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State-owned Shareholders' Participation and Environmental, Social, and Governance Performance of Private Firms: Evidence from China

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Abstract: We investigate the relationship between state-owned shareholders' participation and the environmental, social, and governance performance (ESG) performance of private firms. Based on a sample of Chinese private firms between 2009 and 2022, we find that state-owned shareholders' participation can significantly improve the ESG performance of private firms. Our mechanism tests suggest that state-owned shareholders play a role in improving the ESG performance of private firms through resource support and governance oversight. Moreover, the positive effect of state-owned shareholders' participation on ESG performance is more significant if private firms have lower carbon emission intensity and in industries with a higher degree of competition. We also find that state-owned shareholders' participation effectively increases firm value while improving the ESG performance of private firms. Our results are robust after a series of endogenous and robustness tests. The findings of our study enrich the existing research on the economic consequences of state-owned shareholders' participation in private firms and the factors influencing corporate ESG performance.

Keywords: State-owned Shareholder; Mixed-Ownership Reform; ESG Performance; Private Firms; Sustainable Development

JEL Classification: M40; G32

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I. Introduction

As China's economy transitions from a phase of rapid growth to a stage of high-quality development, sustainable development policies and the "dual carbon" goals are being orderly advanced, leading to an increasingly close relationship between corporate development, social progress, and environmental improvement (Li et al. 2018).[1] The Central Committee of the Communist Party of China (CPC) pointed out in report on the 20th National Congress that, to achieve high-quality economic development, it is necessary to accelerate the green transformation of development modes and promote

[1] The "dual carbon" goals encompass achieving carbon peaking and carbon neutrality. In September 2020, the Chinese government outlined its targets for reaching a "carbon peak" by 2030 and achieving "carbon neutrality" by 2060.

harmonious coexistence between humans and nature. Environmental, Social, and Governance (ESG), representing a framework of sustainable development values, closely aligns with the foundational principles of China's high-quality development philosophy. Therefore, it is of great significance for Chinese-listed firms to actively fulfill their ESG responsibilities to achieve this goal.

China's listed firms comprise state-owned enterprises (SOEs) and privately owned enterprises (POEs). POEs account for more than 90% of all listed firms and contribute more than 60% to the GDP of China. However, as of March 2023, 73.5% of central SOEs and 50.32% of local SOEs listed on the A-share market disclosed independent CSR or ESG reports. In contrast, the disclosure rate for POEs was only 22.52%, indicating a significant gap compared to SOEs.[2] Moreover, the overall ESG performance of POEs is significantly lower than that of SOEs, with only about 3% of POEs evaluated receiving BBB, A, and AA ratings, compared to 6% for SOEs.[3]

The reasons for the differences in ESG performance between SOEs and POEs are complex. On the one hand, SOEs are important tools for the Chinese government to implement macroeconomic policies, with dual business objectives of economic and social effects. ESG practices can help to demonstrate the ability of SOEs to create social value, so SOEs have a strong motivation to improve their ESG performance (Marquis and Qian 2014). In contrast, the main business objective of POEs is to maximize their benefits, lacking emphasis on creating social benefits, making POEs lack the initiative to implement ESG practices (Lau, Lu, and Liang 2016). On the other hand, POEs have significant disadvantages compared to SOEs in terms of policy support, and access to finance (Beck and Demirguc-Kunt 2006; Li and Wu 2022). When implementing ESG projects, especially those requiring large capital investment, POEs may face difficulties due to limited access to financing, making it difficult to make reasonable decisions that benefit long-term value creation, which further exacerbates the difference in ESG performance between SOEs and POEs. Therefore, exploring the factors promoting the ESG performance of POEs and guiding them to focus on long-term sustainable

[2] The data comes from the "China Listed Firms ESG Action Report (2022-2023)," jointly released by the Economic Daily News and the International Institute of Green Finance at the Central University of Finance and Economics in China. Available at: https://www.nbd.com.cn/articles/2023-08-15/2960596.html.

[3] The data is sourced from the HuaZheng ESG database, specifically the A-share ESG ratings data for the first quarter of 2023. Available at: https://chindices.com/esg-data.html.

development holds significant theoretical and practical importance.

Previous studies demonstrate that external governance factors at the state level, industry level, and market level, as well as internal governance factors at the company level, can influence corporate ESG performance (Gillan, Koch, and Starks 2021). Especially at the company level, some studies focus on the effects of institutional investors (Jiang et al. 2022), fund managers (Barko, Cremers, and Renneboog 2022), foreign investors (Cui et al. 2022; Cordeiro et al. 2018), and green investors (Feng and Yuan 2024) on ESG performance, whether state-owned shareholders' participation on the ESG performance of POEs have not been identified yet.

Ownership structure is one of the crucial foundations of corporate governance. Different ownership structures come with varying resource endowments, internal governance mechanisms, and value orientations, ultimately affecting a firm's investment behavior and operational performance (Aghion, Van Reenen, and Zingales 2013; Li et al. 2018). To facilitate the mutual promotion and common development of various types of capital ownership, the Chinese government has introduced multiple important policies. The "Decision of the Central Committee of the Community Party of China on Major Issues Concerned in the Comprehensive Deepening of Reform," which was passed in the Third Plenary Session of the 18th Central Committee of the CPC in 2013, explicitly proposed the active development of the mixed-ownership economy. In 2015, the State Council issued the "Opinions of the State Council on the Development of Mixed Ownership Economy by State Owned Enterprises," which encouraged state-owned capital to invest in POEs in various ways and actively develop the mixed-ownership economy. Under the influence of the above policies, the number of Chinese POEs introducing state-owned shareholders to form mixed ownership is constantly on the rise.

Theoretically, the introduction of state-owned shareholders may have an impact on the ESG performance of POEs. On the one hand, the involvement of state-owned shareholders can help POEs establish political connections with the government, gaining advantages in debt financing (Boubakri and Saffar 2019) and fiscal subsidies (Yu, Song, and Song 2020), thus alleviating the resource constraints faced by POEs in ESG practices, and promoting them to focus more on the long-term value creation and sustainable development, which is manifested as the resource support effect. On the other hand, the introduction of state-owned shareholders can create a more diversified and balanced equity structure within the firm, mitigating the two types of agency problems and improving the overall governance level of POEs (Yang, Qian, and Li 2023). Meanwhile, as state-owned shareholders generally have a high degree of "institutional normativity" and "legitimacy sensitivity" (Marquis and Qian 2014), state-owned shareholders' participation also can motivate POEs to comply with business rules and regulations, pay more attention to the public interest, enhancing awareness of environmental protection and social responsibility (Zhang, Gu, and Wang 2022), and thus improve their ESG performance, which is manifested as the governance supervision effect.

Using a dataset of Chinese private listed firms from 2009 to 2022, our study investigates the impact of state-owned shareholders' participation on corporate ESG performance. We find that state-owned shareholders' participation significantly improves the ESG performance of POEs. In addition, the results of the mechanism test show that state-owned shareholders' participation can have a resource support effect and governance supervision effect by increasing government subsidies, weakening Type II agency problems, as well constraining operational irregularities, and thereafter, improving corporate ESG performance. Furthermore, the positive effect of state-owned shareholders' participation on ESG performance is particularly prominent in the sample of firms with lower carbon intensity and in industries with a higher degree of competition. Our findings are robust after a series of endogeneity and robustness tests.

This study seeks to make the following contributions to the existing literature. First, taking Chinese private firms' mixed ownership as a setting, our study explores the impact of state-owned shareholder participation on corporate ESG performance from the perspective of changes in internal shareholding structure, which enriches the literature relating to ESG performance and its determinants, especially in terms of corporate governance. Second, existing studies lack the knowledge of whether state shareholders' ownership of private firms promotes their ESG performance. This study explores how the interaction between state-owned shareholders and private firms affects firms' ESG strategies and practices, providing a new theoretical basis for understanding the potential role of state-owned shareholders in enhancing firms' non-financial performance. Third, this study not only provides a comprehensive understanding of the impact of state-owned shareholders' participation on corporate ESG performance but also elucidates the underlying mechanisms driving this relationship in terms of both resource support and governance supervision dimensions, which has practical implications for policymakers. In the process of economic transformation, the governments of China and other emerging economies can actively promote the introduction of state-owned shareholders in POEs, so as to give full play to the resource and governance strengths of state-owned shareholders, thereby driving a comprehensive green transformation in both the economic and social domains.

The rest of our study is organized as follows. Section II is the literature review and hypotheses development. Section III introduces the research design. Section IV reports empirical results and discussion. Finally, Section V concludes the study.

II. Literature review and hypotheses development

In the context of China, where key resources are still controlled by the government and state-owned commercial banks monopolize the banking industry, SOEs, leveraging their higher social status and lower market credit risk, can access more credit resources and policy support. In contrast, POEs, which are at a disadvantage in the credit market, often face significant problems of “difficult and expensive financing”, and the threshold and difficulty of obtaining subsidies are much higher for POEs than SOEs, meaning they are subject to stricter resource constraints and greater operational risks in their development (Beck and Demirguc-Kunt 2006). Attig (2023) find that firms with limited resources may reduce resources for high-investment or high-risk projects, such as green innovation and upgrading production processes.

State-owned shareholders’ participation can have a resource support effect to alleviate the resource constraints faced by POEs in ESG activities, thus improving their ESG performance. Based on the resource-dependence theory, organizations are dependent on a range of resources including capital, information, and technology (Pfeffer and Salancik 2015). Effective acquisition and management of these resources are essential to maintain competitive advantage and attain organizational goals (Hillman, Withers, and Collins 2009). Zhang, Gu, and Wang (2022) argue that state-owned shareholders’ participation can improve the relationship between firms and government, which helps obtain more tax incentives, government subsidies, and credit resources. Further, Yu, Song, and Song (2020) show that state-owned shareholders’ participation can provide firms with more financial subsidies and human resources support. Therefore, the nature of equity is changed from single private equity to mixed-ownership equity when POEs introduce state-owned shareholder participation, which makes it possible for them to gain potential resource advantages through state-owned equity and to break through the development bottleneck of resource constraints. More specifically, state-owned shareholders' participation in POEs can help them establish relationship ties with the government and facilitate access to more government subsidies. Meanwhile, as a result of the signaling effect, state-owned shareholders' participation can enhance the reputation of POEs in the capital market and create a potential credit guarantee based on state-owned equity, thus reducing the credit discrimination faced by POEs in the financing process (Boubakri and Saffar 2019). By increasing POEs' access to government subsidies and credit resources, state-owned shareholders' participation can enhance the ESG investment capacity of POEs, thereby improving ESG performance.

Moreover, due to a certain deviation in the objective functions of principals and agents, managers' opportunistic motivation may drive them to invest resources in areas that will bring them private gains or enhance short-term performance, rather than in environmental and social areas that benefit the long-term value of POEs (Ferrell, Liang, and Renneboog 2016). Meanwhile, the highly concentrated shareholding structure of POEs in China often leads to significant Type II agency problems, with controlling shareholders encroaching on the interests of other small and medium-sized shareholders (Djankov et al. 2008), thus emptying firms' limited resources and crowding out ESG-related investments. In addition, the natural profit-seeking character of POEs and the weak external regulatory constraints they face have led to poorer operational compliance. Thus, the frequent occurrence of operational non-compliance among POEs harms the development of their ESG governance systems.

State-owned shareholders' participation can have a governance supervision effect by weakening the dual agency problem and restraining operational irregularities, thereby improving the ESG performance of POEs. On the one hand, based on agency theory, state-owned shareholders as heterogeneous shareholders can help to form a more diversified and mutual check-and-balance shareholding structure within POEs (Khatib et al. 2022; Zhou, Gao, and Zhao 2017). Jiang and Kim (2020) indicate that the participation of heterogeneous shareholders helps to alleviate the principal-agent conflict between owners and managers and improves the scientificity of decision-making. Li et al. (2023)

find that State-owned shareholders' participation can enhance the internal control ability of POEs and strengthen the supervision of managers. Therefore, this change in shareholding structure can prompt management to reduce their opportunism and short-sightedness in investment for personal interests, thus enhancing the willingness to invest in corporate ESG activities. Meanwhile, Zhang, Gu, and Wang (2022) show that state-owned shareholders' participation can reduce the predation of large shareholders to the firm. Due to the unique political attributes of state shareholders, they are more motivated and capable than other small and medium shareholders to resist any attempts by major shareholders to expropriate their interests (Yang, Qian, and Li 2023). Based on that, state-owned shareholders' participation helps to alleviate the two types of agency problems and improve the ESG governance framework of POEs, thereby enhancing ESG performance.

On the other hand, according to stakeholder theory, firms ought to generate value for all individuals or groups that can influence or be influenced by the firm (Freeman 2010). Stakeholders can influence business decisions by exerting pressure on the firm (Khatib et al. 2023). Different from POEs, SOEs, as economic carriers through which the government implements regional economic influence and reflects political achievements, have a high degree of "institutional normativity" and "legitimacy sensitivity" due to their prominent political attributes and the government's requirement that they fulfill their social responsibilities (Boubakri et al. 2011; Marquis and Qian 2014). Kumar et al. (2022) find that there is a positive relationship between state-owned ownership and the extent of sustainability reporting of firms because the involvement in ESG activities can promote a balance between economic, environmental, and social engagement to meet the demand of state-owned shareholders to demonstrate good social sense (Lau, Lu, and Liang 2016). Therefore, state-owned shareholders' participation can motivate POEs to comply with business rules and regulations, pay more attention to environmental protection issues, public issues, product quality, and labor welfare, and reduce irregularities in production or operation that are detrimental to the environment and social benefits, further improving their ESG performance. Based on the above analysis, we propose our hypothesis 1.

H1: State-owned shareholders' participation can improve the ESG performance of POEs.

According to resource-based theory, firms' business behavior is influenced by their key resources and capabilities (Hart 1995). Compared to low-carbon firms, high-carbon firms have high emission levels and heavy assets, resulting in environmental pollution (Downar et al. 2021). Meanwhile, high-carbon firms have long relied on a high-input, sloppy growth model with relatively low ESG ratings.[4] Prior studies on corporate carbon emissions point out that high-carbon firms may not voluntarily reduce their carbon emissions because reducing carbon emissions causes firms to increase environmental costs, which reduces their profits (e.g., Smale et al. 2006; Nishitani and Kokubu 2012). Wang and Zhang (2022) also find that carbon emission reductions by high-carbon firms harm their market power. Therefore, the impact of state-owned shareholder participation on the ESG performance of high-carbon POEs may be constrained by their business attributes, making it difficult to exert an effective positive effect. Moreover, with the increasing regulation of carbon emissions in China in recent years, high-carbon firms are already facing higher potential litigation costs and regulatory pressure (Shu and Tan 2023). Such external regulation may have a substitution effect on the governance supervision effect of state-owned shareholders, which leads to the positive impact of state-owned shareholder participation on corporate ESG, possibly being more significant in low-carbon firms. Therefore, we put forward our hypothesis 2.

H2: In firms with lower carbon emissions intensity, the positive impact of state-owned shareholder participation on the ESG performance of POEs is more significant.

Based on competitive markets theory, the intensity of competition at the industry level can significantly impact a firm's behavioral decisions (Nickell 1996). When a firm belongs to an industry with a high degree of competition, it typically faces severe threats from existing competitors and new entrants in the industry, resulting in higher business risks and resource acquisition difficulties (Laksmana and Yang 2015). While good ESG performance of firms can release positive signals to the market, which can help to enhance information transparency and gain the trust and support of stakeholders (Al Maeeni, Ellili,

[4] In the ESG Development Report for Chinese Listed Companies (2022), compiled and published by China Association for Public Companies (CAPCO) in collaboration with other member organizations, only four companies out of 804 listed in the high-carbon sector received A and above ratings.

and Nobanee 2022), thus promoting the performance of the financing market (Ng and Rezaee 2015), and improving the financial performance (Broadstock et al. 2021). Moskovics et al. (2023) also show that the more competitive the market, the better the ESG performance of the firms is, because good ESG can help to reduce the business risk of the firms (Deng et al. 2022). Based on this analysis, after the entry of state-owned shareholders into POEs, compared to firms in low-competition-intensity industries, firms in high-competition-intensity industries have a stronger incentive to implement differentiated competitive strategies such as environmental governance, fulfillment of social responsibility, and optimization of internal governance (McWilliams and Siegel 2011). By leveraging the resource advantages of state shareholders and basing on strong ESG performance, they create a unique competitive edge in the capital market, thereby alleviating the operational pressures brought about by intense industry competition and enhancing the recognition of the firm among internal and external stakeholders. Hence, our study suggests that the impact of state-owned shareholder participation on corporate ESG performance is expected to be stronger for firms in high-competition-intensity industries. Therefore, we formulate our hypothesis 3.

H3: In industries with a higher degree of competition, the positive impact of state-owned shareholder participation on the ESG performance of POEs is more significant.

III. Research design

Sample processing and data

We use A-share private firms listed on the Shanghai Stock Exchange (SHSE) and Shenzhen Stock Exchange (SZSE) from 2009 to 2022.[5] To alleviate the interference of the reverse causality problem, our empirical analysis uses explanatory variables with a one-year lag. In line with our research requirements, we employ the following sample-selection process: (1) remove the samples from the financial industry; (2) remove the samples at risk of delisting (ST, *ST, and PT); (3) remove samples with changes like the

[5] The data on ESG ratings used in this study comes from the HuaZheng ESG rating, and given that the HuaZheng ESG rating began disclosing information for A-share listed companies in 2009, we use the initial sample from 2009 to 2022.

property rights during the sample period; (4) remove samples which were state-controlled at the time of the IPO; (5) remove samples with missing data on ESG performance or other controls. The final sample consists of 18,712 firm-year observations.

The financial data of POEs required for our study comes from the CSMAR and Wind databases, while data on ultimate controllers is obtained from the CCER database. In addition, to determine the nature and percentage of shareholdings of the top ten shareholders of each private firm, we manually collected basic data on state-owned shareholders in POEs one by one from the top ten shareholders disclosed in annual reports, the firm's regular announcements, and authoritative financial websites. To avoid the impact of extreme values, all continuous variables are winsorized at the 1-99% level before estimation. The selection process of all samples is shown in Table 1.

Table 1. The process of sample selection

	Observations
Initial sample	24,473
Remove: Samples of the financial industry	307
Remove: ST, *ST, and PT samples	735
Remove: Sample of changes in the nature of property rights	2,296
Remove: Samples that were state-controlled at the IPO	1,494
Remove: Samples with missing values	929
Final sample	18,712

Empirical model and variables

As the ESG variable has ordered values with few categories, we employ the following ordered logit (ologit) model to test how state-owned shareholders' participation affects corporate ESG performance (Hair et al. 2006; Cordeiro et al. 2018):

$$\begin{aligned} ESGP_{i,t} = {} & \beta_0 + \beta_1 Soeshare_{i,t-1}\left(Soere_{i,t-1}\ or\ Soedum_{i,t-1}\right) \\ & + \beta_2 Size_{i,t-1} + \beta_3 Lev_{i,t-1} + \beta_4 Growth_{i,t-1} + \beta_5 ATO_{i,t-1} \\ & + \beta_6 Top1_{i,t-1} + \beta_7 Mshare_{i,t-1} + \beta_8 Indep_{i,t-1} + \beta_9 Dual_{i,t-1} \\ & + \beta_{10} Big4_{i,t-1} + \beta_{11} Age_{i,t-1} + Year + Ind + Prov + \varepsilon \end{aligned} \tag{1}$$

where the dependent variable is corporate ESG performance (*ESGP*) which is represented by HuaZheng ESG rating. This ranking is constructed regarding the international mainstream methodology and practical experience, combined with China's national conditions and the characteristics of the capital market, thus the calculation results are objective and accurate, with wide coverage and strong timeliness (Jiang et al. 2022; Mu et al. 2023). The Huazheng ESG rating is divided into grades C, CC, CCC, B, BB, BBB, A, AA, and AAA, which we correspondingly measured as 1 to 9. The larger the number, the better the ESG performance of the private firm. In addition, considering some variation in the rating results of different third-party rating agencies, our study further remeasures the ESG performance using the ESG rating of the Bloomberg database in the robustness check section to enhance the reliability of our findings.

We follow Yu and Qi (2022) to measure our independent variables. Firstly, state-owned shareholders are non-controlling shareholders whose equity is a state-owned legal entity or state-owned shares. [6] Further, we measure state-owned shareholders' participation in three dimensions, respectively. *Soeshare* is the sum of the shareholdings of state-owned shareholders among the top ten shareholders of each private firm, representing the shareholding ratio of state-owned shareholders. *Soere* is the ratio of the amount of state-owned equity to the amount of non-state-owned equity among each firm's top ten shareholders, representing the degree of checks and balances between the state-owned and non-state-owned shareholders. *Soedum* is a dummy variable that takes the value of one if there are state-owned shareholders in the top ten shareholders of the private firm, and zero otherwise, indicating whether state-owned capital has entered.

Our regression model also adds several control variables that may impact corporate ESG performance, including company size (*Size*), asset-liability ratio (*Lev*), operating income growth rate (*Growth*), total asset turnover (*ATO*), largest ownership ratio (*Top1*), management ownership ratio (*Mshare*), percentage of independent directors (*Indep*), whether the CEO also serves as chairman (*Dual*), whether the client firm is audited by the big 4 audit firms (*Big4*), and firm age (*Age*). In addition, our study controls for year-fixed effects (*Year*), industry-fixed effects (*Ind*), and province-fixed effects (*Prov*). Standard errors are clustered at the firm level. The appendix provides a detailed definition

[6] We follow Li et al. (2023) to exclude financial shareholders such as social security funds, securities investment funds, insurance investment accounts, and bank capital accounts.

for each variable.

IV. Empirical results and discussion

Descriptive statistics

Table 2 presents the descriptive statistics for the main variables. Among them, the mean value of *ESGP* is 4.121 with a minimum value of 1, a maximum value of 8, and a standard deviation of 1.047. In other words, the average ESG rating of POEs ranges between B and BB, indicating a wide variation in ESG performance between POEs. The mean value of *Soeshare* is 0.017 while the maximum value is 0.266 and the minimum is 0.000. This indicates that state-owned shareholders are among the most important shareholders of POEs and that there are significant differences in the level of participation between different POEs. The mean value of *Soere* is 0.04, the maximum value is 0.781, and the standard deviation is 0.108, which indicates that in some POEs, state-owned shareholders' participation is crucial to achieving equity balance. The mean value of *Soedum* is 0.391, which indicates that the entry of state capital into POEs has been increasing, with nearly 39% of samples having state shareholders. The descriptive statistics of the other control variables are consistent with the relevant literature (e.g., Mu et al. 2023; Yu and Qi 2022).

Fig. 1 depicts the distribution of firm-year observations of the ESG performance of POEs. We observe that the ESG performance of POEs shows a fluctuating upward trend over time. More importantly, there is a significant difference in ESG performance between POEs with state-owned shareholders (*Soedum*=1) and POEs without state-owned shareholders (*Soedum*=0), supporting the previous theoretical analysis.

Table 2. Summary Statistics

Variables	Obs	Mean	SD	Min	P25	Median	P75	Max
ESGP	18,712	4.121	1.047	1.000	4.000	4.000	5.000	8.000
Soeshare	18,712	0.017	0.041	0.000	0.000	0.000	0.015	0.266
Soere	18,712	0.040	0.108	0.000	0.000	0.000	0.028	0.781
Soedum	18,712	0.391	0.488	0.000	0.000	0.000	1.000	1.000
Size	18,712	21.718	1.031	19.924	20.960	21.586	22.317	25.100
Lev	18,712	0.351	0.186	0.054	0.198	0.332	0.485	0.832
Growth	18,712	0.193	0.337	-0.482	0.008	0.143	0.309	1.899

ATO	18,712	0.656	0.399	0.089	0.401	0.572	0.802	2.439
Top1	18,712	0.326	0.139	0.089	0.218	0.306	0.413	0.712
Mshare	18,712	0.233	0.219	0.000	0.009	0.189	0.416	0.693
Indep	18,712	0.378	0.052	0.333	0.333	0.364	0.429	0.571
Dual	18,712	0.405	0.491	0.000	0.000	0.000	1.000	1.000
Big4	18,712	0.033	0.178	0.000	0.000	0.000	0.000	1.000
Age	18,712	1.545	0.899	0.000	0.693	1.609	2.197	3.367

Note: This table summarizes the main characteristics of the sample firms. The sample period is 2009 to 2022. The unit of observations is the firm-year.

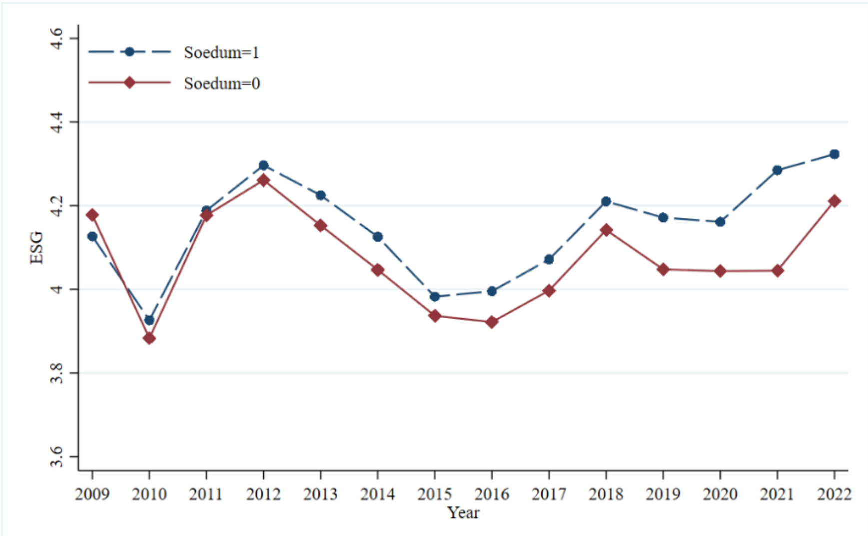

Fig. 1. Time Trend of Corporate ESG Performance

Note: The figure plots the time trend in ESG performance of privately listed firms over the period 2009 to 2022. It classifies firms according to the existence of state-owned shareholders among their top ten shareholders.

Basic regression

Table 3 presents the baseline results of how state-owned shareholders' participation affects ESG performance among POEs. Columns (1)-(3) show the regression results without control variables. Under different measures of state shareholder participation, the regression coefficients of the shareholding ratio of state-owned shareholders (*Soeshare*), the balance degree of state-owned shareholders (*Soere*), and the identification of state-owned shareholders' participation (*Soedum*) are significantly positively associated with the private firm's ESG performance (*ESGP*). Columns (4)-(6), meanwhile, display the results of the regressions when including a series of control variables. The regression coefficient of *Soeshare* in Column (4) is 0.236, which is significantly positive at the 1%

level, indicating that state-owned shareholders' participation can significantly enhance the ESG performance of POEs. Similar results are shown in Columns (5) and (6). The above results show that the participation of state-owned shareholders can exert the resource support effect and governance supervision effect, alleviate resource constraints, mitigate agency problems, and constrain irregularities in the ESG activities of POEs, thus significantly improving the ESG performance of POEs. The results support our hypothesis 1.

Table 3. Stated-owned Shareholder's Participation and ESG Performance

Variables	(1) ESGP	(2) ESGP	(3) ESGP	(4) ESGP	(5) ESGP	(6) ESGP
Soeshare	0.181**			0.236***		
	(2.475)			(3.411)		
Soere		0.064**			0.101***	
		(2.127)			(3.675)	
Soedum			0.186***			0.200***
			(4.070)			(4.571)
Size				0.573***	0.575***	0.563***
				(16.405)	(16.496)	(16.131)
Lev				-0.226***	-0.226***	-0.223***
				(-13.502)	(-13.488)	(-13.435)
Growth				0.250***	0.252***	0.249***
				(5.994)	(6.053)	(5.982)
ATO				0.169**	0.170**	0.172**
				(2.342)	(2.336)	(2.391)
Top1				0.034	0.074	-0.040
				(0.168)	(0.359)	(-0.198)
Mshare				0.656***	0.664***	0.625***
				(5.178)	(5.238)	(4.962)
Indep				0.224***	0.224***	0.215***
				(5.033)	(5.028)	(4.846)
Dual				-0.002	-0.000	-0.003
				(-0.039)	(-0.002)	(-0.059)
Big4				0.082	0.074	0.093
				(0.493)	(0.452)	(0.547)
Age				-0.330***	-0.333***	-0.348***
				(-9.810)	(-9.896)	(-10.494)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Ind	Yes	Yes	Yes	Yes	Yes	Yes

Prov	Yes	Yes	Yes	Yes	Yes	Yes
N	18,712	18,712	18,712	18,712	18,712	18,712
Pseudo R^2	0.019	0.019	0.021	0.053	0.053	0.054

Note: This table presents regression results of stated-owned shareholders' participation and the ESG performance of POEs. All regressions include fixed effects by year, industry, and province. The z-statistics are reported in parentheses, while the estimated standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. The definition of each variable can be found in the Appendix.

Since the estimated coefficients of the ologit model can only be used to identify the relationship and significance of the effect of state-owned shareholders' participation on the ESG performance of POEs, further calculation of the marginal effect is needed. Therefore, we calculate the marginal effects estimated by the ologit model. Panel A of Table 4 shows that each unit increase in the shareholding ratio of state-owned shareholders can lead to a decrease in the probability of ESG scores of "1", "2", "3", and "4" by 0.4%, 0.9%, 2.6%, and 1%, respectively. The probability of corporate ESG scores for "5", "6", and "7" increase by 3.4%, 1.4% and 0.1%, respectively. The regression results of *Soere* and *Soedum* in Panel B and Panel C of Table 4 show similar effects. The higher the proportion of state-owned shareholders' equity in the private firm, the more the firm's ESG score improves, which means that state-owned shareholders' participation has a significant positive effect on the ESG performance of POEs.

Table 4. Results For Marginal Effect

Panel A: marginal effect based on Soeshare								
Variables	(1) ESGP=1	(2) ESGP=2	(3) ESGP=3	(4) ESGP=4	(5) ESGP=5	(6) ESGP=6	(7) ESGP=7	(8) ESGP=8
Soeshare	-0.004***	-0.009***	-0.026***	-0.010***	0.034***	0.014***	0.001***	0.000
	(-3.320)	(-3.414)	(-3.417)	(-3.259)	(3.430)	(3.351)	(3.002)	(0.958)
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Prov	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	18,712	18,712	18,712	18,712	18,712	18,712	18,712	18,712
Panel B: marginal effect based on Soere								
Variables	(1) ESGP=1	(2) ESGP=2	(3) ESGP=3	(4) ESGP=4	(5) ESGP=5	(6) ESGP=6	(7) ESGP=7	(8) ESGP=8
Soere	-0.002***	-0.004***	-0.011***	-0.004***	0.014***	0.006***	0.001***	0.000
	(-3.568)	(-3.679)	(-3.681)	(-3.494)	(3.698)	(3.609)	(3.184)	(0.965)
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Ind	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Prov	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	18,712	18,712	18,712	18,712	18,712	18,712	18,712	18,712

Panel C: marginal effect based on Soedum

Variables	(1) ESGP=1	(2) ESGP=2	(3) ESGP=3	(4) ESGP=4	(5) ESGP=5	(6) ESGP=6	(7) ESGP=7	(8) ESGP=8
Soedum	-0.004***	-0.007***	-0.022***	-0.009***	0.029***	0.012***	0.001***	0.000
	(-4.337)	(-4.544)	(-4.579)	(-4.209)	(4.593)	(4.423)	(3.751)	(0.974)
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Prov	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	18,712	18,712	18,712	18,712	18,712	18,712	18,712	18,712

Note: This table reports results for marginal effects. Panel A shows a marginal effect based on Soeshare, Panel B shows a marginal effect based on Soere, and Panel C marginal effect based on Soedum. All regressions include fixed effects by year, industry, and province. The robust standard errors are reported in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. The definition of each variable can be found in the Appendix.

Endogeneity and robustness tests

Propensity score matching

Considering the degree of difference in financial or governance status between POEs with and without state-owned shareholders, our study uses propensity score matching (PSM) to conduct robustness tests. First, we set the POEs with state-owned shareholders as the treatment group, while POEs without state-owned shareholders as the control group. All control variables are selected as covariates to calculate the propensity score by estimating the logit model. Then, based on the propensity scores, we use nearest 1:1 matching, nearest neighbor matching, caliper matching, radius matching, and kernel matching to ensure the reliability of the regression results. Table 5 reports the PSM results. In detail, ATT indicates the matching result considering only the sample with the presence of state-owned shareholders, which is also the most important result. ATU indicates the matching result considering only the sample without the presence of state-owned shareholders. ATE indicates the matching result considering the whole sample. All matching results are significantly positive, verifying that state-owned shareholders' participation can promote the ESG performance of POEs.

Table 5. PSM Test

Variables	(1) ESGP	(2) ESGP	(3) ESGP	(4) ESGP	(5) ESGP
Matching method	1:1 matching	Neighbor matching	Caliper matching	Radius matching	Kernel matching
Unmatched	0.084***	0.084***	0.084***	0.084***	0.084***
	(5.323)	(5.323)	(5.323)	(5.323)	(5.323)
ATT	0.089***	0.109***	0.109***	0.105***	0.098***
	(2.939)	(5.182)	(5.288)	(0.020)	(0.026)
ATU	0.092***	0.072***	0.074***	0.050**	0.090***
	(2.716)	(3.659)	(3.992)	(0.019)	(0.024)
ATE	0.091***	0.088***	0.089***	0.072***	0.091***
	(3.797)	(5.051)	(5.415)	(0.016)	(0.024)

Note: This table reports PSM test results based on different match methods. The robust standard errors are reported in parentheses, and robust standard errors are obtained by bootstrap test. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Heckman two-stage regressions

To eliminate the problem of potential sample self-selection bias, our study further employs the Heckman two-stage regression. The Government-Market Relations Index (*Marketindex*) and the Development of Market Intermediary Organizations and Legal System Environment Index (*Legalindex*) from the Business Environment Index for China's Provinces 2020 Report are used as the exogenous variables for state-owned shareholders' participation, and missing data for years are supplemented using linear interpolation. The regression results are shown in Table 6. Column (1) presents the first-stage regression result, revealing that both *Marketindex* and *Legalindex* are significantly negative. Columns (2) to (4) show the results of the second-stage regressions, which indicates that the regression coefficients of the inverse mills ratio (*Imr*) are not significant. The results remain robust after using two-stage Heckman estimations to address the identification problems. In other words, the participation of state-owned shareholders still has a significant positive effect on the ESG performance of POEs when controlling the sample selection bias.

Table 6. Heckman-Two Stages Regressions

Variables	(1) Soedum	(2) ESGP	(3) ESGP	(4) ESGP
Marketindex	-0.038**			
	(-2.115)			
Legalindex	-0.021**			
	(-2.089)			
Soeshare		0.234***		
		(3.391)		
Soere			0.101***	
			(3.664)	
Soedum				0.200***
				(4.559)
Imr		-0.018	-0.038	-0.004
		(-0.026)	(-0.055)	(-0.006)
Size	0.241***	0.569***	0.568***	0.561***
	(11.248)	(4.804)	(4.813)	(4.765)
Lev	-0.059***	-0.225***	-0.224***	-0.223***
	(-5.258)	(-6.940)	(-6.939)	(-6.938)
Growth	-0.056**	0.252***	0.255***	0.250***
	(-1.992)	(5.120)	(5.189)	(5.108)
ATO	0.039	0.171**	0.171**	0.174**
	(0.766)	(2.291)	(2.279)	(2.344)
Top1	-0.009	0.028	0.068	-0.046
	(-0.071)	(0.139)	(0.331)	(-0.226)
Mshare	-0.361***	0.656***	0.669***	0.621***
	(-4.332)	(2.929)	(2.989)	(2.788)
Indep	-0.076**	0.226***	0.227***	0.216***
	(-2.574)	(3.910)	(3.932)	(3.753)
Dual	0.037	-0.002	-0.000	-0.002
	(1.133)	(-0.033)	(-0.008)	(-0.043)
Big4	0.095	0.086	0.077	0.097
	(0.971)	(0.486)	(0.440)	(0.541)
Age	0.275***	-0.333**	-0.340**	-0.349**
	(12.105)	(-2.394)	(-2.451)	(-2.527)
Year	Yes	Yes	Yes	Yes
Ind	Yes	Yes	Yes	Yes
Prov	Yes	Yes	Yes	Yes
N	18,691	18,691	18,691	18,691
Log likelihood	-11,420.87			
Pseudo R^2	0.086	0.053	0.053	0.054

Note: This table reports the Heckman-Two stages regression results. All regressions include control variables and fixed effects by year, industry, and province. The z-statistics are reported in parentheses, while the estimated standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. The definition of each variable can be found in the Appendix.

Instrumental variable analysis

POEs with superior ESG performance may be more attractive to state-owned shareholders, which means there may be a reverse causality between state-owned shareholders' participation and the ESG performance of POEs. Following related studies (e.g., Li, Yang, and Yin 2022; Shu and Tan 2023), we choose the one-period lagged province-industry average of the shareholding ratio of state-owned shareholders (*Soeshare_IV*) and the one-period lagged province-industry average of the balance degree of state-owned shareholders (*Soere_IV*) as instrumental variables. The regression results are presented in Table 7. The instrumental variables are significantly positive at the 1% level in the first-stage regression, whereas, in the second-stage regression, the regression coefficients of the shareholding ratio of state-owned shareholders (*Soeshare*) and the balance degree of state-owned shareholders (*Soere*) are significantly positive. The above results suggest that the baseline findings still hold after controlling for the endogeneity problem of reverse causality.

Table 7. Instrumental Regressions

Variables	(1) Soeshare	(2) ESGP	(3) Soere	(4) ESGP
Soeshare_IV	0.610***			
	(6.829)			
Soeshare		0.461**		
		(2.367)		
Soere_IV			0.662***	
			(6.730)	
Soere				0.164**
				(2.240)
Size	0.030***	0.580***	0.054**	0.581***
	(3.413)	(16.712)	(2.145)	(16.729)
Lev	-0.005	-0.226***	-0.011	-0.226***
	(-1.110)	(-13.577)	(-0.798)	(-13.592)
Growth	-0.021**	0.245***	-0.075***	0.245***
	(-2.377)	(5.891)	(-3.152)	(5.890)

ATO	0.035	0.176**	0.096	0.177**
	(1.112)	(2.461)	(1.175)	(2.469)
Top1	-0.291***	-0.013	-1.041***	-0.014
	(-6.594)	(-0.066)	(-8.392)	(-0.068)
Mshare	-0.229***	0.605***	-0.594***	0.606***
	(-7.347)	(4.811)	(-7.573)	(4.824)
Indep	-0.053***	0.214***	-0.118***	0.213***
	(-5.491)	(4.805)	(-4.786)	(4.799)
Dual	0.005	-0.001	-0.008	-0.001
	(0.368)	(-0.022)	(-0.253)	(-0.016)
Big4	0.074	0.089	0.229	0.086
	(1.432)	(0.524)	(1.353)	(0.504)
Age	-0.000	-0.332***	0.022	-0.332***
	(-0.041)	(-9.948)	(0.757)	(-9.950)
Year	Yes	Yes	Yes	Yes
Ind	Yes	Yes	Yes	Yes
Prov	Yes	Yes	Yes	Yes
N	18,712	18,712	18,712	16,221
Adj/Pseudo R^2	0.110	0.053	0.128	0.053
F	48.560		43.105	

Note: This table reports instrumental regressions results. All regressions include control variables and fixed effects by year, industry, and province. The t-statistics are reported in parentheses in columns (1) and (3), the z-statistics are reported in parentheses in columns (2) and (4), while estimated standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. The definition of each variable can be found in the Appendix.

Alternative measures of main variables

We use the ESG rating provided by Bloomberg Consulting (*ESGP_B*) as a proxy variable for the ESG performance of POEs. The regression results are shown in columns (1)-(3) of Table 8, from which the coefficients of the variables *Soeshare*, *Soere*, and *Soedum* are all significantly positive, in line with the baseline regression results. Furthermore, according to the definition of major shareholders laid out by the “Guidelines for the Standardized Operation of Listed Companies on the Stock Exchange” and “Rules for the Listing of Stocks on the Stock Exchange”, we set the dummy variable *Soedum1* as a proxy variable for the independent variable. *Soedum1* takes the value of one if the shareholding ratio of state-owned shareholders is more than 5%, and zero otherwise. Column (4) of Table 8 shows the regression results for the replacement independent variables, and the regression coefficient of *Soedum1* is significantly positive.

Table 8. Alternative Measure of Main Variables

Variables	(1) ESGP_B	(2) ESGP_B	(3) ESGP_B	(4) ESGP
Soeshare	0.887*			
	(1.883)			
Soere		0.311**		
		(2.019)		
Soedum			0.677**	
			(1.974)	
Soedum1				0.180**
				(2.077)
Size	0.215***	0.215***	0.213***	0.577***
	(8.163)	(8.179)	(8.038)	(16.568)
Lev	-0.547	-0.563	-0.465	-0.226***
	(-0.463)	(-0.478)	(-0.391)	(-13.562)
Growth	0.311	0.312	0.322	0.247***
	(1.311)	(1.312)	(1.347)	(5.906)
ATO	0.107**	0.107**	0.106**	0.174**
	(2.114)	(2.132)	(2.087)	(2.412)
Top1	-0.163	-0.149	-0.203	-0.000
	(-1.167)	(-1.061)	(-1.442)	(-0.001)
Mshare	0.935	0.934	0.749	0.628***
	(0.946)	(0.947)	(0.763)	(4.979)
Indep	0.253	0.238	0.193	0.217***
	(0.732)	(0.690)	(0.556)	(4.899)
Dual	0.082	0.102	0.078	-0.000
	(0.229)	(0.289)	(0.219)	(-0.009)
Big4	0.492***	0.490***	0.499***	0.095
	(4.692)	(4.673)	(4.710)	(0.568)
ListAge	-0.346	-0.350	-0.438	-0.330***
	(-1.244)	(-1.261)	(-1.578)	(-9.843)
Year	Yes	Yes	Yes	Yes
Ind	Yes	Yes	Yes	Yes
Prov	Yes	Yes	Yes	Yes
N	4,536	4,536	4,536	18,712
Adj/Pseudo R^2	0.585	0.585	0.585	0.052

Note: This table reports regression results using alternative measures of dependent and independent variables. All regressions include control variables and fixed effects by year, industry, and province. The t-statistics are reported in parentheses in columns (1)-(3), the z-statistics are reported in parentheses in columns (4), while estimated standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. The definition of each variable can be found in the Appendix.

Additional controls

Considering that other investor shareholdings and political connections may have important effects on the ESG performance of POEs in China (Jiang et al. 2022; Boubakri et al. 2011), we additionally control institutional investor shareholdings (*INST*) and political connections (*PC*) in the model (1) and rerun the regression. According to Table 9, the regression coefficients of *Soeshare*, *Soere*, and *Soedum* are all significantly positive when controlling *INST* and *PC*, which indicates the robustness of the main findings.

Table 9. Regressions With Additional Controls

Variables	(1) ESGP	(2) ESGP	(3) ESGP
Soeshare	0.214***		
	(3.083)		
Soere		0.095***	
		(3.464)	
Soedum			0.183***
			(4.179)
INST	0.359***	0.370***	0.360***
	(3.366)	(3.487)	(3.400)
PC	0.156***	0.156***	0.157***
	(2.669)	(2.667)	(2.693)
Size	0.550***	0.551***	0.541***
	(15.706)	(15.763)	(15.433)
Lev	-0.223***	-0.224***	-0.221***
	(-13.458)	(-13.434)	(-13.389)
Growth	0.237***	0.239***	0.236***
	(5.723)	(5.775)	(5.710)
ATO	0.163**	0.163**	0.166**
	(2.275)	(2.263)	(2.320)
Top1	-0.097	-0.061	-0.166
	(-0.477)	(-0.297)	(-0.816)
Mshare	0.774***	0.787***	0.746***
	(6.171)	(6.269)	(5.976)
Indep	0.226***	0.227***	0.219***
	(5.095)	(5.107)	(4.926)
Dual	0.008	0.009	0.007
	(0.159)	(0.194)	(0.143)

Big4	0.068	0.060	0.078
	(0.409)	(0.362)	(0.458)
Age	-0.351***	-0.355***	-0.368***
	(-10.306)	(-10.408)	(-10.950)
Year	Yes	Yes	Yes
Ind	Yes	Yes	Yes
Prov	Yes	Yes	Yes
N	18,669	18,669	18,669
Pseudo R^2	0.054	0.054	0.056

Note: This table presents the regression results after controlling institutional investor shareholdings (INST) and political connections (PC). All regressions include other control variables used in baseline regressions and fixed effects by year, industry, and province. The z-statistics are reported in parentheses, while the estimated standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. The definition of each variable can be found in the Appendix.

Impact homogeneity test

Corporate carbon emissions intensity

To test our hypothesis 2, we refer to the study of Wang, Sun, and Yu (2022) by classifying firms within 18 high-carbon industries as high-carbon firms and the remaining firms as low-carbon firms to conduct subsample regressions.[7] Table 10 presents the subsample regression results, showing that the coefficients of all three variables of state-owned shareholder participation in high-carbon firms are insignificant. The coefficients of *Soeshare*, *Soere*, and *Soedum* in low-carbon firms are 0.287, 0.123, and 0.228, respectively, and all are significantly positive. These results suggest that high-carbon firms have long relied on a high-input, sloppy growth model (Downar et al. 2021) and that reducing carbon emissions has a strong negative impact on their market power and profitability (Smale et al. 2006; Nishitani and Kokubu 2012). Therefore, the effect of state-owned shareholders' participation in the ESG enhancement is more significant in

[7] The high-carbon industries are as follows: oil and gas extraction; electricity, heat and gas production and supply industry; metal products industry; petroleum processing and coking and nuclear fuel processing industry; ferrous metal smelting and rolling processing industry; chemical raw materials and chemical products manufacturing industry; non-ferrous metal smelting and rolling processing industry; chemical fiber manufacturing industry; non-metallic mineral products industry; housing construction industry; non-ferrous metal mining industry; civil engineering construction industry; metal products machinery and equipment repair industry; building decoration and other construction industry; non-metallic mining industry; paper and paper products industry; ferrous metal mining industry; and wood processing and wood, bamboo, rattan, palm, and grass products industry.

low-carbon firms, which supports our hypothesis 2.

Table 10. Heterogeneity Test: Corporate Carbon Emissions Intensity

Variables	(1) High-carbon	(2) Low-carbon	(3) High-carbon	(4) Low-carbon	(5) High-carbon	(6) Low-carbon
	ESGP	ESGP	ESGP	ESGP	ESGP	ESGP
Soeshare	0.172	0.287***				
	(1.084)	(4.122)				
Soere			0.077	0.123***		
			(1.216)	(4.553)		
Soedum					0.110	0.228**
					(0.635)	(2.419)
Size	0.495***	0.626***	0.495***	0.629***	0.500***	0.629***
	(7.981)	(15.109)	(8.040)	(15.175)	(8.121)	(15.198)
Lev	-0.221***	-0.236***	-0.222***	-0.236***	-0.222***	-0.236***
	(-6.859)	(-12.072)	(-6.841)	(-12.084)	(-6.866)	(-12.092)
Growth	0.291***	0.260***	0.293***	0.262***	0.289***	0.256***
	(4.061)	(4.983)	(4.121)	(5.015)	(4.036)	(4.899)
ATO	0.357**	0.093	0.352**	0.097	0.368**	0.095
	(2.148)	(1.174)	(2.107)	(1.220)	(2.215)	(1.198)
Top1	0.259	0.009	0.301	0.050	0.224	-0.026
	(0.654)	(0.038)	(0.755)	(0.210)	(0.566)	(-0.111)
Mshare	0.715***	0.666***	0.725***	0.672***	0.702**	0.628***
	(2.597)	(4.689)	(2.633)	(4.737)	(2.567)	(4.434)
Indep	0.290***	0.204***	0.290***	0.204***	0.286***	0.195***
	(3.262)	(3.993)	(3.258)	(3.988)	(3.224)	(3.838)
Dual	-0.049	0.021	-0.047	0.022	-0.051	0.024
	(-0.476)	(0.375)	(-0.451)	(0.396)	(-0.494)	(0.446)
Big4	0.398	-0.046	0.387	-0.052	0.397	-0.022
	(1.227)	(-0.235)	(1.238)	(-0.263)	(1.208)	(-0.111)
Age	-0.343***	-0.331***	-0.346***	-0.334***	-0.340***	-0.332***
	(-5.272)	(-8.665)	(-5.315)	(-8.757)	(-5.218)	(-8.707)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Ind	Yes	Yes	Yes	Yes	Yes	Yes
Prov	Yes	Yes	Yes	Yes	Yes	Yes
N	4,982	13,730	4,982	13,730	4,982	13,730
Pseudo R^2	0.062	0.057	0.063	0.057	0.062	0.056
P-value	0.020**		0.032**		0.084*	

Note: This table shows subsample regression results based on corporate carbon emissions intensity. All regressions include control variables and fixed effects by year, industry, and province. The z-statistics are reported in parentheses, while the estimated standard errors are clustered at the firm level. *, **, and

*** denote significance at the 10%, 5%, and 1% levels, respectively. The definition of each variable can be found in the Appendix.

Industry competition

To test our hypothesis 3, we divide the sample into two groups based on the median of industry competition intensity into high- and low-competition-intensity industry groups and perform subsample regressions. Industry competition intensity is measured using the Herfindahl index, calculated by firm sales. Table 11 presents the results of the subsample regressions, showing that the coefficients for *Soeshare*, *Soere*, and *Soedum* in the high-competition-intensity industry group are 0.285, 0.133, and 0.235, which are significantly positive. In contrast, the coefficients of *Soeshare* and *Soere* are not significant, and the coefficient of *Soedum* is significantly positive at the 10 % level in the group of low-competitive-intensity industries, but the coefficient of inter-group difference in columns (5) and (6) is 0.002, which is significant at the 5 % level. This suggests that good ESG performance can help POEs form unique competitive advantages in the capital market (Broadstock et al. 2021), reduce the operational pressure brought by fierce industry competition, and improve the recognition of firms by internal and external stakeholders (Deng et al. 2022). Therefore, state-owned shareholders' participation has a stronger positive impact on the ESG performance in high-competitive-intensity industries relative to low-competitive-intensity industries. The above results support hypothesis 3.

Table 11. Heterogeneity Test: Industry Competition

Variables	(1) High-competition	(2) Low-competition	(3) High-competition	(4) Low-competition	(5) High-competition	(6) Low-competition
	ESGP	ESGP	ESGP	ESGP	ESGP	ESGP
Soeshare	0.285***	0.159				
	(3.770)	(1.551)				
Soere			0.133***	0.044		
			(4.363)	(1.164)		
Soedum					0.235***	0.134*
					(4.828)	(1.916)
Size	0.552***	0.637***	0.554***	0.639***	0.541***	0.631***
	(14.449)	(12.706)	(14.551)	(12.783)	(14.115)	(12.559)
Lev	-0.219***	-0.253***	-0.220***	-0.253***	-0.216***	-0.253***
	(-12.025)	(-9.682)	(-12.022)	(-9.705)	(-11.870)	(-9.713)
Growth	0.249***	0.280***	0.252***	0.280***	0.249***	0.278***
	(5.249)	(3.028)	(5.319)	(3.018)	(5.283)	(2.982)
ATO	0.185**	0.178	0.186**	0.182	0.181**	0.191
	(2.462)	(1.369)	(2.467)	(1.403)	(2.411)	(1.466)
Top1	0.019	0.024	0.073	0.025	-0.072	-0.021
	(0.083)	(0.085)	(0.322)	(0.089)	(-0.318)	(-0.076)
Mshare	0.648***	0.806***	0.661***	0.793***	0.611***	0.779***
	(4.648)	(4.297)	(4.751)	(4.225)	(4.422)	(4.153)
Indep	0.240***	0.214***	0.242***	0.210***	0.230***	0.207***
	(4.857)	(3.262)	(4.884)	(3.201)	(4.673)	(3.138)
Dual	-0.001	0.011	0.001	0.011	-0.001	0.009
	(-0.013)	(0.144)	(0.022)	(0.151)	(-0.022)	(0.125)
Big4	0.059	0.248	0.046	0.247	0.073	0.245
	(0.319)	(0.921)	(0.254)	(0.914)	(0.385)	(0.904)
Age	-0.349***	-0.272***	-0.352***	-0.274***	-0.375***	-0.280***
	(-9.344)	(-5.686)	(-9.404)	(-5.747)	(-10.121)	(-5.905)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Ind	Yes	Yes	Yes	Yes	Yes	Yes
Prov	Yes	Yes	Yes	Yes	Yes	Yes
N	13,379	5,150	13,379	5,150	13,379	5,150
Pseudo R^2	0.052	0.068	0.053	0.068	0.052	0.069
P-value	0.008***		0.000**		0.002**	

Note: This table shows subsample regression results based on industry competition. All regressions include control variables and fixed effects by year, industry, and province. The z-statistics are reported in parentheses, while the estimated standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. The definition of each variable can be found in the Appendix.

Impact mechanism test

In the theoretical analysis, our study suggests that the positive effect of state-owned shareholders' participation on the ESG performance of POEs is caused by the "resource support effect" and the "governance supervision effect". This section explores whether the participation of state-owned shareholders improves the ESG performance of POEs through these two dimensions.

To test whether state-owned shareholders' participation can improve corporate ESG performance through the resource support effect, the following model (2) is constructed:

$$\begin{aligned} Subsidy_{i,t} / Loan_{i,t} = \beta_0 + \beta_1 Soeshare_{i,t-1}\left(Soere_{i,t-1}\ or\ Soedum_{i,t-1}\right) \\ + \beta_2 Controls_{i,t-1} + Year + Ind + Prov + \varepsilon \end{aligned} \tag{2}$$

We assess the resource support effect of state-owned shareholder participation in terms of government subsidies and credit access. The variable of government subsidies (*Subsidy*) is measured by using the natural logarithm of government subsidies received by the firm in the current year. The variable of credit access (*Loan*) is measured by the ratio of the difference between the previous year and the current year's loan amount to total assets. Columns (1)-(3) in Table 12 present the regression results for the impact of state-owned shareholders' participation on government subsidies received by POEs, revealing that the coefficients for *Soeshare*, *Soere*, and *Soedum* are significantly positive, respectively. Meanwhile, columns (4)-(6) in Table 12 present the regression results regarding the impact of state-owned shareholders' participation on credit access by POEs, revealing that the coefficients of *Soeshare*, *Soere*, and *Soedum* are all negative but insignificant. The results indicate that state-owned shareholders' participation produces insignificant improvement in POEs' credit access but does help them to enhance their relationship with the government through their state-owned attributes and increase their access to government subsidies (Yu, Song, and Song 2020), thus improving their ESG performance.

Table 12. Channel Analysis: Resource Support Effect

Variables	(1) Subsidy	(2) Subsidy	(3) Subsidy	(4) loan	(5) loan	(6) loan
Soeshare	0.140***			-0.001		
	(2.784)			(-0.816)		
Soere		0.045**			-0.000	
		(2.175)			(-1.023)	
Soedum			0.118***			-0.001
			(4.363)			(-1.359)
Size	0.913***	0.915***	0.906***	0.002***	0.002***	0.002***
	(38.489)	(38.664)	(38.122)	(3.668)	(3.650)	(3.757)
Lev	-0.080	-0.083	-0.064	-0.013***	-0.013***	-0.013***
	(-0.725)	(-0.753)	(-0.581)	(-3.417)	(-3.417)	(-3.471)
Growth	-0.027	-0.027	-0.027	0.012***	0.012***	0.012***
	(-1.012)	(-1.004)	(-1.024)	(7.864)	(7.854)	(7.861)
ATO	0.151***	0.152***	0.154***	0.011***	0.011***	0.011***
	(2.874)	(2.878)	(2.934)	(7.477)	(7.484)	(7.490)
Top1	0.006	0.011	-0.039	0.001	0.001	0.001
	(0.048)	(0.091)	(-0.319)	(0.296)	(0.241)	(0.385)
Mshare	0.157**	0.152*	0.138*	0.001	0.001	0.001
	(1.980)	(1.913)	(1.760)	(0.586)	(0.564)	(0.619)
Indep	0.026	0.003	-0.021	0.002	0.002	0.002
	(0.089)	(0.009)	(-0.073)	(0.216)	(0.215)	(0.231)
Dual	0.026	0.028	0.026	0.003**	0.003**	0.003**
	(0.911)	(0.951)	(0.898)	(2.476)	(2.465)	(2.484)
Big4	0.154*	0.155*	0.159*	-0.003	-0.003	-0.003
	(1.673)	(1.684)	(1.681)	(-1.175)	(-1.154)	(-1.206)
Age	-0.120***	-0.122***	-0.132***	-0.006***	-0.006***	-0.006***
	(-5.447)	(-5.510)	(-5.981)	(-8.654)	(-8.624)	(-8.214)
Constant	-3.652***	-3.680***	-3.490***	-0.029**	-0.029**	-0.031**
	(-7.184)	(-7.247)	(-6.842)	(-1.996)	(-1.975)	(-2.114)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Ind	Yes	Yes	Yes	Yes	Yes	Yes
Prov	Yes	Yes	Yes	Yes	Yes	Yes
N	18248	18248	18248	15697	15697	15697
Adj. R^2	0.415	0.414	0.415	0.034	0.034	0.034

Note: This table shows channel analysis results based on the resource support effect. All regressions include control variables and fixed effects by year, industry, and province. The t-statistics are reported in parentheses, while the estimated standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. The definition of each variable can be found in the Appendix.

To test whether state-owned shareholders' participation can improve the ESG performance of POEs through the governance supervision effect, the following model (3) is constructed:

$$\begin{aligned} Mfee_{i,t} / Orec_{i,t} / Fraud_{i,t} = \beta_0 + \beta_1 Soeshare_{i,t-1}\left(Soere_{i,t-1} \text{ or } Soedum_{i,t-1}\right) \\ + \beta_2 Controls_{i,t-1} + Year + Ind + Prov + \varepsilon \end{aligned} \tag{3}$$

Our study examines the governance supervision effect of state shareholder participation in terms of agency costs and corporate irregularities. Type I agency cost (*Mfee*) is measured by the ratio of overheads to main business income, Type II agency cost (*Orec*) is measured by the ratio of net other receivables to total assets. Corporate irregularity (*Fraud*) is measured by the number of penalties imposed in the current year. Columns (1)-(3) in Table 13 show the regression results of state-owned shareholders' participation on the Type I agency cost, revealing that the coefficients of of *Soeshare*, *Soere*, and *Soedum* are insignificant. Columns (4)-(6) show the regression results of state-owned shareholders' participation in Type II agency cost, from which the coefficients of *Soeshare*, *Soere*, and *Soedum* are negatively significant. Columns (7)-(9) in Table 13 show the regression results of state-owned shareholders' participation in corporate irregularities, which indicates that the coefficients of *Soeshare*, *Soere*, and *Soedum* are negatively significant. The above results reveal that state-owned shareholders' participation has no significant effect on the Type I agency problem of POEs, mainly inhibits the incentives of major shareholders' hollowing out to alleviate the Type II agency problem (Zhang, Gu, and Wang 2022), as well as reduces irregularities in production or operation that are detrimental to environment and social benefits to enhance operational compliance (Marquis and Qian 2014), thereby improving the ESG performance of POEs.

Table 13. Channel Analysis: Governance Supervision Effect

Variables	(1) Mfee	(2) Mfee	(3) Mfee	(4) Orec	(5) Orec	(6) Orec	(7) Fraud	(8) Fraud	(9) Fraud
Soeshare	0.030			-0.013**			-0.162**		
	(1.556)			(-2.121)			(-2.052)		
Soere		0.001			-0.001*			-0.060**	
		(1.034)			(-1.879)			(-2.073)	
Soedum			0.010			-0.005**			-0.179***
			(1.319)			(-1.991)			(-2.804)
Size	-0.016***	-0.016***	-0.016***	-0.002***	-0.001***	-0.002***	-0.202***	-0.204***	-0.190***
	(-14.235)	(-14.110)	(-14.216)	(-2.865)	(-2.804)	(-2.897)	(-5.589)	(-5.664)	(-5.215)
Lev	-0.022***	-0.022***	-0.022***	0.022***	0.022***	0.022***	0.185***	0.186***	0.182***
	(-4.004)	(-3.985)	(-4.013)	(9.986)	(9.919)	(9.998)	(9.860)	(9.880)	(9.655)
Growth	-0.010***	-0.011***	-0.010***	-0.001	-0.001	-0.001	-0.011	-0.012	-0.011
	(-7.006)	(-7.029)	(-6.999)	(-1.239)	(-1.230)	(-1.246)	(-0.153)	(-0.164)	(-0.154)
ATO	-0.063***	-0.063***	-0.063***	-0.001	-0.001	-0.001	-0.392***	-0.393***	-0.396***
	(-24.276)	(-24.187)	(-24.239)	(-0.552)	(-0.584)	(-0.553)	(-4.121)	(-4.133)	(-4.202)
Top1	-0.025***	-0.026***	-0.025***	-0.008***	-0.007***	-0.008***	-0.119***	-0.121***	-0.115***
	(-4.261)	(-4.432)	(-4.228)	(-4.012)	(-3.853)	(-4.049)	(-4.832)	(-4.905)	(-4.677)
Mshare	-0.006	-0.007*	-0.006*	-0.001	-0.001	-0.001	-0.564***	-0.566***	-0.546***
	(-1.637)	(-1.793)	(-1.660)	(-0.716)	(-0.557)	(-0.709)	(-3.314)	(-3.328)	(-3.223)
Indep	0.024	0.022	0.023	0.008	0.008*	0.008	0.149***	0.150***	0.154***
	(1.552)	(1.457)	(1.518)	(1.599)	(1.709)	(1.629)	(2.761)	(2.775)	(2.863)
Dual	0.000	0.000	0.000	-0.000	-0.000	-0.000	0.022	0.021	0.023
	(0.313)	(0.314)	(0.329)	(-0.658)	(-0.653)	(-0.681)	(0.366)	(0.351)	(0.382)
Big4	0.016***	0.016***	0.016***	0.001	0.001	0.001	-0.115	-0.114	-0.121

	(3.312)	(3.344)	(3.317)	(0.720)	(0.692)	(0.720)	(-0.597)	(-0.591)	(-0.630)
Age	0.008***	0.008***	0.008***	0.003***	0.003***	0.003***	0.585***	0.586***	0.601***
	(7.055)	(6.956)	(7.034)	(6.384)	(6.432)	(6.411)	(13.690)	(13.717)	(13.981)
Constant	0.463***	0.465***	0.462***	0.034***	0.033***	0.034***	-1.599	-1.546	-1.845*
	(17.787)	(17.701)	(17.775)	(2.929)	(2.839)	(2.952)	(-1.536)	(-1.485)	(-1.772)
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Prov	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	18712	18712	18712	18712	18712	18712	18712	18712	18712
Adj. R^2	0.431	0.430	0.431	0.129	0.127	0.127	0.138	0.138	0.139

Note: This table shows channel analysis results based on the governance supervision effect. All regressions include control variables and fixed effects by year, industry, and province. The t-statistics are reported in parentheses, while the estimated standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. The definition of each variable can be found in the Appendix.

Consequence investigation

The high-quality ESG performance of POEs can release positive signals to the market. This, in turn, can help gain the trust and support of stakeholders, enhance competitive advantage, and thus increase firm value. However, it may also reduce firm value by increasing additional expenses and harming shareholders' interests. In order to investigate whether state-owned shareholders' participation increase the value of POEs by improving their ESG performance, we construct the following model (4):

$$\begin{aligned} ROA_{i,t+n} / TobinQ_{i,t+n} = \beta_0 + \beta_1 Soeshare_{i,t-1} + \beta_2 ESGP_{i,t} \\ + \beta_3 ESGP_{i,t} \times Soeshare_{i,t-1} + \beta_4 Controls_{i,t-1} \\ + Year + Ind + Prov + \varepsilon \end{aligned} \tag{4}$$

We use *ROA* to measure the book value of firms and *TobinQ* to measure the market value of firms, while also adding the Intersection term (*Soeshare*×*ESGP*) of the shareholding ratio of state-owned shareholders (*Soeshare*) and the ESG performance of POEs (*ESGP*) to the model and ensuring that the control variables in the model (4) are consistent with those in the model (1). In addition, considering the possible lag and persistence of this consequential impact, our study uses the firm value variables in periods t+1, t+2, and t+3 as explanatory variables for the regressions. Table 14 shows that the coefficient of the interaction term *Soeshare*×*ESGP* is insignificant only in column (1), while it is significantly positive in all the other columns. The above results indicate that state-owned shareholders' participation has a positive effect on the book value and market value of POEs while improving their ESG performance, and the effect is largely persistent, showing a trend from weak to strong.

Table 14. Consequence Investigation: Book Value and Market Value

Variables	(1) ROA_{t+1}	(2) ROA_{t+2}	(3) ROA_{t+3}	(4) $TobinQ_{t+1}$	(5) $TobinQ_{t+2}$	(6) $TobinQ_{t+3}$
Soeshare	-0.000	-0.013***	-0.014***	-0.115	-0.040	-0.109
	(-0.080)	(-2.921)	(-3.157)	(-1.144)	(-0.389)	(-0.958)
ESGP	0.007***	0.003***	0.002**	0.021	0.018	-0.001
	(9.873)	(4.770)	(1.998)	(1.479)	(1.221)	(-0.036)
Soeshare×ESGP	0.001	0.004***	0.004***	0.060**	0.040*	0.047*
	(1.213)	(3.988)	(4.134)	(2.561)	(1.685)	(1.815)
Size	0.017***	0.016***	0.016***	-0.368***	-0.352***	-0.321***
	(16.906)	(16.348)	(15.230)	(-12.504)	(-11.397)	(-9.842)
Lev	-0.132***	-0.115***	-0.100***	-0.916***	-0.775***	-0.760***
	(-25.608)	(-22.061)	(-17.948)	(-7.203)	(-5.889)	(-5.396)
Growth	-0.008***	-0.006***	-0.005***	0.477***	0.350***	0.292***
	(-4.965)	(-4.306)	(-3.189)	(9.634)	(7.403)	(7.210)
ATO	0.026***	0.015***	0.008***	0.029	-0.030	-0.060
	(10.704)	(6.875)	(3.361)	(0.646)	(-0.634)	(-1.130)
Top1	0.035***	0.038***	0.042***	0.222*	0.250*	0.325**
	(6.329)	(6.234)	(6.385)	(1.793)	(1.924)	(2.236)
Mshare	0.025***	0.027***	0.028***	-0.439***	-0.402***	-0.345***
	(7.114)	(7.130)	(6.511)	(-5.688)	(-5.008)	(-3.877)
Indep	-0.007	-0.015	-0.003	0.464*	0.601**	0.761**
	(-0.475)	(-1.014)	(-0.198)	(1.705)	(2.031)	(2.343)
Dual	0.001	0.001	0.001	0.060*	0.066**	0.070*
	(0.836)	(0.604)	(0.402)	(1.901)	(2.004)	(1.929)
Big4	0.001	0.002	0.001	0.417***	0.363***	0.311***
	(0.285)	(0.413)	(0.231)	(4.219)	(3.899)	(3.051)
Age	-0.021***	-0.025***	-0.028***	0.465***	0.530***	0.615***
	(-15.931)	(-15.282)	(-14.272)	(12.889)	(11.275)	(10.689)
Contant	-0.265***	-0.230***	-0.225***	9.411***	8.012***	7.235***
	(-12.027)	(-10.319)	(-9.758)	(15.197)	(13.185)	(11.333)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Ind	Yes	Yes	Yes	Yes	Yes	Yes
Prov	Yes	Yes	Yes	Yes	Yes	Yes
N	15,696	13,229	11,194	15,432	12,970	10,937
Adj. R^2	0.289	0.264	0.250	0.292	0.326	0.335

Note: This table shows the regression results of the consequence investigation. All regressions include control variables and fixed effects by year, industry, and province. The t-statistics are reported in parentheses, while the estimated standard errors are clustered at the firm level. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. The definition of each variable can be found in the Appendix.

V. Conclusion

The involvement of state-owned shareholders in POEs, representing a significant aspect of mixed ownership reform, raises a critical question: Can this integration leverage the resource and institutional benefits of state-owned capital to enhance the ESG performance of POEs? This issue deserves an in-depth investigation. Based on the data of POEs listed in the Shanghai and Shenzhen stock exchanges from 2009 to 2022, our study empirically tests whether state-owned shareholders' participation improves the ESG performance of POEs.

We find that state-owned shareholders' participation significantly improves the ESG performance of POEs. Our findings are robust after a series of endogeneity and robustness tests including propensity score matching, Heckman's two-stage, instrumental regressions, and replacement of key variable measures. The positive effect of state-owned shareholders' participation on the ESG performance of POEs is more significant among low-carbon firms and firms operating within industries with high-intensity competition. The mechanism tests suggest that this positive effect is primarily the result of the "resource support effect" and "governance supervision effect" generated by state-owned shareholders' participation. Finally, we find that state-owned shareholders' participation effectively increases firm value while improving the ESG performance of POEs. This study contributes to clarifying the controversy of "progress of state capital and regression of private capital" in the reverse mixed ownership reform and confirms the benefits of state shareholders' participation in the ESG performance, which has not yet been examined in the literature.

Our study also has policy implications, especially for emerging economies. First, our findings provide suggestions for policymakers in advancing the greening and sustainable development of the economy. Under the economic transformation pressures faced by emerging economies, the government can play a crucial role by facilitating the flow of state-owned capital into POEs. This strategic initiative leverages the resource and governance strengths of state-owned capital to regulate the conduct of POEs in areas such as environmental protection, internal governance, and fulfilling social responsibilities. Moreover, it contributes to achieving the dual objectives of enhancing the social impact and value addition of state-owned capital. This approach fosters collaborative development between state-owned and private capital, thereby driving a comprehensive green transformation in both the economic and social domains.

Second, the disadvantage of access to resources based on property rights leads to POEs facing serious resource constraints in ESG activities. To promote ESG practices of POEs, the government should strengthen the construction of the green financial system and improve the ESG regulatory system, thus creating a better external institutional environment for corporate ESG practices. In addition, as heterogeneous shareholders with political attributes, the participation of state-owned shareholders can reduce agency costs and constrain operational irregularities, which means that POEs need to establish more transparent and effective internal governance mechanisms, avoid short-sighted hollowing out of major shareholders, and improve institutional norms to promote long-term sustainable development.

Third, we find that state-owned shareholders' participation can enhance the value of POEs by improving their ESG performance, which provides empirical evidence for the positive value effect of ESG performance. Therefore, these firms should actively coordinate the relationship between self-interests and social requirements, and further strengthen the construction of an ESG governance system to achieve the organic alignment of business value and social value of firms.

This study still has some limitations for future research to complete. First, our study only examines the shareholding ratio of state-owned shareholders, the balance degree of state-owned shareholders, and the identification of state-owned shareholders' participation in the ESG performance of POEs. The differences in the effects between different types of state-owned shareholders have not been examined. For example, whether the state-owned shareholders appoint executives and whether the political hierarchy of the state-owned shareholders is central or provincial. Future research could explore the impact of different types of state-owned shareholders on POEs' ESG performance. Second, our study focuses on the impact of state-owned shareholders' participation on the overall ESG performance of POEs. It is worth exploring the differences between each dimension (i.e., E, S, and G) in the future. Third, our study is based on listed POEs, which may limit the generalizability of the findings. Future research could consider using non-listed POEs (e.g., family firms) data to verify our findings.

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Appendix. Variable Definitions

Variables	Definitions
Dependent variables	
ESGP	Huazheng ESG rating has nine grades corresponding to values from 9 to 1
Independent variables	
Soeshare	The sum of the shareholding of state-owned shareholders among the company's top ten shareholders
Soere	The ratio of the shareholding of state-owned shareholders to that of non-state-owned shareholders among the company's top ten shareholders
Soedum	The dummy variable takes the value of 1 if there exist state-owned Shareholders among the firm’s top 10 shareholders, and 0 if otherwise
Mediating variables	
Subsidy	Natural logarithm of government subsidies
Loan	The ratio of the difference between the previous year's and the current year's loan amount to total assets
Mfee	The ratio of overheads to main business income
Orec	The ratio of net other receivables to total assets
Fraud	Number of penalties imposed in the current year
Control variables	
Size	Natural logarithm of total assets
Lev	Total debt over total assets
Growth	Main business revenue growth rate
ATO	The ratio of operating income to average total assets
Top1	Largest shareholder shareholding ratio
Mshare	Managers hold shares relative to the total equity of the company
Indep	The ratio of independent directors to the number of directors
Dual	The dummy variable takes the value of 1 if the CEO also serves as chairman, and 0 if otherwise
Big4	The company's annual report audit firm is one of the Big Four accounting firms, takes the value of 1, and otherwise 0
Age	Natural logarithm of the number of years the company has been listed

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