

The impact of economic policy uncertainty on corporate ESG scores and their subcategories

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Abstract. With the changes in the global economic environment, economic policy uncertainty (EPU) has had a profound impact on corporate operations and investment decisions. This study explores the impact of EPU on corporate Environmental, Social, and Governance (ESG) scores. Based on data from Chinese listed companies from 2000 to 2020, empirical analysis is conducted using a panel data regression model. The results show that economic policy uncertainty significantly increases corporate ESG scores, especially in the environmental and social dimensions. The study finds that policy uncertainty encourages companies to increase investments in these areas to enhance their social image and long-term competitiveness. Further analysis reveals that company size and industry characteristics play a moderating role in this impact. When facing economic policy uncertainty, companies optimize resource allocation by adjusting their financial structures (reducing financial leverage) to improve ESG performance. Policy recommendations include encouraging companies to continue enhancing their ESG performance in response to policy uncertainty in order to seize the opportunities for improvement brought about by this uncertainty.

Keywords: economic policy uncertainty, corporate ESG performance

1. Introduction

1.1. Research background and significance

With the continuous changes in the global economic landscape, Economic Policy Uncertainty (EPU) has gradually become one of the critical factors influencing corporate behavior. EPU can affect corporate decision-making through various channels, such as investment decisions, financial management, and sustainable development strategies. In recent years, Environmental, Social, and Governance (ESG) performance has increasingly become a key measure of corporate sustainability and social responsibility, attracting significant attention from investors, regulatory authorities, and the public. A company's ESG performance not only impacts its market value and long-term development potential but also reflects its commitment to external environmental and social responsibilities.

However, research on how economic policy uncertainty affects corporate ESG performance is still relatively limited. EPU may lead companies to focus more on financial stability and risk management in the short term, thereby reducing investments in environmental protection and social responsibility. On the other hand, an uncertain policy environment may compel companies to adopt more long-term and sustainable development strategies to cope with future risks.

Against this backdrop, studying the impact of economic policy uncertainty on corporate ESG performance is of great significance. On the one hand, it helps companies better formulate and adjust their sustainable development strategies when facing uncertainty; on the other hand, it provides policymakers with valuable insights on how to guide companies to maintain or improve ESG performance in uncertain environments. This study further reveals the behavioral characteristics of companies in response to economic policy uncertainty and provides valuable insights for companies, investors, and policymakers.

1.2. Literature review

Economic Policy Uncertainty (EPU) has become a hot topic in recent economic and management research. Baker, Bloom, and Davis [1] first proposed and quantified the EPU index, which measures the impact of policy uncertainty on economic activities. In the Chinese context, Xu and Wang [2] explored the impact of EPU on China's macroeconomy, finding that an increase in policy

uncertainty significantly lowers output and price levels, manifesting as a negative demand shock. At the corporate level, research has mainly focused on the impact of EPU on corporate investment decisions, financing behavior, and risk management. Wang et al. [3], Zhang and Liu [4] empirically found that an increase in EPU leads to dynamic adjustments in corporate capital structure. Wang et al. [5] examined the cash holdings behavior of Chinese listed companies during periods of heightened EPU, finding that companies tend to increase cash reserves to cope with potential risks. Additionally, Gulen and Ion [6] found that policy uncertainty has a significant negative impact on the investment behavior of capital-intensive firms.

ESG (Environmental, Social, and Governance) has become an important standard for measuring corporate sustainability and social responsibility. Grewal, Hauptmann, and Serafeim [7] showed that the transparency of corporate ESG information has a significant positive correlation with market performance; companies with higher ESG performance usually have higher market values [8, 9]. Li, Feng [10], Qiu and Yin [11] indicated that ESG performance can promote a company's business credit financing by strengthening its competitive advantages in the product market, improving external supervision, enhancing reputation, and increasing resilience to risks. In the Chinese context, Fang and Hu [12] pointed out that ESG performance promotes corporate innovation mainly through mechanisms such as alleviating financing constraints, improving employee innovation efficiency, and enhancing risk-taking levels. Zhou et al. [13] noted that institutional investors are particularly attuned to a company's ESG responsibilities, and there is a distinct ESG responsibility preference in the Chinese A-share market. In terms of specific dimensions, research by Clark, Feiner, and Viehs [14] found that Governance (G) generally has the most significant impact on a company's financial performance, while the Environmental (E) and Social (S) dimensions mainly affect corporate reputation and risk management. Furthermore, Lins, Servaes, and Tamayo [15] found that companies that performed well in CSR during the financial crisis recovered more quickly, mainly due to their continued investment in social responsibility. In China, Liu and Xu [16] conducted empirical research and found that companies with strong ESG performance demonstrate greater resilience in the face of external shocks, particularly those investing heavily in environmental protection and social responsibility, which makes them more likely to gain consumer and community trust. This result further supports the importance of ESG in the long-term development of companies.

Overall, the current research on the impact of EPU on corporate ESG performance is relatively limited. Existing studies on how policy uncertainty affects specific corporate social responsibility projects, such as environmental investments, are more prevalent. Research on the overall impact of EPU on corporate social responsibility remains to be optimized, especially in terms of mechanisms and sample selection. Additionally, further research on ESG subcategories is sparse, providing room for further exploration of the relationship between the two.

1.3. Research content and methodology

This paper first theoretically derives the pathways through which Economic Policy Uncertainty (EPU) impacts corporate ESG performance, along with the direct role played by the company's leverage ratio. Then, a scientifically rigorous empirical study is designed to verify the positive correlation between EPU and corporate ESG performance. Next, a mechanism test is conducted based on the company's leverage ratio pathway. Further, the heterogeneity of this relationship under different conditions of equity nature, company size, and regional differences is explored, considering how EPU influences the performance in the environmental (E), social (S), and governance (G) dimensions differently. Finally, integrating theoretical analysis with empirical results, targeted strategic recommendations are proposed for governments to adjust policies, for companies to fulfill their ESG responsibilities, and for investors to play their governance roles.

1.4. Main innovations

The innovations of this study are as follows: 1. Systematic Empirical Study: A comprehensive empirical study is conducted to investigate the impact of economic policy uncertainty on corporate ESG scores, filling a gap in the existing literature in this area. 2. Subcategory Analysis: A detailed analysis is performed to assess the influence of economic policy uncertainty on the three key areas of ESG performance—environment (E), social (S), and governance (G). The study uncovers the varying levels of impact on each of these dimensions and the mechanisms involved. For example, the study highlights the inhibitory effect of policy uncertainty on environmental investment decisions and the positive effect on the fulfillment of social responsibilities. 3. Heterogeneity Analysis: A heterogeneity analysis is conducted to compare ESG performance differences among companies of different sizes, locations, and ownership structures in response to economic policy uncertainty. This analysis also explores potential factors contributing to these differences, such as resource allocation, market sensitivity, and others. 4. Future Research Directions: Based on the limitations in current research, the study proposes future research avenues, including establishing dynamic models to track the long-term impacts of policy changes on corporate ESG scores and exploring regional or industry-specific differences.

2. Research hypotheses

2.1. The impact of economic policy uncertainty on corporate ESG performance

2.1.1. Positive impact

Promotion of ESG Investment and Practices: During periods of high economic policy uncertainty, companies may focus more on long-term stability and sustainable development, leading to increased investment in ESG areas. This investment not only helps improve the company's social image and brand value, but also reduces potential future risks, such as tightening environmental regulations or increasing social responsibility standards.

Enhancement of Information Disclosure Transparency: Economic policy uncertainty may prompt companies to improve the transparency of their ESG information disclosure in order to build trust with stakeholders such as investors and consumers. Increased transparency helps reduce information asymmetry, lower agency costs, and attract more long-term investors, thereby stabilizing the company's financing environment.

Stimulating Innovation and Transformation: In response to economic policy uncertainty, companies may be forced to seek new growth points and development paths. In this process, companies with good ESG performance are more likely to receive policy support and market recognition, thus stimulating innovation and transformation in areas such as environmental technology, social responsibility projects, and corporate governance models.

H1a: The higher the economic policy uncertainty, the better the corporate ESG performance.

2.1.2. Negative impact

Increase in Operational Costs: Economic policy uncertainty may lead to higher operational costs for companies. For example, frequent changes in environmental regulations may require companies to increase investments in environmental protection to meet new standards, and implementing social responsibility projects may require additional financial and time commitments. These increased costs may squeeze the space for ESG investments.

Suppression of Investment and Expansion: When economic policy uncertainty is high, companies may adopt a more cautious approach to investment decisions. To avoid potential risks and uncertainty, companies may reduce investments in ESG projects or even suspend or cancel related plans. This will negatively impact the company's ESG performance.

Impact on Risk Management Strategies: Economic policy uncertainty may also influence corporate risk management strategies. During periods of high uncertainty, companies may focus more on short-term profits and cash flow stability, neglecting or weakening risk management in the ESG areas. This may leave companies inadequately prepared to handle environmental, social, or governance-related risks.

H1b: The higher the economic policy uncertainty, the worse the corporate ESG performance.

2.2. Mechanism of the impact of economic policy uncertainty on corporate ESG performance

Economic policy uncertainty may increase corporate financial pressure, and financial pressure could, in turn, affect corporate ESG investments and performance. Financial pressure may serve as a mediator between economic policy uncertainty and corporate ESG performance. Using a company's leverage ratio (LEV) to represent financial pressure, the following hypothesis is proposed:

H2: Economic policy uncertainty (EPU) affects corporate ESG performance by increasing financial pressure (LEV).

2.3. The impact of economic policy uncertainty on corporate performance in Environmental (E), Social (S), and Governance (G) dimensions

Environmental (E) Performance: Economic policy uncertainty may promote corporate performance in the environmental dimension. In an uncertain economic environment, companies may increase investments in green technologies and sustainable development projects in order to reduce costs, improve resource utilization efficiency, and comply with increasingly strict environmental regulations. This forward-looking strategic adjustment not only helps companies alleviate future compliance pressures but may also enhance their market competitiveness by improving environmental performance.

H3: Economic policy uncertainty promotes corporate performance in the environmental (E) dimension.

Social (S) Performance: In response to economic policy uncertainty, companies may strengthen social responsibility activities to shape a positive brand image and cope with market fluctuations and changes in consumer preferences. This strategy not only helps enhance consumer trust and loyalty to the brand but also serves as a risk-buffering mechanism, reducing the negative impacts caused by economic uncertainty. Therefore, economic policy uncertainty may promote corporate performance in the social (S) dimension.

H4: Economic policy uncertainty promotes corporate performance in the social (S) dimension.

Governance (G) Performance: However, economic policy uncertainty may have a suppressive effect on corporate governance (G) performance. In a resource-constrained and uncertain economic environment, company management may be more inclined to

adopt short-term measures to quickly respond to market changes, neglecting the construction of long-term governance structures and internal controls. Furthermore, policy changes may increase the difficulty and complexity of corporate governance, leading to insufficient investment in governance, which in turn affects the company's governance level.

H5: Economic policy uncertainty suppresses corporate performance in the governance (G) dimension.

3. Research design and data description

3.1. Sample selection and data sources

This study focuses on A-share listed companies in China from 2009 to 2022. Following the methods used in existing research, the sample was selected based on the following criteria: (1) Exclusion of Abnormal Data: Companies that were ST or SST during the sample period were excluded to avoid the influence of abnormal data. (2) Exclusion of Financial Sector Companies: Financial sector companies (such as banks and insurance companies) were excluded to avoid the peculiarities of financial industry data. (3) Exclusion of Missing Data: Samples with missing data were excluded. (4) Trimming of Continuous Variables: To reduce the influence of extreme values, the top and bottom 1% of continuous variables were trimmed.

The data for the China Securities ESG rating comes from the Wind Financial Terminal. The economic policy uncertainty index is sourced from the methodology developed by Baker et al. (2016), based on keyword searches from the South China Morning Post. Corporate-level information comes from the Guotai An (CSMAR) database.

3.2. Variable selection and definitions

3.2.1. Dependent variable

Corporate ESG Performance (ESG): Scholars typically measure corporate ESG performance through two methods: creating a self-developed multi-dimensional index system or using third-party institutional ratings. Since third-party ratings are considered accurate and objective, this study adopts the China Securities ESG Rating index, widely recognized in academia and industry, as the measure of corporate ESG performance. This rating system assigns ESG levels to all A-share listed companies, with a scale ranging from "C" to "AAA". Following the approach of Li Zengfu and Feng Liuhua (2022), the nine rating categories are assigned scores from 1 to 9, with the monthly average index score used as the annual score. A higher score indicates better ESG performance by the company.

3.2.2. Independent variable

Economic Policy Uncertainty (EPU): There are two main methods for measuring economic policy uncertainty. One method uses local government official changes, while another method uses text analysis to construct an economic policy uncertainty index. Compared to the limitations of government leadership turnover, such as its local and time-varying nature, the index based on big data can reflect both central and local levels and offers better continuity. Therefore, this study follows the approach of Li and Yang and uses the widely recognized China Economic Policy Uncertainty Index developed by Baker et al. [1] as the proxy indicator. This team conducted a text analysis of key terms like "China," "economy," "policy," and "uncertainty" in the South China Morning Post to calculate the monthly index by analyzing the frequency of related reports and normalizing them. The monthly average of this index is calculated and divided by 100 to yield an annual index. A higher index value indicates greater economic policy uncertainty.

3.2.3. Moderating variable

Leverage Ratio (LEV): Leverage ratio is the key financial indicator selected in this study to measure the proportion of total debt to total assets, reflecting the company's debt burden and financing structure. Data for this variable is obtained from corporate financial reports and serves as an important basis for assessing debt repayment ability, analyzing financing strategies, and forecasting financial risks.

3.2.4. Control variables

This study refers to past research on the determinants of corporate social responsibility. The following company organizational characteristics, which may affect corporate social responsibility, are used as control variables: lnSize: The natural logarithm of the company's market value; gror: The growth rate of operating income; age: The listing age of the company. Additional control variables include: ROA: Return on assets; Board: The size of the board of directors (natural logarithm of the number of board members); Indep: The proportion of independent directors; Listage: The number of years since the company's listing, calculated as the natural logarithm of (current year - listing year + 1).

Since the empirical analysis is based on panel data at the company level, industry dummy variables are not added. Table 1 provides an introduction to the main variables used in this study.

Table 1. Definition and name of relevant variables

Variable Type	Variable Name	Variable Symbol	Variable Description
Dependent Variable	Corporate ESG Performance	esg	China Securities ESG Rating
	Environmental (E) Score	esg1	China Securities ESG Rating
	Social (S) Score	esg2	China Securities ESG Rating
	Governance (G) Score	esg2	China Securities ESG Rating
Independent Variable	Economic Policy Uncertainty	epu	Monthly index average of the China Economic Policy Uncertainty Index / 100
Moderating Variable	Leverage Ratio	lev	Total debt / Total assets
Control Variables	Company Size	size	Natural logarithm of total assets
	Return on Assets	roa	Net profit / Total assets
	Company Growth	growth	Current year operating income / Previous year operating income - 1
	Board Size	board	Natural logarithm of the number of board members
	Proportion of Independent Directors	indep	Number of independent directors / Total board members
	Listing Age	listage	ln (Current year - Listing year + 1)

3.3. Model construction

To test the impact of economic policy uncertainty on corporate ESG performance, Model (1) is designed to verify Hypothesis 1:

$$ESG_{i,t} = \beta_0 + \beta_1 EPU_t + \sum \beta_j Controls_{i,t} + \mu_i + \varepsilon_{i,t} \quad (1)$$

To test the mediating mechanism of economic policy uncertainty on corporate ESG performance, Model (2) and (3) is designed to verify Hypothesis 2:

$$LEV_{i,t} = \alpha_0 + \alpha_1 EPU_t + \sum \beta_j Controls_{i,t} + \mu_i + \varepsilon_{i,t} \quad (2)$$

$$ESG_{i,t} = \beta_0 + \beta_1 LEV_{i,t} + \beta_2 EPU_{i,t} + \sum \beta_j Controls_{i,t} + \mu_i + \varepsilon_{i,t} \quad (3)$$

Where *i* and *t* represent the individual company and year, respectively. ESG represents the dependent variable of corporate ESG performance, EPU represents the independent variable of economic policy uncertainty, LEV represents the moderating variable of leverage ratio, and Controls represents all control variables. μ is the individual fixed effect, ε is the residual term. In Model (1), the primary focus is on the regression coefficients β_1 : if significant and positive, it indicates that higher economic policy uncertainty is associated with better corporate ESG performance, validating Hypothesis 1a. Conversely, if significant and negative, it suggests that higher economic policy uncertainty leads to worse corporate ESG performance, validating Hypothesis 1b. In Model (2) and (3), if the regression coefficients $\alpha_1, \beta_1, \beta_2$ are all significant, it proves the validity of Hypothesis 2.

4. Empirical analysis and discussion

4.1. Descriptive statistical analysis

Table 2. Descriptive statistics

Variable	Obs	Mean	Std.Dev.	Min	Max
esg	32,238	4.236	1.017	1	8
epu	32,238	4.419	2.45	.989	7.919
size	32,238	22.182	1.297	20.041	26.344
roa	32,238	.049	.059	-.176	.228
growth	32,238	.162	.327	-.494	1.757
board	32,238	2.124	.198	1.609	2.708
indep	32,238	37.584	5.288	33.33	57.14
listage	32,238	1.914	.931	0	3.332

Based on descriptive statistical analysis of data from 32,238 companies (as shown in Table 2), the following results were obtained: The mean ESG score (esg) is 4.236, with a standard deviation of 1.017, indicating a large variation in corporate ESG performance within the score range of 1 to 8. The mean Economic Policy Uncertainty (EPU) index is 4.419, with a standard deviation of 2.45, suggesting significant volatility in the level of economic policy uncertainty across the sample companies. The mean company size (size) is 22.182, with a standard deviation of 1.297, indicating some variation in company size, but overall, companies tend to be large. The mean return on assets (ROA) is 0.049, with a standard deviation of 0.059, reflecting relatively low profitability and high volatility in the companies' earnings. The mean revenue growth rate (growth) is 0.162, with a standard deviation of 0.327, indicating significant differences in revenue growth across companies. The mean board size (board) is 2.124, with a standard deviation of 0.198, suggesting relatively small and stable board sizes. The mean proportion of independent directors (indep) is 37.584%, with a standard deviation of 5.288%, indicating significant differences in the proportion of independent directors across companies. The mean listing age (listage) is 1.914, with a standard deviation of 0.931, showing that the sample includes both newly listed companies and more mature firms, with a wide range of listing durations.

4.2. Correlation analysis

Table 3. Correlation analysis results

Variables	esg	epu	size	roa	growth	board	indep	listage
esg	1.000							
epu	0.029*	1.000						
	0.000							
size	0.174*	0.091*	1.000					
	0.000	0.000						
roa	0.201*	-0.081*	-0.059*	1.000				
	0.000	0.000	0.000					
growth	0.018*	-0.092*	0.039*	0.292*	1.000			
	0.001	0.000	0.000	0.000				
board	0.022*	-0.146*	0.266*	-0.002	0.001	1.000		
	0.000	0.000	0.000	0.657	0.890			
indep	0.084*	0.068*	0.013*	-0.009	-0.007	-0.546*	1.000	
	0.000	0.000	0.024	0.125	0.204	0.000		
listage	-0.055*	0.036*	0.500*	-0.262*	-0.096*	0.170*	-0.019*	1.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.001	

Table 3 reports the correlation analysis results of the variables. It can be seen that there is a strong positive correlation between ESG and EPU as individual variables, but further control of other factors is needed to verify the hypotheses of this study. Additionally, the Spearman coefficients between the control variables and ESG are all significant at the 1% level, suggesting a strong correlation between them. This indicates that it is important to control for the potential effects of these variables, and the choice of control variables in this study is reasonable. Moreover, the correlation coefficients between other variables are all less than 0.5, and the VIFs (Variance Inflation Factors) range from 1.094 to 1.692, which is well below 10, indicating that multicollinearity is not an issue in the data.

4.3. Empirical results analysis of the impact of economic policy uncertainty on corporate ESG performance

Table 4. Regression results of economic policy uncertainty on corporate ESG performance

	m1	m2	m3
VARIABLES	esg	esg	esg
epu	0.0120*** (0.00231)		0.0192*** (0.00284)
size		0.238*** (0.0112)	0.214*** (0.0118)
roa		1.445*** (0.112)	1.429*** (0.112)

Table 4. Continued

growth		-0.121*** (0.0152)	-0.105*** (0.0154)
board		0.119** (0.0525)	0.129** (0.0525)
indep		0.0160*** (0.00162)	0.0159*** (0.00162)
listage		-0.262*** (0.0120)	-0.300*** (0.0132)
Constant	4.183*** (0.0117)	-1.451*** (0.272)	-0.943*** (0.282)
Observations	32,238	32,238	32,238
R-squared	0.001	0.035	0.037
Number of stkcd	4,233	4,233	4,233

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4 reports the baseline regression results for the impact of economic policy uncertainty on corporate ESG performance. Both the F-test and Hausman test are significant, and after these tests, a fixed-effects model is chosen. Column (1) only performs a univariate regression of the independent variable without including control variables. The regression result shows that the coefficient of EPU is 0.012, which is statistically significant at the 1% level. Column (2) includes only the company-level control variables and controls for individual fixed effects. Column (3) includes both the independent variable and control variables, controlling for individual fixed effects. The adjusted R-squared (AdjR^2) increases, showing better model fit. The regression coefficient for EPU is positively significant at the 1% level, with its absolute value increasing from 0.012 to 0.0192. The empirical results indicate that economic policy uncertainty is positively correlated with corporate ESG performance, meaning that the higher the economic policy uncertainty, the better the corporate ESG performance, which confirms Hypothesis 1a of this study. In terms of economic significance, for every one-unit increase in economic policy uncertainty, corporate ESG performance increases by 0.0192 points.

5. Further analysis

5.1. Robustness check

Table 5. Robustness test results using subsamples

	m4	m5	m6
VARIABLES	esg	esg	esg
epu	0.0231*** (0.00360)		0.0200*** (0.00342)
size		0.304*** (0.0188)	0.282*** (0.0191)
roa		0.928*** (0.132)	0.904*** (0.132)
growth		-0.0984*** (0.0182)	-0.0788*** (0.0185)
board		0.140* (0.0751)	0.140* (0.0750)
indep		0.0146*** (0.00226)	0.0143*** (0.00226)
listage		-0.255*** (0.0177)	-0.298*** (0.0192)
Constant	4.109*** (0.0211)	-2.921*** (0.443)	-2.439*** (0.450)
Observations	23,307	23,307	23,307
R-squared	0.002	0.023	0.025
Number of stkcd	4,230	4,230	4,230

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

To validate the robustness of the study's results (as shown in Table 5), we conducted a robustness test, particularly by selecting different subsamples to confirm the main conclusions. In this study, we selected data from the period 2015-2022 for a subsample regression analysis to examine whether the impact of Economic Policy Uncertainty (EPU) on corporate ESG scores remains consistent. The results of the regression for the 2015-2022 subsample still show significant results, confirming the robustness of the findings.

5.2. Heterogeneity analysis

State-owned vs. Non-state-owned:

Table 6. Empirical results of property ownership heterogeneity

	State-owned	Non-state-owned
VARIABLES	esg	esg
epu	0.0292*** (0.00450)	0.00685* (0.00373)
Observations	11,240	20,998
R-squared	0.039	0.040
Number of stkcd	1,023	3,210

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

In the heterogeneity analysis (as shown in Table 6), we found significant differences in how Economic Policy Uncertainty (EPU) affects the ESG scores of state-owned and non-state-owned enterprises. Specifically, for state-owned enterprises, the regression coefficient for ESG scores with respect to EPU was 0.0292 (p<0.01), indicating that as economic policy uncertainty increases, the ESG scores of state-owned enterprises significantly improve. This may reflect the tendency of state-owned enterprises to enhance their ESG performance to maintain good relationships with the government and the public in the face of policy uncertainty.

In contrast, for non-state-owned enterprises, the regression coefficient for ESG scores with respect to EPU was 0.00685 (p<0.1), with weaker significance. This suggests that while non-state-owned enterprises also show improvement in ESG scores, the change is relatively smaller. This difference may be due to non-state-owned enterprises placing more emphasis on market and investor reactions, rather than being directly influenced by policy.

This finding highlights the heterogeneity in ESG performance between state-owned and non-state-owned enterprises under economic policy uncertainty, offering important insights into the behavior of firms under different external shocks.

East vs. Midwest:

Table 7. Empirical results of regional heterogeneity between eastern and mid-western China

	East	Midwest
VARIABLES	esg	esg
epu	0.0217*** (0.00332)	0.0117** (0.00552)
Observations	23,928	8,310
R-squared	0.037	0.037
Number of stkcd	3,234	999

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

In the regional heterogeneity analysis (as shown in Table 7), we observed significant differences in the impact of Economic Policy Uncertainty (EPU) on ESG scores between firms in China's eastern and mid-western regions. Specifically, the regression coefficient for ESG scores with respect to EPU for firms in the eastern region was 0.0217 (p<0.01), showing that ESG scores for eastern firms significantly improve as economic policy uncertainty increases. This result may reflect the tendency of eastern firms to actively enhance their ESG performance to build market and investor trust, as they face intense market competition and policy pressures.

In contrast, for firms in the central and western regions, the regression coefficient for ESG scores with respect to EPU was 0.0117 (p<0.05), although still significant, it was smaller than that of the eastern firms. This may be because firms in the central

and western regions face relatively less market pressure and policy influence, resulting in a more moderate increase in ESG performance in response to economic policy uncertainty. Additionally, firms in these regions may focus more on local policies and regional market dynamics rather than national uncertainty.

This finding indicates that there are regional differences in ESG performance when firms face economic policy uncertainty. These regional disparities reflect different response mechanisms and strategic adjustments in different areas, providing useful references for policymakers and business managers in formulating targeted strategies.

Large vs. Small Firms:

Table 8. Empirical results of firm size heterogeneity

	Large Firm	Small Firm
VARIABLES	esg	esg
epu	0.00564 (0.00444)	0.0161*** (0.00402)
Observations	13,682	18,556
R-squared	0.027	0.046
Number of stkcd	2,010	3,498

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

In the analysis of firm size (as shown in Table 8), we found significant differences in the impact of Economic Policy Uncertainty (EPU) on ESG scores between large and small firms. Specifically, for small firms (with total assets below the mean), the regression coefficient for ESG scores with respect to EPU was 0.0161 (p<0.01), indicating that as economic policy uncertainty increases, small firms' ESG scores significantly improve. This may be because small firms are more sensitive to economic policy uncertainty and may enhance their ESG performance to strengthen their market competitiveness and attractiveness, thus mitigating the negative impact of economic uncertainty. Additionally, small firms may be more flexible in adjusting their ESG strategies to meet the changing market and policy demands.

In contrast, for large firms (with total assets above the mean), the regression coefficient for ESG scores with respect to EPU was 0.00564, which was not statistically significant (p>0.1), indicating that the increase in ESG scores for large firms in response to economic policy uncertainty is relatively small. Large firms may have already established mature ESG practices, so their ESG scores do not change as significantly in response to economic policy uncertainty. Large firms may focus more on maintaining existing ESG standards rather than making large adjustments in the short term.

This analysis reveals the differences in ESG performance between small and large firms when facing economic policy uncertainty. Small firms exhibit higher improvements in ESG scores, likely due to their flexibility and sensitivity to market changes. In contrast, large firms experience smaller changes, possibly because of their established ESG strategies and stronger resource base.

5.3. Mechanism analysis

Table 9. Empirical results of financial structure mechanism test

	(1)	(2)
VARIABLES	lev	esg
epu	-0.00713*** (0.000313)	0.0143*** (0.00286)
size	0.0491*** (0.00129)	0.248*** (0.0120)
roa	-0.658*** (0.0123)	0.972*** (0.117)
growth	0.0434*** (0.00170)	-0.0751*** (0.0155)
board	0.00733 (0.00577)	0.134** (0.0523)
indep	-0.000291 (0.000178)	0.0157*** (0.00161)
listage	0.0409*** (0.00146)	-0.271*** (0.0134)
lev		-0.693***

Table 9. Continued

Constant	-0.717*** (0.0310)	(0.0542) -1.440*** (0.284)
Observations	32,238	32,238
R-squared	0.278	0.042
Number of stkcd	4,233	4,233

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

In Table 9, Column (1), we examined the regression of EPU on Lev to investigate how economic policy uncertainty (EPU) affects the financial leverage ratio (Lev). The result showed that the coefficient for EPU was negative and significant (-0.00713), suggesting that as economic policy uncertainty increases, firms tend to reduce their financial leverage ratio. This can be interpreted as firms seeking to reduce debt financing and lower their financial leverage in response to high economic policy uncertainty in order to mitigate financial risks and financing costs.

In Column (2), we regressed both EPU and Lev on ESG scores, observing the effect of Lev on ESG scores as well as the change in the coefficient for EPU. The results show that the coefficient for Lev was negative and significant (-0.693), directly indicating that a reduction in financial leverage is positively correlated with an improvement in ESG scores. Meanwhile, the coefficient for EPU remained positive and significant (0.0143), but its magnitude changed after including Lev in the model.

Direct and Indirect Effects: The direct effect of EPU on ESG scores is positive, meaning that an increase in EPU directly encourages firms to improve their ESG performance. However, EPU also indirectly promotes ESG performance by lowering the financial leverage ratio. This indirect effect suggests that firms, when facing economic policy uncertainty, adjust their financial structure (by reducing leverage) to optimize resource allocation, which in turn enhances their ESG performance.

Firms may reduce financial leverage as part of a risk management strategy to reduce potential losses from economic uncertainty. At the same time, this strategy may also encourage firms to focus more on social responsibility and sustainable development, as strong ESG performance can improve a firm's social reputation and long-term competitiveness.

This indicates that, under conditions of economic policy uncertainty, encouraging firms to reduce their financial leverage may not only help lower financial risks but also indirectly boost ESG performance. Policymakers could consider adjusting tax and credit policies to guide firms in optimizing their financial structure, thereby promoting sustainable development and corporate social responsibility.

5.4. Further analysis of ESG dimensions

Table 10. Regression results of economic policy uncertainty on the three ESG subcategories (E, S, G)

VARIABLES	(1) esg1	(2) esg2	(3) esg3
size	0.237*** (0.0129)	0.244*** (0.0132)	0.0502*** (0.0152)
roa	0.222* (0.122)	1.404*** (0.125)	2.241*** (0.145)
growth	-0.113*** (0.0168)	-0.126*** (0.0173)	-0.156*** (0.0200)
board	-0.122** (0.0574)	0.104* (0.0587)	0.185*** (0.0680)
indep	-0.000821 (0.00177)	0.0142*** (0.00181)	0.0291*** (0.00210)
listage	-0.135*** (0.0145)	-0.154*** (0.0148)	-0.622*** (0.0171)
epu	0.0686*** (0.00311)	0.0347*** (0.00318)	-0.0462*** (0.00368)
Constant	-3.035*** (0.309)	-1.759*** (0.316)	4.199*** (0.366)
Observations	32,238	32,238	32,238
R-squared	0.064	0.034	0.171
Number of stkcd	4,233	4,233	4,233

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

To further explore the differential impact of economic policy uncertainty (EPU) on corporate ESG performance in the E (Environmental), S (Social), and G (Governance) aspects, the regression analysis for EPU's effect on each of these sub-categories is shown in the following columns (seen as Table 10): (1) EPU's effect on corporate ESG E score (Environmental). (2) EPU's effect on corporate ESG S score (Social). (3) EPU's effect on corporate ESG G score (Governance). The results indicate that: Overall ESG Score: There is a positive correlation between overall ESG scores and economic policy uncertainty. Specifically, both Environmental (E) and Social (S) aspects are positively correlated with economic policy uncertainty, whereas the Governance (G) aspect shows a negative correlation with EPU. This can be explained by the following reasons:

Environmental (E) and Social (S) performances are positively correlated with Economic Policy Uncertainty (EPU), meaning that as economic policy uncertainty increases, firms tend to invest more in environmental protection and social responsibility. This, in turn, improves their scores in these areas. Such behavior may help firms stabilize their market position and enhance their attractiveness to stakeholders in an uncertain economic environment. These investments may be viewed as a strategy to mitigate the risks brought on by uncertainty, thereby improving the environmental and social aspects of their ESG scores.

Governance (G) performance, on the other hand, is negatively correlated with Economic Policy Uncertainty. In an uncertain economic environment, firms may face more challenges in strategic adjustments and decision-making, which can lead to instability in their governance structures and processes. The uncertainty and frequent changes in decision-making may result in poor governance performance, which negatively impacts the governance score (G). Moreover, economic policy uncertainty may prompt firms to adopt short-term strategies, which can harm the long-term stability, transparency, and normative aspects of their governance.

6. Conclusion and implications

6.1. Conclusion

This study investigates the impact of Economic Policy Uncertainty (EPU) on corporate Environmental, Social, and Governance (ESG) scores. The empirical analysis indicates that overall corporate ESG scores are positively correlated with economic policy uncertainty, with the Environmental (E) and Social (S) aspects showing a positive correlation, while the Governance (G) aspect exhibits a negative correlation with EPU. These findings reveal diverse responses in corporate ESG performance in the face of economic policy uncertainty.

Environmental and Social Performance: When economic policy uncertainty increases, firms tend to enhance their environmental protection and social responsibility efforts to improve their public image and market position. This approach helps companies attract investors and consumers, thus boosting their competitiveness. Therefore, the positive correlation between the environment and social aspects suggests that firms may view uncertainty as an opportunity to improve their ESG performance.

Governance Performance: On the other hand, the negative correlation with governance indicates that economic policy uncertainty may negatively affect the stability of a company's governance structure and processes. Firms may face decision-making difficulties and structural adjustments, leading to weaker governance. Instability and frequent changes in decision-making may impact transparency and regulatory compliance, which is reflected in the negative effect on governance scores.

Heterogeneity Analysis: **Ownership Type:** There is a significant difference in how economic policy uncertainty affects the ESG scores of state-owned and non-state-owned enterprises. State-owned enterprises show a more significant increase in ESG scores in response to EPU, possibly because they aim to maintain good relationships with the government and the public, prompting them to adjust their ESG strategies more actively. In contrast, non-state-owned enterprises show a smaller increase, likely because they focus more on market and investor feedback than on policy uncertainty. This reflects different strategic responses to policy changes based on ownership type; **Regional Differences:** Companies in the eastern regions of China show a more significant increase in ESG scores in response to economic policy uncertainty compared to those in central and western regions. This may reflect the higher market pressures and regulatory oversight in eastern China, prompting companies in these regions to more actively adjust their ESG performance; **Firm Size:** Small firms show a more significant increase in ESG scores when facing economic policy uncertainty, while large firms exhibit only a small change. This indicates that smaller firms are more sensitive to policy uncertainty, likely due to their flexibility and rapid adaptation to market changes.

6.2. Implications

For Corporate Management:

Enhance Environmental and Social Responsibility: Companies should view economic policy uncertainty as an opportunity to enhance their environmental and social responsibility efforts, improving their public image and market position. By actively addressing environmental and social challenges, companies can increase their competitiveness and attractiveness in uncertain economic environments.

Strengthen Governance Structure: Firms should focus on strengthening the stability of their governance structures and processes, especially during periods of high economic policy uncertainty. Establishing a robust governance system that ensures transparency and regulatory compliance will help firms maintain stability and trust in the face of uncertainty.

Adjust Strategy: Companies should adopt a comprehensive strategy that considers environmental, social, and governance factors in response to economic policy uncertainty. Specifically, they should reinforce internal controls and management practices to address challenges in governance.

Tailored Strategies: Firms should develop adaptive strategies based on their region and size. Companies in the eastern regions and smaller firms may need quicker response mechanisms and greater ESG investment, while those in central and western regions and larger firms should focus on reinforcing governance structures.

For Policymakers:

Provide a Stable Policy Environment: Governments and relevant institutions should strive to create a more stable economic policy environment to mitigate the negative impact of policy uncertainty on corporate governance. By formulating clear and predictable policies, policymakers can help firms better plan their long-term strategies and improve governance standards.

Support Corporate ESG Performance: Policymakers could consider implementing incentives and policy support to encourage firms to invest in environmental and social responsibility. This will not only enhance companies' public image but also promote sustainable development.

For Investors and Stakeholders:

Monitor ESG Performance: Investors and stakeholders should pay close attention to a company's environmental, social, and governance performance during periods of economic policy uncertainty. Understanding how firms navigate these challenges can help make more informed investment decisions; **Strengthen Governance Requirements:** Given the negative correlation with governance (G), it is recommended that policymakers strengthen the supervision of corporate governance to ensure that firms maintain high governance standards, even amid policy uncertainty.

For Further Research:

Future studies could explore the specific mechanisms through which economic policy uncertainty affects corporate ESG performance, particularly the challenges and causes related to governance (G). Additionally, comparative analyses across different types of companies and countries could provide broader insights into these dynamics.

References

- [1] Baker, S. R., Bloom, N., & Davis, S. J. (2016). Measuring economic policy uncertainty. *The Quarterly Journal of Economics*, 131(4), 1593-1636.
- [2] Xu, Z., & Wang, W. (2019). The impact of economic policy uncertainty on the macroeconomy: An empirical and theoretical dynamic analysis. *Economics (Quarterly)*, 18(01), 23-50. <https://doi.org/10.13821/j.cnki.ceq.2018.02.02>
- [3] Wang, C., Zhang, X., & Bao, H. (2018). Economic policy uncertainty, corporate capital structure dynamics, and leverage stabilization. *China Industrial Economics*, (12), 134-151. <https://doi.org/10.19581/j.cnki.ciejournal.2018.12.008>
- [4] Zhang, C., & Liu, G. (2018). Research on investment and financing decision-making mechanisms in China's industrial sector: A perspective based on economic policy uncertainty and the heterogeneity of financing constraints. *Economic Research Journal*, 53(12), 51-67.
- [5] Wang, H., Li, Q., & Xing, F. (2014). Economic policy uncertainty, cash holdings, and market value. *Financial Research*, (09), 53-68.
- [6] Gulen, H., & Ion, M. (2016). Policy uncertainty and corporate investment. *The Review of Financial Studies*, 29(3), 523-564.
- [7] Grewal, J., Hauptmann, C., & Serafeim, G. (2021). Material sustainability information and stock price informativeness. *Journal of Business Ethics*, 171(3), 513-544.
- [8] Shi, Y., & Wang, H. (2023). Corporate social responsibility and company value: A perspective based on ESG risk premiums. *Economic Research Journal*, 58(06), 67-83.
- [9] Yan, B., Cheng, M., & Wang, N. (2024). ESG green spillovers, supply chain transmission, and corporate green innovation. *Economic Research Journal*, 59(07), 72-91.
- [10] Li, Z., & Feng, L. (2022). Corporate ESG performance and business credit acquisition. *Financial Research*, 48(12), 151-165. <https://doi.org/10.16538/j.cnki.jfe.20220815.202>
- [11] Qiu, M., & Yin, H. (2019). Corporate ESG performance and financing costs in the context of ecological civilization construction. *Quantitative Economics and Technical Economics Research*, 36(03), 108-123. <https://doi.org/10.13653/j.cnki.jqte.2019.03.007>
- [12] Fang, X., & Hu, D. (2023). Corporate ESG performance and innovation: Evidence from A-share listed companies. *Economic Research Journal*, 58(02), 91-106.
- [13] Zhou, F., Pan, W., & Fu, H. (2020). ESG responsibility performance of listed companies and institutional investors' stockholding preferences: Empirical evidence from Chinese A-share listed companies. *Scientific Decision*, (11), 15-41.
- [14] Clark, G. L., Feiner, A., & Viehs, M. (2015). From the stockholder to the stakeholder: How sustainability can drive financial outperformance. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.2508281>
- [15] Lins, K. V., Servaes, H., & Tamayo, A. (2017). Social capital, trust, and firm performance: The value of corporate social responsibility during the financial crisis. *Journal of Finance*, 72(4), 1785-1824.
- [16] Liu, J., & Xu, Y. (2024). ESG performance and corporate resilience. *Audit and Economic Research*, 39(01), 54-64.