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The impact of environmental, social and governance performance on brand value: The role of the digitalisation level

Authors:
Ying Wang[1]
Jiang Cao[2]
Xiao Cai[2]

Affiliations:
[1]Department of Marketing and E-Commerce, College of Business Administration, Chaohu University, Hefei, China

[2]School of Business Administration, Dongbei University of Finance and Economics, Dalian, China

Corresponding author:
Jiang Cao,
921157699@qq.com

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Purpose: Studying the role of environmental, social and governance (ESG) performance in enhancing brand value is strategically important for promoting sustainable development.

Design/methodology/approach: Using panel data for 126 different brands over 10 years, we empirically analyse the impact of ESG performance on brand value, considering the moderating role of the digitalisation level.

Findings/results: Firstly, the impact of ESG performance on brand value exhibits a U-shaped relationship. Secondly, the digitalisation level negatively moderates the U-shaped relationship. Thirdly, the effect of ESG performance on brand value is mainly on the sub-items of environment and social responsibility, while the effect of governance is not significant.

Practical implications: Firstly, firms should recognise the complex relationship between ESG performance and brand value, and strive to find a balance between economic benefits and sustainable development. Secondly, firms can utilise digital technology and platforms to communicate and interact with consumers, integrating ESG principles into their daily brand activities. Thirdly, investments in environmental and social responsibility are more meaningful for improving brand value.

Originality/value: Firstly, our study adds value to corporate social responsibility (CSR) and ESG literature by investigating the non-linear impact of ESG performance on brand value. Secondly, we replenish the mechanistic study about how ESG performance affects brand value. Thirdly, we open the black box of the effect of single indicators (E/S/G) on brand value, including the specific direction and strength.

Keywords: ESG performance; brand value; reputation signals; digitalisation level; U-shaped relationship.

Introduction

Environmental, social and governance (ESG) performance, which adds environmental and governance dimensions to corporate social responsibility (CSR), is often used by investors to assess a firm's ability to be sustainable (Garcia et al., 2017; Michelson et al., 2004; Nekhili et al., 2021). Many firms are increasingly incorporating ESG activities into their business practices. Apple, for example, has adopted and prioritised the decarbonisation of manufacturing operations throughout its supply chain, including 100% renewable energy, and tracks the progress annually. Alibaba has established a low-carbon living scene, promoting activities such as low-carbon travel, recycling of idle goods, and ant forest to encourage consumers and partners to engage in ESG activities. Regulators and investors demand firms to disclose their ESG performance (hereinafter, ESGP), indicating that firms can balance economic interests with environmental protection and social responsibility. However, the intrinsic motivation of whether firms can actively undertake ESG responsibilities over a long period lies in whether they can establish competitive advantages and improve firm performance through ESG.

Studies on ESG focusses on the relationship between ESGP and financial investments, financial performance, firm risks and green innovation performance. Several studies have explored the relationship between board diversity and ESGP (Menicucci & Paolucci, 2022; Toerien et al., 2023). Studies on the impact of ESGP are categorised into two main areas. Firstly, from the perspective of reputation mechanisms, ESGP is believed to help mitigate information asymmetry between firms and stakeholders (Freeman, 2010), facilitate resource acquisition from external sources, reduce firm risk and increase firm valuation (Barnett & Salomon, 2012; Chen et al., 2018; Clarkson et al., 2013;

Dhaliwal et al., 2011; Freeman, 2010). Secondly, from a cost-benefit perspective, improving ESGP may increase firm costs. When these costs exceed the benefits from the reputation effect, they can negatively affect financial performance and shareholder interests (Friedman, 1970; Lin et al., 2019; Sen, 2006; Waddock & Graves, 1997). Currently, research findings on the economic effects of ESGP are inconsistent. Empirical evidence supports positive, negative and non-significant correlations (Aouadi & Marsat, 2018; Duque-Grisales & Aguilera-Caracuel, 2021; Wong et al., 2021).

The relationship between ESGP and firm performance has been well-researched, but several gaps remain. Firstly, existing studies assessing the impact of ESGP on firm performance have tended to rely on accounting results (Duque-Grisales & Aguilera-Caracuel, 2021), and have lacked a focus on brand value from a consumer perspective. Secondly, while past research has demonstrated the relationship between CSR and brand value (Agus Harjoto & Salas, 2017), there has been limited exploration of the link between ESG and brand value. The direct application of CSR research findings to ESG lacks sufficient empirical support. In addition, research on the mechanisms studies of the relationship between CSR and brand value has mainly focussed on psychological factors (Menon & Kahn, 2003; Nan et al., 2007), with less consideration of the role of digital technology. Thirdly, it is unclear whether there are differences in the impact of ESG sub-items (environment, social responsibility and governance) on brand value. Some related studies are shown in Table 1.

Addressing these issues is crucial for three reasons. Firstly, brand value is a key parameter associated with firm performance (Chu & Keh, 2006; Lin et al., 2021). Enhancing brand value is a strategic plan for sustainable returns, not just pursuing short-term financial results (Melewar & Nguyen, 2014). Brand value enhancement is essential for building a positive brand image and gaining a competitive advantage (Dutordoir et al., 2015). Therefore, examining the impact of ESG on brand value contributes to a more comprehensive understanding of the role and limitations of ESGP. Secondly, the application of digital technology has been proven to play an important role in firm performance (Wielgos et al., 2021). However, mechanistic studies on the impact of CSR or ESG on brand value have not fully considered the influence of digitisation level. Thirdly, understanding the role of ESG sub-items on brand value can help firms allocate resources and implement branding programmes more effectively.

This study examines how ESGP affects brand value to fill a gap in the literature. Firstly, based on the signalling theory, we systematically articulate the theoretical logic of the impact of ESGP on brand value and empirically test it by using 10 years of panel data. Secondly, we investigate the moderating effect of digitalisation level on the relationship between ESGP and brand value, and explore the role boundary of ESGP affecting brand value. Thirdly, we explore the role of ESG sub-items in brand value and verify its role direction and strength. In addition, in terms of methodology, we first establish a linear regression equation

TABLE 1: Literature about the relationship between ESG or CSR and brand performance.

Authors	Theoretical framework	Data source	Methodology	Relevant findings with our study
Sen and Bhattacharya (2001)	Congruence theory	Experimental	ANOVA	CSR initiatives can increase consumers' intentions to buy a firm's products under certain conditions
Menon and Kahn (2003)	Persuasion knowledge theory	Experimental	ANOVA	Consumers' elaboration levels affect perceptions of corporate social responsibility
Klein and Dawar (2004)	Attribution theory	Experimental	ANOVA	CSR improves consumer brand evaluations and protects a firm from the negative impacts of product hazard crises
Simmons et al. (2006)	Brand fit	Experimental	ANOVA	The fit between a company's specific association and the sponsorship cause can strengthen or obscure the company's positioning, affect sponsorship preferences and increase or undermine the company's equity
Nan et al. (2007)	Not explicitly mentioned	Experimental	ANOVA	Advertisements with an embedded CRM message are more likely to elicit favourable consumer perceptions of a firm than similar ones without CRM messages
Reed et al. (2007)	Not explicitly mentioned	Experimental	ANOVA	The authors examine the potential for utilising consumers' ethical identity to enhance brand and firm identification, as well as to enhance goodwill through community relations
Andersen (2009)	Not explicitly mentioned	Case Study	Qualitative analysis	The study demonstrates how the actual management of CSR practices is determined by environmental factors
Lai et al. (2010)	Reputation theory	Surveys (primary data)	SEM	CSR impacts brand performance by influencing firm reputation and industrial brand equity
Lii et al. (2012)	Reputation theory	Experimental	ANOVA	CSR initiatives have a significant impact on consumer identification with the brand and brand attitudes. The extent of the impact varies according to a firm's CSR reputation
Olsen et al. (2014)	Social identity and framing theories	Surveys (secondary data)	Regression analysis	Introducing new green products can really improve brand attitudes
Sierra et al. (2017)	Business ethics	Surveys (primary data)	SEM	CSR affects brand equity by enhancing a firm's ethical image
Bardos et al. (2020)	RBV, Shareholder theory	Surveys (primary data)	Regression analysis	Visible corporate social responsibility positively affects the market perception of products
Lee et al. (2022)	Signalling theory	Surveys (secondary data)	Qualitative analysis	Automotive brands can deliver ESG signals through social media for brand valuation, directly and interactively, the latter providing value co-creation

Note: Please see the full reference list of the article, Wang, Y., Cao, J., & Cai, X. (2024). The impact of environmental, social and governance performance on brand value: The role of the digitalisation level. *South African Journal of Business Management, 55*(1), a4448. https://doi.org/ 10.4102/sajbm.v55i1.4448, for more information.

ESG, environmental, social and governance; SEM, structural equation modelling; RBV, resource-based view; CRM, cause-related marketing; CSR, corporate social responsibility; ANOVA, analysis of variance.

to verify the relationship. Then we establish a quadratic linear regression equation to further verify the relationship. We performed endogeneity tests and robustness tests to enhance the rigour and depth of the study.

The theoretical framework of this study is illustrated in Figure 1.

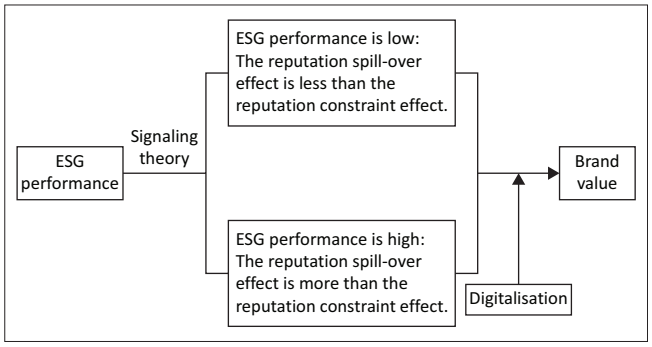
Research review and hypothesis development

Research review

Brand value

Brand value is a concept covering multiple dimensions, which not only represents consumers' cognition and emotional connection to the brand but also reflects the brand's status and influence in the market. It is a synthesis of the economic, reputational and emotional values of a brand in the commercial market and in the minds of the public. Brand value involves three main perspectives: consumer-based perspective, firm-based perspective and stakeholder-based perspective. From the consumer-based perspective, the brand value lies in consumer perceptions such as awareness, attitude, knowledge and behaviour towards the brand (Baalbaki & Guzmán, 2016; Christodoulides & De Chernatony, 2010; Lee et al., 2022), reflecting the brand's performance in the product market. From the firm-based perspective, brand value is the creation of excess profits, expressed in price, market share, revenue and cash flow (Dutordoir et al., 2015; Harjoto & Salas, 2017; Melo & Galan, 2011). It also includes considerations for product and financial markets (Keller & Lehmann, 2006), representing the brand's ability to attract profits (Ailawadi et al., 2003). The stakeholder-based perspective suggests that brand value is generated through the interaction between the firm, consumers and all other stakeholders, considering how these groups work together to create brand value (Eugenio-Vela et al., 2020; Merz et al., 2009; Mingione & Leoni, 2020; Nguyen et al., 2015).

Today's consumers live in the digital age and can access brand information from multiple channels. Some consumers leave their opinions on social platforms, which in turn influence other consumers or brands. The formation of brand value is the result of the gradual shaping of consumers and firms in the interaction process, which must be recognised by the firm, tested and widely recognised by the market. The definition of brand value is not uniform and is often made according to the specific research context. In line with the research context of this article, we adopt the consumer perspective of brand value. Referring to Aaker (1992; 1996), Yoo and Donthu (2001), and Keller and Lehmann (2002, 2006), brand value is considered as 'firms influence customer perceptions of the brand through a series of strategic and tactical actions, ultimately reflected in the valuation of the firm's brand equity'.



ESG, environmental, social and governance.

FIGURE 1: The interaction mechanism between environmental, social and governance performance and brand value.

Environmental, social, and governance performance as a signal

High-value brands can yield greater brand premiums, more stable market positions and stronger competitive advantages (Ailawadi et al., 2003; Dutordoir et al., 2015; Gupta et al., 2020). Factors driving brand value primarily encompass three aspects (Keller, 2003; Lim et al., 2020; Thanasuta et al., 2009). The first is brand elements or identity, such as brand name, spokespersons and packaging. The second aspect comprises marketing activities, supportive marketing plans and brand integration methods, such as product, pricing, distribution and communication strategies. The third is other entities indirectly associated with the brand, such as the firm, country of origin, distribution channels or other brands.

In addition to the above three factors, focussing on a positive firm reputation, such as sustainability investments or social responsibility, can enhance performance (Kiessling et al., 2016; Price & Sun, 2017), brand evaluation (Gürhan-Canli & Batra, 2004; Sweetin et al., 2013 and brand equity (Heinberg et al., 2018; Wang & Sengupta, 2016). Environmental, social and governance or corporate social responsibility activities are a way of signalling to consumers, aiming to build a strong firm reputation and gain a reputation premium (Chabowski et al., 2011; Fombrun & Shanley, 1990; Porter & Kramer, 2006; Roberts & Dowling, 2002). Hur et al. (2014) proved that social responsibility positively affects firm reputation and influences brand equity through brand trust and firm reputation.

However, investing in reputation does not always guarantee increased brand equity (Sierra et al., 2017; Swoboda et al., 2016). Consumers identify associations with brands by searching for signals and making purchasing decisions (Gupta et al., 1999; Karaosmanoglu et al., 2016). In the process of ESG acting as a signal of reputation, a variety of factors come into play, including the sender, transmission medium and receiver. These factors may reduce the effectiveness of the signal, leading consumers to underestimate the reputation efforts made by the brand and not fully recognise the actual brand quality or the firm's intentions (Purohit & Srivastava, 2001). Environmental, social and governance or CSR efforts consume substantial resources and may increase brand costs without significantly improving brand performance, or even having a negative impact (Sen & Bhattacharya, 2001, 2006; Torelli et al., 2012).

Effective signals exhibit two significant characteristics (Spence, 1973). Firstly, they must be sufficiently observable. Secondly, they require certain cost. Previous research has indicated variations in signal strength, with some signals being more easily received than others (Gulati & Higgins, 2003). Effective signals need to reach a certain level of strength for the receiver to perceive them. They require clear motivation (Pancer et al., 2017; Spence, 1973) and consistency with the unobservable quality of the sender. Signal senders can increase the signal effectiveness by sending more observable signals or increasing the number of signals (Janney & Folta, 2003). From the perspective of the signal receiver, signal effectiveness depends on whether the receiver focusses on the signal (Ilmola & Kuusi, 2006) and how the receiver interprets the signal (Perkins & Hendry, 2005; Srivastava, 2001).

The above analysis suggests that the relationship between ESGP as a signal and brand value has not been sufficiently explored. This is predominantly reflected in three aspects. Firstly, current research on ESGP tends to rely on accounting results and empirical evidence supporting positive, negative and non-significant correlations is inconsistent (Aouadi & Marsat, 2018; Avetisyan & Hockerts, 2017; Duque-Grisales & Aguilera-Caracuel, 2021; Wong et al., 2021). Therefore, it is difficult to directly derive the relationship between ESGP and brand value based on the consumer perspective from previous research. Secondly, the literature on signalling theory and brand value theory lacks empirical evidence on the intrinsic mechanisms of the impact of ESGP on brand value, especially the impact of digital technology on this relationship. Thirdly, the impact of ESG sub-items (environment, social responsibility and governance) on brand value has not been clearly depicted.

Hypothesis development

The factors that drive brand value are complex, with potential interactions and inhibitions. Whether or not ESGP can be transformed into a driver of brand value depends on the interaction between ESGP and other brand activities. Firms inform, persuade or remind consumers about their brand through traditional brand activities, such as advertising, promotional activities and research and development (R&D) to establish a dialogue and connection with consumers to enhance brand equity. This process involves firms allocating resources to brand activities (Keller & Lehmann, 2003). These activities influence consumers' brand perceptions, thus achieving the goal of enhancing brand value (Cobb-Walgren et al., 1995; Keller, 2003). Prior research has demonstrated the impact of investments in brand activities such as advertising, research and development, and promotion on brand value (Chaudhuri, 2002; Chu & Keh, 2006; Jeong, 2015). Firms that invest in ESG to gain a good reputation, thereby increasing brand value, exhibit a 'reputation spillover effect'. Investments in ESG occupy a large portion of a firm's operating costs and resources, but crowd out investments in other brand activities, ultimately leading to a reduction in brand value, known as the 'reputation constraint effect'.

When ESGP is at a low level, the reputation signal strength is insufficient, resulting in low signal validity. The reputation signal conveyed by ESGP is not easily perceived, noticed or recognised by consumers and relevant stakeholders. Firms that incur ESG costs reduce the resources or costs they invest in other general brand activities, such as advertising and promotion. The reputation spillover effect is not significant, but it crowds out the contribution of other brand activities to brand value. The reputation spillover effect is smaller than the reputation constraint effect, resulting in a negative correlation between ESG and brand value.

As the ESGP increases, so does the strength of the reputation signal, thereby greatly increasing its signal validity. Reputation signals conveyed by ESGP are more likely to be perceived, noticed and recognised by consumers and relevant stakeholders. At this point, the relationship between firms and consumers improves, consumer trust in the firm increases and perceived risk decreases. The reputation spillover effect is significantly enhanced and exceeds the reputation constraint effect, resulting in a positive correlation between ESG and brand value.

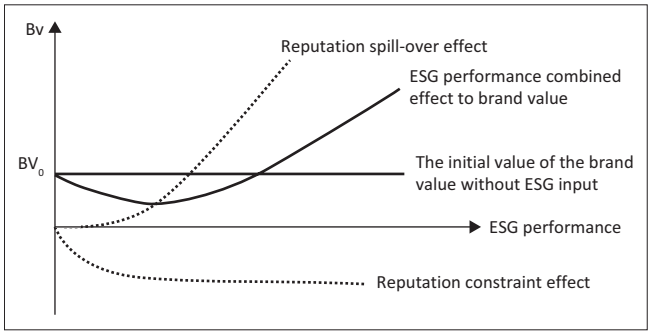
Based on the analysis aforementioned, we propose the first hypothesis:

> **H1:** The effect of ESGP on brand value follows a U-shaped relationship, initially declining and then rising.

Figure 2 illustrates the irregular fluctuations in brand value. The monotonicity of brand value is not obvious. As the level of ESGP increases, brand value may exhibit a non-linear relationship, initially declining and then rising.

The moderating role of digitalisation level

Signalling theory suggests that the signal environment affects the extent to which information asymmetry is reduced, both within and between organisations (Lester et al., 2006). Therefore, the study speculates that the technological environment in which a firm operates may affect the effectiveness of signalling. Digital technologies such as big data mining and AI have a disruptive impact on a firm's production methods, organisational forms and business models (Nambisan et al., 2017; Orlando, 2021; Yoo et al., 2010). Digital technologies support the efficient transmission



ESG, environmental, social and governance; BV, brand value.

FIGURE 2: U-shaped relationship.

of information within and between firms, helping firms provide more effective information to reduce information asymmetry with consumers. Digitalisation refers to the process where firms leverage digital technologies to change traditional production and operation methods, innovate products and services, and implement strategic transformations (Blichfeldt & Faullant, 2021; Chen et al., 2012). Firms utilise digital technologies to coordinate all processes of manufacturing, design, production, management, sales and service. Firms control, monitor, test, predict and execute other production and operational activities based on data produced during the process. As a result, firms curtail the R&D cycle, increase procurement real-time visibility, improve production efficiency and quality, reduce energy consumption and respond to customer demands promptly (Besson & Rowe, 2012).

The application of digital technologies supports intra- and inter-organisational collaboration, and effectively improves the efficiency of information transmission. Digitalisation greatly improves the ability of firms to acquire and analyse information, which facilitates the rapid capture of information about consumer needs (Chen et al., 2020), and enhances business performance and market position. The study conducted by Li et al. (2023) pointed out that the digitalisation of firms can help them break through the information boundaries and reduce the cost of inter-enterprise information searching and supplier verification. Boukis (2020) presented an exploratory discussion about how blockchain applications and platforms impact the relationship between consumers and brands, drawing on a wide range of real-life examples of blockchain applications. Shi et al. (2023) specifically explored the impact of digitalisation on supply chain resilience through China's manufacturing industry. The increase in digitalisation level may help firms enhance the strength of ESG signals and improve the efficiency of information transmission. Based on the above analysis, we propose the second hypothesis:

H2: The level of digitalisation moderates the impact of ESGP on brand value.

Research design

Sample selection and variable description

Our research sample came from empirical panel data in China. The sample was drawn from the listed firms in the 'Top 500 Most Valuable Chinese Brands' of the World Brand Lab from 2012 to 2021. After excluding missing data and singleton entries (firms that appeared on the list only once), a total of 126 listed firms with 777 samples were retained. Brand value data were sourced from the World Brand Lab, while ESGP data were obtained from Bloomberg's database. Control variables were selected from the China Stock Market & Accounting Research (CSMAR) database. With reference to the industry classification standards of the China Securities Regulatory Commission, the sample covered 33 different sub-industries, including automobile manufacturing, banking and securities, real estate, wholesale and retail, and providing a representative cross-section.

Dependent variable

The dependent variable is brand value. Kerin et al. (1998) used brand value assessment reports published by Financial World when studying the relationship between brand value and shareholder value. Wang et al. (2016) and Cowan et al. (2020) relied on Interbrand's brand value ranking data. Drawing on the foreign scholars' research method, this study adopted brand value data provided by the World Brand Lab. The World Brand Lab's evaluation of brand value integrates consumer research, competitive analysis and forecasts of future firm revenue.

Independent variable

The independent variable is ESGP. Drawing from the study of Hammami and Hendijani Zadeh (2020), Eliwa et al. (2021) and Cheng et al. (2023), Bloomberg's ESG scores were used to measure ESGP. Scores range from 0 to 100, with higher scores indicate better ESGP.

Moderator variable

The moderating variable is the digitalisation level. Digitalisation level was measured through the digitalisation index provided by the CSMAR collaboration database, which is built based on relevant information from listed firms' annual reports, fundraising announcements and qualification certifications. It derives the digitalisation transformation index by weighting six indicators: environmental support, strategic leadership, technology drive, organisational empowerment, digital achievements and digital applications.

Control variables

Inspired by Gillan et al. (2021) and Cheng et al. (2023), this study added control variables of board size (Bs), independent director ratio (Idr), development capacity (De), leverage ratio (Lev), firm size (Size), property rights nature (Prty) and industry type (Ind) from various aspects of firms' finance, governance and nature of business. In addition, the model controlled for firm, time and industry effects.

Specific variables are defined in Table 2.

Model design

In order to examine the impact of ESGP on brand value, the regression in this article employed the fixed effects model of firm, year and industry. Because the dependent variables are continuous, we tested the hypotheses using ordinary least squares (OLS) regressions on the panel dataset (Zhong et al., 2021) in Stata 17. We introduced four equations (Eqs) for the modelling design.

Firstly, a baseline model with control variables was constructed:

TABLE 2: Variable description.

Variable	Name	Signal	Variable description
Dependent	Brand value	BV	The evaluation values provided by the World Brand Lab include the business status of the firm brand itself (including operating income, growth rate, etc.) and the income that the brand brings to the firm (brand value-added index and brand strength coefficient)
Independent	ESGP	ESG	ESG scores from Bloomberg
Moderator	Digitalisation level	Dig	The Digitalisation Index provided by the CSMAR database
Controls	Board size	Bs	Number of board of directors
	Independent directors ratio	Idr	Number of independent directors to the number of board members
	Development ability	De	Revenue growth rate
	Asset-liability ratio	Lev	Total liabilities to total assets
	Firm size	Size	Number of employees
	Ownership property	Prty	State-owned business: Prty = 1, others = 0

ESG, environmental, social and governance; ESGP, ESG performance; BV, brand value; CSMAR, China Stock Market & Accounting Research.

$$BV_{i,t} = \alpha_0 + \sum \gamma_i \, Controls_{i,t} + \lambda_i + \eta_t + \delta_i + \varepsilon_{i,t} \quad \text{[Eqn 1]}$$

Then, the first-order term of ESGP was introduced to examine the linear relationship between ESGP and brand value, creating Model 2:

$$BV_{i,t} = \alpha_0 + \alpha_1 ESG_{i,t} + \sum \gamma_i \, Controls_{i,t} + \lambda_i + \eta_t + \delta_i + \varepsilon_{i,t} \quad \text{[Eqn 2]}$$

To better investigate whether there is a non-linear relationship, the square term of ESGP was added to Model 2 to capture non-linear effects and determine whether a U-shaped or inverted U-shaped relationship exists, forming Model 3:

$$BV_{i,t} = \alpha_0 + \alpha_1 ESG_{i,t} + \alpha_2 ESG^2_{i,t} + \sum \alpha_n \, Controls_{i,t} + \lambda_i + \eta_t + \delta_i + \varepsilon_{i,t} \quad \text{[Eqn 3]}$$

To further examine the influence of digitalisation level on the relationship, Model 4 introduced digitalisation level and its interaction with ESGP to test for moderation effects:

$$BV_{i,t} = \beta_0 + \beta_1 ESG_{i,t} + \beta_2 ESG^2_{i,t} + \beta_3 Dig_{i,t} + \beta_4 ESG_{i,t} \times Dig_{i,t} + \beta_5 ESG^2_{i,t} \times Dig_{i,t} + \sum \beta_n \, Controls_{i,t} + \lambda_i + \eta_t + \delta_i + \varepsilon_{i,t} \quad \text{[Eqn 4]}$$

Among them, $BV_{i,t}$ denotes brand value, $ESG_{i,t}$ denotes ESGP, $ESG^2_{i,t}$ denotes the Square term for ESGP and Controls are the control variables. α_0 and β_0 denote the constant term, respectively. α_1, α_2 and α_n denote the coefficient of variable $ESG_{i,t}$, $ESG^2_{i,t}$ and $Controls_{i,t}$ in Eqn 3, respectively. β_1, β_2, β_3, β_4, β_5, and β_n denote the coefficients of variable $ESG_{i,t}$, $ESG^2_{i,t}$, $Dig_{i,t}$, $ESG_{i,t} \times Dig_{i,t}$, $ESG^2_{i,t} \times Dig_{i,t}$ and $Controols_{i,t}$ in Eqn 4, respectively. λ_i, η_t δ_i and $\varepsilon_{i,t}$ denote the individual firm fixed effects, year fixed effects, industry fixed effects and residual term.

Ethical considerations

This article followed all ethical standards for research without direct contact with human or animal subjects.

Empirical results and analysis

Analysis of empirical results

Descriptive statistics

Table 3 presents the descriptive statistics and correlation coefficients of the variables. The mean value of ESGP for the sample firms is 34.31, with a maximum value of 64.38 and a minimum value of 11.49, while the median is 32.54. There exists a significant correlation between Brand Value (BV) and the ESG variable ($p < 0.05$). The correlation coefficients exceed 0.4 between Size and BV, Lev and Bs and Lev and Size. All other variables exhibit correlations below 0.4. In addition, the variance inflation factors of the variables are estimated and all values range from 1.03 and 1.86, which indicates that there is no serious problem of multicollinearity in the regression model.

Regression results

Table 4 provides the regression results for the hypotheses proposed earlier. All models control for individual firm fixed effects, year fixed effects and industry fixed effects. All regressions use robust standard errors clustered to the firm level. Model 1 is the baseline model with control variables. Model 2 introduces a first-order term of ESGP (ESG) into the baseline model. The results indicate that the regression coefficient between ESGP and brand value is not significant, suggesting that there is not a linear relationship. Model 3 introduces the second-order term of ESG into Model 2. The results show that the regression coefficient for the second-order term of ESG is significantly positive, while the coefficient for the first-order term of ESG is significantly negative ($\alpha 1 = -32.935$, $p < 0.05$; $\alpha 2 = 0.428$, $p < 0.05$). The U-test (Lind & Mehlum, 2010) confirms the significance of these results at the 5% level. The inflection point for ESG is found to be 38.43229, within the range of sample firms' ESG scores [11.4878, 64.3798]. The slope at the minimum ESG value is −23.09045, while at the maximum ESG value, it is 22.23607. Before reaching the critical point of ESG at 38.43229, there is a negative correlation between ESGP and brand value, and after reaching this point, there is a positive correlation. These findings indicate a U-shaped relationship, supporting Hypothesis 1.

Model 4 introduces the moderating variable digitalisation level (Dig), the interaction term of ESG and Dig (ESG*Dig) and the interaction term of ESG^2 and Dig (ESG^2*Dig) into Model 3. The results show that even with the inclusion of the moderating variable Dig, a significant U-shaped relationship persists. The coefficient for the interaction term of ESG^2*Dig is significantly negative ($\beta_5 = -0.025$, $p < 0.1$), indicating that digitalisation level significantly negatively moderates the U-shaped relationship between ESGP and brand value, supporting Hypothesis 2.

Moreover, deriving the inflection point for the U-shaped relationship in Model 4, we find that $ESG^* = -(\beta_1 + \beta_4 * Dig)/(2\beta_2 + 2\beta_5 * Dig)$. According to Haans et al. (2016), the

TABLE 3: Correlation coefficient matrix of variables.

Variable	Mean	SD	BV	ESG	Bs	Idr	De	Lev	Size	Prty
BV	427.76	610.06	1.00	-	-	-	-	-	-	-
ESG	34.31	11.30	0.43*	1.00	-	-	-	-	-	-
Bs	9.97	2.93	0.26*	0.21*	1.00	-	-	-	-	-
Idr	0.38	0.07	0.05	0.10*	-0.40*	1.00	-	-	-	-
De	0.14	0.47	-0.11*	-0.03	-0.10*	-0.03	1.00	-	-	-
Lev	0.55	0.23	0.39*	0.35*	0.52*	-0.00	0.04	1.00	-	-
Size	47940.98	90835.03	0.67*	0.38*	0.35*	0.05	-0.05	0.51*	1.00	-
Prty	0.43	0.50	0.07*	0.10*	0.07*	0.07*	-0.03	0.09*	-0.00	1.00

SD, standard deviation; BV, brand value; ESG, environmental, social and governance; Bs, board size; Idr, independent director ratio; De, development capacity; Lev, leverage ratio; Size, firm size; Prty, property rights nature.

*, represents a significance level of 5%.

TABLE 4: Results of regression analysis.

Variable	Model 1	Model 2	Model 3	Model 4
ESG	-	-1.392	-32.935***	-110.669***
	-	(-0.48)	(-2.83)	(-3.01)
ESG^2	-	-	0.428***	1.268**
	-	-	(2.79)	(2.32)
Dig	-	-	-	-40.837**
	-	-	-	(-2.44)
ESG*Dig	-	-	-	2.246**
	-	-	-	(2.52)
ESG^2*Dig	-	-	-	-0.025*
	-	-	-	(-1.97)
Bs	-36.283**	-36.349**	-33.126**	-30.444**
	(-2.55)	(-2.55)	(-2.23)	(-2.19)
Idr	-190.370	-197.196	-151.868	-144.884
	(-0.77)	(-0.78)	(-0.62)	(-0.62)
De	23.662	21.843	31.934	28.781
	(0.58)	(0.52)	(0.75)	(0.67)
Lev	-252.734	-242.850	-211.183	-237.395
	(-1.06)	(-1.04)	(-0.90)	(-1.14)
Size	0.004*	0.004*	0.003	0.003
	(1.88)	(1.87)	(1.47)	(1.47)
Prty	-553.300***	-551.991***	-505.801***	-476.157***
	(-3.53)	(-3.53)	(-3.54)	(-3.43)
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
_cons	1067.472***	1112.984***	1587.760***	2978.831***
	(3.46)	(3.21)	(4.12)	(4.60)
N	777	777	777	777
R^2	0.909	0.909	0.913	0.917
Adj. R^2	0.88	0.88	0.89	0.89

Note: The values in parenthesis are *t*-values.

ESG, environmental, social and governance; Bs, board size; Idr, independent director ratio; De, development capacity; Lev, leverage ratio; Size, firm size; Prty, property rights nature.

*, ** and *** represent the significance level of 10%, 5% and 1%, respectively.

derivative of Dig (dESG*/dDig = $(\beta_1\beta_5 - \beta_2\beta_4)/\ 2(\beta_2 + \beta_5 * \text{Dig})^2$) is less than 0, indicating that the inflection point of the U-shaped relationship shifts to the left with increasing Dig. Figure 3 presents the change of the inflection point at different digitalisation levels.

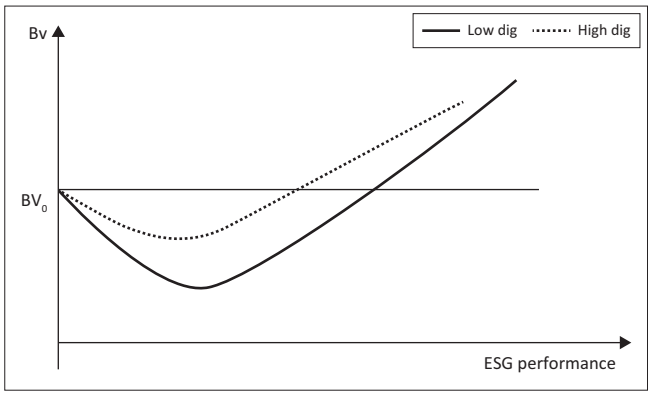
The aforementioned results derived from Model 4 imply two main conclusions. Firstly, the application of digital technology mitigates the U-shaped relationship. Before reaching the threshold, an increase in ESG has a less negative impact on brand value. Secondly, the inflection point for ESG shifts leftward, implying an earlier transition from a negative to a positive correlation between ESGP and brand value.

Extended analysis

Handling endogeneity issues

In this research, two methods of instrumental variables and lagged explanatory variable models were employed to address potential omitted variables, measurement error and reverse causality endogeneity issues for research rigour. The results obtained supported the conclusions drawn from the regression.

Instrumental variable approach: Drawing inspiration from Song et al. (2022) and Breuer et al. (2018), this research utilised the industry average ESG score (INS1) for the current year as the instrumental variable for ESG and the square of the industry average ESG score (INS2) as the instrumental variable for



ESG, environmental, social and governance; BV, brand value.

FIGURE 3: The U-shaped relationship at different digitalisation levels.

TABLE 5: Test results of the instrumental variable method (N = 777).

Variable	First stage regression results: Model 5	Second stage regression results: Model 6
INS1	1.0356*** (0.12)	-
INS2	0.7015*** (0.14)	-
ESG	-	-29.4442*** (9.81)
ESG^2	-	0.7767*** (0.15)
Controls	Controls	Controls
Fixed effect	Controls	Controls

Note: The values in parenthesis are robust standard errors. Unidentifiable test = 217.006***; Weak instrumental variable testing = 160.757.

ESG, environmental, social and governance.

***, represents the significance level of 10%, 5%, and 1% respectively.

ESG squared. Industry ESG was expected to be correlated with firm-level ESG while having minimal impact on brand value at the firm level. Two-stage least squares analysis with instrumental variables was employed.

The results presented in Table 5 show that Model 5 presents the first-stage regression results, with ESG and ESG squared as dependent variables and instrumental variables along with control variables as explanatory variables. Model 6 shows the second-stage regression results with the fitted values of ESG and ESG squared obtained from Model 5. The results demonstrate that the estimated impact of ESG squared on the digital transformation of firms, as obtained using instrumental variables, is significantly positive (β = 0.7015, $p < 0.01$), consistent with the previous regression results. Furthermore, non-identification tests ($p < 0.01$) and weak instrument tests indicate no issues with non-identification and weak instruments. A comparative analysis with the baseline regression results confirms the robustness of the study's conclusions.

Lagged explanatory variable model: Given the potential time lag in the impact of ESGP on brand value, explanatory variables were lagged by one period to alleviate concerns about reverse causality. The regression results indicate that the coefficients for ESG and ESG squared at each lagged period remain significantly negative, consistent with the previous regression results. These findings underline the robustness of research results (see Table 6).

TABLE 6: Test results of hysteresis effect (N = 759).

Variable	Model 7
ESG_{t-1}	-29.627***
	(-2.88)
ESG^2_{t-1}	0.413***
	(2.90)
Bs	-35.677**
	(-2.39)
Idr	-242.248
	(-0.94)
De	46.529
	(1.08)
Lev	-237.022
	(-0.96)
Size	0.003
	(1.64)
Prty	-503.480***
	(-3.55)
Firm fixed effects	Yes
Year fixed effects	Yes
Industry fixed effects	Yes
_cons	1557.175***
	(4.09)
R^2	0.911
Adj. R^2	0.89

Note: The values in parenthesis are t-values.

ESG, environmental social and governance; Bs, board size; Idr, independent director ratio; De, development capacity; Lev, leverage ratio; Size, firm size; Prty, property rights nature.

, and * represent the significance level of 10%, 5% and 1%, respectively.

Robustness tests

Considering regional differences in economic development levels, which may influence the responses of firms, governments, industry regulators, consumers and suppliers to ESGP, the sample was divided into two groups based on the level of urban development. Firms registered in Beijing (B), Shanghai (S), Guangzhou (G) and Shenzhen (S) were grouped (Model 9) together, while those registered in other cities were grouped separately (Model 8). The subsample regression results in Table 7 demonstrate that the coefficients for ESG and ESG squared remain significant, indicating the robustness of research findings.

Examining the impact of different environmental, social and governance sub-items on brand value: To investigate the influence of individual ESG sub-items on brand value, this study replaced the core explanatory variable in the baseline model with environmental (E), social responsibility (S) and corporate governance (G), separately. The regression results in Table 8 reveal that E and S exhibit U-shaped relationships with brand value, while G's impact on brand value is not significant. These results suggest that ESGP predominantly drives overall improvements in brand value through E and S sub-items, while the synergistic effect of G with other brand activities does not significantly impact brand value. This might be attributed to the fact that enhancements in operational performance through optimisation of governance structures and management mechanisms mainly occur within the firm, with external consumers perceiving reputation signals less prominently.

TABLE 7: Subsample regression results.

Variable	Model 8 (others)	Model 9
ESG	-21.345*	-40.006**
	(-1.85)	(-2.17)
ESG^2	0.338**	0.465*
	(2.11)	(1.91)
Bs	5.441	-53.312**
	(0.36)	(-2.48)
Idr	178.318	-149.999
	(0.48)	(-0.48)
De	2.210	62.483
	(0.14)	(0.94)
Lev	-313.772	98.429
	(-1.50)	(0.23)
Size	0.011*	0.002
	(1.86)	(0.84)
Prty	-166.708	-735.743***
	(-1.52)	(-4.20)
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Industry fixed effect	Yes	Yes
_cons	450.272	2280.591***
	(1.48)	(3.59)
N	431	346
R^2	0.894	0.926
Adj. R^2	0.85	0.90

Note: The values in parenthesis are *t*-values.

ESG, environmental, social and governance; Bs, board size; Idr, independent director ratio; De, development capacity; Lev, leverage ratio; Size, firm size; Prty, property rights nature.

*, ** and *** represent the significance level of 10% 5% and 1%, respectively.

TABLE 8: Influence of environmental, social and governance sub-items on brand value.

Variable	Model 10	Model 11	Model 12
E	-7.331**	-	-
	(-2.61)	-	-
E^2	0.135**	-	-
	(2.48)	-	-
S	-	-22.274**	-
	-	(-2.61)	-
S^2	-	0.702***	-
	-	(3.12)	-
G	-	-	-13.221
	-	-	(-1.38)
G^2	-	-	0.090
	-	-	(1.18)
Bs	-37.068**	-35.912**	-34.484**
	(-2.57)	(-2.57)	(-2.34)
Idr	-228.060	-195.176	-181.615
	(-0.93)	(-0.79)	(-0.73)
De	24.104	30.690	24.218
	(0.56)	(0.79)	(0.60)
Lev	-228.110	-231.624	-224.814
	(-0.97)	(-0.97)	(-0.95)
Size	0.003*	0.003*	0.003*
	(1.77)	(1.79)	(1.72)
Prty	-553.753***	-521.729***	-527.511***
	(-3.56)	(-3.66)	(-3.50)
Firm fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes
_cons	1137.259***	1176.093***	1500.925***
	(3.61)	(3.63)	(3.68)
N	777	777	777
R^2	0.910	0.913	0.910
Adj. R^2	0.88	0.89	0.88

Note: The values in parenthesis are *t*-values.

E, environmental; S, social responsibility; G, corporate governance; Bs, board size; Idr, independent director ratio; De, development capacity; Lev, leverage ratio; Size, firm size; Prty, property rights nature.

*, ** and *** represent the significance level of 10%, 5% and 1%, respectively.

Discussion

In this section, we present three key findings as follows.

Firstly, the impact of ESGP on brand value is not a simple linear relationship but exhibits a U-shaped pattern, characterised by an initial decline followed by an ascent. Before reaching the inflection point, ESGP exerts a negative influence on brand value. After the inflection point, ESGP positively affects brand value. On one hand, firms convey a reputation signal to consumers through strong ESGP, increasing brand value and illustrating a 'reputation spillover effect'. However, to enhance ESGP, firms must allocate resources and incur costs, which may compete with other brand activities such as R&D, advertising and promotions. This ultimately leads to a decrease in brand value, demonstrating a 'reputation constraint effect'. When ESGP is relatively low, it generates a reputation signal of insufficient strength and contributes less to brand value enhancement than the contribution of other resource allocations. Therefore, the reputation spillover effect is smaller than the reputation constraint effect, indicating that ESGP has a suppressing effect on brand value. Once a certain threshold is exceeded, the strength of the reputation signal generated by ESG increases significantly, outweighing the contribution of other brand communication activities. This shows the contribution of ESGP to brand value.

Secondly, the digitisation level negatively moderates the U-shaped relationship and shifts the inflection point to the left. When the digitalisation level is high, the reputation spillover effect of ESGP is strengthened, mitigating the negative impact of the reputation constraint effect. This leads to a slower decline in the impact of ESGP on brand value before the tipping point is reached and shifts the relationship from negative to positive earlier.

Thirdly, when examining ESG sub-items separately, the impact of ESGP on brand value is mainly reflected in the sub-items of environment and social responsibility, and the effect of governance is not significant.

Conclusion

Theoretical contributions

Our contribution mainly includes the following two aspects.

Firstly, our study adds value to CSR and ESG literature by investigating the non-linear impact of ESGP on brand value. Despite the rich research outcomes on ESGP over the past decade, much attention has been given to accounting outcomes such as asset return rates, net profits or stock values (Aouadi & Marsat, 2018; Wong et al., 2021). Brand value at the consumer

level has been largely overlooked (Lin et al., 2021). Although studies have demonstrated the positive effects of CSR on brand value, conclusions are mainly positive (Lai et al., 2010; Torres et al., 2012). This study compares consumer reactions to ESGP with other brand communication activities (e.g. advertising or convention and exhibition) based on signalling theory. We find that as a reputation signal, ESGP exhibits different brand effects at different strength levels. Our study contributes to the research on the complex relationship between ESG and brand value, as well as empirical research on the scope and limitations of the role played by ESG and CSR performance. In addition, we open the black box of the effect of sub-items (E/S/G) on brand value, including the specific direction and strength. Our study enriches the boundaries of CSR and ESG research.

Secondly, we complement the research on the mechanisms of how ESGP affects brand value. The intrinsic mechanisms of how ESGP influences brand value are not yet clear and thorough. Existing research on the intrinsic mechanisms between ESG or CSR and brand value mainly focusses on psychological variables such as brand fit, brand awareness and brand identification (Gupta et al., 2013; He et al., 2011), ignoring the role of digital technologies. Artificial intelligence and the Internet of things add more dimensions to understanding brand value, which is a process involving multiple stakeholders between firms and consumers. Some authors have demonstrated the role of digital technology in firm performance (Li et al., 2022; Martínez-Caro et al., 2020; Wielgos et al., 2021). Scholars have called for more research on the co-creation of brand value based on digital technology and stakeholders (Iacobucci et al., 2019; Lee et al., 2022). This study evaluated the moderating role of digital technology in the impact of ESGP on brand value. We demonstrate the role of digital technologies in enhancing brand value and enrich the research on the impact of digitalisation on brand equity.

Managerial contributions

The conclusions drawn from this study provide several managerial insights for firms aiming to enhance brand value and promote sustainable development.

Firstly, firms should recognise the complex relationship between ESG and brand value and strive to find a balance between economic benefits and sustainable development. While it is generally believed that 'doing good' can improve a firm's performance, the reality is that reputation-building efforts do not guarantee success until the ESGP reaches a threshold, because the reputation signals sent out by firms may not be effective to consumers. Reputation building is a continuous, long-term process that cannot be achieved overnight. Firms should assess reputation activities and other brand activities based on their resource investment returns (effectiveness and cost) so that they can develop a reasonable brand activity plan to achieve a positive brand impact. This gradual accumulation of reputation can garner consumer support and brand performance, such as Unilever or Cadillac.

Secondly, firms can utilise digital technologies and platforms to communicate and interact with consumers, integrating ESG principles into their daily brand activities. This will increase the effectiveness of ESG signalling across the interactive network of firms and consumers, co-creating brand value. Many firms recognise that digital technology is critical to remain competitive. However, in the ever-changing business environment, firms must be flexible in integrating digital technologies across functions, depending on the external market environment and internal organisational structure. Firms must fundamentally change the way they operate to deliver better value to their customers. Firms need to strive to identify the right approach for their organisation to achieve digital transformation and engage directly with customers throughout the organisation's value chain. Thirdly, firms that fulfil more obligations on the environmental and social responsibility indices are more likely to be recognised by consumers than on the corporate governance index. Investments in environmental and social responsibility are more significant in enhancing brand value at the consumer level.

Limitations and directions for future research

This study emphasises that ESGP, as a reputation factor driving brand value, exhibits non-linear brand effects influenced by the strength of the reputation signal and its interaction with other brand activities. In an era marked by declining brand differentiation and enhanced information exchange because of digitalisation, how firms go beyond the traditional marketing mix to incorporate ESG into their marketing activities plays a pivotal role in enhancing brand value and gaining sustainable competitive advantage. One of the limitations of this study is that resource allocation plans for ESG activities, R&D, and promotional activities were not discussed. Future research could consider developing mathematical models to quantitatively analyse the relationship between ESG and R&D, marketing and digital technology, attempting to identify optimal solutions.

Furthermore, this study finds that digitisation level moderates the U-shaped effect of ESG on brand value. Before the inflection, digitalisation mitigates the inhibitory effect of ESG on brand value and accelerates the shift from a negative to a positive relationship. However, after a certain threshold, digitalisation weakens the promotional effect of ESG on brand value. Existing studies generally agree that the digitalisation level plays a key role in breaking through resource constraints and enhancing firm value. Studies also suggest that unreasonable digitalisation can lead to resource squeezing, increase coordination costs with stakeholders, weaken the impetus of digitisation to promote high-quality firm development and even cause adverse effects. Therefore, we hypothesise that digital transformation may exacerbate resource constraints and limit business activities, thus

hindering the role of ESGP in promoting brand value. However, this study does not analyse and discuss the complex interaction between digital technology and other resources. Future research could look for evidence of these complex relationships, leading to intriguing conclusions.

Finally, we used empirical data from China. The sample data yield general conclusions that are representative and extendable. However, we call for more cross-cultural scholars to participate in the ESG research. We hope that the cross-cultural context of ESG and brand value research can make a greater contribution to the academic community.

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Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions

Y.W., J.C. and X.C. contributed to the article, including writing the draft, collecting data, applying statistical techniques, analysing the results and writing, reviewing and editing the article.

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Data availability

The data were obtained from three databases: World Brand Lab, Bloomberg and CSMAR. All the data that support the findings of this study are available from the corresponding author, J.C., on reasonable request.

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