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Research on Influencing Factors and Improvement Strategies of Corporate ESG Performance from a Configuration Perspective

Keli Wang *

Chongqing Jiaotong University, Chongqing, China
*458379205@qq.com

ABSTRACT

There is a close relationship between ESG ratings and aviation companies. A higher ESG score can enhance the social image, brand value, and market competitiveness of aviation companies; At the same time, it also helps to reduce financing costs, enhance investor confidence, and promote the sustainable development of the industry. Using 21 aviation manufacturing A-share listed companies as case studies, the dynamic QCA method is adopted to further explore the configuration path of factors affecting the ESG score of aviation enterprises from the spatiotemporal dimension by processing and analyzing the financial panel data of enterprises from 2018 to 2023. Research has found that financial factors indirectly affect the ESG score of aviation companies, and there are three pathways that affect the ESG score of aviation companies, namely market structure, financial performance, and capital structure. The configuration of these three variables has a strong impact on the ESG score of aviation companies, and these impacts have complex and nonlinear characteristics.

KEYWORDS

ESG rating; Aviation companies; Dynamic QCA; Configuration path

1. INTRODUCTION

1.1. Background Introduction

In recent years, global attention to environmental, social, and governance (ESG) scores has continued to rise, especially in areas such as addressing climate change, enhancing corporate social responsibility, and optimizing corporate governance structures. ESG has gradually become an important basis for corporate evaluation and investment decision-making. The aviation industry, as one of the important sources of global carbon emissions, is facing enormous environmental pressure.

In existing literature, most studies use traditional statistical methods such as regression analysis to explore the impact of factors such as corporate financial performance, market structure, and capital structure on ESG. Specifically, this article selected six variables, namely market concentration (HHI), return on assets (ROA), ratio of pre tax profit to total assets, company size (expressed as the logarithm of total assets), net profit attributable to shareholders of the listed company, and asset liability ratio. These variables cover the market structure, financial performance, and capital structure of the enterprise, aiming to reveal the impact path of various variable combinations on the ESG score of airlines.

The purpose of this study is to use cutting-edge research methods and fill the gaps in current literature to explore the mechanism by which different combinations of financial and market structural variables in the aviation industry affect corporate ESG performance, in order to provide scientific basis for corporate managers and policy makers in promoting ESG strategies.

1.2. Literature Review and Analysis Framework

With the increasing importance of global sustainable development issues, the environmental, social, and corporate governance (ESG) performance of enterprises has gradually become a focus of attention in academia and industry. ESG scores not only affect a company's social reputation and market competitiveness, but are also closely related to its long-term financial performance. Existing research mainly explores the key factors that affect corporate ESG scores from multiple perspectives, such as financial performance, market structure, and capital structure.

Although there have been numerous studies exploring the factors influencing corporate ESG performance from different perspectives, the Fuzzy Set Qualitative Comparative Analysis (fsQCA) method, as an innovative research tool, has received increasing attention in ESG research in recent years. Traditional regression analysis methods tend to assume linear relationships between variables, making it difficult to capture the complex interactions between variable configurations. However, fsQCA can identify the causal paths under the combined effects of multiple factors by identifying the configurations of different variables. The fsQCA method proposed by Ragin (2008) has been widely applied in social sciences [6], and in recent years, some scholars have begun to apply it to the ESG field, attempting to explore the impact of nonlinear and complex causal relationships on ESG scores.

1.3. Analysis Framework

(1) Market Concentration Index (HHI)

Market concentration index (HHI) is an indicator that measures the differences in the number and relative size of enterprises within a certain industry. In the aviation manufacturing industry, the level of market concentration reflects the competitive situation and distribution of market share among enterprises in the industry. High market concentration usually means that a few large enterprises occupy the majority of the market share, while low market concentration indicates that there are a large number of small and medium-sized enterprises in the industry, and competition is relatively fierce.

(2) Return on Assets (ROA)

Return on Assets (ROA) is an important indicator for measuring a company's financial performance, typically reflecting its ability to generate profits using its assets. However, directly exploring the impact of asset return on ESG ratings in the aviation manufacturing industry is not direct. Although asset return does not directly determine the ESG ratings of aviation manufacturing companies, there is a certain correlation between the two.

(3) EBIT to total assets ratio (EBIT/total assets)

The ratio of EBIT to total assets can also indirectly affect the ESG rating of the aviation manufacturing industry, mainly by influencing the company's financial stability, risk management capabilities, investor confidence, and brand value. A higher ratio of pre tax profit to total assets usually means that a company's financial condition is more stable and it has more financial resources.

(4) Total assets of log

The "log total assets" is usually a numerical value obtained by logarithmic conversion of the total assets of a company, and its impact on the ESG rating of the aviation manufacturing industry may be indirect and influenced by multiple factors. As an important indicator of a company's financial condition, total assets may indirectly affect the investment and performance of aviation

manufacturing companies in ESG aspects, such as carbon emission management and resource utilization.

(5) Net profit attributable to shareholders of the listed company

Aviation manufacturing companies with higher net profits usually have more abundant financial resources. These resources can be used to support ESG related projects and activities, such as environmental technology research and development, energy conservation and emission reduction investments, social responsibility projects, etc. As a special industry, the ESG rating of the aviation manufacturing industry is also influenced by industry characteristics.

(6) Asset liability ratio

The impact of asset liability ratio on the ESG rating of the aviation manufacturing industry is indirect, mainly through affecting the financial stability, risk management ability, and financing ability of the enterprise. Aviation manufacturing companies with lower asset liability ratios typically have stronger financial stability, which means they may have more financial resources to support ESG related projects and activities.

2. RESEARCH DESIGN

2.1. Sample Selection And Data Sources

This article randomly selects 50 aviation manufacturing A-share listed companies from 2018 to 2023, excluding samples such as ST *, financial, and missing data. The final sample size is 21 companies, with a total of 126 cases. In order to effectively characterize the factors that affect the ESG scores of aviation manufacturing companies, this article manually collected and organized the Huazheng ESG database, CSMAR database, as well as data from the Giant Tide Information Network and annual reports. The media attention, analyst tracking, and other data were manually calculated to ultimately determine the six major factors that may affect the ESG performance of aviation manufacturing listed companies.

2.2. Data Calibration

On the basis of existing theories and previous research, this article conducts unified calibration of data for subsequent analysis of intra group, inter group, and overall consistency and coverage. Based on the numerical characteristics of this variable, the direct calibration method is adopted, with 95% quantile, 50% quantile, and 5% quantile as calibration anchor points, representing complete membership, intersection, and complete non membership, respectively. The specific calibration results are shown in Table 1.

Table 1. Descriptive Statistics

Variable Name		calibration		
		Fully subordinate	intersection	Completely not affiliated
Result variable	ESG score	5	4	3
Conditional variable	HHI	0.190	0.097	0.080
	ROA	0.100	0.026	0.001
	EBIT/Total Assets	0.113	0.031	0.002
	Total assets of log	10.845	9.868	8.883
	Net profit attributable to shareholders of the listed company	1313385633.000	148368672.100	-41891835.030
	Asset liability ratio	0.710	0.417	0.126

3. DATA ANALYSIS AND EMPIRICAL RESULTS

3.1. Necessity Analysis of Individual Conditions

The criterion for determining the necessary condition analysis is that if the consistency level is higher than 0.9, the conditional variable can be considered as a necessary condition for the outcome variable. In QCA panel data analysis, when the adjustment distance is less than 0.1, the accuracy of summary consistency is high and can be used as a basis for judgment. HHI, ROA, the adjustment distances for six conditional variables, including the ratio of pre tax profit to total assets, log total assets, net profit attributable to shareholders of the listed company, and asset liability ratio, are all less than 0.1, and the overall consistency is less than 0.9, indicating that these factors are not necessary conditions for the outcome variables. This result echoes previous research findings and highlights the importance of six conditions, namely HHI, ROA, EBIT to total assets ratio, log total assets, net profit attributable to shareholders of listed companies, and asset liability ratio, in influencing corporate ESG ratings. Aviation listed companies should pay more attention to the impact of six factors, including HHI, ROA, EBIT to total assets ratio, log total assets, net profit attributable to shareholders of the listed company, and asset liability ratio, on the ESG score of the enterprise.

Table 2. Result

Conditional variable	High ESG score						Low ESG score					
	Summarize consistency	Summary coverage	Inter group consistency Euclidean distance	Inter group consistency adjustment distance	Intra group consistency Euclidean distance	Consistency adjustment distance within the group	Summarize consistency	Summary coverage	Inter group consistency Euclidean distance	Inter group consistency adjustment distance	Intra group consistency Euclidean distance	Consistency adjustment distance within the group
High HHI	0.679	0.716	0.072	0.016	0.069	0.009	0.675	0.714	0.07	0.016	0.076	0.009
Low HHI	0.729	0.691	0.071	0.016	0.063	0.008	0.731	0.695	0.07	0.016	0.072	0.009
High ROA	0.639	0.677	0.027	0.006	0.102	0.013	0.593	0.63	0.033	0.007	0.101	0.013
Low ROA	0.65	0.615	0.027	0.006	0.092	0.011	0.696	0.659	0.038	0.008	0.087	0.011
High pre tax profit to total assets ratio	0.668	0.676	0.042	0.009	0.091	0.011	0.621	0.63	0.036	0.008	0.088	0.011
Low interest pre tax profit to total assets ratio	0.635	0.626	0.039	0.009	0.092	0.011	0.68	0.672	0.049	0.011	0.087	0.011
High log total assets	0.626	0.627	0.035	0.008	0.112	0.014	0.657	0.66	0.059	0.013	0.100	0.012
Low log total assets	0.66	0.658	0.030	0.007	0.101	0.013	0.629	0.628	0.027	0.006	0.100	0.012
High net profit attributable to shareholders of listed companies	0.585	0.623	0.037	0.008	0.102	0.013	0.615	0.656	0.020	0.004	0.087	0.011
Low net profit attributable to shareholders of listed companies	0.677	0.637	0.034	0.008	0.088	0.011	0.647	0.61	0.021	0.005	0.087	0.011
High debt to asset ratio	0.587	0.578	0.023	0.005	0.119	0.015	0.652	0.643	0.046	0.010	0.108	0.013
Low debt to asset ratio	0.638	0.647	0.022	0.005	0.118	0.015	0.572	0.581	0.017	0.004	0.124	0.015

3.2. Sufficient Analysis of Conditional Configuration

Configuration analysis, as the core of QCA method, aims to examine how different combinations of antecedent conditions affect the generation of results. The criterion for judgment is the consistency level of sufficiency, which Schneider and Wageman proposed should not be lower than 0.75. Based on previous research and the specific situation of this study, in the process of constructing the truth table, this article selected a consistency threshold of 0.85, a frequency threshold of 1, and a PRI threshold of 0.7, ultimately covering 27 cases. After constructing the truth table, we enter into the strengthened standard analysis. In the counterfactual analysis section, we first simplify the assumptions and eliminate contradictions. However, due to the significant differences in scale, resources, and other factors among enterprises, it is difficult to uniformly judge the effect of antecedent conditions on the results. Therefore, we do not pre-set the direction and select "existence or absence" for all cases. Finally, enhanced simple solutions, intermediate solutions, and complex solutions are obtained. This article focuses on enhanced intermediate solutions and assists in enhancing simplified solutions to find core and edge conditions. Table 3 presents the overall configuration analysis results, which include a total of three configurations.

3.2.1. Summary Results

Table 3. Configuration of ESG scores

Conditional variable	High ESG score		
	Configuration 1	Configuration 2	Configuration 3
A		**U**	●
B		●	●
C	U		
D	●	●	**U**
E	**U**		
F	**U**	**U**	U
uniformity	0.812	0.817	0.836
PRI	0.409	0.466	0.653
Coverage	0.241	0.272	0.369
Unique coverage	0.054	0.035	0.171
Inter group consistency adjustment distance	0.008	0.009	0.006
Consistency adjustment distance within the group	0.007	0.006	0.006
Overall PRI	0.825		
Overall consistency	0.62		
Overall coverage	0.503		
Note: indicates existence; ● Indicates the existence of core conditions; U represents missing; **U** indicates that the core condition is missing			

According to Table 3, the overall consistency of the solution is 0.825, which is greater than 0.75, and the intra group adjustment distance and inter group adjustment distance of a single configuration are both less than 0.1, indicating that the consistency of the summary has good explanatory power. These three configurations can be considered as sufficient conditions for high ESG scores.

Configuration 1 focuses on the total assets of the log, with the ratio of pretax profit to total assets, net profit attributable to shareholders of the listed company, and the absence of asset liability ratio as the edges, which can be summarized as the "market structure". Configuration 2 focuses on ROA as the core, linking the ratio of pretax profit to total assets, log total assets, and net profit attributable to shareholders of the listed company. At the same time, the absence of HHI as the edge jointly affects

the company's ESG score results, which can be summarized as "financial performance". According to configuration 3, when the total assets and asset liability ratio of the log are absent, HHI, ROA, the ratio of pretax profit to total assets can also drive an increase in a company's ESG score, which can be summarized as "capital structure". By comparing Configuration 1, Configuration 2, and Configuration 3, potential substitution relationships between configurations can be further explored.

3.2.2. Inter group Results

As shown in Table 4, the inter group consistency adjustment distance of the three configurations is not greater than 0.1, indicating that there is no significant time effect. Further examination of its temporal changes revealed that the inter group consistency levels of the four configurations fluctuated around 0.75 from 2019 to 2021, but began to collectively show an upward trend from 2022, The inter group analysis results not only make up for the shortcomings of past cross-sectional configurations on the time axis, but also reflect the good explanatory power of these three configurations between 2019 and 2023. As for the reason for the collective rise in 2022, it is suggested that the end of the COVID-19 epidemic may be the reason why the development of aviation manufacturing enterprises has shown a positive recovery trend. The market recovery and growth are significant, and the business performance of enterprises has improved significantly, thus strengthening the strength of enterprise esg. At the same time, as the inter group adjustment distances are all less than 0.1 and will not affect the overall explanatory power, the results of this study still have strong applicability and can be used as a reference for aviation companies.

Table 4. Comparison

	Configuration 1		Configuration 2		Configuration 3	
particular year	Inter group consistency	Inter group coverage	Inter group consistency	Inter group coverage	Inter group consistency	Inter group coverage
2018	0.841	0.257	0.797	0.239	0.83	0.46
2019	0.748	0.285	0.676	0.246	0.768	0.333
2020	0.704	0.237	0.784	0.272	0.796	0.458
2021	0.879	0.204	0.845	0.297	0.846	0.35
2022	0.798	0.209	0.86	0.293	0.833	0.279
2023	0.927	0.256	0.925	0.28	0.959	0.333

3.2.3. Within group results

Like the inter group consistency adjustment distance, the intra group consistency adjustment distance is not greater than 0.1, indicating that there is no significant difference in the explanatory power of the three configurations among different enterprises. Given that there is currently no specific measurement standard developed for sample differences in dynamic QCA, this article uses the micro consistency level of each path to explore its configuration preferences. From it can be seen that in the vast majority of sample enterprises, the explanatory power and consistency of the three configurations are high, but there are still a few enterprises with consistency levels below the 0.75 judgment threshold. On the one hand, the analysis results within this group present the consistency level of each configuration corresponding to the main enterprise, which can help enterprises more accurately grasp the impact of HHI, ROA, EBIT to total assets ratio, log total assets, net profit attributable to shareholders of listed companies, and asset liability ratio on the ESG score of enterprises; On the other hand, it compensates for the situation where the consistency and accuracy level of cross-sectional configuration cannot be explored at the individual level in the past. To the extent that the consistency level of individual enterprises is below the 0.75 judgment threshold, considering the obvious heterogeneity in the development process of each enterprise, it can be deeply explored from the perspectives of corporate governance structure, external competition, and social relations.

4. CONCLUSION AND IMPLICATIONS

4.1. Research Conclusion

Through the analysis of panel data of aviation listed companies from 2018 to 2023, this paper uses dynamic QCA method to explore the impact of market structure, financial performance, and capital structure on corporate ESG scores. The research results indicate that different combinations of variables have a significant impact on the ESG performance of airlines, and these effects have complex and nonlinear characteristics. Enterprises with good financial conditions are usually able to easily raise funds to support ESG projects and have stronger risk resistance capabilities. Meanwhile, good ESG performance can also enhance a company's brand image and value, attracting more investors' attention and support.

Firstly, the market concentration (HHI) and return on assets (ROA) of a company have a positive effect on ESG scores in certain configurations, indicating that a higher market position and stable profitability may help companies to more actively fulfill their social and environmental responsibilities. Secondly, larger companies (log total assets) often have more abundant resources to promote sustainable development, but in some cases, the combination of size and high debt ratios may limit ESG improvements.

These findings provide several insights for business managers in the aviation industry. The management should consider the potential impact of the company's financial condition and market positioning on ESG performance, especially when planning ESG strategies, and pay attention to the synergistic effects of different financial and market variables. Secondly, companies with larger scale and higher market share should fully utilize their resource advantages to enhance their performance in sustainable development.

4.2. Insufficient Research

Although this article reveals the multi factor configuration effect of ESG performance of aviation listed companies through dynamic QCA method, there are still some limitations in the research. Firstly, although the variables selected by the research institute cover key dimensions such as market structure, financial performance, and capital structure, they do not fully reflect the non-financial characteristics of the enterprise, such as corporate culture, management quality, policy and regulatory influence, which may also have a significant impact on ESG scores. Secondly, the data time span is only from 2018 to 2023, although this period covers global economic instability factors, the research results may have different performances in other economic environments. In addition, although dynamic QCA can reveal complex relationships between variables, its results are relatively limited in causal inference, so further exploration is needed in conjunction with other research methods.

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