






“Environmental, social, and governance performance: The role of Chinese employee stock ownership plans”

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ENVIRONMENTAL, SOCIAL, AND GOVERNANCE PERFORMANCE: THE ROLE OF CHINESE EMPLOYEE STOCK OWNERSHIP PLANS

Abstract

The challenges of global warming, resource depletion, and environmental protection require immediate action from corporations, governments, and communities globally. Implementing environmental, social, and governance (ESG) measures represents a key strategy for corporations in addressing sustainability concerns. This study investigates how the ESG performance of publicly listed companies in China is influenced by employee stock ownership plans (ESOPs). Utilizing a dataset covering 4,464 publicly listed Chinese corporations from 2009 to 2022, this analysis employs fixed-effects regressions to reveal the beneficial impact of ESOPs on corporate ESG ratings. A firm's transition from non-ESOP to ESOP status raises ESG ratings by 1.213, representing 22% of the ESG score's standard deviation. The findings indicate that greater involvement of the top management team in an ESOP weakens the positive impact of the ESOP on corporate ESG performance. The positive impact of ESOPs on ESG performance is insignificant in the agriculture sector but more pronounced in the manufacturing and service sectors, where the transition to ESOP status results in ESG score increases of 1.122 and 1.500, respectively. The issue of endogeneity is addressed by utilizing a lagged ESOP independent variable and applying two-stage least squares regression with the average ESOP serving as the instrumental variable. The findings confirm that causality runs from ESOP to ESG rather than ESG influencing ESOP.

Keywords

environmental sustainability, ESG, employee stock ownership plan, top management team, two-stage least squares, China

JEL Classification

Q56, Q51, Q58, M14

INTRODUCTION

The ratification of the 2015 Paris Agreement by 194 nations and the European Union reflects a global consensus on the urgent need to address the environmental and societal impacts of climate change. This agreement emphasizes not only the need for reduced greenhouse gas emissions but also the integration of sustainability into economic frameworks. China's 14th Five-Year Plan (2021–2025) reflects this, committing to peak carbon emissions before 2030 and promoting strategies that foster sustainable economic development alongside environmental protection. Government agencies, now more than ever, are tasked with balancing the contradictions between economic growth and the imperative to preserve natural resources, creating regulatory environments that incentivize sustainable corporate behavior. Environmental, social, and governance (ESG) metrics have emerged as key tools for assessing how well firms comply with these regulatory frameworks and contribute to sustainability goals. In China, the importance of corporate ESG information has gained prominence, as seen in the 2020 regulations by the China Securities Regulatory Commission, which mandate full disclosure of environmental risks, carbon footprints, and sustainability performance (Hasmath, 2020).

Investors, too, are increasingly aligning their portfolios with firms that demonstrate robust ESG performance, particularly in areas of environmental responsibility and risk management, reflecting a broader trend toward prioritizing long-term environmental sustainability over short-term financial gains. This shift reflects a growing recognition that firms must internalize environmental externalities and play a proactive role in addressing global environmental challenges.

In 2014, the China Securities Regulatory Commission introduced guidelines and regulations for implementing employee stock ownership plans (ESOPs) among Chinese listed companies (Zito, 2014). This initiative spurred the rapid development and expansion of ESOPs across firms in China, with the potential to reshape corporate governance and align it with environmental sustainability goals. As employees' financial interests increasingly align with those of company principals, a growing body of research has emerged investigating the impact of ESOPs on various aspects of corporate operations. However, limited research has explored how ESOPs influence ESG metrics, particularly with respect to environmental sustainability and resource management. ESG scores, which measure a company's sustainability performance (Rajesh & Rajendran, 2020), are central to this study. This study focuses on how ESOPs affect environmental sustainability outcomes in publicly listed Chinese companies, contributing to the broader literature on environmental economics and corporate sustainability. By analyzing the effects of ESOPs on ESG scores, with particular attention to the environmental dimensions, this analysis seeks to provide a stronger foundation for corporate decision-making and public policy development that aims to foster sustainable development.

1. LITERATURE REVIEW AND HYPOTHESES

1.1. Determinants of sustainability development

ESG ratings have become essential tools for evaluating a firm's commitment to environmental sustainability and social responsibility (Rajesh & Rajendran, 2020). Understanding the factors that influence these ratings is crucial for both investment strategies and enhancing corporate sustainability practices (Park & Jang, 2021). Zheng et al. (2023) illustrate that customer concentration plays a significant role in shaping ESG outcomes. A reliance on a limited number of customers can reduce a firm's operational flexibility, negatively impacting both its innovation capacity and environmental performance. Madison and Schiehl (2021) emphasize that financial materiality greatly enhances the predictive value of ESG ratings, providing clearer guidance for sustainability-driven investment decisions. Legal frameworks also play a critical role in ESG performance. For example, Lu and Cheng (2023) highlight that China's environmental protection law has served as an important driver in improving the environmental and social performance of state-owned enterprises. Liang et

al. (2023) further examine how ESG ratings affect stock liquidity risk, particularly within Chinese equity markets, offering insights into the broader economic implications of sustainable business practices. The growing integration of sustainability into corporate strategies is seen as essential to addressing global environmental challenges, such as climate change and resource depletion, thus aligning with international environmental goals.

The industry and sector in which a firm operates are crucial determinants of its ESG performance, as different sectors encounter distinct environmental and sustainability challenges. For instance, the energy and mining industries often face more pressing environmental concerns related to resource depletion and pollution management, while the healthcare sector tends to prioritize social and governance dimensions. Similarly, the service and manufacturing sectors emphasize social responsibility and governance practices, whereas the agriculture sector is primarily focused on achieving environmental sustainability through efficient resource use and land management. Consequently, industry and sector-specific factors play a critical role in shaping a firm's ESG score. Ermakova et al. (2023) emphasize the importance of sector-specific approaches to accurately evaluate ESG performance, particularly in addressing the en-

vironmental impacts intrinsic to each industry. This highlights the need for tailored strategies that consider the unique environmental and social responsibilities of each sector.

1.2. Impacts of ESOPs on corporations

ESOPs can influence corporate performance and contribute to sustainability goals. Blair et al. (2000) found that ESOP adoption leads to higher sales and employment growth. In contrast, Lai et al. (2022) observed no correlation between ownership concentration and performance in entrepreneurial firms. Moreover, ESOPs can support long-term sustainability by aligning employee interests with environmental objectives and encouraging corporate innovation in areas such as resource management and pollution control. Zhang (2023) demonstrated that ESOPs enhance corporate patent output. Bova et al. (2015) suggest that employee ownership may curb speculative managerial behaviors and promote stable corporate performance. In the context of environmental economics, ESOPs offer potential benefits by fostering long-term decision-making that balances economic performance with environmental sustainability. While ESOPs have been linked to stock price increases (Cramton et al., 2008), their broader contributions to corporate stability, wealth accumulation, and sustainability make them relevant within the environmental economics discourse (Weissbourd et al., 2021; Fatihat, 2021; Schneider, 2020).

1.3. Impacts of ESOPs on ESG performance through various channels

Institutional stock ownership plays a crucial role in shaping corporate decision-making, particularly with respect to sustainability and environmental protection goals (Lee & Chuang, 2009). The alignment between institutional investors and the company's long-term performance trajectory strengthens incentives to pursue environmental sustainability and social responsibility (Chaganti & Damanpour, 1991). This alignment is driven by institutional investors' interest in promoting the company's long-term success, which safeguards their financial stakes while also ensuring compliance with environmental regulations (Fama & Jensen, 1983). Research high-

lights the role of institutional holdings in promoting corporate environmental performance. For example, Chen et al. (2020) reveal that an exogenous increase in institutional holdings, spurred by Russell Index reconstitutions, positively influences portfolio firms' ESG performance. Lopez-de-Silanes et al. (2024) find that while investors tend to incorporate high-quality ESG companies into their portfolios, a negative correlation exists between ESG ratings and large ownership stakes, highlighting the complexity of this relationship. Velte (2020) demonstrates that long-term institutional ownership is associated with improved ESG performance. Moreover, higher ESG performance tends to attract a greater share of institutional investors, creating a positive feedback loop in corporate environmental responsibility.

ESOPs can influence ESG performance through various channels. The implementation of an ESOP signals a culture of collective ownership, which not only enhances corporate governance but also contributes to environmental stewardship (Barrick et al., 2015). Higher levels of ESOP participation are linked to positive employee attitudes and lower turnover (Klein, 1987), factors that also play a crucial role in the company's ability to manage environmental risks and sustainability practices. The company's commitment to its workforce, through an ESOP, not only boosts employee satisfaction but also encourages engagement in long-term environmental goals and corporate sustainability initiatives, which are crucial for ensuring both economic and environmental prosperity. Additionally, ESOPs promote greater transparency and accountability in corporate governance, reinforcing sustainability-focused decision-making (Jung & Choi, 2021). A high participation rate in an ESOP helps to improve governance practices, aligning the company's operations with broader sustainability objectives. This dynamic encourages stakeholder involvement in the company's decision-making processes and drives corporate strategies toward sustainable development. Zhou et al. (2022) demonstrate that ESOPs in Chinese publicly traded companies create external economic incentives and internal psychological motivators, augmenting employee participation in corporate social and environmental responsibility initiatives.

1.4. Involvement of the top management team in ESOPs

The top management team (TMT) plays a pivotal role in moderating the relationship between ESOP and ESG performance, particularly regarding environmental sustainability. TMT members, who are deeply involved in corporate governance and decision-making, can align ESOP initiatives with long-term environmental goals and sustainability strategies (Hambrick et al., 1996). Empirical studies have shown that greater TMT participation enhances corporate governance, facilitates better management of environmental risks, and improves ESG performance (Cogin et al., 2018). Higher TMT ownership reflects a commitment to the company's long-term success, particularly in meeting sustainability objectives, which bolsters confidence in the firm's future (Schwenk, 1993). TMT diversity, such as gender diversity, has been found to foster innovation (Alexiev et al., 2010), and it helps mitigate the negative impacts of ESG controversies on firm value (Al-Hiyari, 2024). TMT participation thus strengthens the company's capacity to meet both economic and environmental goals, making it a critical factor in improving overall ESG outcomes (Sang et al., 2024).

This study aims to investigate how the ESG performance of publicly listed companies in China is influenced by ESOPs and how TMT participation moderates the ESOP-ESG relationship. Based on the analysis of the relevant literature, this study posits the following two hypotheses:

- H1: ESOP positively impacts ESG performance within Chinese listed companies.*
- H2: The positive impact of ESOP on ESG performance is amplified with greater levels of TMT participation in ESOP.*

2. METHOD

The study utilizes data from two sources. ESG rating datasets are obtained from the Sino-Securities Index Information Service, while the remaining datasets are sourced from the China Stock Market & Accounting Research database. The sample pe-

riod spans from 2009 to 2022, with data collected annually. Observations with missing values in the relevant variables are excluded. The final sample includes 37,224 firm-year observations, representing 4,464 unique firms, of which 648 have implemented an ESOP.

The relationship between ESG ratings and ESOP is analyzed using the following multivariate regression:

$$\begin{aligned}
 ESG_{i,t} = & \beta_0 + \beta_1 ESOP_{i,t} + \beta_2 FirmSize_{i,t} \\
 & + \beta_3 FirmAge_{i,t} + \beta_4 Leverage_{i,t} \\
 & + \beta_5 LiqAsset_{i,t} + \beta_6 CashFlow_{i,t} \\
 & + \beta_7 ROA_{i,t} + \beta_8 Top1_{i,t} + \beta_9 BoardSize_{i,t} \\
 & + \beta_{10} TMTAge_{i,t} + \beta_{11} TMTPay_{i,t} \\
 & + YearFE + IndustryFE + \varepsilon_{i,t},
 \end{aligned} \tag{1}$$

where the subscript i represents company i and t indicates year t . The dependent variable, ESG , is a composite score assessing a company's performance across environmental, social, and governance dimensions. The key independent variable, $ESOP$, is measured using either $ESOPRatio$ or $ESOPDum$. $ESOPRatio$ is the proportion of shares allocated to the ESOP relative to the company's total outstanding shares. $ESOPDum$ is defined as a dummy variable equal to one for companies that implemented an ESOP in year t and zero otherwise. The remaining variables in Equation (1) are control variables expected to influence ESG ratings. $FirmSize$ is measured as the natural logarithm of a firm's total assets. $FirmAge$ is defined as the number of years since the company's establishment. $Leverage$ is calculated as the ratio of total liabilities to total assets. $LiqAsset$ is the ratio of liquid assets to total assets. $CashFlow$ is defined as the net cash flows from operating activities divided by total assets. ROA measures net income divided by total assets. $Top1$ represents the stock ownership of the largest shareholder. $BoardSize$ is measured as the natural logarithm of the number of board directors. $TMTAge$ denotes the average age of the TMT. $TMTPay$ is the natural logarithm of total executive compensation. $YearFE$ and $IndustryFE$ represent year and industry fixed effects, respectively. β represents the estimated regression coefficient, while ε denotes the error term.

3. RESULTS

Table 1 provides descriptive statistics for the sample variables. The mean ESG score is 72.886, ranging from 36.620 to 92.930, indicating substantial variability in ESG ratings. Only 14.5% of firms in the sample, totaling 648, have implemented ESOPs. Consequently, 85.5% of firms report an *ESOPDum* variable value of 0, leading to extremely small values for related variables such as *ESOPRatio* and *ESOPDum*. *ESOPRatio*, which measures the proportion of shares allocated to ESOP relative to total shares outstanding, averages 0.036% with a standard deviation of 0.304%, highlighting considerable variation in ESOP. *ESOPDum* has an average of 0.025 and a standard deviation of 0.157, indicating the relatively low adoption of ESOP. *FirmSize*, calculated as the natural logarithm of total assets, shows an average of 22.127 with a standard deviation of 1.383. *FirmAge* averages 2.873 with a standard deviation of 0.362, suggesting that the sampled firms are relatively young. *Leverage*, measured as the debt ratio, averages 0.446, implying a moderate level of indebtedness. *LiqAsset*, with a mean of 2.677% and a standard deviation of 4.139%, reflects diverse liquidity levels among the firms. *CashFlow* averages 4.4%, indicating healthy cash flow conditions. *ROA*, as a measure of profitability, averages 3.7% with

a significant standard deviation of 18.7%. *Top1*, which represents the percentage of shares held by the largest shareholder, averages 34.356% with a standard deviation of 15.072%, indicating a high concentration of ownership. *BoardSize*, defined as the natural logarithm of the number of board directors, averages 2.126 with a standard deviation of 0.202, suggesting consistent board sizes across firms. *TMTAge*, with an average of 49.085 and a standard deviation of 3.276, indicates limited age diversity within top management. *TMTPay*, calculated as the natural logarithm of total compensation for TMTs, averages 15.238 with a standard deviation of 0.806, reflecting minimal variation in executive compensation. Finally, *TMTRatio*, measured as the proportion of ESOP shares allocated to the TMT relative to the total ESOP shares, averages 0.715%, reflecting a relatively low level due to the limited implementation of ESOPs across firms.

Table 2 presents the correlations among all variables. The correlations between the dependent variable (*ESG*) and the independent variables (*ESOPRatio* and *ESOPDum*) are significantly positive, supporting H1. Additionally, there is a positive correlation between *ESG* and *FirmSize*, *LiqAsset*, *CashFlow*, *ROA*, *Top1*, *BoardSize*, *TMTAge*, *TMTPay*, and *TMTRatio*. This implies that firms with higher ESG scores tend to be larger in scale,

Table 1. Descriptive statistics

Variable	Obs	Mean	Std.Dev.	Min	P25	Median	P75	Max
<i>ESG</i>	37,224	72.886	5.604	36.620	69.850	73.320	76.630	92.930
<i>ESOPRatio</i>	37,224	0.036	0.304	0.000	0.000	0.000	0.000	9.210
<i>ESOPDum</i>	37,224	0.025	0.157	0.000	0.000	0.000	0.000	1.000
<i>FirmSize</i>	37,224	22.127	1.383	0.000	21.178	21.939	22.874	28.636
<i>FirmAge</i>	37,224	2.873	0.362	0.000	2.639	2.944	3.135	4.159
<i>Leverage</i>	37,224	0.446	0.656	-0.195	0.257	0.419	0.587	58.082
<i>LiqAsset</i>	37,224	2.677	4.139	-5.132	1.128	1.661	2.788	204.742
<i>CashFlow</i>	37,224	0.044	0.123	-11.056	0.006	0.045	0.087	2.457
<i>ROA</i>	37,224	0.037	0.187	-7.285	0.009	0.035	0.069	20.788
<i>Top1</i>	37,224	34.356	15.072	0.286	22.719	32.030	44.486	89.991
<i>BoardSize</i>	37,224	2.126	0.202	0.000	1.946	2.197	2.197	2.890
<i>TMTAge</i>	37,224	49.085	3.276	35.600	46.915	49.160	51.290	62.880
<i>TMTPay</i>	37,224	15.238	0.806	9.385	14.749	15.232	15.735	18.780
<i>TMTRatio</i>	37,224	0.715	5.720	0.000	0.000	0.000	0.000	100.000

Note: *ESG* represents a firm's ESG performance. *ESOPRatio* measures the proportion of shares allocated to the ESOP. *ESOPDum* is a dummy variable that indicates whether a firm has implemented an ESOP. *FirmSize* is the natural logarithm of total assets, while *FirmAge* captures the number of years since the firm's establishment. *Leverage* is defined as the ratio of total liabilities to total assets, *LiqAsset* reflects liquid assets as a percentage of total assets, and *CashFlow* is the ratio of net operating cash flows to total assets. *ROA* denotes the net income-to-assets ratio, *Top1* represents the ownership share of the largest shareholder, *BoardSize* is the natural logarithm of the number of board members, *TMTAge* is the average age of top management, *TMTPay* is the natural logarithm of total compensation for top management, and *TMTRatio* represents the proportion of shares held by top management in the ESOP.

Table 2. Pairwise correlations

Variable	ESG	ESOPRatio	ESOPDum	FirmSize	FirmAge	Leverage	LiqAsset	CashFlow	ROA	Top1	BoardSize	TMTAge	TMTPay	TMTRatio
ESG	1	—	—	—	—	—	—	—	—	—	—	—	—	—
ESOPRatio	0.028***	1	—	—	—	—	—	—	—	—	—	—	—	—
ESOPDum	0.051***	0.727***	1	—	—	—	—	—	—	—	—	—	—	—
FirmSize	0.241***	0.016***	0.051***	1	—	—	—	—	—	—	—	—	—	—
FirmAge	-0.054***	0.016***	0.022***	0.175***	1	—	—	—	—	—	—	—	—	—
Leverage	-0.089***	-0.004	-0.006	0.058***	0.064***	1	—	—	—	—	—	—	—	—
LiqAsset	0.056***	-0.016***	-0.019***	-0.236***	-0.144***	-0.175***	1	—	—	—	—	—	—	—
CashFlow	0.086***	0.006	0.012**	0.092***	0.006	-0.140***	0.008	1	—	—	—	—	—	—
ROA	0.082***	0.008	0.016***	0.015***	-0.022***	-0.219***	0.040***	0.017***	1	—	—	—	—	—
Top1	0.129***	-0.028***	-0.038***	0.212***	-0.114***	-0.003	-0.017***	0.068***	0.041***	1	—	—	—	—
BoardSize	0.045***	-0.023***	-0.027***	0.247***	0.004	0.042***	-0.090***	0.039***	0.009*	0.030***	1	—	—	—
TMTAge	0.125***	-0.006	-0.006	0.378***	0.235***	0.009*	-0.116***	0.056***	0.009*	0.122***	0.197***	1	—	—
TMTPay	0.268***	0.040***	0.083***	0.530***	0.173***	-0.036***	-0.059***	0.131***	0.064***	0.001	0.164***	0.239***	1	—
TMTRatio	0.020***	0.571***	0.754***	0.024***	0.022***	-0.006	-0.014***	0.006	0.009*	-0.031***	-0.021***	-0.011**	0.061***	1

Note: *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively. *ESG* represents a firm's ESG performance. *ESOPRatio* measures the proportion of shares allocated to the ESOP. *ESOPDum* is a dummy variable that indicates whether a firm has implemented an ESOP. *FirmSize* is the natural logarithm of total assets, while *FirmAge* captures the number of years since the firm's establishment. *Leverage* is defined as the ratio of total liabilities to total assets, *LiqAsset* reflects liquid assets as a percentage of total assets, and *CashFlow* is the ratio of net operating cash flows to total assets. *ROA* denotes the net income-to-assets ratio, *Top1* represents the ownership share of the largest shareholder, *BoardSize* is the natural logarithm of the number of board members, *TMTAge* is the average age of top management, *TMTPay* is the natural logarithm of total compensation for top management, and *TMTRatio* represents the proportion of shares held by top management in the ESOP.

maintain greater liquidity and cash flows, exhibit stronger profitability, have higher shareholder ownership concentration, possess larger boards, and feature older management teams with higher levels of executive compensation. However, *ESG* is negatively correlated with *FirmAge* and *Leverage*, indicating that younger firms and those with lower leverage tend to have higher ESG ratings. Nearly all correlation coefficients have magnitudes below 0.5, indicating a lack of multicollinearity among the explanatory variables. Notably, *ESOPRatio*, *ESOPDum*, and *TMTRatio* show strong positive correlations of 0.727, 0.571, and 0.754, respective-

ly. Consequently, this study includes only one of these variables in the multivariate regressions.

Table 3 reports the results of the baseline multivariate regressions, incorporating both year- and industry-fixed effects, estimated according to Equation (1). Both columns indicate that the coefficients for *ESOPRatio* and *ESOPDum* are statistically significant at the 1% level. A 1% increase in *ESOPRatio* is associated with a 0.446 increase in the ESG score, which represents 8% of the standard deviation of the ESG score. This indicates that the effect of *ESOPRatio* on ESG ratings is

Table 3. Baseline regressions

Variable	(1)	(2)
	<i>ESG</i>	<i>ESG</i>
<i>ESOPRatio</i>	0.446*** (0.087)	–
<i>ESOPDum</i>	–	1.213*** (0.169)
<i>FirmSize</i>	0.699*** (0.027)	0.693*** (0.027)
<i>FirmAge</i>	–1.393*** (0.088)	–1.387*** (0.088)
<i>Leverage</i>	–0.517*** (0.043)	–0.518*** (0.043)
<i>LiqAsset</i>	0.110*** (0.007)	0.110*** (0.007)
<i>CashFlow</i>	1.748*** (0.222)	1.748*** (0.222)
<i>ROA</i>	1.288*** (0.145)	1.278*** (0.145)
<i>Top1</i>	0.031*** (0.002)	0.031*** (0.002)
<i>BoardSize</i>	–0.802*** (0.143)	–0.790*** (0.143)
<i>TMTAge</i>	0.123*** (0.009)	0.124*** (0.009)
<i>TMTPay</i>	1.338*** (0.044)	1.332*** (0.044)
Constant	35.434*** (0.716)	35.551*** (0.716)
Year FE	Yes	Yes
Industry FE	Yes	Yes
Observations	37,224	37,224
Adjusted <i>R</i> ²	0.184	0.185

Note: Robust standard errors are shown in parentheses beneath each estimated coefficient. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively. *ESG* represents a firm's ESG performance. *ESOPRatio* measures the proportion of shares allocated to the ESOP. *ESOPDum* is a dummy variable that indicates whether a firm has implemented an ESOP. *FirmSize* is the natural logarithm of total assets, while *FirmAge* captures the number of years since the firm's establishment. *Leverage* is defined as the ratio of total liabilities to total assets, *LiqAsset* reflects liquid assets as a percentage of total assets, and *CashFlow* is the ratio of net operating cash flows to total assets. *ROA* denotes the net income-to-assets ratio, *Top1* represents the ownership share of the largest shareholder, *BoardSize* is the natural logarithm of the number of board members, *TMTAge* is the average age of top management, and *TMTPay* is the natural logarithm of the total compensation for top management.

both statistically and economically significant. Similarly, when a firm transitions from non-ESOP status to ESOP status, ESG ratings increase by 1.213, equivalent to 22% of the standard deviation of the ESG score. The effect of *ESOPDum* on ESG ratings is also statistically and economically significant. Most control variables exert a positive impact on ESG ratings, consistent with the correlations observed in Table 2. As expected, *FirmAge* and *Leverage* negatively affect ESG ratings, indicating that younger and lower-leverage firms tend to have higher ESG ratings. Contrary to the correlation results, the coefficient for *BoardSize* is significantly negative, suggesting that a larger board reduces ESG ratings. The adjusted *R*-squared is 0.18, indicating that the model explains approximately 18% of the variation in ESG ratings. Overall, the baseline results in Table 3 support *H1*.

Table 4 presents the moderating role of *TMTRatio* in the relationship between ESOP and ESG ratings, as modeled by the following regression equation:

$$\begin{aligned}
 ESG_{i,t} = & \beta_0 + \beta_1 ESOP_{i,t} + \beta_2 ESOP_{i,t} \\
 & \times TMTRatio_{i,t} + \beta_3 FirmSize_{i,t} \\
 & + \beta_4 FirmAge_{i,t} + \beta_5 Leverage_{i,t} \\
 & + \beta_6 LiqAsset_{i,t} + \beta_7 CashFlow_{i,t} + \beta_8 ROA_{i,t} \\
 & + \beta_9 Top1_{i,t} + \beta_{10} BoardSize_{i,t} + \beta_{11} TMTAge_{i,t} \\
 & + \beta_{12} TMTPay_{i,t} + YearFE + IndustryFE + \varepsilon_{i,t},
 \end{aligned} \tag{2}$$

where *TMTRatio* is defined as the proportion of TMT-owned ESOP shares relative to the total ESOP shares. For instance, a *TMTRatio* of 30% indicates that 30% of ESOP shares are owned by the TMT, while the remaining 70% are held by other employees. After including the interaction term between *TMTRatio* and *ESOP*, the coefficients on *ESOP* in Table 4 remain positive and statistically significant. However, the coefficients on the interaction term between *TMTRatio* and *ESOP* are negative and significant at the 1% level. These results suggest that a higher *TMTRatio* weakens the positive impact of *ESOP* on ESG ratings, contradicting *H2*. It appears that a higher subscription ratio for TMT diminishes, while a higher ratio for other employees amplifies the positive effect of ESOP on ESG ratings.

Table 4. Moderating effect of TMT subscription ratio

Variable	(1)	(2)
	ESG	ESG
<i>ESOPRatio</i>	0.874*** (0.146)	–
<i>ESOPRatio</i> × <i>TMTRatio</i>	–0.014*** (0.004)	–
<i>ESOPDum</i>	–	2.095*** (0.263)
<i>ESOPDum</i> × <i>TMTRatio</i>	–	–0.032*** (0.007)
<i>FirmSize</i>	0.697*** (0.027)	0.689*** (0.027)
<i>FirmAge</i>	–1.391*** (0.088)	–1.383*** (0.088)
<i>Leverage</i>	–0.518*** (0.043)	–0.519*** (0.043)
<i>LiqAsset</i>	0.110*** (0.007)	0.110*** (0.007)
<i>Cashflow</i>	1.746*** (0.222)	1.744*** (0.222)
<i>ROA</i>	1.286*** (0.145)	1.275*** (0.145)
<i>Top1</i>	0.031*** (0.002)	0.031*** (0.002)
<i>BoardSize</i>	–0.799*** (0.143)	–0.786*** (0.143)
<i>TMTAge</i>	0.123*** (0.009)	0.124*** (0.009)
<i>TMTPay</i>	1.338*** (0.044)	1.334*** (0.044)
Contant	35.470*** (0.716)	35.595*** (0.716)
Year FE	Yes	Yes
Industry FE	Yes	Yes
Observations	37,224	37,224
Adjusted <i>R</i> ²	0.184	0.185

Note: Robust standard errors are reported in parentheses beneath each estimated coefficient. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively. *ESG* represents a firm’s ESG performance. *ESOPRatio* measures the proportion of shares allocated to the ESOP. *ESOPDum* is a dummy variable that indicates whether a firm has implemented an ESOP. *TMTRatio* represents the proportion of shares held by top management in the ESOP. *FirmSize* is the natural logarithm of total assets, while *FirmAge* captures the number of years since the firm’s establishment. *Leverage* is defined as the ratio of total liabilities to total assets, *LiqAsset* reflects liquid assets as a percentage of total assets, and *CashFlow* is the ratio of net operating cash flows to total assets. *ROA* denotes the net income-to-assets ratio, *Top1* represents the ownership share of the largest shareholder, *BoardSize* is the natural logarithm of the number of board members, *TMTAge* is the average age of top management, and *TMTPay* is the natural logarithm of the total compensation for top management.

Chinese companies are broadly categorized into three major sectors: primary industry (agriculture), secondary industry (manufacturing), and tertiary industry (service). To explore heterogeneity in the baseline results, this study re-estimates regressions based on Equation (1) across these three industry subsamples. The findings, reported in Table 5, show that the coefficients on *ESOP* lose significance in the agriculture sector. However, the coefficients on *ESOP* remain positive and statistically significant in the manufacturing and service

sectors. Furthermore, the magnitude of the coefficient on *ESOP*, as well as the adjusted *R*-squared, is higher in the service sector than in the manufacturing sector. These results indicate that the positive impact of *ESOP* on ESG ratings is evident in the service and manufacturing sectors but not in the agriculture sector.

Endogeneity issues arise in the baseline regression specified by Equation (1). Reverse causality is plausible, where higher ESG ratings may attract

Table 5. Different industries

Variable	(1)	(2)	(3)	(4)	(5)	(6)
	Agriculture Sector	Manufacturing Sector	Service Sector	Agriculture Sector	Manufacturing Sector	Service Sector
	<i>ESG</i>	<i>ESG</i>	<i>ESG</i>	<i>ESG</i>	<i>ESG</i>	<i>ESG</i>
<i>ESOPRatio</i>	-0.113 (0.621)	0.411*** (0.103)	0.560*** (0.165)	-	-	-
<i>ESOPDum</i>	-	-	-	0.247 (1.639)	1.122*** (0.195)	1.500*** (0.342)
<i>FirmSize</i>	1.592*** (0.315)	0.617*** (0.034)	0.962*** (0.048)	1.582*** (0.317)	0.609*** (0.034)	0.958*** (0.048)
<i>FirmAge</i>	0.231 (1.091)	-1.423*** (0.105)	-0.994*** (0.162)	0.241 (1.091)	-1.417*** (0.105)	-0.982*** (0.162)
<i>Leverage</i>	-7.156*** (1.509)	-1.228*** (0.071)	-0.088 (0.055)	-7.182*** (1.512)	-1.229*** (0.071)	-0.088 (0.055)
<i>LiqAsset</i>	0.157* (0.094)	0.088*** (0.008)	0.142*** (0.015)	0.156* (0.094)	0.088*** (0.008)	0.142*** (0.015)
<i>CashFlow</i>	-7.295** (2.947)	1.800*** (0.246)	1.294** (0.532)	-7.291** (2.947)	1.801*** (0.246)	1.298** (0.531)
<i>ROA</i>	7.333** (3.217)	0.924*** (0.165)	2.045*** (0.307)	7.274** (3.203)	0.914*** (0.165)	2.037*** (0.307)
<i>Top1</i>	0.010 (0.016)	0.034*** (0.002)	0.022*** (0.003)	0.010 (0.016)	0.034*** (0.002)	0.023*** (0.003)
<i>BoardSize</i>	-1.635 (1.226)	-0.634*** (0.172)	-0.849*** (0.260)	-1.606 (1.234)	-0.617*** (0.172)	-0.855*** (0.260)
<i>TMTAge</i>	0.000 (0.088)	0.089*** (0.011)	0.200*** (0.017)	0.001 (0.088)	0.090*** (0.011)	0.201*** (0.017)
<i>TMTPay</i>	0.041 (0.375)	1.454*** (0.053)	0.971*** (0.081)	0.044 (0.375)	1.447*** (0.053)	0.969*** (0.081)
Constant	40.717*** (7.287)	37.093*** (0.854)	30.554*** (1.331)	40.797*** (7.298)	37.244*** (0.854)	30.578*** (1.330)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	518	26,237	10,469	518	26,237	10,469
Adjusted <i>R</i> ²	0.195	0.154	0.267	0.195	0.154	0.268

Note: Robust standard errors are reported in parentheses beneath each estimated coefficient. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively. *ESG* represents a firm's ESG performance. *ESOPRatio* measures the proportion of shares allocated to the ESOP. *ESOPDum* is a dummy variable that indicates whether a firm has implemented an ESOP. *FirmSize* is the natural logarithm of total assets, while *FirmAge* captures the number of years since the firm's establishment. *Leverage* is defined as the ratio of total liabilities to total assets, *LiqAsset* reflects liquid assets as a percentage of total assets, and *CashFlow* is the ratio of net operating cash flows to total assets. *ROA* denotes the net income-to-assets ratio, *Top1* represents the ownership share of the largest shareholder, *BoardSize* is the natural logarithm of the number of board members, *TMTAge* is the average age of top management, and *TMTPay* is the natural logarithm of total compensation for top management.

employee investments, thereby enhancing the ESOP. Alternatively, unobserved third-party factors could simultaneously boost both ESOP and ESG ratings, leading to a spurious positive correlation. This study modifies Equation (1) by lagging the independent variable by one year. If the coefficient on the lagged independent variable remains significant, it can mitigate concerns about reverse causality. The following regression equation is employed:

$$\begin{aligned}
 ESG_{i,t} = & \beta_0 + \beta_1 ESOP_{i,t-1} + \beta_2 FirmSize_{i,t} \\
 & + \beta_3 FirmAge_{i,t} + \beta_4 Leverage_{i,t} \\
 & + \beta_5 LiqAsset_{i,t} + \beta_6 CashFlow_{i,t} + \beta_7 ROA_{i,t} \\
 & + \beta_8 Top1_{i,t} + \beta_9 BoardSize_{i,t} \\
 & + \beta_{10} TMTAge_{i,t} + \beta_{11} TMTPay_{i,t} + YearFE \\
 & + IndustryFE + \varepsilon_{i,t},
 \end{aligned} \tag{3}$$

where the independent variable, *ESOP*, is lagged by one year and, as before, represents either *ESOPRatio* or *ESOPDum*. Consistent with expectations, the results presented in Table 6 show that the one-year-lagged *ESOP* exerts a significantly positive influence on ESG ratings. The coefficient for the lagged *ESOPRatio* is 0.400, which is comparable to the 0.446 reported in Table 3, and both coefficients are statistically significant at the 1% level. The adjusted *R*-squared is 0.202, slightly higher than the 0.184 reported in Table 3. Similar observations can be made for *ESOPDum*. Overall, the findings in Table 6 support H1, indicating that ESOP positively impacts ESG ratings rather than the reverse.

Table 6. Lagged independent variable

Variable	(1)	(2)
	ESG	ESG
Lagged <i>ESOPRatio</i>	0.400*** (0.097)	–
Lagged <i>ESOPDum</i>	–	1.119*** (0.200)
<i>FirmSize</i>	0.874*** (0.030)	0.869*** (0.030)
<i>FirmAge</i>	–1.219*** (0.101)	–1.212*** (0.101)
<i>Leverage</i>	–1.137*** (0.072)	–1.136*** (0.072)
<i>LiqAsset</i>	0.088*** (0.008)	0.088*** (0.008)

Variable	(1)	(2)
	ESG	ESG
<i>CashFlow</i>	1.804*** (0.236)	1.806*** (0.236)
<i>ROA</i>	1.493*** (0.165)	1.491*** (0.165)
<i>Top1</i>	0.027*** (0.002)	0.027*** (0.002)
<i>BoardSize</i>	–0.752*** (0.155)	–0.741*** (0.155)
<i>TMTAge</i>	0.151*** (0.010)	0.151*** (0.010)
<i>TMTPay</i>	1.277*** (0.048)	1.272*** (0.048)
Constant	30.733*** (0.783)	30.798*** (0.783)
Year FE	Yes	Yes
Industry FE	Yes	Yes
Observations	32,513	32,513
Adjusted <i>R</i> ²	0.202	0.203

Note: Robust standard errors are displayed in parentheses beneath each estimated coefficient. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. *ESG* represents a firm’s ESG performance. *ESOPRatio* measures the proportion of shares allocated to the ESOP. *ESOPDum* is a dummy variable that indicates whether a firm has implemented an ESOP. *FirmSize* is the natural logarithm of total assets, while *FirmAge* captures the number of years since the firm’s establishment. *Leverage* is defined as the ratio of total liabilities to total assets, *LiqAsset* reflects liquid assets as a percentage of total assets, and *CashFlow* is the ratio of net operating cash flows to total assets. *ROA* denotes the net income-to-assets ratio, *Top1* represents the ownership share of the largest shareholder, *BoardSize* is the natural logarithm of the number of board members, *TMTAge* is the average age of top management, and *TMTPay* is the natural logarithm of total compensation for top management.

This study also employs a two-stage least squares estimation framework to address endogeneity concerns, using the industry-average *ESOP* as the instrumental variable.

$$\begin{aligned}
 ESOP_{i,t} = & \beta_0 + \beta_1 ESOPMean_{i,t} \\
 & + \beta_2 FirmSize_{i,t} + \beta_3 FirmAge_{i,t} + \beta_4 Leverage_{i,t} \\
 & + \beta_5 LiqAsset_{i,t} + \beta_6 CashFlow_{i,t} + \beta_7 ROA_{i,t} \\
 & + \beta_8 Top1_{i,t} + \beta_9 BoardSize_{i,t} + \beta_{10} TMTAge_{i,t} \\
 & + \beta_{11} TMTPay_{i,t} + YearFE + \varepsilon_{i,t},
 \end{aligned} \tag{4}$$

$$\begin{aligned}
 ESG_{i,t} = & \beta_0 + \beta_1 ESOPPred_{i,t} \\
 & + \beta_2 FirmSize_{i,t} + \beta_3 FirmAge_{i,t} + \beta_4 Leverage_{i,t} \\
 & + \beta_5 LiqAsset_{i,t} + \beta_6 CashFlow_{i,t} + \beta_7 ROA_{i,t} \\
 & + \beta_8 Top1_{i,t} + \beta_9 BoardSize_{i,t} + \beta_{10} TMTAge_{i,t} \\
 & + \beta_{11} TMTPay_{i,t} + YearFE + \varepsilon_{i,t}.
 \end{aligned} \tag{5}$$

In the first stage, Equation (4) regresses *ESOP* on the industryaverage *ESOP* (*ESOPMean*), which is used as the instrumental variable. The second stage then uses the predicted value (*ESOPPred*) from the first stage to forecast ESG ratings in Equation (5). Prior research suggests that industryaverage independent variables are valid instruments (Hu et al., 2023). The rationale is that companies within the same industry tend to exhibit similar *ESOP* at the industry level, making indi-

vidual firms' *ESOP* more influenced by industry factors than firm-specific ones. This instrumental variable is presumed exogenous. Specifically, ESG ratings are unlikely to be associated with industryaverage *ESOP* in each industry, as ESG ratings are firmlevel behavior rather than industrylevel behavior.

Table 7 presents the results of the two-stage least squares regression. The first-stage results, consis-

Table 7. Two-stage least squares regressions

Variable	(1) 1 st stage	(2) 2 nd stage	(3) 1 st stage	(4) 2 nd stage
	<i>ESOPRatio</i>	<i>ESG</i>	<i>ESOPDum</i>	<i>ESG</i>
<i>Predicted ESOPRatio</i>	–	1.482*** (0.565)	–	–
<i>Mean ESOPRatio</i>	0.992*** (0.032)	–	–	–
<i>Predicted ESOPDum</i>	–	–	–	4.714*** (1.058)
<i>Mean ESOPDum</i>	–	–	0.987*** (0.031)	–
<i>FirmSize</i>	0.004** (0.001)	0.578*** (0.026)	0.006*** (0.001)	0.559*** (0.026)
<i>FirmAge</i>	–0.008 (0.005)	–1.176*** (0.087)	–0.009*** (0.003)	–1.138*** (0.088)
<i>Leverage</i>	0.001 (0.003)	–0.513*** (0.044)	0.001 (0.001)	–0.515*** (0.044)
<i>LiqAsset</i>	–0.001*** (0.000)	0.112*** (0.007)	–0.001*** (0.000)	0.113*** (0.007)
<i>CashFlow</i>	0.007 (0.013)	1.405*** (0.227)	0.005 (0.007)	1.391*** (0.227)
<i>ROA</i>	0.014* (0.009)	1.242*** (0.150)	0.013*** (0.004)	1.200*** (0.151)
<i>Top1</i>	–0.000*** (0.000)	0.029*** (0.002)	–0.000*** (0.000)	0.030*** (0.002)
<i>BoardSize</i>	–0.017** (0.008)	–1.070*** (0.145)	–0.015*** (0.004)	–1.010*** (0.147)
<i>TMTAge</i>	–0.001* (0.001)	0.099*** (0.009)	–0.001*** (0.000)	0.104*** (0.009)
<i>TMTPay</i>	0.007*** (0.002)	1.492*** (0.044)	0.007*** (0.001)	1.461*** (0.045)
Constant	–0.059 (0.039)	38.266*** (0.680)	–0.108*** (0.020)	38.607*** (0.687)
Year FE	Yes	Yes	Yes	Yes
Observations	37,224	37,224	37,224	37,224
Adjusted R ²	0.035	0.127	0.046	0.122

Note: Standard errors are provided in parentheses beneath the estimated coefficients. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively. *ESG* represents a firm's ESG performance. *ESOPRatio* measures the proportion of shares allocated to the ESOP. *ESOPDum* is a dummy variable that indicates whether a firm has implemented an ESOP. *FirmSize* is the natural logarithm of total assets, while *FirmAge* captures the number of years since the firm's establishment. *Leverage* is defined as the ratio of total liabilities to total assets, *LiqAsset* reflects liquid assets as a percentage of total assets, and *CashFlow* is the ratio of net operating cash flows to total assets. *ROA* denotes the net income-to-assets ratio, *Top1* represents the ownership share of the largest shareholder, *BoardSize* is the natural logarithm of the number of board members, *TMTAge* is the average age of top management, and *TMTPay* is the natural logarithm of total compensation for top management.

tent with Equation (4), show that the coefficient for the mean *ESOPRatio* is 0.992 and statistically significant at the 1% level, addressing concerns about weak instruments. In the second stage, following Equation (5), the results demonstrate a statistically significant positive relationship between the predicted *ESOPRatio* from the first stage and ESG ratings, with a coefficient of 1.482 at the 1% level. Similarly, when the mean *ESOPDum* is used as the instrumental variable, the coefficient on the predicted *ESOPDum* is 4.714, which is also statistically significant at the 1% level. These two-stage least squares regression outcomes are consistent with the previous baseline regression results in Table 3.

4. DISCUSSION

4.1. Limitations and constraints

This study finds a positive relationship between ESOPs and ESG performance among Chinese publicly listed companies. However, several limitations must be acknowledged. First, the relatively low adoption rate of ESOPs (14.5%) limits the generalizability of the results, as many companies have not adopted ESOPs, resulting in reduced variation in ESOP-related variables such as *ESOPRatio* and *ESOPDum* (Zhou et al., 2022). The limited scope of ESOP adoption may also constrain the ability to evaluate the broader environmental sustainability impacts, particularly in sectors that face significant environmental challenges, such as manufacturing or energy. This concentration limits the external validity of the findings, particularly across different sectors and firm sizes, as ESOP adoption is still in its early stages in China, especially outside large enterprises (Zhang, 2023).

Second, the reliance on ESG scores, while widely used, introduces variability in results due to differences in rating methodologies. ESG ratings, derived from several agencies with distinct criteria, may cause inconsistencies in the observed relationship between ESOP and ESG performance (Rajesh & Rajendran, 2020). These inconsistencies may affect the study's conclusions about the impact of ESOPs on ESG ratings, particularly regarding environmental metrics, which are crucial for sustainability development.

Lastly, this paper focuses on publicly listed companies, which may not capture the full range of ESOP dynamics present in privately held firms or state-owned enterprises. The governance structures in these entities often differ significantly from those of listed firms, potentially influencing their ability to address environmental challenges through ESOP-related mechanisms (Lu & Cheng, 2023). Further research is needed to explore the role of ESOPs across different organizational contexts, especially in sectors where natural resource management and environmental protection are critical components of sustainability outcomes.

4.2. Challenges and implications

The study uncovers critical challenges regarding ESOPs' role in improving ESG performance, particularly the misalignment of incentives between TMTs and general employees. The results reveal that while ESOPs enhance ESG performance, a higher concentration of shares held by TMTs weakens the positive effect on sustainability performance (Kim & Ouimet, 2014). This finding suggests that when TMTs dominate ESOP ownership, the motivational effects intended for broader employee engagement may be diluted, reducing overall corporate efforts toward environmental sustainability (Sheikh, 2019). This highlights a governance challenge for companies aiming to align ESOPs with long-term environmental and social sustainability goals.

Furthermore, the negative moderating effect of TMT participation in ESOPs aligns with earlier studies, indicating that increased management ownership may lead to the prioritization of financial gains over broader ESG objectives, potentially exacerbating agency problems (Hambrick et al., 1996). This imbalance may detract from the company's ability to meet environmental challenges or engage effectively in sustainability initiatives. Kramer (2010) points out that excessive concentration of ownership among top executives can reduce the incentives for regular employees to actively engage with corporate governance, undermining the goals of transparency and accountability that ESOPs aim to promote. Additionally, Mazibuko and Boshoff (2003) emphasize that the alignment of employee ownership with environmental and corporate social responsibility re-

quires a balance in ownership structures to maintain broad-based employee engagement.

Sectoral disparities also pose significant challenges. The results show that ESOPs have a greater impact on environmental and social sustainability performance in the manufacturing and service sectors, where employee engagement with corporate governance structures is higher (Xiao et al., 2019). In contrast, the agriculture sector sees less benefit from ESOPs, potentially due to its labor-intensive nature and lower levels of employee involvement in decision-making processes (Ermakova et al., 2023). This sector's challenges also stem from its reliance on natural resources, which adds complexity to aligning ESOPs with sustainability goals. This suggests that sector-specific adaptations of ESOP policies may be necessary to maximize their effectiveness in enhancing environmental sustainability and corporate governance.

These findings carry important implications for corporate governance and sustainability practices. Companies must carefully design ESOP structures to avoid over-concentrating ownership in TMTs and ensure that all employees, especially rank-and-file workers, are motivated to engage with sustainability and environmental protection goals (La Porta et al., 1999). Policymakers must also consider sectoral differences when drafting ESOP regulations, tailoring them to the specific environmental challenges and sustainability needs of each sector.

4.3. Future prospects

The future of ESOPs in China presents significant opportunities for enhancing corporate environmental sustainability and ESG performance. As China's economy continues to evolve and the government emphasizes sustainability, ESOPs could be leveraged to align corporate objectives with national environmental and sustainability goals, especially in light of initiatives like the 14th Five-Year Plan and China's commitment to the Paris Agreement (Hasmath, 2020). This suggests that the further expansion and formalization of ESOP policies could foster stronger commitments to environmental protection and sustainable development among Chinese companies.

One promising area for future research is the long-term effects of ESOPs on environmental and social sustainability performance. This study assumes that employees sell their ESOP shares after the restriction period, but longer holding periods could potentially lead to deeper employee engagement and greater sustainability improvements (Blair et al., 2000). Examining whether longer-term ownership fosters sustained increases in environmental and social sustainability outcomes could provide valuable insights into the role of ESOPs in corporate governance and sustainability.

Moreover, as corporate governance in China gradually adopts international standards, the integration of global best practices into ESOP frameworks may enhance their effectiveness in promoting environmental and sustainability goals (Zhang, 2023). Further research could explore how different governance models impact the relationship between ESOPs and environmental sustainability performance, particularly in multinational firms operating in China. Policymakers may also consider incentivizing broader ESOP adoption among small and medium enterprises to promote environmental sustainability at the grassroots level, contributing to a more sustainable development model.

Lastly, Kurland (2018) highlights that ESOPs have the potential to foster a culture of ownership and accountability, which, when combined with benefit corporations, can create a synergistic approach to enhancing both governance and sustainability practices, particularly in environmental management. As China's ESOP framework matures, integrating such approaches may offer new pathways for companies to achieve their environmental sustainability objectives.

4.4. Application to other markets

While this study focuses on Chinese publicly listed companies, its findings offer important lessons for other markets. ESOPs, as equity incentive mechanisms, have the potential to improve environmental sustainability and ESG performance in various geo-economic contexts, particularly in emerging markets where corporate governance structures and environmental regulations are still developing (Xu & Duan, 2023). In countries with similar

economic structures to China, such as Vietnam or Brazil, ESOPs could serve as powerful tools to align employee incentives with environmental sustainability goals (Le and Nguyen, 2023; Kurnia & Tandiontong, 2015). However, adopting these mechanisms would require careful consideration of local environmental policies and regulatory frameworks.

In developed markets like the United States and Europe, where ESOPs are more widespread, companies might look to refine their ESOP structures based on the findings of this study. Ensuring broader participation across all employee levels – rather than concentrating ownership among top executives – could help firms avoid the negative moderating effects of high TMT ownership on

sustainability performance (Alexiev et al., 2010). Additionally, this study's sectoral analysis suggests that industry-specific approaches to ESOP implementation may be necessary, as the impact of ESOPs on environmental and social sustainability outcomes varies significantly across different industries (Ermakova et al., 2023).

In conclusion, this analysis provides a strong foundation for understanding the role of ESOPs in enhancing environmental and social sustainability across various markets. The findings offer valuable insights for both companies and policy-makers in designing ESOP frameworks that foster sustainable corporate practices while aligning employee interests with long-term environmental success.

CONCLUSION

This study aimed to investigate the relationship between ESG performance of publicly listed companies and employee stock ownership plans (ESOPs), with a particular focus on environmental sustainability and corporate governance. The sample spanned from 2009 to 2022 and covered 4,464 listed companies in China. Multivariate regression results, with year- and industry-fixed effects, show that ESOP adoption positively influences ESG ratings in Chinese companies. This positive impact diminishes with higher TMT subscription ratios but intensifies with higher ordinary employee subscription ratios. Additionally, the effect of ESOP is stronger in the service and manufacturing sectors than in agriculture, where environmental challenges may limit the effectiveness of ESOP structures. To address potential endogeneity, this study regresses ESG ratings on lagged ESOP and uses industry-average ESOP as an instrumental variable in two-stage least squares regressions. Both methods confirm the causal link between ESOP and environmental and social sustainability performance, alleviating endogeneity concerns.

This study is the first to examine the impact of ESOP ratios on ESG ratings among publicly listed companies in China. While existing literature mainly explores the influence of ESOP on company performance, stock prices, innovation, and employee-related factors like motivation and talent retention, this paper fills a critical gap by focusing on ESOP's role in corporate sustainability, particularly in environmental governance. By distinguishing between *ESOPRatio* and *ESOPDum*, this study offers deeper insights into this incentive mechanism's role in sustainability development, aiding decision-makers in formulating more targeted strategies. The inclusion of *TMTRatio* as a moderating variable further enriches the understanding of top management's influence on the ESOP–ESG relationship, offering practical guidance for executives. Lastly, the findings have significant implications for investors and policy-makers. For investors, the demonstrated positive impact of ESOP on ESG highlights the importance of considering corporate environmental and social responsibility in investment decisions. Policymakers can draw on the present study's empirical support to craft policies promoting ESOP practices, fostering a healthier, more environmentally sustainable corporate ecosystem.

The present study has several limitations. First, the investigation is constrained by the limited sample of ESOPs, with only 14.5% of firms implementing ESOPs and not consistently across all sample years, leading to limited variation in key explanatory variables. This restricted sample size also hinders a more comprehensive analysis of ESOP's impact on environmental sustainability outcomes across industries.

Second, the study does not account for the cumulative effects of ESOP over time, assuming employees sell their shares post-restriction, which may limit understanding of long-term sustainability impacts. Third, the focus on Chinese listed companies limits generalizability, suggesting future research could expand internationally for comparative analysis, especially in regions where environmental regulations and corporate governance differ significantly. Investigating ESOP's role in fostering sustainability practices across diverse regulatory environments could offer richer insights. Finally, despite the robustness checks, potential endogeneity issues may not be entirely resolved. Future studies could employ methods like propensity score matching and differences-in-differences to further validate the findings and explore the link between ESOPs and sustainability performance more deeply.

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