZE	0.0040	−0.0727***
	(1.2744)	(−6.7819)
ROA	1.0570***	1.4645***
	(28.4870)	(11.8132)
LEV	0.1098***	−0.2671***
	(3.7454)	(−2.7016)
Constant	−0.1117**	2.1298***
	(−2.2839)	(12.5973)
IMR	0.0393**	0.0520
	(2.5348)	(0.9739)
Observations	10,022	10,022
Year dummies	Yes	Yes
Rho	0.166	0.0664
Sigma	0.236	0.783

Note: Table 11 provides the results for ESG and ESG and ADV interaction on performance using the Heckman selection model to control for self-selection bias. Model 1 shows results for EARN as the dependent variable, and Model 2 documents the results for TQ. IMR indicates inverse Mills ratio. *z*-statistics are in parentheses. The definitions and symbols for all independent and control variables are the same as outlined in Table 2.
*Significance at the 10% level.
**Significance at the 5% level.
***Significance at the 1% level.

In additional analysis, we replace the ESG aggregate score with the ESGC score and rerun the analysis. The ESGC takes into account whether or not a firm has been involved in ESG-related controversies that have been reported in the media. If a firm is involved in any ESG-related controversies in a fiscal year, its overall ESG score will be reduced in that period. It can be argued that ESGC provides a better measure of a firm's ESG commitments. If a firm's ESG score is high, but at the same time, the firm is involved in ESG-related controversies, then its true commitment to ESG can be questioned. Using the ESG score alone will not capture such situations. Therefore, using ESGC could be considered a relatively better proxy of a firm's ESG commitment. Table 10 provides the results for ESGC with respect to earnings and TQ. In line with our hypotheses, the results in Table 10 show that ESGC is significantly positively associated with both EARN and TQ. Furthermore, advertising and R&D positively moderate the relationship between ESGC and firm performance. Overall, the results of our study support hypotheses H1a, H1b and H1c. The findings of our study are also consistent with the predictions in hypotheses H2a and H2b.

5 | Robustness Tests

5.1 | Heckman Selection Model

This study's main argument focuses on the role of R&D and advertising in moderating the relationship between ESG and firms' performance. However, there is a possibility that this relationship may, in fact, be endogenous due to sample selection bias and because other factors not included in our empirical models may have influenced the presence of advertising expenditure.

In order to address the self-selection problem, we implement Heckman's two-stage estimation approach in our empirical models (Heckman 1979). We create a binary variable (ADVB),

TABLE 12 | Propensity score matching treatment effects.

Variables	(1) EARN	(2) TQ
ADV vs. no ADV	0.0172**	0.150**
	(0.00682)	(0.0668)
Observations	11,454	11,064

Note: Table 12 reports the results using the PSM approach. ADV is the treatment effect. The sample is divided into advertising firms (treatment firms) and non-advertising (control firms) groups. Each treatment firm is matched with a control firm based on the proximity of the ESG score. Standard errors are in parentheses.
*Significance at the 10% level.
**Significance at the 5% level.
***Significance at the 1% level.

which takes the value 1 if a firm has nonzero advertising and 0 otherwise. In the first stage, the likelihood of advertising is the dependent variable and lagged values of firm size, sales, leverage, ROA, mean industry advertising (Mean_ADV), R&D, cash flows from operations (CFOP) and ESG are used as determinants. In the second stage, we add the inverse Mills ratio (IMR) derived from the first-stage regression into Equation (1) to control for potential selection bias. This approach is in line with existing literature (Ballou et al. 2018; Abebe and Tangpong 2018). These results are reported in Table 11 and show that the findings of this study are robust after controlling for self-selection bias.

5.2 | Propensity Score Matching (PSM)

In order to better estimate the causal relationship, we use PSM as an additional robustness test. In the PSM approach, we divide the sample into advertising firms (treatment firms) and non-advertising firms (control firms). We create a binary variable (ADVB), which takes the value 1 if a firm has nonzero advertising and 0 otherwise. We match each treatment firm with a control firm based on the proximity of their ESG scores (Caliendo and Kopeinig 2008; Hu et al. 2020). The results are reported in Table 12 and show that the treatment effect (ADV) is significantly positively associated with both measures of performance.

TABLE 13 | The impact of ESG and advertising intensity on return on sales and return on equity.

	ROS		ROE	
Variables	**(1)**	**(2)**	**(3)**	**(4)**
ESG	0.0004***	0.0003***	0.0003***	0.0005***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
ADV INT	−5.9517***	−6.4430***	1.1689***	0.2562***
	(0.0013)	(0.0016)	(0.0013)	(0.0054)
ESGxADVINT	0.0231***		0.1099***	
	(0.0000)		(0.0000)	
R&D INT	−2.9788***	−2.8282***	0.0676***	0.0148***
	(0.0001)	(0.0002)	(0.0003)	(0.0005)
ESGxRDINT		0.0282***		0.0032***
		(0.0000)		(0.0000)
SIZE	−0.0031***	−0.0091***	0.0323***	0.0257***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
LEV	0.3769***	0.3808***	−0.0975***	0.0102***
	(0.0000)	(0.0001)	(0.0001)	(0.0002)
ROA	0.8986***	0.9146***	2.6903***	2.7063***
	(0.0000)	(0.0001)	(0.0001)	(0.0002)
Constant	0.0118***	0.0811***	−0.4639***	−0.3980***
	(0.0001)	(0.0001)	(0.0001)	(0.0004)
Observations	7638	7638	7638	7638
Number of firms	967	967	967	967
Year dummies	Yes	Yes	Yes	Yes
AR1 (*p*-value)	−2.619 (0.000)	−2.616 (0.000)	−5.554 (0.000)	−5.542 (0.000)
AR2 (*p*-value)	−0.216 (0.829)	−0.213 (0.832)	−0.414 (0.679)	−0.412 (0.681)
J-test (p-value)	795.8 (0.368)	808.4 (0.257)	761.6 (0.701)	774.7 (0.577)

Note: Table 13 provides the system GMM results for the impact of advertising, R&D and its interaction with ESG on performance. Models 1 and 2 provide results for ESG and its interaction with advertising and R&D when return on sales (ROS) is used as the dependent variable. Models 3 and 4 provide results for ESG and its interaction with advertising and R&D intensity when return on equity (ROE) is used as the dependent variable. Three lags of performance are included in all specifications (to preserve space, these lagged coefficients are not reported). Firm-clustered standard errors are in parentheses. *AR (1)* and *AR (2)* are tests for first-order and second-order serial correlation in the first-differenced residuals, under the null of no serial correlation. The Sargan–Hansen (*J*) test of overidentification is under the null that all instruments are valid. The definitions and symbols for all independent and control variables are the same as outlined in Table 2.
*Significance at the 10% level.
**Significance at the 5% level.
***Significance at the 1% level.

5.3 | Alternative Measure of Performance

Following Servaes and Tamayo (2013), we also use return on sales (ROS) and return on equity (ROE) as alternative measures to check the robustness of the findings. The results are reported in Table 13 and show that our main findings are unaffected by the use of alternative performance measures.

6 | Conclusion and Policy Implications

This paper examines the moderating effects of firms' strategic investment in advertising and R&D as two alternative forms of differentiation in the ESG–performance relationship. Despite the growing literature on ESG, research on the moderating role of advertising in the ESG–performance relationship is virtually nonexistent in the UK context, mainly due to the lack of advertising data availability. Similarly, despite the availability of R&D data in the UK, evidence on the moderating role of R&D in the ESG–performance relationship is scarce. Our study, therefore, provides some useful evidence on the moderating roles of R&D and advertising in the ESG–performance relationship in the UK context to fill that void.

Drawing on the RBV and signalling theory perspectives and employing the GMM estimation method for a sample of UK firms over the 2002–2018 period, we find consistent evidence suggesting that both advertising and R&D significantly positively moderate the ESG–performance relationship. Our findings thus add to the stream of literature that regards firms' strategic investment in ESG, advertising and R&D activities as key elements of their differentiation strategies intended to give those firms a competitive advantage over their counterparts. The results remain robust whether we use earnings as a proxy for an accounting-based measure of performance or TQ as a measure of firms' market-based performance. These findings thus document that both advertising and R&D strengthen the ESG–performance relationship.

Contrary to prior studies that typically examine the impact of aggregate ESG on firms' performance, which can potentially obscure the effects of the individual environmental, social and governance pillars, we extend our analyses by interacting advertising and R&D with each of the three key ESG pillars separately and show that the positive ESG–performance relationship still holds. These findings, therefore, suggest that both advertising and R&D complement firms' environmental, social and governance efforts, respectively. Our results are robust to alternative model specifications and the use of alternative measures for accounting and market-based proxies for firm performance. Due to the importance of ESG investments in today's business environment and the significant amounts firms strategically invest in R&D and advertising, we argue that our findings have implications for policy and practice.

Our study has policy implications in informing managers of the efficacy of meeting their sustainable development goals through investment in ESG-related activities, complemented by their strategic investment in discretionary outlays on R&D and advertising. This highlights the missing link concerning the need for firms to devise policies on R&D and advertising expenditures when setting up their sustainable development targets. Firms can benefit from gaining competitive advantage by aligning R&D and advertising strategies with their ESG initiatives.

The results of this study provide support for the disclosure of information on each of the three pillars of ESG and preemptive disclosure of any potential negative ESG-related information. This would enable stakeholders to distinguish between a firm's overall ESG performance and its performance adjusted for controversies, providing a more nuanced view of the firm's sustainability profile. Our findings also provide useful information for policy makers in deliberating on and developing future sustainability standards, encouraging responsible business practices and formulating ESG disclosure strategies that will inform investors and other stakeholders regarding their investment and stewardship decision making across global financial markets. In this regard, policy makers might, for instance, introduce tax credits for sustainable innovation as incentives for a high level of strategic alignment between ESG and R&D expenditure. Similarly, regulators might require more detailed disclosure of advertising expenditure related to sustainability initiatives, thus increasing transparency and allowing stakeholders to better assess firms' commitment to ESG.

Moreover, for investors, our findings support the notion that strategic investments in ESG, R&D and advertising serve as a signal of firms' intentions to differentiate themselves from their counterparts by catering to the needs of stakeholders and reducing information asymmetry, thus positively affecting firms' performance. This implies that firms' spending on ESG, R&D and advertising is necessary for not only enhancing firms' business performance, meeting market expectations and reducing agency costs but also helping companies meet their sustainability targets, which is now an essential element of strategic targets for most companies in both developed and developing economies. In line with this, our findings also suggest that firms' spending on R&D and advertising will add value to their sustainability targets and sustainable development goals, which in turn will positively influence shareholder value.

From a value-enhancing perspective, firms focusing on optimising their strategic investments in ESG, R&D and advertising are more likely to benefit from producing and promoting environmentally friendly products, brands and supply chains and communicating their ESG efforts via enhanced sustainability reports and authentic advertising. Firms could therefore prioritise R&D projects that align with sustainability goals, such as developing eco-friendly products or processes. Similarly, firms could allocate a certain percentage of their advertising budget to campaigns that explicitly promote their sustainability efforts. This could in turn help mitigate information asymmetry, increase transparency and help investors and other stakeholders make informed decisions (e.g., Kim et al. 2012; Cui et al. 2018; Shah et al. 2025). Further, increased provision of sustainability reporting could help align a firm's goals with the United Nations' Sustainable Development Goals (SDGs) and signal the firm's resolve to engage in sustainable and responsible business practices and transparency, thus resulting in an improved firm's reputation and increased monitoring and accountability by the stakeholders.

Similarly, firms that optimise their strategic investment in ESG are more likely to avoid making misleading claims in their advertising for fear of tarnishing their reputation and brand image and could therefore help reduce the risk of greenwashing. Finally, firms with an ESG focus are also likely to be well placed to gather, analyse and effectively use relevant ESG data to support their sustainability claims in their advertising campaigns and communication with stakeholders, thus resulting in improved brand reputation and building trust with stakeholders.

In summary, optimising ESG, R&D and advertising investments could potentially have significant implications for sustainability standards and disclosure regulations in terms of not only improving a firm's ethical image and reputation among its stakeholders but also helping to reduce agency costs and regulatory risks.

Like other relevant studies, our study is not without limitations and provides useful avenues for future research. First, we do not include corporate governance variables in our estimation models because we examine the three separate pillars of ESG (environmental, social and governance) and related initiatives; it is evident that the governance pillar score in our data accounts for the corporate governance effects. Second, since the focus on strategic investments in ESG, R&D and advertising and the relevant corporate governance structures may vary across different jurisdictions and industries, the results obtained from a sample of UK firms may not directly apply to firms operating in other regulatory or market environments. Therefore, studying how the interaction of ESG, R&D and advertising varies across different industries and/or geographic regions could be a useful avenue for future studies. Third, the advertising data contain firms' yearly spending on advertising, and it is unknown how much of this spending is directly associated with firms' ESG efforts. The availability of dedicated data on firms' yearly advertising spending related to their ESG efforts may add further insight into this line of research.

Fourth, we consider R&D and advertising as complementary strategic sources of differentiation in firms' ESG–performance relationship, providing firms with a competitive advantage. Future studies may explore the moderating role of other proxies, such as digital transformation initiatives, for competitive advantage in the ESG–performance relationship. Finally, it may be useful to consider the moderating role of other key corporate governance variables, such as political connections, institutional ownership and other board characteristics, in the ESG–performance relationship.

Author Contributions

Syed Zulfiqar Ali Shah: conceptualization, methodology, original draft preparation, reviewing and editing. **Saeed Akbar:** conceptualization, methodology, reviewing and editing. **Sardar Ahmad:** methodology, data curation, analysis, validation.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Endnotes

[1] For the purpose of this paper, we use ESG and corporate social responsibility (CSR) interchangeably.

[2] For example, a KPMG survey shows that 96% of the top 250 global firms issued sustainability reports in 2022. However, despite the significant rise in sustainability reporting by firms, there is no clear evidence on whether and how firms' investment in ESG, complemented by strategic investments in R&D and advertising, affects firms' performance; https://www.ifrs.org/groups/international-sustainability-standards-board/, accessed 21st December 2022.

[3] https://www.unilever.com, accessed 7th November 2022.

[4] https://www.bmogam.com/gb-en/institutional/wp-content/uploads/2020/05/responsible-investment-annual-review-2019-retail-1.pdf, accessed 28th December 2020.

[5] https://www.statista.com/statistics/265645/ranking-of-the-20-companies-with-the-highest-spending-on-research-and-development, accessed 28th December 2020.

[6] The worldwide spending on advertising is estimated to have exceeded $560 billion in 2019. https://www.statista.com/topics/990/global-advertising-market, accessed 28th December 2020.

[7] Advertising and promotion are two alternative forms of marketing approaches with different objectives and implications (Mela et al. 1997). While Compustat's measure of advertising expenditures combines advertising media and promotional expenses, our measure of advertising expenditures is derived by aggregating firm-level monthly media advertising expenditure (press, TV, radio, cinema, outdoor, direct mail and internet) at the brand level (see, e.g., Cohen et al. 2010, and Shah et al. 2021, for a description of ACNielsen advertising data).

[8] The International Financial Reporting Standard (IFRS) Foundation, for instance, recently announced (November 3rd, 2022) the formation of a new International Sustainability Standards Board (ISSB) that will develop sustainability disclosure standards to meet the needs of investors and other stakeholders for quality information. https://www.ifrs.org/news-and-events/news/2021/11/ifrs-foundation-announces-issb-consolidation-with-cdsb-vrf-publication-of-prototypes/, accessed 12th June 2022. Similarly, the Securities Exchange Commission (SEC) has issued two new disclosure and naming requirements proposals for investment funds that take ESG factors into account. These are aimed at addressing public concerns with regard to climate change, social justice and 'greenwashing' by asset managers pursuing higher charges from customers.

https://www-wsj-com.cdn.ampproject.org/c/s/www.wsj.com/amp/articles/sec-to-propose-more-disclosure-requirements-for-esg-funds-11653498000, accessed 26th May 2022.

[9] See Gillan et al. (2021) for a thorough review of relevant literature on ESG and CSR research in corporate finance.

[10] https://www.lseg.com/en/data-analytics/sustainable-finance/esg-scores

[11] https://www.lseg.com/content/dam/data-analytics/en_us/documents/methodology/lseg-esg-scores-methodology.pdf, accessed 13th January 2025.

[12] This result represents how much EARN changes, given that ESG changes by one standard deviation. Similarly, for ESGxADV, the combined effect of ADV and ESG on EARN represents a 7.71% change in average earnings when ESG is accompanied by advertising.

[13] This result represents how much EARN changes, given that ESG changes by one standard deviation. Similarly, for ESGxRD, the

combined effect of R&D and ESG on EARN represents a 24.78% change in average earnings when ESG is accompanied by advertising.

[14] Advertising appears to have stronger moderating effects than R&D in some models. This could be due to a number of reasons. First, advertising can be used as a vehicle to create brand awareness and trust, resulting in increased brand loyalty among target customers. Similarly, the use of ESG focused advertising may signal a firms' adherence to responsible business practices and emphasise their commitments to ESG. This could, in turn, help enhance a firm's brand equity, resulting in positive effects on firm performance. Further, ESG-related advertising can provide a firm with a competitive advantage by differentiating them from their counterparts and targeting customers who put more value on sustainable brands and products. In addition, while R&D can help facilitate innovation in terms of products and services, its impact of brand equity can be relatively less direct than advertising. Similarly, there is an inherent uncertainty about R&D investment outcomes and long gestation periods of R&D investments before yielding positive returns.

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