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Research on the Impact of Social Responsibility Fulfillment of New Energy Vehicle Enterprises on Competitiveness under the "Dual Carbon" Goal

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Abstract: *In the context of the "dual carbon" goal, the fulfillment of social responsibility of new energy vehicle enterprises has become a key driving force to promote energy transformation and industrial upgrading. Based on the triple bottom line theory, this study uses the method of data analysis to construct a theoretical model of economic responsibility, social responsibility and environmental responsibility and corporate competitiveness, and conducts empirical tests through regression analysis to deeply explore the new connotation of corporate social responsibility and its impact on corporate operation strategy under the background of the "dual carbon" goal. The results show that environmental responsibility has a significant positive impact on the core competitiveness and its subdivision dimensions, and the effect is sustainable. Economic responsibility has a short-term promotion effect on business ability and corporate image; Social responsibility has a weak direct impact on competitiveness, but it plays an indirect role through environmental responsibility and technological innovation. The study suggests that NEV vehicles should give priority to strengthening the fulfillment of environmental and economic responsibilities and optimizing the practice path of social responsibility, so as to achieve the synergistic improvement of the "dual carbon" goal and competitiveness.*

Keywords: *Dual carbon, Fulfillment of social responsibility, Competitiveness*

1. Introduction

In the context of global climate change and energy crisis, China has put forward the strategic goal of "carbon peak and carbon neutrality" to promote the new energy vehicle industry as the core area of green transformation. The "dual carbon" goal takes carbon emission intensity control as the core, and requires enterprises to achieve sustainable development through clean technology application and green production. For NEV companies, this goal is not only a policy constraint, but also a strategic opportunity for technological innovation and market expansion. As a technology-intensive entity, the social responsibility of new energy vehicle enterprises is not only related to environmental benefits, but also directly affects technological innovation and market competitiveness. However, how the fulfillment of social responsibility can affect the competitiveness of enterprises through the path of economic, social and environmental responsibility still needs to be discussed at the theoretical and empirical levels. This study adopts the theory of enterprise competitiveness to construct a dynamic model of the impact of social responsibility on competitiveness, so as to provide a decision-making basis for NEV vehicles to optimize their responsibility practice and respond to the "dual carbon" goal.

2. Theoretical analysis

Under the guidance of the "dual carbon" goal, new energy vehicle companies shoulder the important mission of promoting new energy transformation and automobile industry upgrading. Based on the triple bottom line theory proposed by John Elkington, the fulfillment of social responsibility of new energy vehicle enterprises can be decomposed into three key dimensions: economy, society and environment, and ultimately drive the improvement of core competitiveness through the three core variables of business ability, technological innovation ability and corporate image.

From the perspective of economic responsibility, new energy vehicle companies enhance their

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operating capabilities by expanding market share and optimizing cost structure, and then provide financial support for technology research and development. This solid economic performance helps to strengthen consumer trust and create a good corporate image.

From the perspective of social responsibility, new energy vehicle companies can not only create a positive social atmosphere, improve business capabilities, demonstrate corporate responsibility, win recognition, and enhance their image by improving Employee welfare, devoting themselves to public welfare, and promoting industrial progress, but also stimulate technological innovation and improve technical strength.

In terms of environmental responsibility, the promotion of clean energy and green production by car companies not only helps to reduce emissions and meet the requirements of the "dual carbon" policy, so as to enhance business capabilities, establish an image of environmental protection pioneers, and enhance corporate image, but also accumulate experience in the development of environmental protection technology and promote the progress of technological capabilities. By fulfilling our social and environmental responsibilities in this way in a comprehensive and proactive manner, we can effectively increase consumer trust and create an excellent corporate image.

The above analysis shows that when new energy vehicle companies fulfill their economic, social and environmental responsibilities, they gradually form core competitiveness through synergy in business capabilities, technological innovation capabilities and corporate image. This pathway framework (Figure 1) reveals the impact mechanism of social responsibility fulfillment on the sustainable competitive advantage of enterprises.

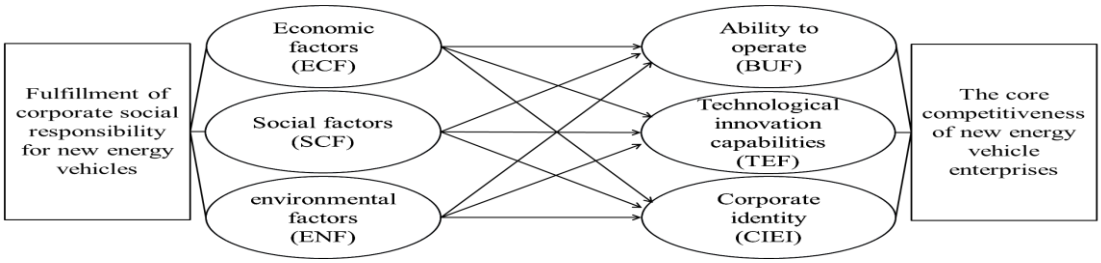

Figure 1: Framework model of the impact of new energy vehicles on their core competitiveness.

Based on the results of the above path framework, the following empirical analysis examines the influence relationship between each path, and reveals the mechanism of social responsibility fulfillment on the core competitiveness of enterprises.

3. Empirical analysis

3.1. Data Sources

This article selects 283 sample data from A-share listed companies in Shenzhen and Shanghai from 2010 to the end of 2023, excluding companies that have not published ESG reports and data with serious data deficiencies, and the data comes from corporate financial statements and ESG reports.

3.2. Indicator selection

In order to study the relationship between the active realization of social responsibility and the competitiveness of new energy vehicle enterprises, we refer to the research results on corporate social responsibility fulfillment and corporate competitiveness at home and abroad, as well as the characteristics of the new energy industry, and select the following index system.

1) Core Competencies (CC)

Operating Factors (BUF): Includes total operating income, profit amount, profit tax burden and operating profit margin. These indicators can reflect the financial health and profitability of enterprises, and are the basis for measuring the competitiveness of enterprises[1].

Technology Factor (TEF): Patents and R&D expenditures are key indicators to measure a company's innovation capability and technological strength, which is particularly important for NEV companies, as technological innovation is the core driving force for the development of the industry[2].

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Corporate image (CIEI): Test drive satisfaction, customer satisfaction, and complaint handling satisfaction rate can reflect a company's market performance and customer relationship management capabilities, which are all important components of a company's competitiveness [3].

2) Corporate Social Responsibility (CSR)

Economic Factors (ECF): The growth rate of operating income and the operating cash ratio are important indicators of a company's performance of economic responsibility, and they reflect the growth and financial stability of the company[4].

Social Factors (SCF): The total number of hours of charitable donations and Employee safety training reflects the company's contribution to society and care for Employees, which are important components of CSR and can enhance the company's brand image and social recognition[5].

Environmental factors (ENF): Total carbon dioxide emissions, total greenhouse gas emission intensity, and total energy consumption are key indicators to measure corporate environmental responsibility, and these indicators are particularly important for NEVs because they are directly related to the company's sustainable development ability [6]. Table 1 below describes the details.

Table 1: Indicator selection and numerical representation.

Level 1 indicators	Secondary indicators	Level 3 indicators	Indicator numerical representation	Metric attributes
Core Competencies (CC)	Ability to operate (BUF)	Total operating income	Total operating income / 100 million yuan	+
		Amount of profits	Total profit / 100 million yuan	+
		Tax rate on profits	Gross income tax/profits	+
		Operating margin	Operating Income/Profit Margin	+
	Technological innovation capabilities (TEF)	It has patents	Number of patents	+
		R&D expenditures	R&D expenditure/100 million yuan	+
	Corporate identity (CIEI)	Test drive satisfaction	Test Drive Satisfaction/%	+
		Customer satisfaction	Customer satisfaction/%	+
		Satisfaction rate with complaint handling	Satisfaction rate with complaint handling	+
Corporate Social Responsibility Fulfillment (CSR)	Economic Factors (ECF)	Growth rate of operating income	(Operating income for the current period - Operating income for the previous period)/Operating income for the previous period ×100%	+
		Operating cash ratio	Net cash flow/operating income	+
	Social Factors (SCF)	Public donations	Public welfare donation/100 million yuan	+
		Employee safety training hours	Total Employee safety training hours/hours	+
	Environmental Factors (ENF)	Total CO2 emissions	Total CO2 emissions/tonne	-
		Total greenhouse gas emissions intensity	Total greenhouse gas emissions/Operating income	-
		Total energy consumption	Total energy consumption/thousand kWh	+

There are many ways to measure core competitiveness and corporate social responsibility, and this paper uses the "National Standard Enterprise Competition Evaluation System of the People's Republic of China" issued by the State Administration for Market Regulation. The method uses a comprehensive evaluation model to calculate the core competitiveness index (CC) by weighting and summing the three indicators of business factors, technical factors and corporate image, and the weights of the three indicators are 30%, 40% and 30% respectively. The performance of corporate social responsibility (CSR) is calculated by weighting and summing the three indicators of economic factors, social factors and environmental factors, and the weights of the three indicators are 40%, 30% and 30% respectively. For the measurement method of the second-level indicators, this paper uses the entropy method to calculate the corresponding second-level index data by summing the weights of the third-level indicators. Based on the above level 1 and level 2 indicators, we further refine them into specific level 3 indicators, and provide a clear numerical definition for each indicator.

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3) Control variables

a) Sive: Expressed as a natural logarithmic total asset, it controls the impact of enterprise size on competitiveness.

b) Employee: Expressed by the total number of Employees by the natural logarithm, it controls the impact of human resources on the operation of the enterprise.

c) Gearing Ratio (ALR): The debt-to-asset ratio that controls the impact of a company's financial structure on its competitiveness. The details are shown in Table 2 below.

Table 2: Control variable selection and numerical representation.

Variable type	Alternative indicators	Indicator numerical representation
Control variables	Enterprise Scale (Sive)	LN Total Assets
	Employee	Total number of Employees
	Gearing Ratio (ALR)	Debt-to-asset ratio

3.3. Stationarity test

In order to avoid spurious regression problems, the stationarity of the data needs to be tested before regression analysis can be performed. In this paper, the ADF-Fisher test was selected to test the stationarity of the data, and the results are shown in Table 3. It can be seen that CC, CSR, BUF, TEF, CIEI, ECF, SCF, ENF, Sive, Employee, and ALR are all stable at the significance level of 5%, so subsequent regression analysis can be performed.

Table 3: Stationarity test results of the data.

variable	ADF-Fisher test value	The type of inspection	P-value	Test results
CC	-4.159***	(c,0,0)	0.005	smooth
CSR	-12.398***	(c,0,1)	0.000	smooth
BUF	-4.413***	(c,0,0)	0.002	smooth
TEF	-3.795**	(c,0,0)	0.017	smooth
CIEI	-8.238***	(c,0,1)	0.000	smooth
ECF	-12.508***	(c,0,1)	0.000	smooth
SCF	-10.523***	(c,0,1)	0.000	smooth
ENF	-5.702***	(c,0,0)	0.000	smooth
Sive	-8.912***	(c,0,0)	0.000	smooth
Employee	-4.257***	(c,0,0)	0.004	smooth
ALR	-3.592**	(c,0,0)	0.031	smooth

Note: c in (c, t, k) represents the intercept term, t represents the trend term, and k represents the lag order; *, **, and *** indicate significant at significance levels of 10%, 5%, and 1%, respectively.

3.4. Correlation Analysis

In order to explore the correlation between the variables, the Pearson correlation coefficient test was used for analysis, and the specific results are shown in Table 4. It can be seen that there is a significant positive correlation between the variables CC, CSR, BUF, TEF, CIEI, ECF and ENF at the significance level of 1%. There was a significant positive correlation between the variables SCF and CSR, BUF, Sive, Employee, and ALR at a significance level of 10%.

Table 4: Results of correlation analysis.

variable	1	2	3	4	5	6	7	8	9	10	11
CC(1)	1										
CSR(2)	0.47***	1									
BUF(3)	0.90***	0.53***	1								
TEF(4)	0.89***	0.38***	0.72***	1							
CIEI(5)	0.63***	0.20*	0.42***	0.3***	1						
ECF(6)	0.28***	0.92***	0.33***	0.18*	0.18*	1					
SCF(7)	0.13	0.31***	0.18*	0.12	-0.05	0.14	1				
ENF(8)	0.57***	0.30***	0.60***	0.58***	0.10	-0.06	0.20*	1			

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Table 4: Results of correlation analysis(continued).

Sive(9)	0.75***	0.45***	0.77***	0.63***	0.40***	0.35***	0.14	0.34***	1		
Employee(10)	0.39***	0.40***	0.50***	0.38***	0.01	0.36***	0.13	0.15	0.39***	1	
ALR(11)	-0.14	-0.28**	-0.17	0.08	-0.38***	-0.37***	-0.05	0.25**	-0.25**	0.10	1

Note: *, **, and *** indicate significant at 10%, 5%, and 1% significance levels, respectively.

In order to explore the correlation between the secondary indicators, a standardized roadmap of the impact of corporate social responsibility on the core competitiveness of enterprises was drawn, and the specific results are shown in Figure 2. It can be seen that there is a significant positive correlation between the variable ECF and BUF, TEF and CIEI at the 10% significance level. There was a significant positive correlation between the variable SCF, BUF and ENF at the 10% significance level. There was a significant positive correlation between ENF and BUF and TEF at the 1% significance level.

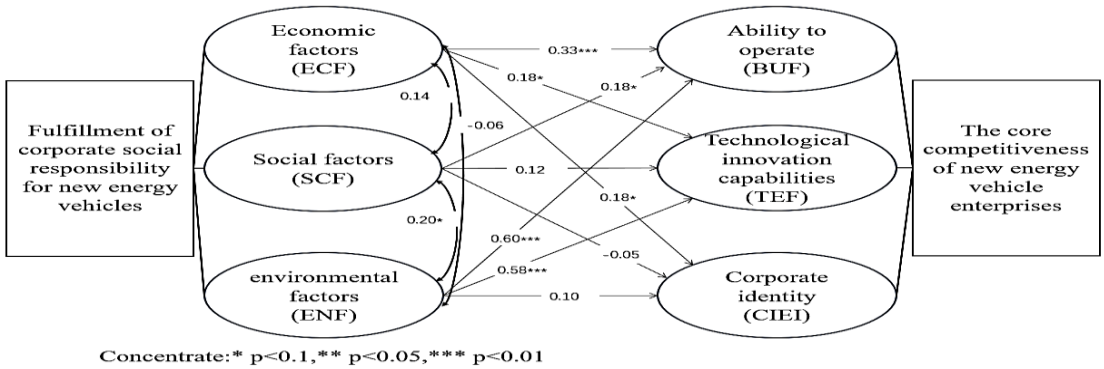

Figure 2: The impact of corporate social responsibility on core competitiveness is the standardization path.

3.5. Modeling

According to the above research hypothesis, based on the observation data of multiple enterprises in different years covered by the panel data, three secondary indicators on the implementation of corporate social responsibility are established, and the impact of the secondary indicators on core competitiveness is established, as shown in equation (1):

$$\begin{cases} BUF_{it} = \alpha_1 + \beta_1 ECF_{it} + \beta_2 SCF_{it} + \beta_3 ENF_{it} + \beta_4 Sive_{it} + \beta_5 Employee_{it} + \beta_6 ALR_{it} + \varepsilon_{it} \\ TEF_{it} = \alpha_1 + \beta_1 ECF_{it} + \beta_2 SCF_{it} + \beta_3 ENF_{it} + \beta_4 Sive_{it} + \beta_5 Employee_{it} + \beta_6 ALR_{it} + \varepsilon_{it} \\ CIEI_{it} = \alpha_1 + \beta_1 ECF_{it} + \beta_2 SCF_{it} + \beta_3 ENF_{it} + \beta_4 Sive_{it} + \beta_5 Employee_{it} + \beta_6 ALR_{it} + \varepsilon_{\mathrm{it}} \end{cases} \quad (1)$$

In equation (1), CC represents the core competitiveness, in which BUF, TEF, AND CIEI represent business factors, technical factors, and corporate image, respectively. Sive, Employee, and ALR represent the control variables of the enterprise in different time periods, representing the size of the enterprise, the size of the Employees, and the debt ratio, respectively.

By referring to the existing research, the structural equation model is used, combined with the enterprise competitiveness evaluation system, the core competitiveness and corporate social responsibility performance are obtained, and the model (2) and model (3) are constructed to test the impact of corporate social responsibility performance on the core competitiveness, see equations (2) and (3):

$$\mathrm{CC_{it}} = \alpha_2 + \beta_1 \mathrm{ECF_{it}} + \beta_2 \mathrm{SCF_{it}} + \beta_3 \mathrm{ENF_{it}} + \beta_4 \mathrm{Sive_{it}} + \beta_5 \mathrm{Employe_{it}} + \beta_6 \mathrm{ALR_{it}} + \varepsilon_{\mathrm{it}} \quad (2)$$

$$\mathrm{CC_{it}} = \alpha_3 + \beta_1 \mathrm{CC_{it}} + \beta_2 \mathrm{Sive_{it}} + \beta_3 \mathrm{Employe_{it}} + \beta_4 \mathrm{ALR_{it}} + \varepsilon_{\mathrm{it}} \quad (3)$$

In the formula, CSR stands for the fulfillment of social responsibility, where ECF, SCF, and ENF represent economic factors, social factors, and environmental factors, respectively. i represents different enterprises, t represents different time points,α_1 , α_2 , α_3 represents constant terms,β represents the regression coefficients of each index, and ε represents random perturbation terms.

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3.6. Regression and Result Analysis

In order to test the current impact of corporate social responsibility performance on core competitiveness, a regression model of corporate social responsibility performance and its secondary indicators on enterprise competitiveness and its subdivision dimensions was constructed. The results of the analysis are shown in Table 5. It can be seen from the results of model 1 in Table 5 that the regression coefficient of ECF to BUF is positive and significant at the significance level of 10%, indicating that listed companies can effectively improve their operating ability by actively fulfilling their economic responsibilities, which is consistent with the expected path of economic factors to enhance their operating ability through market performance in the theoretical analysis. The regression coefficient of SCF to BUF is negative and not significant, indicating that listed companies actively fulfill their social responsibilities and cannot effectively improve their operating ability, which is inconsistent with the mechanism of social factors in the theoretical analysis to improve their operating ability through social performance, which may be due to the increase of short-term costs, resulting in a temporary decline in operating ability. The regression coefficient of ENF to BUF is positive and significant at the significance level of 1%, indicating that listed companies can effectively improve their operating ability by actively fulfilling their environmental responsibilities, which is consistent with the expected path of environmental factors to enhance their operating ability through energy conservation and emission reduction in the theoretical analysis.

It can be seen from the results of model 2 in Table 5 that the regression coefficient of ECF to TEF is positive but not significant, indicating that listed companies actively fulfill their economic responsibilities and cannot effectively improve their technical capabilities, which is inconsistent with the influence mechanism of economic factors in the theoretical analysis to improve technological innovation capabilities by optimizing the cost structure, which may be due to the long time it takes for R&D investment to be transformed into actual results, which cannot be truly reflected in the short term. The regression coefficient of SCF to TEF is negative and not significant, indicating that listed companies actively fulfill their social responsibilities and cannot effectively improve their technical capabilities, which is inconsistent with the influence mechanism of social factors in the theoretical analysis to enhance technological innovation capabilities through industrial progress, which may be due to the fact that the depth of short-term cooperation is not significant, so that the conversion rate of technological innovation is not high. The regression coefficient of ENF to TEF is positive and significant at the significance level of 1%, indicating that listed companies can effectively improve their technical capabilities by actively fulfilling their environmental responsibilities, which is consistent with the expected path of environmental factors to improve technological innovation capabilities through the accumulation of environmental protection knowledge in theoretical analysis.

It can be seen from the results of model 3 in Table 5 that the regression coefficient of ECF to CIEI is positive and significant at the significance level of 5%, indicating that listed companies can effectively improve their corporate image by actively fulfilling their economic responsibilities, which is consistent with the expected path of economic factors in the theoretical analysis to improve corporate image through stable economic performance. The regression coefficient of SCF to CIEI is negative and insignificant, indicating that listed companies actively fulfill their social responsibilities and cannot effectively improve their corporate image, which is inconsistent with the influence mechanism of social factors in the theoretical analysis to improve corporate image through consumer performance, which may be due to consumer cognitive bias, which makes corporate image insignificant in the short term. The regression coefficient of ENF to CIEI is positive but not significant, indicating that listed companies actively fulfill their environmental responsibilities and cannot effectively improve their corporate image, which is inconsistent with the influence mechanism of environmental factors in the theoretical analysis to improve corporate image through environmental image, which may be due to the long time it takes for long-term accumulation to transform into brand reputation.

It can be seen from the results of model 4 and model 5 in Table 5 that the regression coefficients of ECF and SCF for CC are 0.034 and -0.037, respectively, and they are not significant, indicating that listed companies cannot effectively improve their core competitiveness when they actively fulfill their economic and social responsibilities, which may be due to the imbalance of resource allocation, which may lead to market advantages and decline in brand reputation in the short term. The regression coefficient of ENF to CC is positive, and it is significant at the significance level of 1%, indicating that listed companies can effectively enhance their core competitiveness by actively fulfilling their environmental responsibilities. The regression coefficient of CSR to CC is positive, and it is significant at the significance level of 1%, indicating that listed companies can effectively enhance their core competitiveness by actively fulfilling their social responsibilities.

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Table 5: Regression results of the data.

variable	Model (1) BUF	Model (2) TEF	Model (3) CIEI	Model (4) CC	Model (5) CC
Constant terms	-4.561*** (-7.556)	-3.399*** (-4.936)	0.897*** (12.67)	-2.989*** (-5.311)	-3.547*** (-6.245)
CSR					0.257** (2.309)
ECF	0.108* (1.727)	0.040 (0.464)	0.029** (2.24)	0.034 (0.552)	
SCF	-0.034 (-0.551)	-0.012 (-0.135)	-0.077 (-1.01)	-0.037 (-0.564)	
ENF	0.597*** (6.924)	0.409*** (3.770)	0.089 (0.82)	0.413*** (5.002)	
Sive	0.326*** (6.684)	0.291*** (4.831)	0.016** (2.53)	0.287*** (6.217)	0.366*** (7.760)
Employee	0.223*** (3.724)	0.094 (1.359)	0.007 (-0.98)	0.084 (1.522)	0.059 (1.025)
ALR	-0.721** (-2.393)	0.424 (1.242)	-0.065* (-1.77)	-0.314 (-1.193)	0.224 (0.868)
F-number	44.052***	15.085***	3.94***	26.044***	27.506***
Adjusted R^2	0.792	0.543	0.276	0.679	0.599

Note: *, **, and *** indicate significant at 10%, 5%, and 1% significance levels, respectively; The t-value is enclosed in parentheses.

According to the regression results of the control variables in Table 5, enterprise size is an important factor affecting the core competitiveness and its subdivision dimensions, and the impact coefficients in each model are significant at the significance level of 5%. The impact of Employee size on the operating ability of enterprises is positive, and it is significant at the significance level of 1%, indicating that Employee size is an important factor affecting the operating ability of enterprises. The impact of the asset-liability ratio on the operating ability and corporate image of the enterprise is negative, and it is significant at the significance level of 10%, indicating that the asset-liability ratio is an important factor affecting the operating ability and corporate image of the enterprise.

3.7. Regression and Result Analysis

In order to test the endogeneity problem, the explanatory variables were lagged by one period, and the OLS regression method was used to re-regress the original model, and the results of the endogeneity test are shown in Table 6. It can be seen from the results of model 1 in Table 6 that the regression coefficient of ECF to BUF in the lag period is positive and significant at the significance level of 5%, indicating that the listed companies can actively fulfill their economic responsibilities and not only have a significant impact on the operating ability of the enterprises in the current period, but also have a significant impact in the lag period. The regression coefficient of SCF to BUF in the first lag period is negative and not significant, indicating that the lag effect of the listed company's social responsibility on the company's operating ability is not obvious. The regression coefficient of ENF to BUF in the lagging period is positive and significant at the significance level of 1%, indicating that the listed companies actively fulfill their environmental responsibilities and can not only have a significant impact on the operating ability of the enterprises in the current period, but also have a significant impact in the lagging period.

It can be seen from the results of model 2 in Table 6 that the regression coefficient of ECF to TEF in the lag period is positive and significant at the significance level of 5%, indicating that although the listed companies actively fulfill their economic responsibilities and will not have a significant impact on the technical capabilities of the enterprises in the current period, they will play a significant role in promoting the technical capabilities of the enterprises in the lag period. The regression coefficient of SCF to TEF in the first lag period is positive but not significant, indicating that the lag effect of the listed company's social responsibility on the technical ability of the enterprise is not obvious. The regression coefficient of ENF to TEF in the lag period is positive and significant at the significance level of 1%, indicating that the listed companies can not only have a significant impact on the technical capabilities of the enterprises in the current period, but also in the lag period.

It can be seen from the results of model 3 in Table 6 that the regression coefficient of ECF to CIEI in the lag period is positive but not significant, indicating that the lag effect of the listed company's social

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responsibility on the corporate image is not obvious. The regression coefficient of SCF to CIEI in the first lag period is negative, but it is significant at the significance level of 5%, indicating that listed companies actively fulfill their social responsibilities and cannot effectively improve their technical capabilities in the short term. The regression coefficient of ENF to CIEI in the first phase of the lag period is negative and not significant, indicating that the lag effect of the listed company's social responsibility on the corporate image is not obvious.

It can be seen from the results of model 4 and model 5 in Table 6 that the regression coefficient of ECF to CC in the lag period is positive and significant at the significance level of 5%, indicating that although the performance of social responsibility by listed enterprises will not have a significant impact on the core competitiveness of enterprises in the current period, the lag period will play a significant role in promoting the core competitiveness of enterprises. The regression coefficient of SCF to CC in the first lag period is negative and insignificant, indicating that the lag effect of the impact of listed enterprises on the core competitiveness of listed enterprises is not obvious. The regression coefficient of ENF to CC in the lag period is positive, and it is significant at the significance level of 1%, indicating that it can not only have a significant impact on the core competitiveness of enterprises in the current period, but also have a significant impact in the lag period. The regression coefficient of CSR to CC in the lag period is positive, and it is significant at the significance level of 1%, indicating that the active practice of social responsibility by listed companies can not only have a significant impact on the core competitiveness of enterprises in the current period, but also have a significant impact in the lag period.

In summary, the regression coefficient of ECF for BUF, TEF and CC in the lag period is positive and significant, indicating that the active performance of economic responsibilities by listed companies has a significant impact on the operating ability, technical ability and core competitiveness of the listed enterprises in the current period and the lag period. The regression coefficient of SCF to BUF, TEF and CC in the first lag period is negative or insignificant, indicating that the lag effect of the listed company's performance of social responsibility on the company's operating ability, technical ability and core competitiveness is not obvious. The regression coefficients of ENF to BUF, TEF and CC in the lagged period were positive and significant, indicating that the active performance of environmental responsibilities by listed companies had a significant impact on their business capabilities, technical capabilities and core competitiveness in the current and lagging periods. The regression coefficient of CSR to CC in the lag period is positive and significant, indicating that the fulfillment of social responsibility can have a significant impact on the core competitiveness of enterprises in both the current period and the lag period. It can be seen that the fulfillment of corporate social responsibility and its detailed factors not only have an impact in the current period, but also have a certain continuity of impact on the enterprise, which supports the robustness of the model.

Table 6: Stability test results.

variable	Model (1) BUF	Model (2) TEF	Model (3) CIEI	Model (4) CC	Model (5) CC
Constant terms	-4.714*** (-5.909)	-2.869*** (-3.659)	0.356 (0.298)	-2.979*** (-4.542)	-2.595*** (-4.109)
CSR					0.462*** (3.721)
ECF	0.195** (2.196)	0.254** (2.583)	0.242 (1.624)	0.158** (2.167)	
SCF	-0.116 (-1.559)	0.012 (0.135)	-0.301** (-2.304)	-0.093 (-1.267)	
ENF	0.270*** (2.692)	0.371*** (3.753)	-0.011 (-0.072)	0.240*** (2.860)	
Sive	0.391*** (6.607)	0.302*** (5.219)	0.239*** (2.719)	0.321*** (6.383)	0.337*** (7.322)
Employee	0.160** (2.122)	0.018 (0.238)	-0.170 (-1.493)	0.040 (0.644)	-0.012 (-0.208)
ALR	0.063 (0.187)	0.900*** (2.939)	-1.219** (-2.619)	0.171 (0.647)	0.247 (1.015)
F-number	25.473***	16.018***	5.475***	19.995***	32.667***
Adjusted R^2	0.683	0.563	0.277	0.620	0.644

Note: *, **, and *** indicate significant at 10%, 5%, and 1% significance levels, respectively; The t-value is enclosed in parentheses.

The regression results of the control variables in Table 6 show that the impact coefficient of the lag period of enterprise size in each model is significant at the significance level of 1%, indicating that the

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impact of enterprise size on enterprise competitiveness and its secondary index factors is continuous. The impact of Employee size on the company's operating ability in the lag period is positive, and it is significant at the significance level of 1%, indicating that the impact of Employee size on the company's operating ability is continuous. The impact of the asset-liability ratio on the technical capability of the enterprise in the lag period is positive, and it is significant at the significance level of 10%, but the coefficient is small, indicating that the lag period of the asset-liability ratio has a certain lag impact on the technical ability of the enterprise, but the impact effect is weak. The impact of the asset-liability ratio on the corporate image in the lagging period is negative, and it is significant at the significance level of 10%, indicating that the impact of the asset-liability ratio on the corporate image is continuous.

3.8. Conclusion

Based on the level of enterprises actively fulfilling their social responsibilities, this paper empirically examines the impact of corporate social responsibility fulfillment on their competitiveness by using the data of A-share listed companies in Shenzhen and Shanghai from 2010 to 2023. The results show that: (1) The performance of corporate social responsibility, its economic ability and environmental ability are positively correlated with the core competitiveness, management ability, technical ability and corporate image, and the social factors of the enterprise are positively correlated with the business ability of the enterprise. (2) The environmental ability of the enterprise can affect the competitiveness, operation ability and technical ability of the enterprise in the current period and the lag period; (3) The economic ability of the enterprise can affect the operating ability and technical ability of the enterprise in the current period; (4) Corporate social responsibility mainly has a short-term negative impact on corporate image in the lag period. (5) The performance of corporate social responsibility can affect the competitiveness of enterprises in the current period and the lagging period.

In summary, the above research shows that enterprises should optimize the economic responsibility strategy, improve the financial status of enterprises and optimize economic activities, enhance the operating ability of enterprises, and gradually improve the corporate image, so as to achieve the continuous improvement of the core competitiveness of enterprises. Although the social factors of a company have a negative impact on the corporate image in the short term, in the long run, actively fulfilling social responsibilities can help improve the business status and overall image of the enterprise. Therefore, enterprises can balance short-term costs and long-term benefits by investing in social responsibility projects in stages to ensure the long-term effect of corporate social responsibility. At the same time, in order to improve the company's operating ability and technological innovation ability, enterprises should actively fulfill their environmental responsibilities, respond to national policies, practice low-carbon environmental protection strategies, and ensure the long-term development and market competitiveness of enterprises. In addition, enterprises should fully integrate the concept of corporate social responsibility into their corporate strategy and culture to enhance their core competitiveness and achieve high-quality and high-level development.

Therefore, enterprises should take the initiative to fulfill their social responsibilities, pay attention to the improvement of environmental and economic capabilities, and then overcome the negative impact of social factors on corporate image in the short term, realize the coordinated development of enterprises, society and environment, and promote the competitive advantage of enterprises in the new energy vehicle industry.

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