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The Impact of Foreign Mergers and Acquisitions on ESG Performance of Chinese Listed Companies: Empirical Analysis Based on the PSM-DID Method

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Abstract: In recent years, green finance has led to increased focus on ESG performance, measuring corporate social responsibility. Meanwhile, mergers and acquisitions (M&A) play a crucial role in international capital flow, which have attracted widespread attention. Exploring the impact of foreign M&A on ESG performance of companies has become an important research topic. Based on the sample of foreign mergers and acquisitions of Chinese listed companies from 2017 to 2022, this paper innovatively examines the impact and mechanism of foreign M&A on Chinese listed companies' ESG performance using propensity score matching and multi-period difference-in-differences methods. Findings indicate: (1) Foreign M&A significantly improves corporate ESG performance; (2) The impact of foreign M&A varies across different types of enterprises. Regarding the acquiring companies, foreign companies have a greater impact on improving ESG performance compared to companies from Hong Kong, Macau, and Taiwan. On the target companies' side, large-scale companies are more effective in utilizing the opportunities provided by mergers and acquisitions (M&A) to leverage their advantages. (3) Foreign M&A is particularly effective in enhancing environmental indicators within the ESG framework; (4) The mechanism behind this improvement involves a significant green culture effect, which promotes the improvement of ESG performance by amplifying the influence of corporate green culture.

Keywords: ESG, Foreign M&A, DID-PSM

1. Introduction

Corporate mergers and acquisitions (M&A) have become a common method for international expansion due to globalization and economic development. Companies are increasingly prioritizing sustainability and considering Environmental, Social, and Governance (ESG) factors as a core business strategy.

However, the relationship between foreign mergers and acquisitions and ESG performance has not been fully researched. Existing studies mainly focus on the impact of corporate social responsibility on mergers and acquisitions, suggesting that corporate social responsibility has an important positive impact on the decision-making and performance of cross-border mergers and acquisitions [1-3]. Companies with higher ESG performance are more likely to become acquisition targets [4]. Only a few studies have focused on the impact of M&A transactions on corporate social responsibility and ESG performance. Existing research has shown that M&A transactions have a positive impact on the ESG performance of acquiring companies [5]. In contrast, our paper will explore the impact of M&A transactions on the ESG performance of the target company, that is, whether the ESG performance level of the target company changes after being acquired.

China, as a major destination for foreign investment and M&A, is crucial for researching foreign M&A and corporate ESG performance. Chinese companies have had a delayed start in ESG investment management, while foreign investment concepts are more mature. Examining the impact of foreign M&A on Chinese companies' ESG performance is therefore important.

This article explores the impact of foreign M&A on corporate ESG performance when Chinese companies act as the target firm. Based on panel data of non-financial enterprises listed on China's A-share market from 2017 to 2022 and matching data of A-share Hua-Zheng ESG ratings, the article uses Difference-in-Difference (DID) and Propensity Score Matching (PSM) methods to empirically test the impact of foreign M&A on the ESG performance of Chinese listed companies. Furthermore, in order to study the mechanism of the impact of foreign M&A on corporate ESG performance, we construct a cultural effect variable and use text analysis to measure the impact of corporate culture on social responsibility.

The marginal contribution of this article lies in: This article fills the gap in previous studies that focused only on acquirer firms and introduces a cultural perspective to understand the mechanisms behind improving ESG performance through foreign M&A.

2. Literature Review

The impact of foreign M&A on enterprises has been studied by scholars, with a focus on three areas: operational performance, social responsibility, and corporate governance. In terms of operational performance, foreign M&A has a positive effect on the productivity level of target enterprises, thereby improving operational performance [6]. In terms of social responsibility, studies have shown that capital market openness has a positive and significant relationship with corporate social responsibility [7]. With respect to corporate governance, foreign M&A can promote the integration of the internal structure of enterprises and improve the governance structure and system of target enterprises [8]. However, few scholars have studied ESG as a whole and the impact of capital market openness on corporate ESG performance.

Compared to the existing concept of corporate social responsibility (CSR), the ESG concept is based on sustainable development theory and incorporates environmental factors into the consideration of enterprise long-term development. This contributes to the harmonious unity of the internal and external effects of enterprise management and is more in line with the sustainable development of the entire society. Research on the factors affecting corporate ESG performance can be divided into two aspects: macro and micro. At the macro level, the political system, economic system, and cultural environment of enterprises affect their ESG performance. Countries with higher political freedom, economic development, market-oriented financial systems, ESG indices, and harmonious and equal cultural environments tend to have better ESG performance [9]. At the micro level, the factors influencing ESG performance can be roughly divided into internal and external factors. Corporate characteristics, management characteristics, enterprise scale, and media supervision all affect corporate social responsibility performance and thus ESG performance [10].

Recent studies have shown that ESG and M&A activities have a two-way relationship. On the one hand, the ESG performance of enterprises affects the decision-making and performance of M&A activities. This is because the acquiring companies consider environmental reputation in the planning and construction of the M&A [11]. Therefore, improving ESG performance can increase the market value of the target enterprise and bring a premium for the M&A transaction [12]. At the same time, research has also shown that reducing social responsibility costs affects the returns of M&A activities. Therefore, the CSR performance of the acquiring company before the M&A is conducive to the achievement of cross-border transactions [13]. On the other hand, M&A activities have a reverse impact on ESG performance. Existing research has mainly focused on the acquirer. Targets with better ESG performance can help the acquirer improve its own ESG performance [14]. By considering the three pillars of environmental, social, and governance, M&A activities have a positive impact on the scores of acquirer companies [15].

3. Methodology

3.1. Hypothesis

The Impact of Foreign Mergers and Acquisitions on ESG Performance of Companies. Stakeholder theory points out that in foreign mergers and acquisitions activities, not only should the interests of the company's shareholders be considered, but also the legitimate rights and interests of other stakeholders need to be protected. This can effectively enhance the company's ability to assume social responsibility and thereby improve its ESG competitiveness. Through foreign acquisitions, companies can also integrate high-quality resources, carry out efficient management and optimize capital allocation, increase the company's synergistic capacity, creating more abundant capital reserves for improving ESG performance.

Therefore, we propose the first hypothesis:

H1 Foreign mergers and acquisitions can promote the improvement of ESG performance of Chinese listed companies.

The Influence Mechanism of Cultural Effects on ESG Performance of Companies. Corporate cultural strength constitutes the core competitiveness of a company. Corporate culture, as a type of unwritten behavioral norm, is an internal constraint on employees and has better social effects than external constraints such as rules and regulations. Expanding the influence of green culture is an important way to promote the improvement of ESG performance of companies, and foreign mergers and acquisitions are to some extent an important means for companies to introduce green culture.

Therefore, we propose the second hypothesis:

H2: Foreign mergers and acquisitions can promote the improvement of ESG performance of companies by promoting the improvement of corporate culture.

3.2. Data Sources

As ESG has developed relatively late in China, in order to ensure the completeness and authenticity of the data, this paper uses panel data of non-financial enterprises listed on A-shares in China from 2017 to 2022 to evaluate the impact of foreign mergers and acquisitions on their ESG performance. The data comes from the CSMAR database. The following screening processes were carried out: (1) exclusion of financial, real estate and ST-type enterprises; (2) exclusion of enterprises whose acquisition of equity is less than 10%, only selecting enterprises that have already disclosed the completion date of foreign mergers and acquisitions; (3) if a company undergoes multiple mergers and acquisitions during the sample period, only the first merger and acquisition event is retained. Finally, 41 foreign mergers and acquisitions enterprises are selected as the treated group, and 765 enterprises that have not undergone foreign mergers and acquisitions are selected as the control group. Other financial data of companies come from the CSMAR database. To eliminate the influence of outliers, this paper carries out Winsorize processing on all continuous variables at the level of the upper and lower 1%. After the above processing, the initial sample size of this article is 4833 firm-year observations.

3.3. Variable Selection

3.3.1. Dependent Variable

This study selects corporate ESG performance (ESG) as the dependent variable and measures it using the HuaZhi ESG rating system. The HuaZhi ESG indicator system divides corporate ESG performance into nine levels of ratings from C to AAA. For convenience of empirical analysis, the nine levels (C, CC, CCC, B, BB, BBB, A, AA, AAA) are assigned values of 1-9 points respectively, forming the ESG variable.

3.3.2. Independent Variable

The core independent variable of the article is foreign mergers and acquisitions, which is used as the experimental group. Non-foreign mergers and acquisitions enterprises are used as the control group, constructing the binary dummy variable CBMA and time dummy variable t. The coefficient of the interaction term between CBMA and t represents the net effect of foreign mergers and acquisitions.

3.3.3. Control Variables

This study also selects other variables that influence corporate ESG performance as control variables.

Table 1. *Variable Selection.*

Variable Name	Description
ESG	Enterprise ESG rating (1-9)
CBMA	Assigned a value of 1 if the enterprise conducted foreign mergers and acquisitions during the sample period, otherwise 0
t	Assigned a value of 1 for the year after the enterprise conducted foreign mergers and acquisitions, otherwise 0
Asset	Logarithm of total assets
ROE	Net profit after tax /owner's equity
Leverage	Total liabilities /total assets
Quick	Quick assets/current liabilities
Age	Number of years since the company went public minus the observation period
Share	Percentage of shares held by the largest shareholder
growth	Ratio of owner's equity at the end to owner's equity at the beginning
Cash	Ratio of cash and cash equivalents to total assets

3.4. Model Design

3.4.1. DID Multi-Period Double Difference

The abstract is a brief introduction of the paper. It should include 200-400 words with no formulas, pictures, tables, superscripts or subscripts.

This paper uses a multi-period double difference method to compare the difference in ESG performance between foreign-acquired companies and non-foreign-acquired companies to determine the effect of foreign acquisitions. A multi-period double difference model is constructed:

$$\mathrm{ESG}_{it} = \alpha_0 + \alpha_1 \mathrm{CBMA}_{it} + \alpha_2 t_{it} + \alpha_3 \mathrm{CBMA}_{it} \times t_{it} + \lambda_i \sum \mathrm{Control} + c_t + c_i + \varepsilon_{it} \quad (1)$$

ESG_{it} measures the ESG performance of company i in period t. $\sum \mathrm{Control}$ is a combination of observable control variables that affect company ESG performance, including: company size (Asset), company ability (ROE), company leverage ratio (Leverage), company quick ratio (Quick), company age at listing (Age), shareholding concentration (Share), development ability (growth), and cash asset ratio (Cash). c_t is the annual fixed effect. c_i is the unobserved effect controlling for unobservable factors that remain constant over time. ε_{it} is the error term.

3.4.2. Propensity Score Matching (PSM)

The application of the DID method requires the common trend assumption, that is, the control and experimental group companies have no systematic differences in ESG performance over time, excluding the impact of foreign mergers and acquisitions. Therefore, we use the PSM-DID method proposed by Heckman to control for sample bias [16].

We use the propensity score matching method (PSM) to eliminate sample bias. We estimate the propensity score based on control variables and use logit regression to match the treated and control group companies based on the propensity score. The paired companies with the closest propensity score value are considered the matching companies for the foreign mergers and acquisitions companies. This method can minimize the systematic differences in ESG performance levels among different companies and reduce the DID estimation bias. We calculate the average treatment effect on the treated (ATT) by subtracting the ESG performance change of the matched other companies from that of the foreign mergers and acquisitions companies, to effectively measure the actual impact of foreign mergers and acquisitions on companies. The DID method can solve endogeneity problems and obtain policy treatment effects through double differences. The regression model based on the PSM-DID method in this paper is set as follows:

$$\mathrm{ESG}_{it}^{PSM} = \alpha_0 + \alpha_1 \mathrm{CBMA}_{it} + \alpha_2 t_{it} + \alpha_3 \mathrm{CBMA}_{it} \times t_{it} + \lambda_i \sum \mathrm{Control} + c_t + c_i + \varepsilon_{it} \quad (2)$$

3.5. Descriptive Statistics

Tables 2 and 3 show the descriptive statistics of variables and the analysis results of differences between the experimental and control groups. According to the results, the mean ESG performance of all selected sample companies is 4.134. There is a significant difference in innovation performance between the experimental and control groups. The average ESG performance of foreign-acquired enterprises is 4.75, with a median of 5, which is higher than the average performance (mean of 3.19, median of 4) of non-foreign-acquired enterprises, indicating that implementing foreign acquisitions does indeed have a certain impact on improving corporate ESG performance. The mean values of profitability (ROE), growth, and size of the experimental group are higher than those of the control group, indicating that the experimental group's average ability is higher than the control group's in many aspects.

Table 2. *Descriptive Statistics.*

Variable	Obs	Mean	Std.	dev.	Min	Max
ESG	4833	4.1340	4.0000	1.2830	1.0000	8.0000
Asset	4833	9.7390	9.6770	0.5460	8.7120	11.3400
ROE	4833	0.0394	0.0628	0.1690	-0.9960	0.3270
Leverage	4833	0.4270	0.4270	0.1820	0.0741	0.8650
Quick	4833	1.7250	1.2240	1.6190	0.2310	10.4000
Age	4833	14.2500	12.0000	7.4510	5.0000	29.0000
Share	4833	31.6000	29.7100	14.0300	7.7680	69.0600
growth	4833	0.1050	0.0551	0.2600	-0.4930	1.3760
Cash	4833	0.6290	0.3630	0.8140	0.0209	4.9350

Table 3. *Mean-Median Difference Test.*

Variable	Control N=4590		Treated N=243		Diff	
	Mean	Median	Mean	Median	Mean	Median
ESG	4.1000	4.0000	4.7500	5.0000	-0.6500***	42.7100***
Asset	9.7200	9.6600	10.1500	10.0600	-0.4300***	112.3900***
ROE	0.0400	0.0600	0.1100	0.1100	-0.0800***	53.4400***
Leverage	0.4200	0.4200	0.4700	0.4900	-0.0500***	19.4800***
Quick	1.7500	1.2400	1.2300	1.0100	0.5200***	24.3400***
Age	14.1100	12.0000	16.9800	14.0000	-2.8700***	18.9700***
Share	31.5700	29.7000	32.2600	30.5900	-0.6900	0.7400
growth	0.1000	0.0500	0.1600	0.0900	-0.0600***	28.4600***
Cash	0.6300	0.3600	0.5200	0.3600	0.1100**	0.0400

The results show that there is a significant difference between companies with and without foreign acquisitions. At the same time, some control variables also have significant differences, reflecting the rationality of using PSM methods to eliminate systematic differences.

4. Empirical Results and Analysis

4.1. The Impact of Foreign Acquisitions on Corporate ESG Performance

This paper assesses the impact of foreign acquisitions on corporate ESG performance using the multi-period DID method. The regression results in Table 4 reveal that foreign acquisitions have a significantly positive correlation with corporate ESG performance at the 1% significance level. The interaction coefficients of columns (1), (2), and (3) are 0.618, 0.483, and 0.442, respectively, and are all significantly and positively correlated with corporate ESG performance at the 1% significance level. As is shown in column (3), the inclusion of control variables and fixed effects confirms that foreign acquisitions increase corporate ESG performance by 44.18%, supporting H1 that foreign acquisitions enhance corporate ESG performance. The regression results also indicate that asset size, profitability, and quick ratio levels have a significant positive effect on improving corporate ESG performance, while a high leverage ratio has a negative effect.

Table 4. *Baseline Regression Results.*

Variable	(1)	(2)	(3)
	ESG	ESG	ESG
DID	0.6179*** (4.8955)	0.4829*** (4.7116)	0.4418*** (3.5475)
Asset		1.1077*** (16.6745)	1.6932*** (11.5278)
ROE		0.0604 (0.5643)	-0.2466** (-2.4855)
Leverage		-1.1652*** (-6.6609)	-1.1341*** (-5.2434)

Variable	(1)	(2)	(3)
	ESG	ESG	ESG
Quick		0.0220	0.0436*
		(1.0268)	(1.8433)
Age		-0.0305***	0.0000
		(-6.7288)	(.)
Share		0.0069***	0.0081**
		(3.1657)	(2.2634)
growth		-0.0333	-0.0403
		(-0.5473)	(-0.6268)
Cash		0.0185	0.0053
		(0.5204)	(0.1320)
_cons	4.0892***	-6.0004***	-12.1174***
	(140.4609)	(-9.9909)	(-8.7219)
Individual fixed effects	Yes	NO	Yes
Time fixed effects	Yes	NO	Yes
N	4833	4833	4833
R2	0.0409		0.0988

z statistics in parentheses
* p < 0.1, ** p < 0.05, *** p <0.01

4.2. Robustness Test Based on PSM-DID Method

To avoid sample selection bias, this study uses the PSM-DID method to overcome systematic differences in ESG performance between foreign-acquired and non-foreign-acquired enterprises. The method uses a logit regression to control variables and obtain propensity scores to match enterprises with the closest scores, reducing differences in ESG performance. The effectiveness of the PSM method is tested by checking the balance of variables and whether there is a significant difference between the matched experimental and control groups. The results indicate a good matching effect, with no significant statistical differences between the variables of the experimental and control groups.

The figure below shows the density function graphs of the propensity scores before and after matching. Comparing the two graphs, it is clear that the probability density of the propensity scores after matching is closer, indicating a better matching effect. Based on the common support hypothesis, this supports the feasibility and rationality of the PSM-DID method.

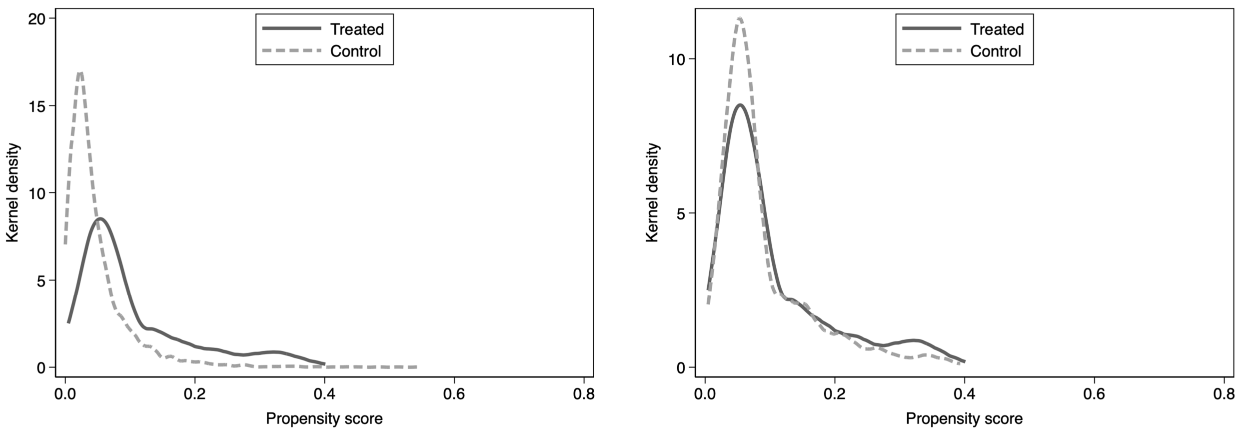

Figure 1. *Density Plot before Matching/after Matching.*

Table 5. *Balance Test Result.*

Variable	Mean		%bias	t-test	
	Treated	Control		t	P>|t|
Asset	10.1500	10.1300	0.0380	0.4100	0.6820
ROE	0.1136	0.1157	-0.0150	-0.2400	0.8070
Leverage	0.4702	0.4661	0.0260	0.3000	0.7640
Quick	1.2333	1.2198	0.0100	0.1600	0.8700
Age	16.9840	16.8480	0.0180	0.2000	0.8450
Share	32.2560	32.2540	0.0000	0.0000	0.9990
growth	0.1579	0.1737	-0.0630	-0.6900	0.4920
Cash	0.5221	0.5194	0.0040	0.0500	0.9600

The Table 6 below presents the regression results of the robustness test. Column (1) shows the baseline regression results, and columns (2)-(4) show the results of regression using different methods of PSM matching. Despite a decrease in the coefficient of the interaction term, foreign mergers and acquisitions still have a significant positive impact on ESG performance of firms, increasing it by about 39%. The PSM-DID estimation results are consistent with the previous DID results, indicating that foreign mergers and acquisitions have a significant positive impact on the ESG level of firms. Therefore, the baseline regression results remain robust, even after accounting for selection bias.

Table 6. *Robustness Test Results for PSM-DID.*

Variable	(1)	(2)	(3)	(4)
	ESG	ESG	ESG	ESG
DID	0.4418***	0.3857***	0.3999***	0.3847***
	(3.5475)	(3.4623)	(3.9165)	(3.5507)
Asset	1.6932***	0.7644***	0.8185***	0.7861***
	(11.5278)	(8.1273)	(20.4400)	(8.7789)
ROE	-0.2466**	0.8932*	2.1012***	0.8028
	(-2.4855)	(1.6661)	(9.3207)	(1.5987)
Leverage	-1.1341***	-0.8750**	-1.1492***	-1.0738***
	(-5.2434)	(-2.2869)	(-7.7024)	(-2.9634)
Quick	0.0436*	0.0038	0.0045	-0.0362
	(1.8433)	(0.0387)	(0.1433)	(-0.3777)
Age	0.0000	-0.0039	-0.0227***	-0.0048
	(.)	(-0.6474)	(-8.8204)	(-0.8305)

Variable	(1)	(2)	(3)	(4)
	ESG	ESG	ESG	ESG
Share	0.0081**	0.0066**	0.0064***	0.0054*
	(2.2634)	(2.1364)	(5.0835)	(1.8315)
growth	-0.0403	-0.1534	-0.0907	-0.1361
	(-0.6268)	(-0.7989)	(-1.1431)	(-0.7535)
Cash	0.0053	0.0918	0.0597	0.1188
	(0.1320)	(0.6778)	(1.3543)	(0.9059)
_cons	-12.1174***	-3.1617***	-3.3691***	-3.1889***
	(-8.7219)	(-3.5169)	(-9.2301)	(-3.7456)
N	4833	660	4469	728
R2	0.0988	0.1873	0.1586	0.1905

z statistics in parentheses
* p < 0.1, ** p < 0.05, *** p <0.01

4.3. Further Robustness Test

A further robustness test is conducted by replacing the dependent variable. Here, the ESG rating data from Wind Financial Terminal for the years 2018-2022 is used. The results show that the benchmark regression remains significant, indicating that foreign mergers and acquisitions have a positive and significant impact on the ESG performance of companies.

Table 7. *Robustness test results.*

Variable	(1)	(2)
	ESG	ESG
DID	0.5735***	0.4485***
	(4.6531)	(3.6720)
Asset		1.9280***
		(10.2818)
ROE		-0.2437**
		(-2.2895)
Leverage		-1.1946***
		(-4.7881)
Quick		0.0423*
		(1.6649)
Age		0.0000
		(.)
Share		0.0074*
		(1.7980)
growth		-0.2668***
		(-2.9745)
Cash		-0.0377
		(-0.8196)
_cons	4.1301***	-14.3135***
	(152.9935)	(-8.0539)
N	4030	4030
R2	0.0504	0.1082

z statistics in parentheses
* p < 0.1, ** p < 0.05, *** p <0.01

4.4. Mechanism Test

Corporate culture is a key non-financial factor affecting a company's ESG performance. When foreign capital acquires a company, its culture will influence the target company's ESG performance. Therefore, we propose H2 that foreign mergers and acquisitions can enhance corporate culture and thus promote better ESG performance.

To test H2, this study creates a cultural effect variable by identifying green culture keywords like "stakeholders, social responsibility, sustainable development, environmental protection, biodiversity, energy conservation and emissions reduction, circular economy, clean production, low-carbon operations, and green ecology" in company annual reports using text analysis methods [17]. The logarithm of the frequency of these keywords is then logged to measure the emphasis on social responsibility in corporate culture. The study aims to examine the relationship between the cultural effect variable and ESG performance, to determine if it serves as the mechanism through which foreign mergers and acquisitions impact corporate ESG performance.

This study uses Baron and Kenny three-step method to test for cultural effects [18]. Step 1: Regress the double difference term and the corporate cultural effect separately to see if foreign mergers and acquisitions affect cultural effects. Step 2: Regress the double difference term and corporate ESG performance to see if foreign mergers and acquisitions affect ESG performance. Step 3: Regress the double difference term and cultural effect separately with corporate ESG performance to confirm whether the double difference term becomes insignificant or significant and the coefficient decreases. The model is set as follows:

Verify the impact of foreign mergers and acquisitions on cultural effect:

$$\mathrm{Culture}_{it} = \alpha_0 + \alpha_1 \mathrm{CBMA}_{it} \times t_{it} + \lambda_i \sum \mathrm{Control} + \varepsilon_{it} \quad (3)$$

Verify the impact of foreign mergers and acquisitions on ESG performance:

$$\mathrm{ESG}_{it} = \beta_0 + \beta_1 \mathrm{CBMA}_{it} \times t_{it} + \lambda_i \sum \mathrm{Control} + \varepsilon_{it} \quad (4)$$

Include the treatment effect and cultural effect separately in the regression equation:

$$\mathrm{ESG}_{it} = \gamma_0 + \gamma_1 \mathrm{CBMA}_{it} \times t_{it} + \gamma_2 \mathrm{Culture}_{it} + \lambda_i \sum \mathrm{Control} + \varepsilon_{it} \quad (5)$$

The results of the three-step regression are reflected in columns (1), (2), and (3) of the table below. In the first step, foreign mergers and acquisitions have a significant positive impact on corporate cultural effects. The second step shows that foreign mergers and acquisitions have a significant positive impact on ESG performance. The third step confirms that the cultural effect has a positive promoting effect on the improvement of corporate ESG performance, and the coefficient of the double difference variable becomes insignificant, indicating that foreign mergers and acquisitions improve corporate culture through the cultural effect. H2 is supported.

Table 8. *Mechanism Test - Cultural Effect.*

	(1)	(2)	(3)
	Culture	ESG	ESG
DID	0.1173**	0.3951***	0.2101
	(2.3068)	(3.2727)	(1.3201)
Asset	0.3663***	0.9314***	0.9343***
	(11.7056)	(13.1655)	(12.4557)
ROE	-0.0145	0.1130	0.1186
	(-0.4024)	(1.0296)	(1.0724)

	(1)	(2)	(3)
	Culture	**ESG**	**ESG**
Leverage	-0.0052 (-0.0596)	-1.1473*** (-6.0716)	-1.1958*** (-6.2005)
Quick	-0.0053 (-0.6435)	0.0090 (0.4025)	0.0081 (0.3593)
Age	-0.0057** (-2.4207)	-0.0248*** (-5.3141)	-0.0258*** (-5.4500)
Share	-0.0029*** (-3.0086)	0.0087*** (4.0271)	0.0085*** (3.8766)
growth	-0.0326* (-1.6511)	-0.0061 (-0.0990)	-0.0032 (-0.0522)
Cash	-0.0293** (-2.0788)	0.0604* (1.6754)	0.0569 (1.5712)
Culture			0.0128 (0.2586)
_cons	-0.7261*** (-2.6153)	-4.4879*** (-7.0418)	-4.5060*** (-6.8621)
N	3902	3990	3902

z statistics in parentheses
* p < 0.1, ** p < 0.05, *** p <0.01

4.5. Heterogeneity Analysis

To further investigate the heterogeneity of the impact of foreign M&A on corporate ESG performance, this paper explores heterogeneity from two aspects: the corporate level and the ESG indicator level. The classification test is conducted based on the country where the acquiring party is located, the size of the enterprise, and the ESG three-dimensional indicators.

4.5.1. Institutional Effect - The Country of the Acquiring Party

We investigates the institutional effect on corporate ESG performance and divides the sample into Hong Kong and foreign enterprise acquisitions based on the country of the acquiring party. The results show that foreign enterprise acquisitions have a greater positive impact on ESG performance compared to Hong Kong enterprise acquisitions. This may be related to the institutional requirements for ESG responsibility in the country where the acquiring party is located. The smaller difference in institutional factors between Hong Kong, Macao, Taiwan, and Chinese domestic enterprises may result in a smaller impact and improvement in ESG performance. Thus, domestic enterprises acquired by enterprises from these regions have lower ESG performance improvement than foreign-invested enterprises.

Table 9. *Heterogeneity Analysis Results - the Acquiring Firm's Country.*

	(1)	(2)
	ESG (HongKong firm)	**ESG (Foreign firm)**
DID	0.3498** (2.3072)	0.6926*** (3.8700)
_cons	-12.0118*** (-8.4553)	-12.2605*** (-8.7329)
Individual fixed effects	Yes	Yes
Time fixed effects	Yes	Yes
N	4767	4656
R2	0.0931	0.0948

z statistics in parentheses
* p < 0.1, ** p < 0.05, *** p <0.01

4.5.2. Enterprise Scale

Sample companies were categorized based on whether they have an asset greater than the average into large-scale and small-scale enterprises. Regression results in Table 10 indicate that large-scale enterprises perform better in ESG, with a unit change in the interaction term for large-scale enterprises leading to a 0.6885 unit increase in ESG performance, while the same change leads to a 0.3912 unit increase in ESG performance for small-scale enterprises. This difference can be attributed to the larger corporate funds available to undertake social value for larger enterprises, enhancing ESG performance, and larger companies have stronger capabilities to update technologies and reduce pollution emissions, leading to better ESG performance than smaller companies.

Table 10. *Heterogeneity Analysis Results - Enterprise Scale.*

	(1)	(2)
	ESG (large size)	**ESG (small size)**
DID	0.7559*** (3.8290)	0.3571** (2.4365)
_cons	-12.1669*** (-8.5222)	-12.0944*** (-8.4958)
Individual fixed effects	Yes	Yes
Time fixed effects	Yes	Yes
N	4686	4737
R2	0.0945	0.0899

z statistics in parentheses
* p < 0.1, ** p < 0.05, *** p <0.01

4.5.3. ESG Three Dimensions

This study further investigated the impact of foreign mergers and acquisitions on the performance of ESG indicators in each dimension. The ESG indicators were divided into three dimensions: environmental, social, and governance. As shown in columns (1), (2) and (3), the study found that foreign mergers and acquisitions mainly improved a company's environmental and governance performance but the impact on social performance was not significant. These findings confirm the main effect regression and the discussion of using green culture as a mediating variable to influence a company's overall ESG performance.

Table 11. *Heterogeneity Analysis - ESG Three Dimensions.*

	(1)	(2)	(3)
	Environmental	**Social**	**Governance**
DID	0.5187* (1.7686)	0.3254 (1.3348)	0.3971*** (3.4336)
_cons	-10.0333*** (-7.5680)	-0.2889 (-0.2357)	1.0938** (2.1430)
Individual fixed effects	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes
N	2458	2458	2458

z statistics in parentheses
* p < 0.1, ** p < 0.05, *** p <0.01

5. Conclusions

This paper used propensity score matching and multi-period difference-in-differences methods to examine the impact and mechanism of foreign mergers and acquisitions on the ESG performance of Chinese listed companies from 2017 to 2022. The study conducted subgroup tests from the perspectives of main acquiring companies, target company size, and ESG indicator classification. The results showed that (1) Foreign mergers and acquisitions have a significant and robust effect on improving ESG performance, particularly on environmental indicators. (2) Foreign companies and large-scale companies can create a greater impact on improving ESG performance. (3) The mechanism of action is related to the green culture effect, where foreign mergers and acquisitions amplify the impact of corporate green culture on ESG performance.

The research findings of this paper provide insights for enterprises: (1) All enterprises should fulfill ESG responsibilities to improve their ESG performance and promote sustainable development. (2) Considering the impact of foreign mergers and acquisitions on ESG performance, enterprises should have a broader international vision, actively respond to the opening of the capital market. (3) Enterprises should consider institutional and scale factors before foreign mergers and acquisitions, and understand the cultural differences between countries. After the merger and acquisition, they should use the cultural effects to improve ESG performance. There are two policy implications from a government perspective: (1) Foreign investment will promote the improvement of China's ESG disclosure system and standards through the adoption of advanced ESG governance systems abroad. (2) The research findings of this paper support the development of a dual circulation pattern and relaxation of restrictions on foreign investment by alleviating concerns about negative effects of foreign mergers and acquisitions.

This study has some limitations and areas for future research. The sample may not be fully representative due to data availability limitations. Future research should strive to collect more extensive data. Additionally, there is room to enhance the quantitative accuracy of ESG performance, and more advanced assessment methods should be utilized. Furthermore, more research can be conducted based on comprehensive and precise subcategory data on environment, social, and governance to expand the research perspective.

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