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The Threshold Effect of Board Characteristics, Corporate Social Responsibility and Brand Value

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Abstract

Brand value remains a crucial element for listed companies striving to sustain competitiveness amid the double-cycle economic context. Using panel data from Chinese A-share listed companies spanning 2017–2021, this study employs a threshold effect model to probe into the boundary conditions of the complex relationship between corporate social responsibility (CSR) and brand value. It empirically investigates the role of board characteristics in shaping the brand value of listed companies through their involvement in CSR, considering the dimensions of board size and board shareholding ratio. The results reveal that a commitment to social responsibility enhances brand value up to a certain point. However, prolonged and extensive resource investment can divert the company's focus, leading to a detrimental impact on brand value. This manifests as a non-strict inverted U-shaped threshold effect between CSR and brand value. Furthermore, the study explores variations in board size and board shareholding ratio, uncovering that board members' perspectives on CSR commitment are subject to distinct constraints. This dynamic results in a non-linear, symmetric U-shaped relationship between CSR and brand value-initially negative and subsequently positive. The study explores whether board characteristics intervene in CSR decision-making and thus contribute to brand value, with a view to guiding listed companies' board governance practices and optimizing the path to brand value enhancement.

Keywords: board characteristics, corporate social responsibility, brand value, threshold effect

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Introduction

With the accelerated development of the new "double-cycle" paradigm, elevating open competition and establishing robust brands has emerged as the optimal strategy for Chinese enterprises to expand internationally and solidify their domestic presence. Brands have garnered significant attention from both corporate and academic spheres due to their potential to generate high value-added outcomes, fostering sustainable competitive advantages [1]. As a distinctive competitive strategy, Corporate Social Responsibility (CSR) holds the power to shape corporate reputation, accumulate ethical resources [2], and serve as a crucial tool for image-building and brand strength [3]. This, in turn, significantly enhances brand competitiveness, ultimately creating elevated brand value.

Nevertheless, the execution of social responsibility entails high costs, uncertain market feedback, and intertemporal benefits, leading companies to adopt a cautious investment approach [4]. Therefore, how the board of directors, as the central decision-making body, navigates the balance between benefits and risks becomes a pivotal factor influencing corporate social responsibility investments.

Despite the theoretical debate, the impact of CSR on brand value lacks a consistent linear or standard U-shaped or inverted U-shaped relationship in practice. Few scholars have delved into the exploration of potentially more intricate relationships. Furthermore, findings on the directional influence of board size and board shareholding, the core variables of board characteristics, on CSR have been inconsistent [5].

Building upon this analysis, this paper aims to unravel the mechanisms of the relationship between CSR and brand value. It further investigates how this relationship evolves with variations in board size and board shareholding. The insights gained from addressing this question are anticipated to offer both theoretical and practical guidance for enterprises seeking to navigate the dynamic interplay between social responsibility investments and brand value enhancement.

Literature review and hypothesis development

Corporate social responsibility and brand value

Studies indicate the potential for two divergent outcomes in the relationship between Corporate Social Responsibility (CSR) and brand value, namely the "facilitating effect" and the "inhibiting effect". Some scholars contend that CSR, as an indicator of corporate strength [6], can effectively enhance corporate reputation [7] and positively influence the enhancement of corporate brand value. Firstly, proactive fulfillment of social responsibility enables enterprises to cultivate unique emotional connections with consumers. This fosters consumer identification, trust-building, and loyalty formation [8], all of which contribute to feedback loops reinforcing brand value. Secondly, CSR aids in establishing, maintaining, and consolidating political affiliations [9], optimizing corporate relationships with governmental entities, and securing additional resources crucial for brand value enhancement. Lastly, by disclosing social responsibility information, enterprises diversify investor risks [10], making it easier to secure financing at a lower cost, thus reducing the cost of capital. This, in turn, enhances brand competitiveness [11] and ultimately contributes to the elevation of brand value. Notably, companies with tarnished reputations may even use robust social responsibility performance to rebuild their corporate image, mitigating consumer boycotts and allowing their brand value to rebound [12].

In contrast, opposing viewpoints suggest that CSR may inhibit brand value growth or even lead to its decline. Firstly, in line with the zero-sum game concept, CSR could consume various limited corporate resources that could otherwise be employed to enhance brand value. This division of focus may hinder the enterprise's ability to concentrate on building an outstanding brand [13]. Secondly, if a company only assumes social responsibility within its immediate business scope, stakeholders may question its commitment to eliminating negative externalities from its primary business activities, potentially causing a detrimental effect on the brand and, consequently, brand value. Similarly, a lack of perceived sincerity and ethical responsibility, viewed instead as hypocritical behavior and a mere show for business gain [14], can lead to a decline in brand value. Moreover, the imperative to balance inputs with returns while meeting external stakeholder expectations of social responsibility fulfillment may drive companies to engage in pseudo-social responsibility behaviors under the guise of genuine commitment [15]. Once exposed, these behaviors can lead to a rapid deterioration of the brand reputation accumulated over time, significantly reducing brand value.

Board characteristics and corporate social responsibility

Board size and board shareholding ratio represent two key dimensions in the examination of board characteristics and stand out as contentious variables in the study of CSR investment impact. Thus, this paper will concentrate on exploring both board size and board shareholding ratio.

Board size and corporate social responsibility

The theories supporting the idea that board size promotes corporate social responsibility (CSR) highlight several key aspects. Firstly, a larger board size facilitates the fulfillment of the board's monitoring function, reducing firm risks by curbing rent-seeking behaviors and potential abuses of power by management [16; 17]. This guidance encourages executives to commit to CSR and make decisions aligned with the company's long-term interests. Secondly, a larger board size, representing diverse stakeholders, fosters inclusive decision-making. This approach aims for "common governance", allowing professionals with varied knowledge to contribute, resulting in more scientifically and reasonably informed de-

cisions [18; 19]. This enhances stakeholder protection and significantly improves CSR efficiency. Finally, a larger board size can prevent large shareholders from manipulating the board, thereby deterring fraudulent behavior of internal managers and promoting better CSR fulfillment [20].

Conversely, opposing views suggest that an excessively large board size may have negative implications for CSR. Firstly, it may lead to inefficient decision-making by reducing the firm's coordination and communication abilities, resulting in losses that outweigh the benefits of increased number of members [21; 22]. This inefficiency is not conducive to the disclosure of socially responsible information [23]. Secondly, a larger board size may encourage "free-riding" and speculative behavior among members, turning the board into a passive entity susceptible to control by majority shareholders or management. This can lead to decisions that prioritize these stakeholders over others, reducing CSR efficiency [22; 24]. Additionally, the increased size of the board brings forth new problems that require time and energy to resolve, diverting resources away from CSR and incurring additional costs [25], thus hindering the enhancement of social responsibility efficiency.

Board shareholding and corporate social responsibility

There is no consensus in previous studies regarding the impact of board shareholding on CSR. Some scholars assert that board shareholding positively contributes to CSR. Firstly, board shareholding can effectively curb opportunistic behavior, conserve corporate resources [26], and incentivize board members to prioritize the overall interests of the enterprise. This, in turn, leads to decisions that enhance the company's long-term performance, such as embracing CSR [27]. Secondly, higher board shareholdings enable effective monitoring and control of management, aligning the interests of the board with those of shareholders [28]. This alignment ensures clear shared goals within the firm, motivating the fulfillment of social responsibilities to safeguard the interests of all parties [29]. Finally, as firms gain competitive advantages through socially responsible actions like charitable donations, effective decision-making requires a higher level of commitment and effort from the company's directors. Increased board shareholding facilitates this process [30].

Conversely, scholars with opposing views argue that board ownership hinders corporate social responsibility. Firstly, based on the "managerial self-interest" hypothesis, a higher board shareholding level may lead to a more risk-averse board that resists engaging in the uncertain and delayed returns associated with CSR [31]. Secondly, a high board shareholding level prompts intensified executive supervision and the development of incentive systems, potentially motivating management to prioritize projects with higher returns over CSR initiatives [32]. Lastly, an excessively high board shareholding level may grant directors greater decision-making control, allowing decisions that favor personal short-term interests over the long-term interests of shareholders. This could lead to reluctance to undertake CSR, as it dilutes directors' interests in favor of other stakeholders [33].

While existing research results offer robust theoretical support for this paper, certain limitations need to be considered. Previous studies have predominantly focused on the relationship between board characteristics and CSR, or CSR and brand value, with limited exploration of the intricate interplay among the three factors. Additionally, the prevailing literature adopts a linear perspective, yet the polarized findings suggest that the relationship between board characteristics, CSR, and brand value is not straightforwardly linear but entails a complex non-linear nature. Consequently, this paper aims to address these gaps by introducing a threshold regression model to delve deeper into the nuanced relationship among board characteristics, CSR, and brand value.

Data and methodology

Sample selection

This study utilizes a sample of listed companies included in the World Brand Lab's list of China's 500 Most Valuable Brands spanning the years 2017 to 2021. The sample selection process is as follows: 1) identification of companies consistently present on the list throughout the five-year period; 2) exclusion of financial and insurance firms; 3) removal of samples with abnormal trading statuses; and 4) elimination of samples with missing values. Following these criteria, 111 listed companies with a total of 555 samples were ultimately included in the study. Financial data and corporate governance-related values were sourced from Cathay Pacific (CSMAR) and WIND databases, while brand value data were obtained from the official website of the World Brand Lab. The measurements and analysis were conducted using Stata 15.0 software.

Definition of variables

The dependent variable in this study is brand value, measured by the absolute value of the brand value data of A-share listed companies as per the rankings released by the World Brand Lab. The independent variable is CSR, defined based on the research findings of H. Shen et al. [34]. Comprehensive CSR performance is calculated through the equal-weighted average of government responsibility performance, employee responsibility performance, supplier responsibility performance, customer responsibility performance, financial institutions' responsibility performance, and social welfare responsibility performance.

The moderating variables encompass board of directors' characteristics, specifically two factors: board size and board shareholding. Board size is measured using the natural logarithm of the total number of board members, while board shareholding is determined by the ratio of the total number of shares held by the board to the overall shares. Control variables include firm size [35], book-to-market ratio [36], equity concentration [37], management shareholding [38], outstanding shareholding [39], leverage ratio [40], and operating income growth rate [41], as detailed in Table 1.

Table 1. Definition of variables

Variable category	Variable name	Variable symbol	Description of variables
Dependent Variable	Brand Value	BV	Logarithmic brand value
Independent Variable	Corporate Social Responsibility	CSR	(Government Responsibility Performance + Employee Responsibility Performance + Supplier Responsibility Performance + Customer Responsibility Performance + Financial Institution Responsibility Performance + Social Good Responsibility Performance)/6
Moderator Variables	Board size	BSize	Natural logarithm of total number of board members
	Board of Directors' shareholding	BStock	Ratio of total number of shares held by the Board of Directors to total number of shares
Control Variables	Enterprise size	Lnsize	Natural logarithm of the total number of employees in the enterprise
	Book-to-market ratio	BM	Ratio of total company assets to closing market capitalization
	Shareholding Concentration	CR	Shareholding of the largest shareholder
	Management Shareholding	Mown	Ratio of management's shareholding to total shares
	Percentage of Outstanding Shares	PSO	Total number of issued and outstanding shares of each class of shares of the listed company as a percentage of the company's total share capital on the appointed date
	Leverage Ratio	Lev	Total liabilities divided by total assets
	Revenue Growth Rate	Growth	Ratio of operating income growth to prior period operating income

Modeling

Ordinary panel regression model

This paper employs an ordinary panel regression model as the foundational framework. Taking into account that the influence of CSR on corporate brand value is not instantaneous but rather exhibits a certain time lag, and to mitigate potential endogeneity effects, this study follows the approach of W. Liang and H. Ge (2023) [42] by utilizing lagged one-period data for explanatory variables. The independent variables include corporate social responsibility, board of directors' characteristics (comprising the size of the board of directors and the board of directors' shareholding ratio), along with the interaction term of the two. The specific model is illustrated in equation (1):

$$\begin{aligned} BV_{\text{it}} &= a_0 + a_1 LnSize_{i,t\text{-}1} + a_2 BM_{i,t\text{-}1} + a_3 CR_{i,t\text{-}1} + \\ &+ a_4 \text{Mown}_{i,t\text{-}1} + a_5 PSO_{i,t\text{-}1} + a_6 \text{Lev}_{\text{i,t-1}} + \\ &+ a_7 \text{Growth}_{\text{i,}t\text{-}1} + b_1 CSR_{i,t\text{-}1} + b_2 BSize_{i,t\text{-}1} + \\ &+ b_3 BStock_{i,t\text{-}1} + b_4 CSR_{i,t\text{-}1} \times BSize_{i,t\text{-}1} + \\ &+ b_5 CSR_{i,t\text{-}1} \times BStock_{i,t\text{-}1} + e_{it} \end{aligned} , \quad (1)$$

where i and t denote the company and year respectively, a and b are the coefficients of variables, e_{it} is the random perturbation term, BV_{it} denotes the lagged one-period brand value, CSR denotes board size, $BSize_{i,\text{t-1}}$ denotes board size, $BStock_{i,t\text{-}1}$ denotes board shareholding ratio. $LnSize_{i,\text{t-1}}$ denotes the size of the firm, $BM_{i,\text{t-1}}$ denotes the book-to-market ratio, $CR_{i,t\text{-}1}$ denotes the firm's shareholding concentration, $Mown_{i,\text{t-1}}$ denotes the proportion of management shareholding, $PSO_{i,\text{t-1}}$ denotes the proportion of outstanding shares, $Lev_{i,\text{t-1}}$ denotes leverage, $Growth_{i,\text{t-1}}$ denotes the growth of operating income.

Threshold panel regression model

This paper proposes a hypothesis that, in the presence of differences in board characteristics, namely board size, board shareholding, and *CSR*, the relationship with brand value is not characterized by a simple linear pattern. Instead, it suggests the existence of a complex threshold effect. To investigate this issue, we employ the threshold panel regression model introduced by B. Hansen [43], setting the threshold value as γ. The threshold regression model is expressed in Equations (2)–(4), where all three models

consider *CSR* as the independent variable and brand value as the dependent variable. In Equation (2), *CSR* functions as the threshold variable; in Equation (3), board size serves as the threshold variable; and in Equation (4), the threshold variable is the board of directors' shareholding ratio.

$$BV_{it} = \mu_i + a_1 LnSize_{i,t-1} + a_2 BM_{i,t-1} + a_3 CR_{i,t-1} + a_4 Mown_{i,t-1} + a_5 PSO_{i,t-1} + a_6 Lev_{i,t-1} + a_7 Growth_{i,t-1} + b_1 CSR_{i,t-1} I(CSR_{i,t-1} \le \gamma_1) + b_2 CSR_{i,t-1} I(\gamma_1 < CSR_{i,t-1} \le \gamma_2) + \cdots\cdots + b_n CSR_{i,t-1} I(\gamma_{n-1} < CSR_{i,t-1} \le \gamma_n) + b_{n+1} CSR_{i,t-1} I(CSR_{i,t-1} \ge \gamma_n) + e_{it} \quad ; \quad (2)$$

$$BV_{it} = \mu_i + a_1 LnSize_{i,t-1} + a_2 BM_{i,t-1} + a_3 CR_{i,t-1} + a_4 Mown_{i,t-1} + a_5 PSO_{i,t-1} + a_6 Lev_{i,t-1} + a_7 Growth_{i,t-1} + b_1 CSR_{i,t-1} I(BSize_{i,t-1} \le \gamma_1) + b_2 CSR_{i,t-1} I(\gamma_1 < BSize_{i,t-1} \le \gamma_2) + \cdots\cdots + b_n CSR_{i,t-1} I(\gamma_{n-1} < BSize_{i,t-1} \le \gamma_n) + b_{n+1} CSR_{i,t-1} I(BSize_{i,t-1} \ge \gamma_n) + e_{it} \quad ; \quad (3)$$

$$BV_{it} = \mu_i + a_1 LnSize_{i,t-1} + a_2 BM_{i,t-1} + a_3 CR_{i,t-1} + a_4 Mown_{i,t-1} + a_5 PSO_{i,t-1} + a_6 Lev_{i,t-1} + a_7 Growth_{i,t-1} + b_1 CSR_{i,t-1} I(BStock_{i,t-1} \le \gamma_1) + b_2 CSR_{i,t-1} I(\gamma_1 < BStock_{i,t-1} \le \gamma_2) + \cdots\cdots + b_n CSR_{i,t-1} I(\gamma_{n-1} < BStock_{i,t-1} \le \gamma_n) + b_{n+1} CSR_{i,t-1} I(BStock_{i,t-1} \ge \gamma_n) + e_{it} \quad , \quad (4)$$

where μ_i denotes the firm's individual effect, $I(\cdot)$ denotes the exponential function, γ is the threshold to be estimated, and the rest of the variables are explained as in equation (1).

Empirical results and analysis

Analysis of the results of descriptive statistics

Table 2 provides the results of the descriptive statistical analysis for the main variables. Upon reviewing the table data, it is evident that the mean and standard deviation of CSR are 0.428 and 0.112, respectively. This indicates that the sample firms generally exhibit a low degree of social responsibility fulfillment, aligning with the prevailing perception among Chinese listed companies that view CSR as a costly investment. The mean and median of brand value are 5.684 and 5.681, respectively, with the maximum value reaching 8.428. This suggests substantial variations in brand value across the sample firms.

In regard to board characteristics, the mean and median of board size are 9.083 and 9, respectively, suggesting that the board size tends to hover around 9 persons for the majority of the sample firms. For board shareholding, the mean and median are 0.028 and 0, respectively, indicating that more than half of the sample firms have boards of directors that are not engaged in shareholding. The values of the other control variables fall within reasonable ranges, and there are no instances of extreme values in this study.

Table 2. Descriptive statistics of main variables

Variable	Mean	Median	Std	Min	Max
BV	5.684	5.681	1.058	2.287	8.428
CSR	0.428	0.404	0.112	0.236	1.135
Bsize	9.083	9	2.009	5	17
BStock	0.0280	0	0.0830	0	0.427
Lnsize	9.435	9.282	1.272	6.655	13.11
BM	1.827	1.171	2.236	0.0600	26.49
CR	0.377	0.360	0.158	0.0930	0.826
Mown	0.0110	0	0.0370	0	0.280
PSO	0.921	0.997	0.140	0.127	1
Lev	0.495	0.515	0.192	0.0740	1.290
Growth	0.110	0.0930	0.219	-0.693	1.519

Panel data regression results

Table 3 displays the regression outcomes for board characteristics, CSR, and brand value. In this study, the fixed effects model proves superior to the mixed least squares model. The preference for the fixed effects model is attributed to the mixed least squares method's lack of consideration for the time and cross-section dimensions in data processing. It merely expands the data to augment the sample size. Given the divergent ownership attributes and business scopes of the sample firms, inter-individual differences impact not only their social responsibility fulfillment but also their board characteristics. Primary evidence is found in cross-sectional variations. Initially, the Hausman test was conducted, yielding a p-value of 0.000, rejecting the original hypothesis and substantiating the application of the fixed effect model. Subsequently, a test for heteroskedasticity was executed, producing a p-value of 0.000, indicating the presence of heteroskedasticity. Consequently, the fixed effects model was estimated for heteroskedasticity robustness. The specific results are outlined in Table 3.

A comparison of columns (2) and (3) reveals identical coefficients for the explanatory variables, with the chi-square value escalating from 0.203 to 0.365. This signifies that the heteroskedasticity robust model offers an improved overall fit during estimation, enhancing accuracy compared to the model in column (2). In column (3), the coefficient for CSR is -4.161, significantly and negatively correlated at the 10% level. This implies that, when controlled for certain conditions, brand value decreases by 4.161 units with each unit increase in CSR. The coefficients for board size and board shareholding are both negative, with the former not being significant. Meanwhile, the latter reveals that the firm's brand value diminishes by 4.231 units for every unit increase in board shareholding. The interaction term between board size and CSR yields a coefficient of 1.574, indicating that board size positively moderates the relationship between CSR and brand value. The interaction term between board shareholding and CSR yields a coefficient of -0.948, signifying that higher board shareholding intensifies the negative impact of CSR on brand value. However, the moderating effect of both interactions is not deemed significant.

Table 3. Regression results for board characteristics, CSR and brand value

Variable	(1) Mixed least squares model	(2) Fixed effects model	(3) Heteroskedastic robust
LnSize	0.427*** (16.88)	0.314*** (4.21)	0.314*** (2.97)
BM	0.212** (1.69)	0.791*** (11.32)	0.791*** (8.21)
CR	0.613*** (3.10)	-0.530** (-1.72)	-0.530 (-1.47)
Mown	-8.777 (-1.39)	1.256 (0.39)	1.256 (0.71)
PSO	0.697*** (3.51)	0.395*** (4.16)	0.395*** (3.64)
Lev	0.001 (0.00)	-0.116 (-0.55)	-0.116 (-0.37)
Growth	0.299** (2.05)	0.154*** (2.74)	0.154** (2.47)
CSR	3.089 (1.06)	-4.161** (-2.16)	-4.161*(-1.94)
BSize	0.499 (0.83)	-0.583 (-1.48)	-0.583 (-1.17)
BStock	10.417 (1.41)	-4.231 (-1.08)	-4.231*(-1.69)
CSR_BSize	-1.493 (-1.12)	1.574** (1.78)	1.574 (1.59)
CSR_BStock	-6.608 (-1.07)	-0.948 (-0.22)	-0.948 (-0.28)
_cons	-0.376 (-0.28)	3.766*** (3.35)	3.766** (2.58)
R_squared	0.474	0.378	0.378
Adjusted *R_squared*	0.463	0.203	0.365
N	555	555	555
F-value	41.45***	22.32***	19.72***

Note: *, **, and *** are significant at the 10%, 5%, and 1% levels, respectively, with t-values in parentheses.

Threshold regression results

In this study, we investigate the threshold effect – specifically, the presence and quantity of thresholds – using Bootstrap repeated sampling (300 iterations). We derive the asymptotic distribution, p-value, and critical value of the F-statistic, and present the results in Table 4. Our findings indicate that the single and double thresholds in all three models are statistically significant, with only the triple threshold in Model II demonstrating significance. Consequently, our subsequent analysis focuses on a triple-threshold approach for Model II and a double-threshold model for Models III and IV, respectively. Subsequently, we test the threshold estimates, and the results are detailed in Table 5, showcasing the estimated thresholds alongside their corresponding 95% confidence intervals.

Table 4. Threshold effect test

Model	Dependent Variable	Independent Variable	Threshold Variables	Number of Thresholds	Critical Value				
					F-value	P-value	1%	5%	10%
Model II	*BV*	*CSR*	*CSR*	Single Threshold	17.932***	0.003	16.773	12.392	10.200
				Double Threshold	22.537**	0.013	23.428	18.324	14.479
				Triple Threshold	15.471**	0.030	22.551	14.466	11.586
Model III	*BV*	*CSR*	*BSize*	Single Threshold	12.954***	0.007	12.216	7.252	5.682
				Double Threshold	11.801*	0.090	15.521	13.289	11.467
				Triple Threshold	5.491	0.200	14.953	9.683	7.542
Model IV	*BV*	*CSR*	*BStock*	Single Threshold	20.806**	0.017	21.651	16.391	12.974
				Double Threshold	8.179*	0.100	17.395	9.994	8.165
				Triple Threshold	3.087	0.137	8.370	4.580	3.649

Note: 1) Critical values and p-values are results obtained from repeated self-sampling 300 times using Bootstrap; 2) ***, **, and * represent significant correlation at 1%, 5%, and 10% confidence levels, respectively.

Table 5. Estimated thresholds and confidence intervals

Model	Threshold Value	Estimated Value	95% Confidence Interval
Model II	Threshold I	0.352	(0.345,0.354)
	Threshold II	0.407	(0.404,0.462)
	Threshold III	0.460	(0.437,0.466)
Model III	Threshold I	1.869	(1.869,2.441)
	Threshold II	2.674	(2.602,2.674)
Model IV	Threshold I	0.000	(0.000,0.000)
	Threshold II	0.084	(0.000,0.388)

The results of the threshold panel regression are presented in Table 6, revealing significant interval effects across all three models. These effects are observed within the intervals defined by individual thresholds, indicating a complex and nonlinear relationship. The implications drawn from Table 6 are as follows:

The influence of CSR on brand value initially manifests as a positive and subsequently negative, non-strictly inverted U-shaped nonlinear relationship. Specifically, when CSR is below 0.352, the impact strength is 1.425 and passes the 1% significance level test, signifying a substantial role in enhancing brand value. As CSR increases beyond 0.352 but remains below 0.407, the impact coefficient decreases to 0.750, passing the 5% significance level test. This suggests that within this threshold interval, CSR maintains a positive effect on brand value, albeit displaying an inverted U-shaped non-linear relationship compared to the first threshold interval. The positive effect persists, but with diminishing marginal efficiency compared to the initial threshold interval. Once CSR exceeds 0.407 but remains below 0.460, its positive impact on brand value becomes statistically insignificant. When CSR surpasses 0.460, the impact coefficient becomes -0.011, indicating that CSR's impact on brand value within this fourth threshold interval begins to exhibit an inhibitory effect. However, this inhibitory effect is not statistically significant. This observation implies that the maximization of corporate social responsibility investment does not necessarily lead to optimal outcomes; rather, there exists an inverted U-shaped threshold effect.

Second, under the influence of the board size level, a non-strict U-shaped relationship manifests between CSR and brand value. Specifically, when the board size level drops below 1.869, the impact coefficient registers at -1.135 and successfully passes the 1% significance level test. This result signifies a noteworthy inhibitory effect of CSR on brand value within the initial threshold interval. Within the board size range of 1.869 to 2.674, the impact coefficient becomes -0.746 and passes the 1% significance level test, indicating a reduction in the negative effect of CSR on brand value in the second threshold interval. As the board size level surpasses 2.674, the impact coefficient becomes 0.022, suggesting that in the third threshold interval, CSR begins to exhibit a positive effect on brand value. However, this effect is not statistically significant. Consequently, a larger board size appears to be more favorable to brand value.

Third, influenced by the level of board of directors' shareholding, CSR and brand value demonstrate a non-strict U-shaped non-linear relationship. In the absence of board of directors' shareholding (ratio is 0), the impact coefficient is -1.241, passing the 1% significance level test. This indicates a significant inhibitory effect of CSR on brand value in the first threshold interval. When the board of directors' shareholding ratio ranges from 0 to 0.084, the impact coefficient becomes -0.639, passing the 1% significance level test. This implies a reduction in the negative effect of corporate social responsibility on brand value in the second threshold. The adverse impact of social responsibility on brand value has diminished. As the proportion of board of directors' shareholding exceeds 0.084, the impact coefficient turns positive at 0.360, signifying a positive influence of CSR on brand value within the third threshold interval. However, this effect is not statistically significant. Consequently, board shareholding can effectively contribute to the promotion of brand value.

Table 6. Parameter estimation results of the two-threshold model

Variable	Model II Coefficient Estimate	Model III Coefficient Estimate	Model IV Coefficient Estimate
LnSize	0.290*** (4.06)	0.335*** (4.56)	0.352*** (4.77)
BM	0.772*** (11.70)	0.801*** (11.76)	0.768*** (11.38)
CR	-0.484 (-1.64)	-0.594* (-1.96)	-0.595** (-1.98)
Mown	-3.148*** (-3.65)	-2.690*** (-3.06)	-2.964*** (-3.35)
PSO	0.353*** (3.89)	0.455*** (4.78)	0.340*** (3.65)
Lev	0.035 (0.17)	-0.223 (-1.07)	0.005 (0.03)
Growth	0.148*** (2.80)	0.175*** (3.24)	0.158*** (2.93)

Variable	Model II Coefficient Estimate	Model III Coefficient Estimate	Model IV Coefficient Estimate
CSR_1	1.425*** (3.65)	-1.135*** (-4.79)	-1.241*** (-5.25)
CSR_2	0.750** (2.31)	-0.746*** (-3.58)	-0.639*** (-3.04)
CSR_3	0.318 (1.11)	0.022 (0.07)	0.360 (0.81)
CSR_4	-0.011 (-0.05)		
Intercept Term	2.180*** (3.11)	2.306*** (3.24)	2.236*** (3.14)
F-value	30.14***	29.16***	29.69***
R^2	0.429	0.398	0.402

Note: 1) *, **, *** represent significant correlations at the 10%, 5%, and 1% levels, respectively; 2) t-values of coefficient significance tests under the heteroscedasticity setting are shown in parentheses; 3) p-values are the results of 300 repeated samples using Bootstrap.

Conclusions

This paper constructs a model to investigate the interactive effects of board characteristics and Corporate Social Responsibility (CSR) on brand value. It builds upon a comprehensive review of domestic and international literature, aiming to elucidate the intrinsic mechanism among these variables and elucidate the complex relationship between CSR and brand value.

Initially, the following conclusions are drawn employing three different models – mixed least squares, fixed effects, and heteroskedasticity robustness: CSR significantly inhibits its brand value; regression coefficients for board size and board shareholding exhibit negative trends with brand value, with board size coefficients being insignificant; and the interaction term coefficients for board size and CSR are positive, suggesting that board size positively moderates the relationship between CSR and brand value. Conversely, the interaction term coefficients for board shareholding and CSR are negative, indicating that a higher board shareholding level may result in a crowding-out effect on brand value.

However, results from the threshold panel model estimation reveal a non-linear relationship between board characteristics, CSR, and brand value. Firstly, CSR exhibits a non-strictly inverted U-shaped nonlinear relationship with brand value—initially positive and then negative. This is attributed to companies initially fulfilling social responsibility to enhance their reputation and brand value. Yet, as CSR investment intensifies, it may divert resources and lead to negative consumer perceptions, thus diminishing brand value.

Secondly, concerning board size differences, a non-strictly U-shaped threshold effect emerges between CSR and brand value – initially negative and then positive. Smaller board sizes increase the risk of internal fraud, causing reduced investment in CSR and brand value-related activities. Conversely, larger board sizes provide efficient human resources, fostering cautious decision-making in support of brand value to ensure stakeholder interests.

Lastly, in the context of board shareholding differences, the relationship between CSR and brand value also demonstrates a non-strictly U-shaped threshold effect—initially negative and then positive. Lower board shareholding ratios correlate with weak oversight and low social responsibility, hindering brand value. As board shareholding increases, directors align with shareholder interests, emphasizing long-term enterprise goals and strengthening supervision. This results in increased investment in activities that enhance brand value.

Theoretical contributions

This study makes several significant theoretical contributions. Firstly, we construct a research framework of "Board Characteristics – Corporate Social Responsibility (CSR) – Brand Value". Previous studies have focused on the impact of board characteristics on brand value [44] or the influence of social responsibility on brand value [45], neglecting the interactive effects of board characteristics and corporate social responsibility on brand value. This study not only elucidates the complexity of their interaction but also extends the research paradigm to the relationship between corporate social responsibility and brand value. Secondly, by introducing board characteris-

tics as an internal governance variable, we delineated the boundary conditions of the conflict between board characteristics and corporate social responsibility. Thirdly, this study resolves the contradiction in existing research regarding whether corporate social responsibility "promotes" or "constrains" the enhancement of brand value. For example, M. Salmones et al. (2005) [46] discover that businesses can cultivate public trust and reliance through social responsibility initiatives, providing a promising pathway to bolster their brand value. Conversely, M. Fabrizi et al. (2014) [4] contend that the considerable expenses linked to social responsibility efforts could diminish the resources necessary for brand value development, potentially resulting in its deterioration. This research enriches the literature by investigating the reciprocal relationship between CSR and brand value. The inconsistent conclusions from previous research may stem from the consideration of only linear relationships without accounting for the complex nonlinear relationship between CSR and brand value.

Practical contributions

Practical insights can be summarized as follows: Firstly, when facing resource constraints, enterprises should consider their own circumstances to judiciously allocate resources for social responsibility. This prevents the potential dilution of brand value resulting from excessive investment in corporate social responsibility. Secondly, assuming the total number of board members aligns with the overall scale of the enterprise, a larger board can contribute to more informed decision-making. This increased capacity enables greater attention to activities such as brand building that can yield long-term benefits. Therefore, enterprises should strategically determine the size of the board of directors to optimize overall corporate performance. Thirdly, the alignment of interests between directors and shareholders through board of directors' shareholding is advantageous. This alignment facilitates decision-making aimed at enhancing brand value, driven by a shared objective. Enterprises should establish a well-considered board shareholding plan, enhancing incentives for directors to promote the elevation of brand value. Additionally, this study encourages enterprises to redefine the concept of social responsibility, viewing the fulfillment of social responsibility more as an investment than a cost. This shift in perspective enables enterprises to engage in social responsibility practices more consistently, better safeguarding the interests of stakeholders, and yielding higher social benefits.

Limitations and future research

This study has several limitations. First, the data obtained only reflect results within the selected time period. The generalizability of the conclusions to subsequent years requires validation through empirical tests over a more extended period. Second, the moderating role of only two factors in the board of directors' characteristics – specifically, the size of the board and the proportion of shareholding – has been analyzed in the mechanism of CSR's impact on brand value. Future research should consider the influence of other variables related to board characteristics. Finally, this study is solely based on data from listed companies. To improve the conclusions' reliability, future research could extend to include data from non-listed companies, thus increasing sample diversity. In subsequent studies, it is advisable to explore the impact of additional variables related to board characteristics.

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