



Does ESG performance indicate corporate economic sustainability? Evidence based on the sustainable growth rate



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ARTICLE INFO

Keywords:
 Agency costs
 Corporate innovation
 Economic sustainability
 ESG performance
 Firm risk
 Sustainable growth rate

ABSTRACT

Based on a sample of Chinese listed companies from 2009 to 2021, this study finds that environmental, social, and governance (ESG) performance has a positive impact on having a sustainable growth rate (SGR). Our heterogeneity analysis reveals that ESG performance leads to higher SGR, particularly among firms with lower SGR or non-state-owned enterprises. The mechanism analysis suggests that ESG performance enhances SGR by stimulating patent applications, reducing agency costs, and mitigating corporate risk. Further analysis indicates that the environmental score has a negative influence on SGR, whereas social and governance scores have a positive impact. Ultimately, this research emphasizes that ESG performance can enhance financial performance by driving SGR.

1. Introduction

As global awareness of environmental, social, and governance (ESG) issues continues to grow, researchers have found that its actual impact on company performance is mixed (Bissondoyal-Bheenick et al., 2023; Gillan et al., 2021; Vuong, 2022). This has raised concern that some companies engage in “greenwashing” (A phenomenon in which a company’s advertised ESG effort is greater than its real ESG effort) by intentionally promoting positive news and concealing negative information to enhance their image. Greenwashing can mislead external investors into believing that a company has strong ESG performance, thus making it more attractive to investors. However, if the sole purpose of improving ESG performance is for greenwashing, it can lead to unnecessary costs and a decline in operational efficiency. In these cases, greenwashing is detrimental to a company’s sustainable development. Improving ESG performance through means other than greenwashing can significantly enhance a company’s economic sustainability, but greenwashing does not. Companies often resort to greenwashing to evade regulations or obtain market funding. Hence, it is essential to exclude the influence of external financing and study the real effect of ESG activities on corporate economic sustainability.

In recent years, academic interest in ESG research with a focus on ESG and corporate performance has grown. Some studies have found

that ESG activities enhance a company’s profitability, whereas others suggest that ESG practices can harm performance (Gillan et al., 2021; Sila & Cek, 2017). However, previous research has focused primarily on whether ESG is beneficial for improving company profit, without delving more deeply into the underlying mechanisms. The impact of ESG activities on a company’s potential for sustainable growth may be a crucial pathway for explaining profitability enhancement. But existing research on economic sustainability has predominantly concentrated on the macro level (Sun & Tang, 2022), in the absence of studies on company-level economic sustainability. And few papers have used objective and replicable unweighted financial indicators to examine company-level economic sustainability. Moreover, companies engaged in ESG activities might do so for greenwashing purposes to obtain external financing (Bai et al., 2022). Current research on the impact of ESG activities on economic sustainability does not examine the impact of external financing. Therefore, it is necessary to use simple and easily obtainable indicators that existed before the emergence of the ESG concept to measure company-level economic sustainability and investigate the effects of ESG performance on economic sustainability.

To achieve this goal, we use the sustainable growth rate (SGR) to measure the economic sustainability of companies. Some research has shown that higher SGR indicates greater survival capability and better sustainability by businesses (Patel et al., 2020). SGR is a critical

Peer review under responsibility of Borsa İstanbul Anonim Şirketi.

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indicator that defines a company's ability to achieve growth in revenue based on current operational and financial constraints (Babcock, 1970). Therefore, SGR reflects a company's potential for endogenous growth without reliance on external financing (Higgins, 1977). ESG performance can mitigate financing constraints (Bai et al., 2022) and might even incentivize some companies to engage in greenwashing to attract financing. To accurately assess the true impact of ESG performance on corporate economic sustainability, the influence of external financing dependence needs to be eliminated. Under these constraints, its SGR is an appropriate metric for assessing a company's economic sustainability. This study examines the impact of ESG performance on SGR.

This study focuses on the relationship between ESG performance and SGR using data on listed Chinese companies between 2009 and 2021. The baseline regression results show a positive effect of ESG performance on SGR. Our robustness tests further support a positive relationship between ESG performance and SGR. Our heterogeneity analysis reveals that the positive impact of ESG performance on SGR is stronger at non-state-owned enterprises or those with lower economic sustainability. Our mechanism analysis suggests that ESG performance facilitates innovation, reduces agency costs, and lowers firm risk, thereby improving SGR. Further analysis indicates that the environmental (E) score has a negative impact on SGR, whereas the social (S) and governance (G) scores have a positive impact. Ultimately, ESG performance enhances financial performance by raising SGR.

This study makes several contributions. First, we find that ESG activities enhance a company's potential for sustainable growth. Our results establish a positive relationship between ESG performance and a company's economic sustainability. SGR is used to measure a company's endogenous growth potential, excluding external financing. By excluding the impact of financing capabilities, we offer a more accurate estimation of the effects of ESG practices on a company's economic sustainability, offering new insights in ESG research that does not consider greenwashing or financing (Gillan et al., 2021). Second, we find that environmental performance has a negative impact on a company's economic sustainability when external financing support is not available. This reveals that excessive emphasis on environmental performance can harm a company's endogenous growth momentum, offering a different perspective from previous research (Lee et al., 2016; Malik et al., 2023). Third, we find that ESG activities have a positive impact on financial performance by enhancing a company's economic sustainability, offering a new perspective for research on the relationship between ESG and financial performance (Vuong, 2022; Xie et al., 2019). Lastly, in the channel tests, we find that ESG practices promote economic sustainability by fostering innovation, reducing agency costs, and mitigating risk. The findings from the channel analysis provide new insights into the mechanisms through which ESG affects a company's economic potential, contributing to related research on the real effect of ESG on a company's economic potential (Liu et al., 2022; Sila & Cek, 2017).

The remainder of the paper is structured as follows. Section 2 provides a theoretical analysis and proposes our hypotheses. Section 3 describes the data and the model. Section 4 presents the main empirical findings. Section 5 explores the potential mechanisms. Additional analysis is performed in Section 6. Finally, Section 7 concludes the paper.

2. Theoretical analysis and hypothesis development

2.1. ESG performance and corporate sustainable growth rate

Better ESG performance enhances a company's risk-taking capacity from a risk management perspective. ESG activities can mitigate risk, enabling firms to achieve sustainable and stable growth in the future (He et al., 2023). Strong ESG performance typically indicates better corporate social responsibility (CSR) and higher levels of corporate governance, which have the potential to enhance the economic sustainability

of a firm. Positive ESG performance is often associated with favorable CSR and corporate governance outcomes. Stakeholder theory suggests that stakeholders play a crucial role in a company's success, growth, stability, and financial performance (Paolone et al., 2022; Rahman et al., 2023). Prior research indicates that establishing healthy relationships with stakeholders, such as employees, can improve financial performance (Godfrey et al., 2010; Jiao, 2010). Strong CSR performance helps companies build good relationships with stakeholders and gain the trust of customers/stakeholders (Luo & Du, 2015). Improving CSR performance can create a positive work environment for employees, attracting and retaining talented workers. When talented employees feel respected by the company and actively contribute to its development, they can make more valuable contributions to growth in the company's business (Mao & Weathers, 2019; Turban & Greening, 1997). Therefore, high CSR performance is associated with higher sales growth, per capita employee sales contribution, and profitability (Lins et al., 2017). As ESG's core focus is fostering healthy stakeholder relationships, it can have a positive impact on a company's economic sustainability. Positive interactions with stakeholders can promote sustainable growth. Furthermore, an improved governance environment has favorable effects on financial growth and profitability (Ararat et al., 2017; Cek & Eyupoglu, 2020). Thus, ESG performance can enhance corporate governance practices, improve financial growth, and ultimately have a positive impact on sustainable growth rates. ESG performance can enhance a firm's endogenous development potential through improved CSR performance and corporate governance practices. In summary, strong ESG performance can build positive relationships with stakeholders, improve corporate governance, and enhance the economic sustainability of a company. Therefore, we propose the first hypothesis:

Hypothesis 1a. ESG performance has a positive effect on sustainable growth rates.

However, not all ESG activities necessarily enhance corporate economic sustainability. Environmental investment may only increase costs without directly having economic benefits (Hassel et al., 2005). Excessive environmental investment can put a financial burden on companies. Reducing pollutant emissions may harm a company's profitability (Wagner, 2005). Companies may increase green investment in order to comply with government regulations or obtain a good reputation. A good environmental reputation may help a company secure funding but does not contribute to improving the company's domestic growth potential. As studied in this paper, economic sustainability excludes a company's financing capability and focuses on endogenous growth potential. As a result, we believe that green investment may undermine corporate economic sustainability. Based on this, we propose a competing hypothesis:

Hypothesis 1b. ESG performance has a negative effect on sustainable growth rates.

2.2. ESG performance, corporate innovation, and sustainable growth rate

Focusing on innovation activities enhances a company's potential for domestic growth. In terms of environmental performance, ESG ratings can incentivize companies to engage in green innovation activities (Tan & Zhu, 2022), indirectly improving their innovation output. With respect to social responsibility, CSR is a key driver of corporate innovation (Chkir et al., 2021). Encouraging CSR disclosure stimulates innovation activities and increases R&D expenditure (Gangopadhyay & Homroy, 2023). Companies that prioritize social responsibility performance often establish harmonious labor relations and value their employees, thereby cultivating stable innovation teams and enhancing innovation capabilities (Li & Wang, 2022). CSR performance promotes various types of innovation among companies (Luo & Du, 2015; Tuyen et al., 2023). Thus, good ESG performance can encourage companies to invest more in researchers and promote innovation activities. Finally,

improving a company's sustainability indirectly promotes innovation by strengthening corporate governance. Good governance creates a positive environment for innovation. Improving innovation efficiency has a positive impact on investment returns, thereby influencing sustainable profit growth rates (Qiao et al., 2021). Therefore, ESG performance can enhance corporate SGR by promoting innovation. Thus, this study proposes the second hypothesis:

Hypothesis 2. ESG performance enhances corporate sustainable growth rate by fostering innovation.

2.3. ESG performance, agency costs, and sustainable growth rate

According to agency theory, effective corporate governance enhances a company's ability to mitigate agency conflicts. Unlike traditional financial reporting, ESG disclosures provide novel financial information, thereby reducing agency costs (Agoraki et al., 2023). ESG disclosure has a particularly positive impact on the financial performance of firms with high agency costs (Chen & Xie, 2022). ESG performance represents good corporate governance, and strengthening corporate governance can mitigate agency issues and reduce agency costs (Panda & Leepsa, 2017). Prior studies have shown that agency costs have a significant inhibitory effect on firm growth (Khidmat & Rehman, 2014; Wang, 2010). Agency costs lead to unnecessary financial waste, reducing the efficiency of capital utilization, negatively affecting a business's ability to grow sustainably and economic sustainability (Ang et al., 2000; Khidmat & Rehman, 2014; Wang, 2010). Therefore, ESG performance indirectly promotes corporate SGR by mitigating agency issues and reducing agency costs. Thus, this study proposes the third hypothesis:

Hypothesis 3. ESG performance reduces agency costs, thereby increasing sustainable growth rates.

2.4. ESG performance, firm risk, and sustainable growth rate

Companies that prioritize ESG performance tend to adopt low-risk business strategies that reduce corporate risk. Companies that behave responsibly enhance their resilience to risk (Rui et al., 2019). Low-risk strategies are beneficial for improving a company's long-term operational capabilities. Adopting low-risk behavior ensures sustainable growth for the company. Prioritizing risk management enhances a company's profitability (Mohammed & Knapkova, 2016). ESG practices can enhance a company's economic sustainability by reducing firm risk. We therefore propose a fourth hypothesis:

Hypothesis 4. ESG activities improve sustainable growth rates by reducing firm risk.

3. Research design

3.1. Sample selection

The data used in this study come primarily from two sources: the Wind database, which is used for Huazheng ESG ratings, and the China Stock Market and Accounting Research (CSMAR) database, which is used for financial and company-specific characteristics. The sample includes all Chinese listed companies from 2009 to 2021. The sample excludes the finance industry, missing values, and companies that have been listed for only one year. Further variable definitions are in Appendix Table A1, and Table 1 provides descriptive statistics for the main variables.

Table 1
Descriptive statistics.

Variable	Obs.	Mean	Std. Dev.	Min	Max
SGRA	34,127	0.038	0.141	-0.742	0.396
SGRB	34,127	0.038	0.14	-0.742	0.392
ESG	34,127	4.041	1.141	1	8
R&D ratio	34,127	0.002	0.006	0	0.04
Size	34,127	22.156	1.317	19.529	26.309
Sale	34,127	21.438	1.489	17.786	25.582
TobinQ	34,127	2.128	1.474	0.858	9.833
Leverage	34,127	0.44	0.215	0.054	0.975
InstOwn	34,127	0.375	0.054	0.333	0.571
IndDirectorRatio	34,127	0.439	0.242	0.003	0.907
ROA	34,127	0.032	0.074	-0.362	0.2
Patents	34,127	1.52	1.584	0	5.911
AC	34,127	0.017	0.028	0	0.177
Firmrisk	31,768	0.034	0.042	0.0001	0.434

Note: All the main variables are winsorized at the 1% level.

3.2. Variables

3.2.1. Measuring the sustainable growth rate

This study introduces two metrics for sustainable growth rates, SGRA and SGRB, which are derived from data obtained from the CSMAR database. The CSMAR database calculates two SGR metrics due to the use of capital stock data from two data sources. SGRA is calculated with Equation (1), and SGRB is calculated with Equation (2).

$$\text{SGRA} = \frac{\text{ROE} \times \left(1 - \text{Dividends per share before tax} / \frac{\text{Net Profit}}{\text{Pacl-in Capital}}\right)}{1 - \text{ROE} \times \left(1 - \text{Dividends per share before tax} / \frac{\text{Net Profit}}{\text{Pacl-in Capital}}\right)} \quad (1)$$

$$\text{SGRB} = \frac{\text{ROE} \times \left(1 - \text{Dividends per share before tax} / \frac{\text{Net Profit}}{\text{Latest Capital Stock}}\right)}{1 - \text{ROE} \times \left(1 - \text{Dividends per share before tax} / \frac{\text{Net Profit}}{\text{Latest Capital Stock}}\right)} \quad (2)$$

3.2.2. Measuring ESG performance

This paper employs the Huazheng ESG rating to gauge ESG performance. The Huazheng ESG ratings are based on over 20 million pieces of data collected since 2009 from all listed firms, evaluating their environmental, social, and corporate governance performance using a hierarchical system of indicators. The Huazheng ESG rating system rates companies on an eight-level scale from AA to CCC, which is represented in this study by values from 8 to 1, with 8 denoting the highest rating, AA.

3.2.3. Measuring control variables

This study controls for several variables, including R&D ratio, leverage, sales, firm size, Tobin's Q, institutional ownership, and the proportion of independent directors (Deng et al., 2023; Vuong, 2022).

3.3. Model specification

To assess the impact of ESG performance on sustainable growth rates, we employ the following estimation model:

$$\text{SGRA}_{i,t} (\text{SGRB}_{i,t}) = a + b\text{ESG}_{i,t} + c'\text{Controls}_{i,t} + YR_t + \text{Firm}_i + \text{error}_{i,t} \quad (3)$$

To enhance robustness, this paper employs both fixed-year and fixed-firm effects, along with robust standard errors that are clustered at the firm level.

4. Empirical results

4.1. Baseline regression results

We next test which hypothesis is confirmed: H1a or H1b. According to the baseline regression results in Table 2, the estimated coefficient for ESG performance is 0.006, which is statistically significant at the 1 percent level. This suggests that SGR can be enhanced by improving ESG performance. These findings indicate confirmation of H1a. ESG performance has a positive impact on SGR. Engaging in ESG activities is a beneficial approach for improving a company's economic sustainability.

4.2. Robustness test

4.2.1. Instrumental variable method

To ensure robustness of the baseline estimation results, we employ instrumental variable (IV) method to address endogeneity issues. Following previous studies (Benlemlah & Bitar, 2016; Zhou et al., 2023), we use the mean ESG of the same industry and province (ESGProInd) as our IV. To ensure that the IV has a one-way effect on company ESG performance, we use a lagged one-year IV. The ESG activities of the same industry within a province can influence corporate SGR only indirectly by fostering an ESG-focused environment. The ESG performance of the same industry within the same province in the previous year can affect SGR only indirectly by influencing corporate ESG performance in the following year. Because the provincial scope is large, the reverse impact of companies on the province can be ignored. A company cannot influence the previous year's ESG performance within a province. Therefore, we consider ESGProInd exogenous. The IV estimation results, shown in Table 3, indicate that ESGProInd significantly enhances corporate ESG performance in the following year. The estimation results from the second stage show that ESG significantly improves SGR. Therefore, the IV approach confirms the robustness of the baseline estimation results.

To ensure the robustness of our IV estimation, we incorporate Confucian culture as an additional instrument. Cultural factors play a crucial role in determining ESG performance, as ESG is particularly influenced by morality. Confucian culture, which has set the moral

Table 2
Baseline regression results.

	(1)	(2)
	SGRA	SGRB
ESG	0.006*** (5.083)	0.006*** (5.081)
R&D ratio	-0.460** (-2.186)	-0.456** (-2.170)
Size	-0.008 (-1.630)	-0.008 (-1.624)
Sale	0.064*** (15.751)	0.064*** (15.733)
TobinQ	0.013*** (11.388)	0.013*** (11.346)
Leverage	-0.342*** (-24.275)	-0.342*** (-24.326)
IndDirectorRatio	-0.041 (-1.461)	-0.045* (-1.653)
InstOwn	0.051*** (4.561)	0.049*** (4.425)
Constant	-1.070*** (-16.107)	-1.061*** (-16.140)
Year FE	Yes	Yes
Firm FE	Yes	Yes
N	34,127	34,127
R ²	0.379	0.379

Note: Robust standard errors are clustered at the firm level. The t-statistics are in parentheses. *, **, and *** indicate significance of 10%, 5%, and 1%, respectively.

Table 3
Results of the instrumental variable method.

	First stage		Second stage
	(1)		(2)
	ESG	SGRA	SGRB
ESGProInd	0.521*** (23.860)		
ESG		0.011** (2.340)	0.011** (2.383)
Control variable	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
N	32,838	32,838	32,838
R ²	0.597	0.152	0.151

Note: Robust standard errors are clustered at the firm level. The t-statistics are in parentheses. *, **, and *** indicate significance of 10%, 5%, and 1%, respectively.

standards in China for nearly two thousand years, also has an impact on contemporary ESG development. As Confucian culture is a historical factor with strong exogeneity, it is appropriate to use it as an IV for ESG performance. In this study, we measure the influence of Confucian culture on companies by the number of Confucian temples near them. Confucian temples are representative of a culture that values social contribution. At the same time, Confucian temples cannot directly affect corporate SGR, as they are just some historical sites. Confucius Temple can only indirectly influence SGR by influencing corporate ESG performance. Therefore, the number of Confucian temples is exogenous to SGR. Following previous research, we use interaction between the number of Confucian temples near the company and average ESG performance in the city (ConfucianESG_mean) as IVs (He et al., 2022). The estimation results using these two IVs are in Table 4. The first-stage estimation results indicate that ConfucianESG_mean also significantly enhances ESG performance. In the second stage, we find that ESG still promotes SGR. The overidentification test confirms that the two IVs used are exogenous. The p-value of the overidentification test is 0, rejecting the null hypothesis that the two IVs are endogenous. So, we consider the IV estimation results robust, confirming that ESG performance enhances

Table 4
Results of the instrumental variable method with two instrumental variables.

	First stage		Second stage
	(1)		(2)
	ESG	SGRA	SGRB
ESGProInd	0.458*** (21.809)		
Confucian*ESG_mean	0.079*** (20.568)		
ESG		0.008** (2.005)	0.008** (2.038)
Control variable	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
N	32,838	32,838	32,838
R ²	0.616	0.153	0.152
Instrumental variable diagnostics			
Underidentification test	–	548.256***	548.256***
Weak identification test	–	1689.398	1689.398
Overidentification test of all instruments	–	0.888 (<i>p</i> = 0.3459)	0.930 (<i>p</i> = 0.3350)

Note: The t-statistics are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% confidence levels, respectively. The overidentification test examines the Hansen J statistic of all IVs, and all the *p*-values are significantly higher than 10%, indicating that the null hypothesis of exogeneity of instrumental variables cannot be rejected by the test.

SGR.

4.2.2. Propensity score matching method

Differences in characteristics between companies can introduce bias into baseline estimates. Reducing these differences leads to more accurate estimates. We use the propensity score matching (PSM) method to eliminate samples with significant differences in order to reduce the differences in control variables. Hence, we split the sample into experimental and control groups based on the average annual ESG performance and use all the control variables for matching with the PSM method. The nearest-neighbor matching method is used to generate matched samples at a ratio of 1:1. The PSM-OLS regression results in Table 5 indicate that ESG performance has a positive effect on SGR. Therefore, the estimates obtained from a more rigorous approach still support our finding that ESG practices contribute to enhancing SGR.

4.2.3. Change regression

If H1a holds, then, theoretically, an increase in ESG performance should result in higher SGR. This study estimates the effect of changes in the independent variable on SGR more accurately by using the first-order differences in the predictor variable. We calculate the differential of firm-level ESG performance (ΔESG) using Equation (4). The estimated coefficients in Table 6 are significantly positive, indicating that the improvement in ESG performance significantly promotes SGR.

$$\Delta\text{ESG}_{i,t} = \text{ESG}_{i,t} - \text{ESG}_{i,t-1} \quad (4)$$

4.2.4. Estimation results after adding SGR in period $t - 1$ to the control variables

SGR may be affected by the historical SGR of a company. In order to control for the potential impact of past SGRs on present-day SGR, this study includes SGR at time $t - 1$ as a control variable in the estimation results, as shown in Table 7. The results show that the positive impact of ESG performance on SGR remains consistent with the baseline estimates and does not change significantly. Table 7 further confirms the robustness of the baseline estimates.

4.3. Heterogeneity analysis

4.3.1. Analysis of heterogeneity in SGR

If ESG activities contribute to a company's economic sustainability, then ESG practices will have a more significantly positive impact on companies with less economic sustainability. To confirm this, we divide the sample into two subsamples using the annual average SGR: low SGR (LowSGR = 1) and high SGR (LowSGR = 0). We label the dependent variables A and B, respectively. The heterogeneity analysis in Table 8 confirms that the coefficient of the interaction term between ESG performance and low SGR is significantly positive at the 1 percent level. The results demonstrate that ESG performance has a stronger enhancement effect on the SGR of companies with less economic sustainability. This suggests that companies with less economic sustainability stand to

Table 5
Results of the PSM method.

	(1)	(2)
	SGRA	SGRB
ESG	0.005*** (3.290)	0.005*** (3.289)
Control variable	Yes	Yes
Year FE	Yes	Yes
Firm FE	Yes	Yes
N	17,005	17,005
R ²	0.449	0.448

Note: Robust standard errors are clustered at the firm level. The regression t-statistics are presented within parentheses. Significance levels are denoted by *, **, and ***, indicating confidence levels of 10%, 5%, and 1% correspondingly.

Table 6
Results of the change regression.

	(1)	(2)
	SGRA	SGRB
ΔESG	0.005*** (5.639)	0.005*** (5.568)
Control variable	Yes	Yes
Year FE	Yes	Yes
Firm FE	Yes	Yes
N	30,107	30,107
R ²	0.392	0.391

Note: Robust standard errors are clustered at the firm level. The t-statistics are in parentheses. *, **, and *** indicate significance of 10%, 5%, and 1%, respectively.

Table 7
Estimated results after adding the SGR of period $t - 1$ to the control variables.

	(1)	(2)
	SGRA	SGRB
ESG	0.006*** (4.640)	0.006*** (4.674)
SGRAt-1	0.005 (0.312)	
SGRBt-1		0.003 (0.192)
Control variable	Yes	Yes
Year FE	Yes	Yes
Firm FE	Yes	Yes
N	30,103	30,103
R ²	0.392	0.391

Note: Robust standard errors are clustered at the firm level. The t-statistics are in parentheses. *, **, and *** indicates significance of 10%, 5%, and 1%, respectively.

Table 8
Analysis of heterogeneity in SGR.

	(1)	(2)
	SGRA	SGRB
ESG*LowSGRA	0.044*** (18.938)	
ESG*LowSGRB		0.044*** (18.984)
ESG	0.002** (2.117)	0.002** (2.159)
LowSGRA	-0.121*** (-49.973)	
LowSGRB		-0.120*** (-50.090)
Control variable	Yes	Yes
Year FE	Yes	Yes
Firm FE	Yes	Yes
N	34,127	34,127
R ²	0.520	0.519

Note: Robust standard errors are clustered at the firm level. The t-statistics are in parentheses. *, **, and *** indicates significance of 10%, 5%, and 1%, respectively.

benefit more from improvements in ESG performance. Companies with less economic sustainability can attain greater enhancement in economic sustainability through ESG activities. When a company has less SGR, more effort should be invested in ESG practices to obtain higher benefits.

4.3.2. Analysis of heterogeneity in corporate characteristics

Because they are under government regulation, state-owned

enterprises (SOEs) might prioritize environmental and social performance, whereas non-SOEs may have higher efficiency. The impact of ESG performance on SGR may vary depending on whether a company is state owned. It is important to consider the influence of heterogeneity in company characteristics. The results in Table 9 suggest that ESG performance has a more significantly positive effect on SGR at non-SOEs, so they can benefit from greater promotion of economic sustainability through ESG practices. This indicates that if non-SOEs prioritize ESG activities, they will also obtain higher economic returns. They have greater flexibility, which enables them to reap greater benefits from ESG efforts, leading to higher economic sustainability.

5. Potential mechanism

5.1. Corporate innovation

To test H2, we construct a mediation model using Equations (3), (5) and (6). The level of innovation by companies is measured using the logarithmically transformed number of patent applications (Patents). The regression results in Table 10 indicate a positive impact of innovation on SGR. A comparison of Columns (2) and (3) shows that the introduction of patents leads to a decrease in the coefficient of ESG performance, confirming partial mediation. Similarly, Columns (4) and (5) also confirm the presence of partial mediation effects. The mediation model confirms H2, demonstrating that ESG performance indirectly improves SGR by facilitating corporate innovation. ESG practices enhance a company's economic sustainability by facilitating technological progress.

$$\text{Patents}_{i,t} = a + b\text{ESG}_{i,t} + c' \text{Controls}_{i,t} + YR_t + \text{Firm}_i + \text{error}_{i,t} \quad (5)$$

$$\begin{aligned} \text{SGRA}_{i,t}(\text{SGRB}_{i,t}) &= a + b\text{ESG}_{i,t} + c\text{Patents}_{i,t} \\ &+ d\text{Controls}_{i,t} + YR_t + \text{Firm}_i + \text{error}_{i,t} \end{aligned} \quad (6)$$

5.2. Agency costs

To test H3, we construct a mediation model using Equations (3), (7) and (8). In this study, we measure agency costs (AC) using the proportion of other receivables to total assets. The regression results in Table 11 show that agency costs harm SGR, whereas ESG performance indirectly improves SGR by reducing agency costs. The coefficient of ESG performance in Column (3) decreases after AC is added, indicating partial mediation. This is supported by the comparison in Columns (4) and (5). The mediation model confirms H3, showing that ESG performance indirectly improves SGR by reducing agency costs. ESG activities contribute to the economic sustainability of companies by curbing agency costs.

Table 9
Analysis of heterogeneity in corporate characteristics.

	(1)	(2)
	SGRA	SGRB
ESG*non-SOE	0.006** (2.486)	0.006** (2.385)
ESG	0.006*** (5.016)	0.006*** (5.018)
non-SOE	0.024*** (3.116)	0.023*** (3.042)
Control variable	Yes	Yes
Year FE	Yes	Yes
Firm FE	Yes	Yes
N	34,127	34,127
R ²	0.380	0.379

Note: Robust standard errors are clustered at the firm level. The t-statistics are in parentheses. *, **, and *** indicates significance of 10%, 5%, and 1%, respectively.

Table 10
Results on the mediating effect of corporate innovation.

	(1)	(2)	(3)	(4)	(5)
	Patents	SGRA	SGRA	SGRB	SGRB
ESG	0.074*** (9.659)	0.006*** (5.083)	0.0058*** (4.914)	0.006*** (5.081)	0.0058*** (4.909)
Patents			0.003*** (2.785)		0.003*** (2.857)
Control variable	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
N	34,127	34,127	34,127	34,127	34,127
R ²	0.778	0.379	0.379	0.379	0.379

Note: Robust standard errors are clustered at the firm level. The t-statistics are in parentheses. *, **, and *** indicates significance of 10%, 5%, and 1%, respectively.

Table 11
Results on the mediating effect of agency costs.

	(1)	(2)	(3)	(4)	(5)
	AC	SGRA	SGRA	SGRB	SGRB
ESG	-0.002*** (-7.265)	0.006*** (5.083)	0.005*** (4.493)	0.006*** (5.081)	0.005*** (4.491)
AC			-0.462*** (-7.346)		-0.462*** (-7.344)
Control variable	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
N	34,127	34,127	34,127	34,127	34,127
R ²	0.472	0.379	0.384	0.379	0.383

Note: Robust standard errors are clustered at the firm level. The t-statistics are in parentheses. *, **, and *** indicates significance of 10%, 5%, and 1%, respectively.

$$\text{AC}_{i,t} = a + b\text{ESG}_{i,t} + c' \text{Controls}_{i,t} + YR_t + \text{Firm}_i + \text{error}_{i,t} \quad (7)$$

$$\begin{aligned} \text{SGRA}_{i,t}(\text{SGRB}_{i,t}) &= a + b\text{ESG}_{i,t} + c\text{AC}_{i,t} \\ &+ d\text{Controls}_{i,t} + YR_t + \text{Firm}_i + \text{error}_{i,t} \end{aligned} \quad (8)$$

5.3. Firm risk

To test H4, we construct a mediation model using Equations (3), (9) and (10). We use the difference between ROA and the industry average ROA as adjusted ROA in this study. The three-year standard deviation of adjusted ROA is used to measure firm risk (Firmrisk). The results in

Table 12
Result on the mediating effect of firm risk.

	(1)	(2)	(3)	(4)	(5)
	Firmrisk	SGRA	SGRA	SGRB	SGRB
ESG	-0.006*** (-12.573)	0.003*** (2.967)	-0.000 (-0.101)	0.003*** (2.967)	-0.000 (-0.128)
Firmrisk			-0.596*** (-16.016)		-0.599*** (-16.169)
Control variable	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
N	31,768	31,768	31,768	31,768	31,768
R ²	0.429	0.347	0.371	0.346	0.370

Note: Robust standard errors are clustered at the firm level. The t-statistics are in parentheses. *, **, and *** indicates significance of 10%, 5%, and 1%, respectively.

Table 12 show that ESG significantly reduces Firmrisk, which has a significant negative impact on SGR. ESG performance indirectly improves SGR by reducing Firmrisk. The coefficients of ESG performance in Columns (3) and (5) significantly decrease after Firmrisk is added, indicating partial mediation. The mediation model confirms H4, showing that ESG performance indirectly improves SGR by reducing firm risk. ESG activities enhance a company's risk management capabilities to ensure low-risk, sustainable growth.

$$\text{Firmrisk}_{i,t} = a + b\text{ESG}_{i,t} + c'\text{Controls}_{i,t} + YR_t + \text{Firm}_i + \text{error}_{i,t} \quad (9)$$

$$\begin{aligned} \text{SGRA}_{i,t} (\text{SGRB}_{i,t}) &= a + b\text{ESG}_{i,t} + c\text{Firmrisk}_{i,t} \\ &\quad + d\text{Controls}_{i,t} + YR_t + \text{Firm}_i + \text{error}_{i,t} \end{aligned} \quad (10)$$

6. Further analysis

6.1. Impact of ESG components

We next analyze the contributions to SGR of the three components of ESG ratings: environment (E), social (S), and corporate governance (G). The results in **Table 13** indicate that E harms SGR. Although a company's contribution to environmental sustainability may have positive externalities, these contributions are often unsustainable without external financing or subsidies. This result aligns with the theoretical analysis in Section 2.1. Overemphasizing environmental performance can hurt a company's economic sustainability in the absence of external financing. As SGR captures the concept of growth potential independent of external factors, E has a negative impact on SGR. The findings suggest that policy makers should give tax incentives to companies with excellent environmental performance to compensate for the loss in their SGR performance. Lastly, S and G have a positive impact on SGR. Companies should focus on enhancing social and governance performance to improve their long-term competitiveness.

6.2. Mediating effects of SGR on ESG and corporate financial performance

This study reveals the positive impact of ESG performance on corporate financial performance. Using Equations (11) and (12), we next investigate the mediating role of SGR in the relationship between ESG performance and the return on assets (ROA). The findings in **Table 14** suggest that ESG performance drives corporate financial performance. However, after SGRA or SGRB is added to the model, the coefficient of ESG performance declines, confirming the presence of partial mediating effects. Thus ESG efforts indirectly enhance a company's financial performance by improving the company's ability to grow sustainably. The benefits of ESG activities on company performance are reflected in the enhancement of endogenous growth potential. ESG activities strengthen corporate profitability by improving corporate economic sustainability.

Table 13
Impact of ESG components.

	(1) SGRA	(2) SGRB	(3) SGRA	(4) SGRB	(5) SGRA	(6) SGRB
E	-0.003** (-2.424)	-0.003** (-2.508)				
S			0.003*** (4.129)	0.003*** (4.209)		
G					0.005*** (4.989)	0.005*** (4.990)
Control variable	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
N	34,127	34,127	34,127	34,127	34,127	34,127
R ²	0.378	0.378	0.379	0.378	0.379	0.379

Note: Robust standard errors are clustered at the firm level. The t-statistics are in parentheses. *, **, and *** indicates significance of 10%, 5%, and 1%, respectively.

Table 14
Results on the mediating effect of SGR.

	(1) ROA	(2) ROA	(3) ROA
ESG	0.004*** (7.231)	0.002*** (5.134)	0.002*** (5.140)
SGRA		0.343*** (39.652)	
SGRB			0.343*** (39.704)
Control variable	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
N	34,127	34,127	34,127
R ²	0.505	0.767	0.766

Note: Robust standard errors are clustered at the firm level. The t-statistics are in parentheses. *, **, and *** indicates significance of 10%, 5%, and 1%, respectively.

$$\text{ROA}_{i,t} = a + b\text{ESG}_{i,t} + c'\text{Controls}_{i,t} + YR_t + \text{Firm}_i + \text{error}_{i,t} \quad (11)$$

$$\begin{aligned} \text{ROA}_{i,t} &= a + b\text{ESG}_{i,t} + c\text{SGRA}_{i,t} (\text{SGRB}_{i,t}) \\ &\quad + d\text{Controls}_{i,t} + YR_t + \text{Firm}_i + \text{error}_{i,t} \end{aligned} \quad (12)$$

7. Conclusion

This study examines the impact of ESG performance on sustainable growth rates. The baseline regression shows that ESG performance enhances SGR. A series of robustness tests confirm the positive effect of ESG performance on SGR. Our heterogeneity analysis reveals that ESG performance has a stronger enhancement effect on SGR for companies with less economic sustainability or non-SOEs. The mechanism analysis suggests that ESG performance improves SGR by promoting innovation, reducing agency costs, and mitigating firm risk. Further analysis reveals that the environmental dimension of ESG has a negative impact on SGR, whereas the social and governance dimensions have a positive impact on SGR. ESG performance enhances financial performance by driving SGR.

Our study has some limitations. We did not have data for measuring “greenwashing” behavior by companies. Future studies can further investigate the negative impact of “greenwashing” on SGR. Our measure of economic sustainability might also have some limitations, as we do not include many nonfinancial indicators. Future research could potentially construct new economic sustainability metrics through textual analysis.

This study has theoretical significance because it confirms that ESG efforts enhance corporate economic sustainability, a crucial channel through which ESG activities positively impact corporate financial performance. ESG practices contribute to the economic sustainability of

individual firms at the micro level. Our findings can give companies more confidence in implementing ESG strategies as they are beneficial for sustainable development. The study also provides evidence for stakeholders to justify encouraging ESG activities by companies. Companies should prioritize enhancing their social reputation and improving governance mechanisms, both of which contribute to the company's endogenous growth potential. At the same time, companies should exercise moderation in making green investments to ensure that they do not undermine corporate endogenous growth momentum. ESG activities can enhance SGR by driving innovation, reducing agency costs, and mitigating risk.

This study also has some policy implications related to ESG. We recommend that governments compile ESG ratings to encourage companies to prioritize and disclose their ESG performance. Information related to ESG performance can assist investors in understanding a company's sustainability potential. Developing countries can enhance the economic sustainability of companies by encouraging ESG activities. In addition, governments should extend more financial support to companies with better environmental performance when they face

financing difficulties, in order to mitigate the potential negative impact of environmental protection on economic sustainability. Governments concerned about corporate performance should guide companies in performing CSR activities and improving corporate governance, both of which can help companies enhance their potential for sustainable growth. Finally, governments should encourage companies with low economic sustainability and non-state-owned enterprises to prioritize ESG activities, as their efforts will yield higher returns and efficiency.

CRediT authorship contribution statement

Zihao Lin: Conceptualization, Methodology, Formal analysis, and, Writing – original draft.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix

Appendix Table A1

Variable definitions

Variable	Definition	Data source
Measures of sustainable growth rate		
SGRA	Sustainable growth rate, obtained with Equation (1)	CSMAR
SGRB	Sustainable growth rate, obtained with Equation (2)	CSMAR
Measures of ESG performance		
ESG	Huazheng ESG rating of firm i in year t	Wind
Measures of other variables		
R&D Ratio	The ratio of R&D expenditures to total asset at the end of fiscal year t	CSMAR
Leverage	Firm i 's leverage ratio, defined as book value of debt divided by book value of total assets measured at the end of fiscal year t	CSMAR
TobinQ	Firm i 's Tobin's Q in year t	CSMAR
Size	Natural logarithm of total assets of firm i in year t	CSMAR
Sale	Natural logarithm of operating income in year t	CSMAR
IndDirectorRatio	The percentage of independent board members of firm i	CSMAR
InstOwn	Institutional holdings (percent) for firm i over fiscal year t	CSMAR
ROA	Return on assets ratio, measured at the end of fiscal year t	CSMAR
Patents	Natural logarithm of one plus number of patent applications of firm i in year t	CNIPA
AC	Ratio of other receivables to total assets of fiscal year t	CSMAR
Firmrisk	Standard deviation of ROA	CSMAR

References

- Agoraki, M. K., Giaka, M., Konstantios, D., & Patsika, V. (2023). Firms' sustainability, financial performance, and regulatory dynamics: Evidence from European firms. *Journal of International Money and Finance*, 131, Article 102785.
- Ang, J. S., Cole, R. A., & Lin, J. W. (2000). Agency costs and ownership structure. *Journal of Financial Economics*, 55(1), 81–106.
- Ararat, M., Black, B. S., & Yurtoglu, B. B. (2017). The effect of corporate governance on firm value and profitability: Time-series evidence from Turkey. *Emerging Markets Review*, 30, 113–132.
- Babcock, G. C. (1970). The concept of sustainable growth. *Financial Analysts Journal*, 26 (3), 108–114.
- Bai, X., Han, J., Ma, Y., & Zhang, W. (2022). ESG performance, institutional investors' preference and financing constraints: Empirical evidence from China. *Borsa Istanbul Review*, 22(2), S157–S168.
- Benlemlah, M., & Bitar, M. (2016). Corporate social responsibility and investment efficiency. *Journal of Business Ethics*, 148, 647–671.
- Bissoondoyal-Bheenick, E., Brooks, R., & Do, H. X. (2023). ESG and firm performance: The role of size and media channels. *Economic Modelling*, 121, Article 106203.
- Cek, K., & Eyupoglu, S. (2020). Does environmental, social and governance performance influence economic performance? *Journal of Business Economics and Management*, 21 (4), 1165–1184.
- Chen, Z., & Xie, G. (2022). ESG disclosure and financial performance: Moderating role of ESG investors. *International Review of Financial Analysis*, 83(C), Article 102291.
- Chkri, I., El Haj Hassan, B., Rjiba, H., & Saadi, S. (2021). Does corporate social responsibility influence corporate innovation? International evidence. *Emerging Markets Review*, 46(C), Article 100746.
- Deng, X., Li, W., & Ren, X. (2023). More sustainable, more productive: Evidence from ESG ratings and total factor productivity among listed Chinese firms. *Finance Research Letters*, 51, Article 103439.
- Gangopadhyay, S., & Homroy, S. (2023). Do social policies foster innovation? Evidence from India's CSR regulation. *Research Policy*, 52(1), Article 104654.
- Gillan, S. L., Koch, A., & Starks, L. T. (2021). Firms and social responsibility: A review of ESG and CSR research in corporate finance. *Journal of Corporate Finance*, 66, Article 101889.
- Godfrey, P. C., Hatch, N. W., & Hansen, J. M. (2010). Toward a general theory of CSRs: The roles of beneficence, profitability, insurance, and industry heterogeneity. *Business & Society*, 49, 316–344.
- Hassel, L., Nilsson, H., & Nyquist, S. (2005). The value relevance of environmental performance. *European Accounting Review*, 14(1), 41–61.
- He, F., Ding, C., Yue, W., & Liu, G. (2023). ESG performance and corporate risk-taking: Evidence from China. *International Review of Financial Analysis*, 87, Article 102550.
- He, F., Du, H., & Yu, B. (2022). Corporate ESG performance and manager misconduct: Evidence from China. *International Review of Financial Analysis*, 82, Article 102201.
- Higgins, R. C. (1977). How much growth can a firm afford? *Financial Management*, 6, 7–16.
- Jiao, Y. (2010). Stakeholder welfare and firm value. *Journal of Banking & Finance*, 43(10), 2549–2561.
- Khidmat, W. B., & Rehman, M. U. (2014). The impact of free cash flows and agency costs on firm performance: An empirical analysis of KSE listed companies of Pakistan. *Journal of Financial Engineering*, 1(3), 1–25.
- Lee, K. H., Cin, B. C., & Lee, E. Y. (2016). Environmental responsibility and firm performance: The application of an environmental, social and governance model. *Business Strategy and the Environment*, 25(1), 40–53.

- Li, T., & Wang, Y. (2022). Corporate responsibility towards employees and innovation: Evidence from an emerging market. *International Review of Financial Analysis*, 84, Article 102410.
- Lins, K. V., Servaes, H., & Tamayo, A. (2017). Social capital, trust, and firm performance: The value of corporate social responsibility during the financial crisis. *The Journal of Finance*, 72(4), 1785–1824.
- Liu, H., Wu, K., & Zhou, Q. (2022). Whether and how ESG impacts on corporate financial performance in the Yangtze River delta of China. *Sustainability*, 14(24), Article 16584.
- Luo, X., & Du, S. (2015). Exploring the relationship between corporate social responsibility and firm innovation. *Marketing Letters*, 26(4), 703–714.
- Malik, F., Wang, F., Li, J., & Naseem, M. A. (2023). Impact of environmental disclosure on firm performance: The mediating role of green innovation. *Revista de Contabilidad - Spanish Accounting Review*, 26(1), 14–26.
- Mao, C. X., & Weathers, J. (2019). Employee treatment and firm innovation. *Journal of Business Finance & Accounting*, 46, 977–1002.
- Mohammed, H. K., & Knapkova, A. (2016). The impact of total risk management on company's performance. *Procedia-Social and Behavioral Sciences*, 220, 271–277.
- O'Connor, M., & Rafferty, M. (2012). Corporate governance and innovation. *Journal of Financial and Quantitative Analysis*, 47(2), 397–413.
- Panda, B., & Leepsa, N. M. (2017). Agency theory: Review of theory and evidence on problems and perspectives. *Indian Journal of Corporate Governance*, 10(1), 74–95.
- Paolone, F., Cucari, N., Wu, J., & Tiscini, R. (2022). How do ESG pillars impact firms' marketing performance? A configurational analysis in the pharmaceutical sector. *Journal of Business & Industrial Marketing*, 37(8), 1594–1606.
- Patel, P. C., Guedes, M. J., Pagano, M. S., & Olson, G. T. (2020). Industry profitability matters: The value of sustainable growth rate and distance from bankruptcy as enablers of venture survival. *Journal of Business Research*, 114, 80–92.
- Qiao, S., Shen, T., Zhang, R. R., & Chen, H. H. (2021). The impact of various factor market distortions and innovation efficiencies on profit sustainable growth: From the view of China's renewable energy industry. *Energy Strategy Reviews*, 38, Article 100746.
- Rahman, H. U., Zahid, M., & Al-Faryan, M. A. S. (2023). ESG and firm performance: The rarely explored moderation of sustainability strategy and top management commitment. *Journal of Cleaner Production*, 404, Article 136859.
- Rui, A., Koskinen, Y., & Zhang, C. (2019). Corporate social responsibility and firm risk: Theory and empirical evidence. *Management Science*, 65, 4470–4488.
- Sila, I., & Cek, K. (2017). The impact of environmental, social and governance dimensions of corporate social responsibility on economic performance: Australian evidence. *Procedia Computer Science*, 120, 797–804.
- Sun, Y., & Tang, X. (2022). The impact of digital inclusive finance on sustainable economic growth in China. *Finance Research Letters*, 50, Article 103234.
- Tan, Y., & Zhu, Z. (2022). The effect of ESG rating events on corporate green innovation in China: The mediating role of financial constraints and managers' environmental awareness. *Technology in Society*, 68, Article 101906.
- Turban, D. B., & Greening, D. W. (1997). Corporate social performance and organizational attractiveness to prospective employees. *Academy of Management Journal*, 40, 658–672.
- Tuyen, B. Q., Phuong Anh, D. V., Mai, N. P., & Long, T. Q. (2023). Does corporate engagement in social responsibility affect firm innovation? The mediating role of digital transformation. *International Review of Economics & Finance*, 84(C), 292–303.
- Vuong, N. B. (2022). Investor sentiment, corporate social responsibility, and financial performance: Evidence from Japanese companies. *Borsa Istanbul Review*, 22(5), 911–924.
- Wagner, M. (2005). How to reconcile environmental and economic performance to improve corporate sustainability: Corporate environmental strategies in the European paper industry. *Journal of Environmental Management*, 76(2), 105–118.
- Wang, G. Y. (2010). The impacts of free cash flows and agency costs on firm performance. *Journal of Service Science and Management*, 3, 408–418.
- Xie, J., Nozawa, W., Yagi, M., & Managi, S. (2019). Do environmental, social, and governance activities improve corporate financial performance? *Business Strategy and the Environment*, 2(28), 286–300.
- Zhou, Y., Huo, W., Bo, L., & Chen, X. (2023). Impact and mechanism analysis of ESG ratings on the efficiency of green technology innovation. *Finance Research Letters*, 58, Article 104591.