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Can ESG Led by "Double Carbon" Enhance Corporate Value?

-- Empirical Research Based on Chinese A-share Listed Companies

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Abstract

Environmental, Social and Governance (ESG), as a comprehensive corporate evaluation standard, has established a paradigm and path for implementing the "dual carbon" strategy. This paper takes China's A-share listed companies from 2018 to 2020 as an example to empirically study the impact and mechanism of corporate ESG management on corporate value enhancement. Research shows that: (1) ESG management can enhance corporate value. (2) ESG management can promote the company's R&D innovation. (3) R&D innovation plays an intermediary role between corporate ESG management and corporate value. The research in this paper helps to clarify the economic significance of corporate ESG management, provides a new perspective for the promotion of corporate value, and provides an empirical basis for companies to attach importance to and implement ESG management.

Keywords

ESG; R&D innovation; Enterprise value; Fixed-effect model.

1. Introduction

Since the establishment of the United Nations Framework Convention on Climate Change (UNFCCC) in 1992, the international issue of addressing climate change has gradually evolved into the current international governance framework for climate change. China has followed the international climate negotiations and proposed the "double carbon" target in 2020, specifying the "3060" vision and specific targets for green, low-carbon and cyclic development and comprehensive green transformation of economic and social development, and has launched a comprehensive strategic layout to promote extensive and In this context, the concept of ESG has been developed to promote a broad and profound economic and social systemic change.

In this context, the concept of ESG has been enriched. The scale of global ESG management is expanding rapidly, and ESG concepts are penetrating globally, as shown in Figure 1. Domestic ESG management has gradually entered the mainstream, with ESG responsibility and management gradually receiving attention from the domestic financial market and being taken seriously by the management of some listed companies, as manifested in the social responsibility reports disclosed by companies. Although the number of domestic companies adopting ESG management disclosure has increased in recent years, it accounts for a small proportion of the overall market, and most companies believe that ESG management will become a cost burden and run counter to the goal of profit maximisation, so the larger the market capitalisation, the more active the companies are in disclosing ESG information, as shown in Figure 2. This paper empirically analyses the impact of ESG management on

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enterprise value and further investigates the mediating role of R&D innovation between ESG management and enterprise value, with a view to reversing enterprises' perception of the burden of ESG, increasing their attention to ESG management, spurring more enterprises to implement ESG management responsibilities, and promoting the effective implementation of the "double carbon The aim is to reverse the perception of ESG burden among enterprises, raise their awareness of ESG management, spur more enterprises to implement ESG management responsibilities and promote the effective implementation of the "double carbon" objective.

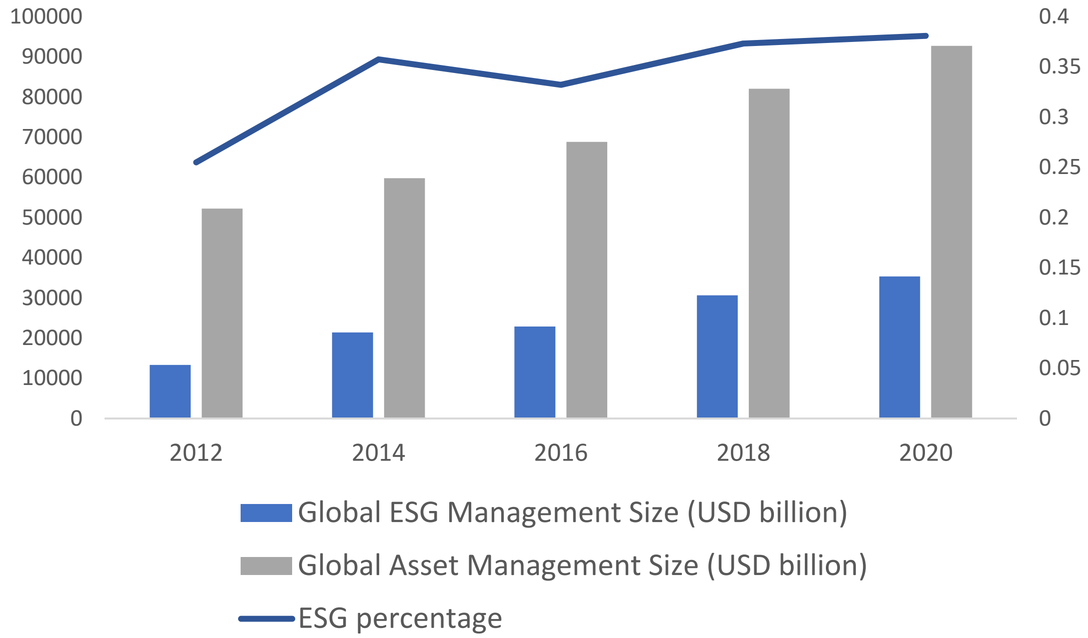

Figure 1. Size and share of ESG management in major global markets, 2012-2020
Source: Global Sustainable Investment Coalition, Boston Consulting Group statistics

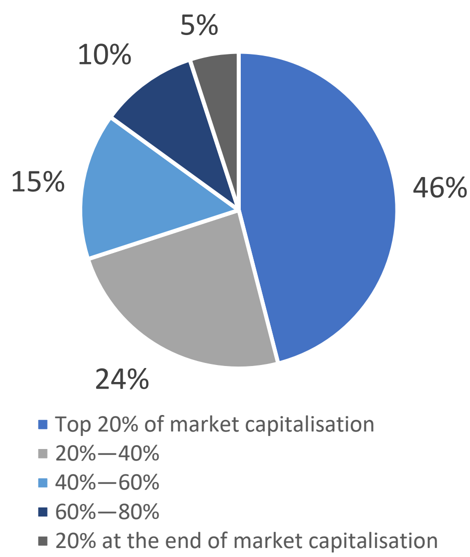

Figure 2. Share of companies of different market capitalisation sizes in ESG disclosure
Source: Compiled by WAND and the Institute of Economics and Finance of Industrial Securities

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2. Review of the Literature

Whether corporate ESG management affects corporate value is a subject of interest to many scholars and there are conflicting interpretations. Zheng Li [1] found through empirical research that the more socially responsible a company is in the short term, the lower its corporate value, but in the long term, taking social responsibility does not reduce corporate value, i.e. there is a time lag in the transformation between responsibility and value. Xiaowei Wang [2] pointed out that there is a positive relationship between the social responsibility undertaken by enterprises and enterprise value, and that the social responsibility of enterprises to different stakeholders has different degrees of influence on enterprise value. Xiaofeng Quan [3] point out that there is a significant positive relationship between corporate social responsibility and the risk of share price collapse, i.e. the implementation of social responsibility by Chinese listed companies is not conducive to the stability of corporate value. Ali Fatemi [4] finds that corporate ESG strengths increase corporate value while weaknesses decrease corporate value through a survey of annual data of US companies. Hoje Jo [5] points out that the implementation of corporate ESG management Hoje Jo [5] pointed out that the implementation of ESG management has a positive impact on the value of the company.

Along with the continuous development of ESG concept and its gradual embedding in corporate strategy formulation and operation management, scholars have conducted theoretical and empirical studies on the realization path between corporate ESG management and corporate value. The results of an empirical study by Jun Huang [6] show that technological innovation plays a mediating role in the effect of social responsibility on corporate value, and that the mediating effect of technological innovation varies significantly across industries. Yunjiang Geng [7] concluded that media attention plays a complete mediating role between corporate responsibility and corporate value, i.e. the better a company fulfils its social responsibility, the higher the media attention, and the higher the corporate value. By exploring the synergistic effects of technological innovation investment and CSR on financial performance, Naiping Zhu [8] concluded that innovation investment moderates and enhances the positive impact of CSR on long-term financial performance, while CSR also plays a significant moderating role in enhancing the positive relationship between technological innovation investment and long-term financial performance. Gunnar Friede[10] showed that corporate ESG management improves corporate portfolio and positively affects corporate financial performance, which in turn enhances corporate value.

In summary, most of the analyses of the factors influencing corporate value in the existing literature stand on the social responsibility (S) perspective, but there is a slight lack of research on the impact of the combined environmental (E), social responsibility (S) and corporate governance (G) factors on corporate value. Considering that the analysis of corporate ESG management and its impact on enterprise value is rather isolated, this paper examines the mediating effect of corporate R&D innovation between the two on the basis of a comprehensive analysis of the impact of ESG management on enterprise value, in order to better explain the relationship between corporate ESG management and enterprise value.

3. Theoretical Analysis and Research Hypothesis

3.1. Corporate ESG management and corporate value

According to stakeholder theory, shareholders, employees, government and other groups can influence the realisation of corporate value, so companies need to consider the demands of different stakeholders when making decisions. ESG management is the responsibility of a company to its stakeholders, such as responding to shareholders' demands for returns by paying dividends, responding to employees' needs for treatment by focusing on employee

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development, and responding to government initiatives to reduce energy consumption and emissions by reducing pollution. Through ESG management, companies can improve the satisfaction of their stakeholders and stimulate reinvestment in the company, thus achieving a virtuous circle and increasing corporate value. According to sustainability theory, companies should maintain the integrity of their ecosystems and use resources wisely to meet current and future needs. Corporate ESG management incorporates environmental issues into the strategic decisions of the company and provides action support for the sustainable development of the company, thus ensuring the sustainability of the company's performance to a certain extent and increasing the future value of the company. Through the above analysis, this paper proposes Hypothesis 1.

H1: Corporate ESG management enhances corporate value, all other things being equal.

3.2. Corporate ESG management, corporate R&D innovation and corporate value

According to the theory of endogenous growth, an economy can grow sustainably not by relying on external but by endogenous technological innovation. On the one hand, enterprises need to invest costs to implement ESG management, and can only remain profitable by optimising the input-output ratio through internal R&D innovation, i.e. corporate ESG management can force enterprises to increase R&D innovation. On the other hand, R&D investment will improve the productivity of all factors of the enterprise, enhance the competitiveness and profitability of the enterprise, weaken the effect of diminishing marginal returns, and thus increase the value of the enterprise. According to signalling theory, due to the asymmetry of market information, companies tend to attract investors by transmitting internal information to the outside world. The former can be disclosed in financial statements, while the latter can be disclosed through CSR reports. At the same time, the former as financial information can play a supplementary role in proving the non-financial information of the latter, improving the transparency and trustworthiness of corporate information, attracting investors' attention and thus promoting corporate value. Through the above analysis, this paper proposes hypotheses 2 and 3.

H2: Other things being equal, corporate ESG management can promote corporate R&D innovation.

H3: All else being equal, corporate R&D innovation plays a mediating role between corporate ESG management and corporate value.

4. Research Design

4.1. Sample selection and data sources

In this paper, data of A-share listed companies in China from 2018 to 2020 were selected and processed as follows: (1) excluding data of financial and insurance industries as well as ST companies; (2) excluding data of companies with missing data; and (3) excluding extreme values and outliers. In this paper, a total of 1,488 sample observations were obtained after tailoring the variables. The ESG rating data in this paper were obtained from R&L Global, and all other financial data were obtained from the CSMAR database. The statistical processing software was Excel, Stata 16.0.

4.2. Definition and description of variables

(1) Explanatory variable: ESG management (ESG). The evaluation database of R&L Global involves a full sample of A-share companies, and the evaluation system is more objective and scientific, so this paper assigns scores based on R&L Global's 7 levels of ESG management indicators by taking the average of the intervals. The highest AAA score of 9.30 indicates good

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ESG management, while the lowest CCC score of 0.70 indicates poor ESG management. The results are shown in Table 1.

Table1. ESG Rating Assignment Table

Rating	CCC	B	BB	BBB	A	AA	AAA
Rating range	[0,1.4)	[1.4,2.9)	[2.9,4.3)	[4.3,5.7)	[5.7,7.1)	[7.1,8.6)	[8.6,10.0)
Assignment	0.70	2.15	3.60	5.00	6.40	7.85	9.30

(2) Moderating variable: corporate R&D innovation (Inno). Scholars at home and abroad generally adopt R&D investment to measure the innovation capability of enterprises. In this paper, drawing on the approach of Hongwei Cheng [11], we use R&D expenditure as a percentage of operating income to indicate the strength of enterprise R&D innovation.

(3) Explained variable:Enterprise value (TobinQ). According to TobinQ theory, TobinQ is the ratio of the market value of a company to its current replacement cost of capital, and its value is influenced by the stock price, which is a quantitative representation of information. Therefore, this paper adopts the Tobin's Q value to measure the value of enterprises.

(4) Control variables: In order to control the impact of internal characteristics on enterprise value, this paper refers to the existing literature [12-14] and controls for variables such as enterprise size (Size), enterprise growth (Growth) and gearing (Lev). See Table 2 for details.

Table 2. Variable definitions

Variable type	Variable name	Variable symbol	Variable explanation
Explained variables	Corporate value	TobinQ	Total market capitalisation/assets
Explanatory variables	ESG	ESG	ESG Rating Assignment
Adjustment variables	Innovation	Inno	R&D expenses/operating income
Control variables	Size of business	Size	ln (total value of assets)
	Business Growth	Growth	(Total assets at the end of the year - total assets at the beginning of the year)/total assets at the beginning of the year
	Gearing ratio	Lev	Total liabilities/total assets
	Return on assets	Roa	Net profit/total asset balance

4.3. Model construction

To test hypothesis 1 on the impact of corporate ESG management on corporate value, a regression model was constructed (1).

$$TobinQ_{it} = \alpha_0 + \alpha_1 ESG_{it} + \alpha_i Control_{it} + \varepsilon_{it} \tag{1}$$

To test hypothesis 2 the effect of corporate ESG management on corporate R&D innovation, regression model (2) was constructed.

$$Inno_{it} = \beta_0 + \beta_1 ESG_{it} + \beta_i Control_{it} + \varepsilon_{it} \tag{2}$$

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To test hypothesis 3 the mediating role of corporate R&D innovation between corporate ESG management and corporate value, regression models were constructed (3).

$$TobinQ_{it} = \gamma_0 + \gamma_1 ESG_{it} + \gamma_2 Inno_{it} + \gamma_i Control_{it} + \varepsilon_{it} \quad (3)$$

α_0, β_0, $\gamma_0$denotes random variables that vary with individuals, $TobinQ_{it}$ denotes the firm value of firm i at time t, ESG_{it} denotes the firm ESG management score of firm i at time t, $Inno_{it}$ denotes the firm R&D innovation value of firm i at time t, $Control_{it}$denotes a series of control variables, and ε_{it} denotes a disturbance term that varies over time and with individuals.

5. Empirical Results and Analysis

5.1. Descriptive statistics

Table 3 presents the descriptive statistical characteristics of the variables. From the results, it can be seen that the mean, minimum and maximum values of enterprise value (TobinQ) are 1.975, 0.690 and 29.167 respectively, indicating that there are large differences in the value of listed enterprises in China's A-share market. the mean value of ESG is 1.982, indicating that the overall ESG management of enterprises in the A-share market is poor and there is still much room for development. The mean, minimum and maximum values of enterprise R&D innovation (Inno) are 0.028, 0.000 and 0.112 respectively, indicating that there are significant differences in the degree of importance attached to R&D innovation among enterprises, but overall it conforms to a normal distribution. The mean value of enterprise size was 23.974, higher than the median value of 23.820, indicating that all the sample enterprises were larger in size. The mean, minimum and maximum values of Growth were 0.609, -0.593 and 5.921, indicating that the development of enterprises in the A-share market varies greatly, but is generally stable and positive. The mean, minimum and maximum values of the gearing ratio (Lev) are 0.474, 0.014 and 0.933, indicating that the level of gearing of A-share listed companies varies widely and the overall debt level is high. The mean value of Return on Assets (Roa) is 0.054, which is greater than the median value of 0.042, indicating that the overall profitability of A-share market enterprises is better.

Table 3. Descriptive statistics

Variable	Sample size	Average value	Standard deviation	Median value	Minimum value	Maximum value
TobinQ	1488	1.975	1.958	1.358	0.690	29.167
ESG	1488	1.982	1.122	2.150	0.700	6.400
Inno	1488	0.028	0.020	0.023	0.000	0.112
Size	1488	23.974	1.157	23.820	21.481	28.257
Growth	1488	0.609	0.658	0.426	-0.593	5.921
lev	1488	0.474	0.182	0.491	0.014	0.933
Roa	1488	0.054	0.072	0.042	-0.528	0.377

5.2. Correlation analysis

The results of the correlation analysis in Table 4 show that the Pearson correlation coefficient between ESG and corporate value (TobinQ) is 0.610 and significant at the 1% level, indicating that corporate ESG management has a positive influence on corporate value without considering the influence of other factors, which tentatively supports the hypothesis 1 of the article. The Pearson correlation coefficient between ESG and corporate R&D innovation (Inno) is 0.388 and significant at the 1% level, indicating that corporate ESG management has a positive effect on corporate R&D investment without considering other factors, which

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tentatively supports hypothesis 2 of the article. This suggests that hypothesis 3 is likely to be supported.

Table 3. Relevance analysis

Variable	TobinQ	ESG	Inno	Size	Growth	Lev	Roa
TobinQ	1.000						
ESG	0.610***	1.000					
Inno	0.503***	0.388***	1.000				
Size	-0.333***	0.452***	-0.349***	1.000			
Growth	0.613***	0.421***	0.346***	-0.186***	1.000		
Lev	-0.360***	0.367***	-0.314***	0.625***	-0.148***	1.000	
Roa	0.386***	0.317***	0.271***	-0.197***	0.231***	-0.387***	1.000

Note: ***, ** and * denote significant at the 1%, 5% and 10% levels respectively.

5.3. Regression analysis

Through the Hausman test, this paper chooses a fixed effects model for regression analysis, and the regression results are shown in Table 5.

First, the direct effect of corporate ESG management on firm value is verified, as shown in column (1). The results show that the regression coefficient of corporate ESG management on enterprise value (TobinQ) is 0.226 and significant at the 1% level, indicating that better corporate ESG management can positively promote enterprise value, and the hypothesis 1 of the article is supported.

Table 5. Analysis of fixed effects model regression results

Variable	(1)	(2)	(3)
	TobinQ	Inno	TobinQ
ESG	0.226*** (6.32)	0.029*** (5.76)	0.226*** (6.36)
Inno			7.887*** (4.37)
Size	1.930*** (11.7)	-0.029*** (-5.45)	1.899*** (11.61)
Growth	1.266*** (19.87)	0.064*** (8.4)	1.245*** (19.66)
Lev	-0.268*** (-3.13)	-0.086** (-2.53)	-0.306*** (-3.24)
Roa	-1.412* *(-2.41)	0.300*** (4.27)	-1.304** (-2.24)
Constant	-43.889*** (-11.22)	0.904*** (7.42)	-43.353** *(-11.18)
Observations	1488	1488	1488
R-squared	0.421	0.247	0.432
F test	0.000	0.000	0.000
F	143.600	97.400	125.000

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

Secondly, the impact of corporate ESG management on corporate R&D innovation was verified, as shown in column (2). The results show that the regression coefficient of corporate ESG management on corporate R&D innovation (Inno) is 0.029 and is significant at the 1% level, indicating that better corporate ESG management can normally motivate corporate R&D innovation investment, and hypothesis 2 of the article is supported.

Finally, it is verified that there is a mediating effect of corporate R&D innovation between corporate ESG management and firm value, as shown in column (3). The results show that the regression coefficient of corporate ESG management on enterprise value (TobinQ) is 0.226, and the regression coefficient of corporate R&D innovation (Inno) on enterprise value (TobinQ) is 7.887, and both are significant at the 1% level, indicating that corporate R&D innovation plays a mediating role between corporate ESG management and enterprise value, i.e. corporate ESG management can pull corporate R&D innovation capability, which in turn enhances corporate value, and hypothesis 3 is supported.

5.4. Robustness tests

The article performs robustness tests on the model by replacing variables. This article draws on the method of Zhu Yaqin [13] and replaces enterprise value with earnings per share (EPS) from the CSMAR database. The results show that the regression coefficient of ESG on EPS is 0.195 and is significant at the 5% level, which means that corporate ESG performance positively affects corporate value, and the results obtained are generally consistent with the previous paper.

6. Conclusion and Insights

This paper empirically examines the impact of corporate ESG management on corporate value and its mechanism of action from the perspective of corporate ESG management, using A-share listed companies in China in 2018-2020 as the research object. The results show that good corporate ESG management helps to enhance corporate value, and corporate R&D innovation plays a mediating effect between the two, and the research findings remain reliable after robustness testing.

This paper draws the following research conclusions: (1) Corporate ESG management can enhance corporate value. ESG management enhances a company's reputation and image in the market, enabling it to build up a differentiated competitive advantage and thus increase its corporate value. (2) Corporate ESG management can promote corporate R&D innovation. Good ESG management can force enterprises to invest more in R&D, reduce agency costs and make it easier to obtain government subsidies, thus positively motivating enterprises to innovate in R&D. (3) Corporate R&D innovation plays a mediating role between corporate ESG management and corporate value. By implementing ESG responsibilities and R&D innovation activities, companies improve their internal efficiency and external image, and the two complement each other in both financial and non-financial terms. The combination of the two enhances both the 'blood transfusion' and 'blood creation' capabilities of the company, thus improving its performance and sustainability, and thus its value.

The implications of the findings of this paper are mainly in three aspects: (1) for listed companies, they should incorporate ESG management into their corporate development strategies, actively disclose information on corporate ESG management, and at the same time increase their R&D and innovation efforts. The company can set up an ESG committee and recruit ESG specialists to manage, monitor and disclose its low-carbon, CSR and sustainability

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initiatives, and invest more in R&D and innovation to accelerate the transformation between ESG performance and corporate value. (2) For financial regulators, they should pay attention to the differences in the dimensions and focus of ESG in different industries, accelerate the designation of corporate ESG disclosure guidelines, achieve full coverage of mandatory disclosure of ESG responsibility implementation for listed companies as soon as possible, and encourage disclosure of resources by non-listed companies, strengthen the level of ESG regulation and build the market with high standards, thereby forcing the improvement of corporate ESG management and capital market optimization. (3) For investors, the importance of corporate ESG management disclosure should be raised, socially responsible investment concepts should be cultivated, the adoption rate of ESG indicators in the market should be increased, thereby promoting the mainstreaming of ESG investment and accelerating the establishment of an ESG investment system.

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