



The impact of economic policy uncertainty on corporate social responsibility: an intertemporal analysis of Chinese listed companies

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Abstract

The increasing economic policy uncertainty makes the business environment more complicated, which affects corporate social responsibility (CSR) in different periods. Based on the panel data of Chinese listed companies from 2010 to 2018, this paper uses a fixed effect model to analyze the impact of economic policy uncertainty on CSR from the perspective of short-term period and long-term period analysis. The results show that: in the short-term period, economic policy uncertainty is mainly manifested as the risk effect on enterprises, which harms CSR. But from the perspective of long-term period, economic policy uncertainty turns into policy dividend impact on enterprises, which has a positive effect on CSR. Further, mediating mechanism and parallel mediating mechanism test found that the corporate business risk and financial performance play a significantly mediating role between economic policy uncertainty and CSR. The heterogeneity test results show that in executives with non-overseas backgrounds and a low proportion of independent directors, economic policy uncertainty has a significant impact on CSR.

Keywords Economic policy uncertainty · Corporate social responsibility · Mediation mechanism · Parallel mediating mechanism

1 Introduction

In recent years, the world economy has entered a period of profound adjustment, and the uncertainty of global economic growth has increased. Countries have been improving the international financial architecture to avoid the recurrence of the crisis. In this context, the economic policies of various countries are constantly adjusted to adapt to the

new environment. In addition, China's economic development has gradually shifted from the stage of high-speed growth to the high-quality development. To cope with various economic shocks at home and abroad, stabilize the new normal of economic development trends, and promote economic transformation and upgrading, China has successively introduced a series of economic policies (Wen et al. 2020). With the frequent introduction and adjustment of Chinese economic policies, economic policy uncertainty was increasing, which also has a direct impact on enterprise operation. Existing studies have conducted a series of analyses on the impact of economic policy uncertainty on microeconomics, including the impact on micro-business investment, cash holding, corporate mergers and acquisitions, senior management change, R&D investment, and other aspects of business behaviors (Gulen and Ion 2016; Demir and Ersan 2017; Hou et al. 2021). Most studies have found that economic policy uncertainty is negatively correlated with enterprise investment expenditure and operating costs (Wolfgang et al. 2018; Ma and Hao 2022).

With the continuous emergence of environmental pollution, labor rights, product quality, and other issues, people pay more and more attention to corporate social

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responsibility (CSR). However, the CSR index of China's listed companies shows that the average score of CSR is only at Grade C, and the practice level of CSR is still at the primary stage. Therefore, it is necessary to conduct an in-depth analysis of the main factors affecting CSR (Aupperle et al. 1985). Theoretically, economic policy uncertainty affects CSR. Especially for China in a transition period, the reform of the economic system and advance will motivate the adjustment of economic policy, resulting in the surged economic policy uncertainty, the political environment can have a huge and wide-ranging impact on CSR. Only by clarifying the influence mechanism of economic policy uncertainty on CSR can we better provide an empirical basis for promoting the sustainable development of CSR on the government side.

Few studies have focused on this issue. Regarding how economic policy uncertainty affects CSR, existing research opinions are not consistent. Panousi and Papanikolaou (2012) found that with the increasing economic policy uncertainty, enterprises will reduce expenditures and operating costs, which will reduce risks and promote sustainable development. To reduce costs, enterprises will take the initiative to reduce their CSR. However, Ongsakul et al. (2019) have found that economic policy uncertainty has a positive effect on CSR. This is inconsistent with the previous research conclusions. The divergence of scholars' research conclusions shows that it is necessary to conduct further in-depth research on the relationship between economic policy uncertainty and CSR.

Given that economic policies usually go through the stage from proposals, incubation, introduction to implementation, and promotion, the impact of policy changes on enterprise operation is different in different stages, so the impact of economic policy uncertainty on CSR presents heterogeneity. However, the existing studies mainly focus on the disparity of the impact of increased economic policy uncertainty on CSR, without considering the impact from the perspective of different periods. In fact, when firms perceive greater uncertainty about economic policy, they are more cautious as they cannot judge the situation. However, with the introduction and implementation of policies, enterprises will gradually understand and digest the changing trend of policy. Then the enterprises will take actions to promote their sustainable development. Thereby, the impact of economic policy uncertainty on CSR in the different periods may be different. Therefore, this paper focuses on the analysis of the impact of economic policy uncertainty on CSR in different periods.

To comprehensively analyze the relationship between economic policy uncertainty and CSR, this paper studies the different relationship in the short-term and long-term period. The results show that: First, in the short-term period economic policy uncertainty has a significant negative impact on CSR, but from the perspective of long-term period, there

is a significant positive impact on CSR. Second, the corporate business risk and financial performance play a mediating role in the impact of economic policy uncertainty on corporate social responsibility respectively and they play a parallel mediating role between economic policy uncertainty and CSR together. Third, among enterprises with different management characteristics, including executives with non-overseas backgrounds and a low proportion of independent directors, the impact of economic policy uncertainty on CSR is also different.

Compared with the existing studies, the incremental contributions of this paper are as follows: First, this paper reveals the differences in the impact of economic policy uncertainty on CSR within different periods, which adds empirical evidence to the existing relative researches. Second, previous studies have not explored the specific impact mechanism of economic policy uncertainty on CSR. This paper establishes the analysis framework of economic policy uncertainty, corporate business risk, corporate financial performance, and CSR, finds that both corporate business risk and corporate financial performance mediates the relationship of economic policy uncertainty and CSR, and tests the parallel mediating effects of corporate business risk and corporate financial performance. Third, from the perspective of the characteristics of senior executives of Chinese listed companies, this paper illustrates the difference in the impact of economic policy uncertainty on CSR, and points out the direction of policy adjustment for the government.

2 Theoretical analysis and hypothesis

With the social, political, and economic environment changes, the government's economic policy will change. However, as the time, content direction, implementation intensity and effect of policy change cannot be known exactly, the economic subject is faced with an unpredictable policy environment, which is the economic policy uncertainty (Shleifer 1998). Based on the theory of enterprise strategic management, external macroeconomic policy is an important factor that enterprises need to consider when formulating business strategies. Therefore, when economic policies change, enterprise managers will correct the deviation of enterprise expectations by changing enterprise behaviors (Kenneth and Andrew 2019). Especially for listed companies, due to their large economic scale, they will timely adjust their business behaviors and decisions-making according to economic policies to achieve stable development. Therefore, economic policy uncertainty may affect the business behaviors of listed companies.

In 1984, Milton Friedman put forward the stakeholder theory, arguing that the participation of stakeholders is an essential link to promote the sustainable development of

enterprises. Enterprises should aim to realize the overall interests of stakeholders, rather than just pursue the interests of some subjects, that is, companies are required to meet the demands of stakeholders. In this way, individuals such as consumers, suppliers, employees and shareholders form a community of destiny to achieve the optimal state of enterprise development. Therefore, good corporate social responsibility practice is helpful for enterprises to obtain higher national support, set up the enterprise image, and promote the positive interactive between the stakeholders and enterprise individual (Clarkson 1995). In addition, from the present situation of China, as a transitional country, domestic enterprises tend to fulfill corporate social responsibility, which they see it as a tool of rent-seeking to establish a good corporate image in front of the government and to obtain more policy information (Lin et al. 2015). However, profit maximization is the first issue that enterprises should consider. Enterprises' fulfillment of social responsibility will cause a significant increase in economic costs. This requires enterprises to measure the costs and benefits of CSR when facing the different environment.

Economic policy uncertainty has both risk effect and policy dividend effect on enterprises. Under different impact effects, enterprises' expenditure on social responsibility may be measured. Therefore, this chapter will put forward hypotheses based on the risk effect and policy dividend effect of economic policy uncertainty on the CSR of enterprises.

2.1 The short-term period impact of economic policy uncertainty on CSR

Economic policy uncertainty has a risk effect on enterprises. The government issues and adjusts economic policies to guide the future development direction of the economy. However, before the introduction of the policy, it is difficult for enterprises to predict the changes of policies, which leads to the increase of uncertainty and uncontrollability of the external environment of enterprises. After the policy is introduced, it will take some time to promote and implement the relevant policies (North 1994). Therefore, enterprises may be faced with problems such as insufficient understanding of new policies and the inability to judge how the market will change in a short time, which will also lead to an increase in corporate business risk. Economic policy uncertainty will increase the external environmental risks and operational risks of enterprises, so enterprises will adopt relatively conservative operating strategies to deal with risks (Dung et al. 2020).

In the short-term period, high economic policy uncertainty means that the policy has not yet been implemented, and the dividend effect of the policy has not been fully released. At this time, for enterprises, the impact

of economic policy uncertainty on enterprises is mainly reflected in the risk effect. According to the theory of risk aversion and expectations, as a rational person in the market, when a company believes that it is facing greater operating risks, it usually chooses relatively conservative operating behaviors in the short-term period, for example, they may reduce the low-priority expenses in the short-term period to reduce operations risk. The so-called low-priority expenses are expenses that cannot directly bring obvious profit returns to the enterprise in the short-term period. CSR refers to the economic, environmental, and charitable responsibility of an enterprise to shareholders, employees, suppliers, consumers, and the public (Clarkson 1995), which is usually one of the low-priority expenses of the enterprise. Existing studies have also found that when market risks are high, companies whose CSR investment is greater than the industry average will be at a disadvantage (Zia et al. 2020). Therefore, enterprises will reduce their investment in CSR in the short-term period. Based on this, hypothesis 1 is proposed.

H1: In the short-term period, economic policy uncertainty has a negative impact on CSR.

2.2 The long-term period impact of economic policy uncertainty on CSR

Although the economic policies are introduced and adjusted frequently, which will increase the uncertainty of enterprise development in the short-term period, the fundamental goal of economic policy adjustment is to adjust the national economic structure, accelerate economic transformation and upgrading, develop emerging industries and promote economic development and optimize the market structure, which will create a favorable business environment for enterprises. Therefore, in the long-term period, the negative effect of economic policy uncertainty on enterprises diminishes and the policy dividend effect begins to appear, and then have a positive effect on CSR in the long-term period. Specifically, this is mainly due to two reasons. On the one hand, the uncertainty caused by the prediction of whether, when, and how to implement the relevant policies and the possible effect of the implementation is gradually responded to. So that enterprises may formulate targeted business strategies to alleviate the risks caused by policy changes. On the other hand, with the gradual determination and implementation of policies, enterprises and market entities will gradually increase their awareness of policies, the dividend effects of policies may be gradually released, and the corporate environment may be improved (Baker et al. 2016). In addition, with the implementation of economic policies, eligible companies will likely receive corresponding policy preferences or subsidies, which will help companies eliminate capital barriers, force companies to reform

and optimize their internal mechanisms, and form a healthy development of companies in the long-term period. Companies will have positive expectations for future operations, so companies may adjust their operating behaviors to adapt to new expectations.

At the same time, on the one hand, economic policy uncertainty also represents an opportunity for companies in countries in transition. Some studies have shown that the social responsibility of enterprises in transition countries is more like a strategic political donation, which plays a role in rent-seeking to a certain extent (Porter and Kramer 2006; Zhang et al. 2010). When the risks brought by economic policy uncertainty are reduced, in order to obtain more government policy information dynamics and policy preferences, thus enterprises can timely correct their development direction and obtain more benefits. Therefore, enterprises will give full play to the value of CSR as a tool for rent-seeking and strengthen the implementation of CSR (Lin et al. 2015; Park et al. 2017). On the other hand, based on the theory of signal, the ability of enterprises to fulfill social responsibility and enthusiasm to deliver the stakeholders market signals, which are of important value to shape good corporate image, establish a good market position, corporate stakeholders such as customers, shareholders and employees also prefer enterprises that perform well in corporate social responsibility (Korschun et al. 2014). Based on the above analysis, hypothesis 2 is proposed.

H2: From the perspective of long-term period, the economic policy uncertainty will have a positive effect on CSR.

2.3 The mediating mechanism of economic policy uncertainty on CSR

H1 and H2 show that economic policy has a policy dividend effect, while the economic policy uncertainty may also bring a risk effect. The difference between the dividend effect and risk effect is bound to have an impact on the corporate business risk and financial performance of enterprises. In the short-term period, the risk of policy effect is greater than the policy of dividend effect, the risk effect is mainly reflected in the enterprises at this time. Enterprises are unable to make immediate countermeasures in the short-term period, so they may adopt conservative strategies, which may propel enterprises to change their orders, investment and financing decisions to be implemented before the default risk, which will increase their corporate business risk, reduce their financial performance, and further weaken the fulfillment of corporate social responsibility. But in the next stage, the policy may come into play, and create a more efficient and sound market environment for enterprises, the economic policy uncertainty mainly

embodied in the positive effect, which will have a positive effect on the enterprise's financial performance undoubtedly, in this context, the management risk of the enterprise may be lower and financial performance may be higher, which enables enterprises to increase the performance of corporate social responsibility.

Therefore, in the process of policy development, corporate risk and financial performance may jointly play a parallel mediating role between economic policy uncertainty and corporate social responsibility performance. Based on the above analysis, this paper examines whether corporate business risk and financial performance are the mechanisms by which economic policy uncertainty affects CSR performance.

H3: Both Corporate business risk and financial performance mediates the relationship of economic policy uncertainty and CSR performance. Also, they play a parallel mediating role between economic policy uncertainty and CSR performance together.

3 Model, methodology, and data

In order to test the relationship between economic policy uncertainty and CSR, this chapter adopts the specific data of Chinese listed companies and selects the corresponding regression model and regression methodology.

3.1 Sample selection and data sources

Considering that large companies are more obviously affected by policies and the availability of superimposed data, this paper selects the annual data of Shanghai and Shenzhen A-share listed companies from 2010 to 2018, and then gradually deletes the data of B-share Listed Companies and financial industry listed companies, finally, a total of 9606 data of 1956 listed companies are obtained. China's economic policy uncertainty index comes from the policy uncertainty index website established by Baker, Davis, etc. CSR data comes from Hexun, and financial statement data of listed companies comes from The China Stock Market and Accounting Research Database. The data processing is completed by Stata 14.0.

3.2 Definition of variables

In order to select more targeted and extensive variable indicators, this paper refers to the studies of many scholars on the explained variables, explanatory variables and control variables, and the specific selected indicators are as follows:

(1) Explained variables

This paper adopts the CSR score released by the Chinese Hexun website¹ as the proxy variable of CSR. The total score of CSR is 100 points. To a certain extent, the level of CSR scores reflects how well an enterprise fulfills its social responsibility. Specific indicators and weights are all shown in Table 1.

(2) Explanatory variables

In this paper, the economic policy uncertainty index constructed by Baker et al. (2016)² is used as the proxy variable of economic policy uncertainty (EPU). The index is calculated monthly, and higher readings indicate greater uncertainty over economic policy. Considering the order of magnitude of the other variables, we divide the exponent by 100.

(3) Mediating variables

For the measurement method of corporate business risk (CBR), this paper adopts Z-index to measure corporate business risk. Z-score modified by Altman (2002) is more consistent with the financial condition of listed companies in the environment of emerging capital market while retaining a comprehensive index. Therefore, this paper adopts the modified Z-Score as a substitute index of corporate business risk, and the level of its value shows the business risks faced by the enterprise.

For the measurement method of corporate financial performance (CFP), ROA (Tang et al. 2012) is adopted in most existing literature as an indicator to measure corporate financial performance. ROA represents the short-term profitability of an enterprise and the financial efficiency of its asset operation, known as the accounting performance of an enterprise. Since this paper only studies the short-term and long-term period, this paper chooses ROA as a substitute indicator of corporate financial performance. The magnitude of this value also reflects the financial performance of the business.

(4) Control variables

In terms of control variables, this paper controls variables at the enterprise level and regional level. At the corporate level, this paper controlled the asset scale of the company (SIZE), asset-liability ratio (LEV), years of enterprise establishment (AGE), net cash flow of financing (FCF), quick ratio (QR), return on investment (INA), market value (MARVUE), whether duality of COB and CEO (Dual), operating revenue growth rate (GR), basic earnings per share (EPS) and goodwill

Table 1 CSR evaluation system of the Chinese Hexun website

First level indicators	Secondary indicators	Weight
Shareholder liability (Weight: 30%)	Profit	10%
	Debt service	3%
	Return	8%
	Letter approval ^a	5%
	Innovation	4%
Employee responsibility (Weight: 15%)	Achievements	5%
	Safety	5%
	Caring for employees	5%
Rights and responsibilities of suppliers, customers, and consumers (Weight: 15%)	Product quality	7%
	After-sale service	3%
	Honesty and mutual benefit	5%
Environmental responsibility (Weight: 20%)	Environmental governance	20%
Public welfare responsibility (Weight: 20%)	Contribution value	20%

^a The letter approval refers to the number of times that the exchange punishes the company and the relevant responsible persons

(GWILL), whether the top ten shareholders are related (TORATE), and the degree of ownership concentration (HERFDAL). At the regional level, this paper selects foreign direct investment (FDI), market index (MARKET), and gross national product (GDP), then finally take industry and year as dummy variables to control.

The above are the explanation of all data meanings of explained variables, explanatory variables, intermediate variables and control variables. Specific variable definitions and descriptions are shown in Table 2.

3.3 Model setting

In order to explore the relationship between EPU and CSR in a more comprehensive way and discover the influencing mechanism, the following three models are selected in this paper:

(1) Fixed Effect Model

Referring to the fixed effects model (Mehanna and Shamsub 2009), model M1 and model M2 are constructed to verify H1 and H2 respectively. The specific model is set as follows:

$$CSR_{it} = \alpha_0 + \alpha_1 EPU_{it} + \sum_j \alpha_j Controls + \varepsilon_{it} \quad (M1)$$

$$CSR_{it} = \beta_0 + \beta_1 EPU_{t-1} + \sum_j \beta_j Controls + \varepsilon_{it} \quad (M2)$$

¹ Hexun website is the earliest and largest financial portal in China. Its main business is financial and securities information services. URL: <http://stock.hexun.com>.

² URL: <http://www.policyuncertainty.com/>.

Table 2 Variable description

Variable type	Variable symbol	Variable name	Calculation method of variables
Dependent variable	<i>CSR</i>	Corporate social responsibility	CSR score of Hexun website
Independent variable	<i>EPU</i>	Economic policy uncertainty	Economic policy uncertainty index compiled by Baker et al.
Mediating Variable	<i>CBR</i>	Corporate business risk	Z-score=(0.717×working capital + 0.847×retained Earn-ings + 3.107× EBIT + 0.42× total stock market value + 0.998× sales revenue)/total assets
Control variable	<i>CFP</i>	Corporate financial performance	Net profit/Average balance of assets
	<i>SIZE</i>	Enterprise asset scale	Logarithm of total assets
	<i>LEV</i>	Asset liability ratio	Total liabilities / total assets
	<i>SOE</i>	Nature of enterprise property rights	State-owned enterprises = 1, Private enterprises = 0
	<i>AGE</i>	years of enterprise establishment	Observation year minus the establishment year
	<i>FCF</i>	Net cash flow from financing	Net cash flow from financing
	<i>QR</i>	Quick ratio	Quick assets / current liabilities
	<i>INA</i>	Income from investment	Income from investment
	<i>EPS</i>	Basic earnings per share	Net profit/annual average total number of shares
	<i>MARVUE</i>	Market value	A share * closing price today
	<i>DUAL</i>	Whether the chairman of the board of directors and the general manager are both concurrently appointed	Whether the chairman of the board of directors and the general manager are both concurrently appointed, yes = 1, no = 0
	<i>GR</i>	Growth rate of operating revenue	Operating revenue amount in current quarter of the year - amount of operating revenue in the previous quarter) / (amount of operating revenue in the previous quarter)
	<i>GWILL</i>	Goodwill of the enterprise	Net goodwill
	<i>TORATE</i>	Are the top ten shareholders related	1 = there is no correlation, 2 = there is a correlation
	<i>HERFDAL</i>	Ownership concentration	The sum of the square of the top ten circulating shares of the company
<i>MARKET</i>	Marketization index	The larger the marketization index calculated., the higher the degree of marketization	
<i>GDP</i>	Gross domestic product	Gross domestic product	
<i>FDI</i>	Regional openness	Foreign direct investment	
<i>YEAR</i>	Year dummy variable	Year dummy variable	
<i>IND</i>	Industry of the enterprise	Industry dummy variable	

The model M1 is to test the impact of economic policy uncertainty on CSR in short-term period. The explained variable CSR_{it} in the model is the CSR score of i enterprise in the t year, and the explanatory variable EPU_t is the economic policy uncertainty index in the t year. The model M2 is to test the impact of economic policy uncertainty on the fulfillment of CSR in the long-term period. When significant α_1 is negative, it confirms H1, that is, economic policy uncertainty has a negative impact on the performance of CSR in the short-term period. When significant β_1 is positive, it confirms H2, that is, the economic policy uncertainty of the short-term period has a positive impact on CSR in the next year.

(2) Mediating effect model

To test the mediating effect of corporate business risk and financial performance on the influence of economic

policy uncertainty on CSR in the short-term and the long-term period, this paper constructed the following mediating effect model proposed by Judd and Kenny (1981) and Baron and Kenny (1999).

$$CSR_{it} = \alpha_0 + \alpha_1 EPU_t + \sum_j \alpha_j Controls + \varepsilon_{it} \quad (M3-1)$$

$$MED_{it} = \beta_0 + \beta_1 EPU_t + \sum_j \beta_j Controls + \varepsilon_{it} \quad (M3-2)$$

$$CSR_{it} = \gamma_0 + \gamma_1 EPU_t + \gamma_2 MED_{it} + \sum_j \gamma_j + \varepsilon_{it} \quad (M3-3)$$

The model M3 is to test the impact of economic policy uncertainty on corporate social responsibility in the short-term period. This set of models constructs three equations, CSR_{it} scores the corporate social responsi-

bility of i enterprise in t year. The explanatory variable EPU_t represents the uncertainty index of economic policy in the t year, and MED_{it} represents the mediating variables, including corporate business risk and corporate financial performance. The model M3-1 in the model group analyzes the impact of the economic policy uncertainty on CSR fulfillment in the short-term period. If α_1 is negative, hypothesis H1 is confirmed. Model M3-2 and model M3-3 in the model group analyze the mediating role of corporate business risk and financial performance in the relationship between economic policy uncertainty and corporate social responsibility in the short-term period. If $\alpha_1, \beta_1, \gamma_2$ are all significant, γ_1 is not significant, there is a complete mediating effect; if $\alpha_1, \beta_1, \gamma_2$ are all significant, γ_1 is significant and the absolute value is less than α_1 , there is a partial mediation effect. It can be confirmed that in the short time period economic policy uncertainty will affect the performance of corporate social responsibility through corporate business risk and corporate financial performance.

$$CSR_{it} = \chi_0 + \chi_1 EPU_{t-1} + \sum_j \chi_j Controls + \varepsilon_{it} \quad (M4-1)$$

$$MED_{it} = \eta_0 + \eta_1 EPU_{t-1} + \sum_j \eta_j Controls + \varepsilon_{it} \quad (M4-2)$$

$$CSR_{it} = \lambda_0 + \lambda_1 EPU_{t-1} + \lambda_2 MED_{it} + \sum_j \lambda_j Controls + \varepsilon_{it} \quad (M4-3)$$

The model M4 is to test the impact of the uncertainty of the last economic policy on corporate social responsibility. Consistent with model M3, model M4 also constructed three equations, CSR_{it} scores the corporate social responsibility of i enterprise in t year. The explanatory variable EPU_{t-1} represents the uncertainty index of economic policy in the $t-1$ year, and the MED_{it} represents the mediating variables, including corporate business risk and corporate financial performance. For the measurement method of corporate business risk, this paper adopts Z-index to measure corporate business risk (CBR). For the measurement method of corporate financial performance, ROA is adopted in most existing literatures as an indicator to measure corporate financial performance (CFP).

The model M4-1 analyzes the impact of economic policy uncertainty on enterprises' performance of the corporate social responsibility in the long-term period. If χ_1 is negative, hypothesis H2 is confirmed. The model M4-2 and model M4-3 in the model M4 analyze the mediating effect of corporate business risk and financial performance on the relationship between economic policy uncertainty and corporate social responsibility

after the economic policy uncertainty lags for one period. If $\chi_1, \eta_1, \lambda_2$ are all significant, λ_1 is not significant, there is a complete mediating effect; if $\chi_1, \eta_1, \lambda_2$ all significant, λ_1 is significant and the absolute value is less than χ_1 , there is a partial mediation effect. It can be confirmed that the uncertainty of economic policy in the last period will affect the fulfillment of corporate social responsibility in the long-term period through the corporate business risk and financial performance of enterprises.

(3) The parallel mediating effects model

To test whether corporate financial performance and corporate operating risk play an mediating role in the impact of economic policy uncertainty on corporate social responsibility, this paper also innovatively tests the parallel mediating effect between financial performance and corporate business risk. As shown in M5, this paper adds corporate financial performance and corporate business risk into the mediating effect model to test the parallel mediation effect.

$$CSR_{it} = \pi EPU_t + \rho CBR + \sigma CFP + \sum_j \Delta_j Controls + \varepsilon_{it} \quad (M5-1)$$

$$CSR_{it} = \tau EPU_{t-1} + \varphi CBR + \omega CFP + \sum_j \Omega_j Controls + \varepsilon_{it} \quad (M5-2)$$

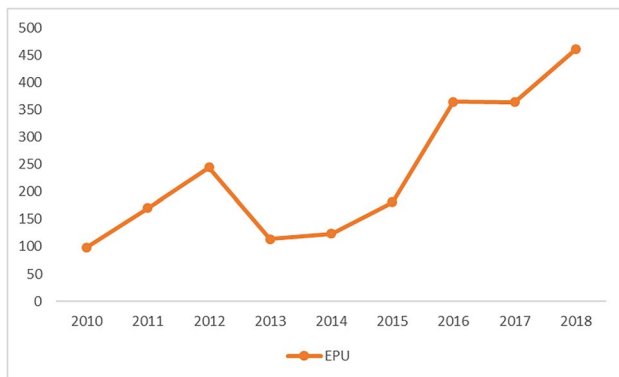
The model M5 is to test whether corporate financial performance and corporate business risk play a parallel mediating role in the short-term and the long-term period. As shown in the M5-1, if π, ρ , and σ in the formula are significant, it indicates that corporate financial performance and corporate business risk play a partial parallel mediating effects role in the short-term period. As shown in the M5-2, if τ, φ , and ω in the formula are significant, it indicates that corporate financial performance and corporate business risk play a partial parallel mediating effects role in the long-term period.

3.4 Descriptive statistical analysis

This paper conducted a descriptive statistical analysis on the sample data from 2010 to 2018. Table 3 shows the descriptive statistical results. The average value of CSR is 27.764, the standard error is 17.831, according $CV = \text{Std}/\text{Mean}$, when CV in the range of 5-35% indicates that data fluctuation is not obvious, while CV of CSR reaches 67%, indicating that CSR data fluctuation is obvious. The minimum value is -3.7, and the maximum value is 75.2. Compared with the total CSR score of 100, the higher the score is, the better the CSR performance is. If the score is negative, it indicates that the enterprise fails to fulfill CSR and has negative externalities. The mean value of economic policy uncertainty (EPU)

Table 3 Descriptive statistical results of variables

Variable	Observations	Mean	Std	Minimum	Maximum
CSR	9606	26.764	17.831	-3.7	75.2
EPU	9606	2.257	1.078	0.989	4.605
CBR	9606	1.500	1.010	-24.944	29.850
CFP	9606	0.042	0.053	-0.160	0.208
SIZE	9606	22.29	1.292	19.883	26.186
LEV	9606	0.442	0.209	0.054	0.898
SOE	9606	0.337	0.473	0	1
AGE	9606	16.42	5.585	4.17	30.5
FCF	9606	3.588	17.638	-50.2	105
QR	9606	1.822	2.158	0.179	13.762
INA	9606	0.884	2.787	-0.626	20.5
EPS	9606	0.344	0.444	-1.05	2.04
MARVUE	9606	233.284	572.165	12.59	6398.73
DUAL	9606	0.269	0.443	0	1
GR	9606	0.398	1.029	-0.697	7.485
GWILL	9606	2.349	5.916	0	37.11
TORATE	9606	2.298	0.525	1	3
HERFDAL	9606	0.091	0.11	0	0.492
MARKET	9606	8.287	1.786	2.94	11.41
GDP	9606	40.017	23.056	0.606	97.278
FDI	9606	3.707	3.607	0.0568	17.622

**Fig. 1** Trend chart of economic policy uncertainty in China from 2010 to 2018

is 225.7, the maximum value is 460.5, and the minimum value is 98.9, indicating that China's economic policy had strong volatility in recent years. As can be seen from Fig. 1, the overall uncertainty of China's economic policy has shown a significant upward trend since 2010 with frequent fluctuations of economic policy. The maximum value of *CBR* is 29.850, and the minimum value is -24.944. As mentioned above, this paper calculates *CBR* through Z-score, and from the formula we can know that the value of EBIT is

may be negative, and then the calculated operating risk may also be negative, but the larger the value is, the smaller the operating risk the enterprise faces. Similarly, the maximum value of *CFP* is 0.208, and the minimum value is -0.160. As mentioned above, *CFP* represents the financial efficiency of an enterprise's asset operation, known as the accounting performance of the enterprise, when the *CFP* is negative, indicating that the enterprise is in a state of loss.

Among the control variables, the variance of enterprise-scale (*SIZE*) is large, reaching 22.29, indicating that there is a significant gap between the enterprise samples selected, and the sample covers a wide range of enterprises. The average value of *SOE* is 0.337, indicating that the number of non-state-owned enterprises is slightly higher than state-owned enterprises. Variables such as *MARVUE* are also large. The mean value of *DUAL* is 0.269, indicating that 26.9% of enterprises have one person simultaneously serving as chairman and general manager.

4 Results and discussion

According to the above theoretical analysis and regression results, this paper draws the corresponding conclusions, and puts forward some specific suggestions based on the current domestic reality. This chapter presents the main conclusions of this paper, including the relationship between *EPU* and *CSR*, and the influence mechanism of *EPU* on *CSR*. According to the conclusion, corresponding suggestions are put forward from the perspective of government and enterprises.

4.1 Fixed-effect model regression results

Firstly, the Hausman test is carried out, and the result shows that the P-value is 0.0000. Therefore, the fixed-effect model is selected. As the results are shown in Table 4. The regression coefficient of EPU_t in column M1 is -6.4610, which is significantly negative at the 1% level. Therefore, the improvement of economic policy uncertainty has a significant negative impact on *CSR* in the short-term period, which verifies H1.

The column M2 in Table 4 reflected the impact of the economic policy uncertainty on *CSR* in the long-term period. The regression coefficient of EPU_{t-1} is 24.5092, which is significantly at the level of 1%, indicating that economic policy uncertainty will have a significant positive impact on *CSR* in the long-term period, which verifies H2.

In terms of control variables, the regression coefficient of enterprise total assets (*SIZE*) is significantly positive at the level of 1%. The regression coefficient of asset-liability ratio (*LEV*) is significantly negative at the level of 1%. The

Table 4 Analysis of the impact of economic policy uncertainty on CSR

CSR	M1		M2	
	Coefficient	t-Statistic	Coefficient	t-Statistic
<i>EPU_t</i>	-6.4610^{***}	-3.40		
<i>EPU_{t-1}</i>			24.5092^{***}	3.43
<i>SIZE</i>	6.8867 ^{***}	15.42	6.9246 ^{***}	15.15
<i>LEV</i>	-10.3258 ^{***}	-5.96	-9.7849 ^{***}	-5.49
<i>SOE</i>	-1.5763	-0.98	-1.3825	-0.83
<i>AGE</i>	0.1817	0.22	0.1864	0.22
<i>FCF</i>	0.0098 ^{**}	2.42	0.0096 ^{**}	2.36
<i>QR</i>	-0.1908 ^{***}	-2.72	-0.1926 ^{***}	-2.73
<i>INA</i>	0.0369	0.75	0.0319	0.64
<i>EPS</i>	7.8600 ^{***}	20.17	7.9223 ^{***}	20.06
<i>MARVUE</i>	-0.0061 ^{***}	-12.31	-0.0118 ^{***}	-13.10
<i>DUAL</i>	-0.6612	-1.26	-0.7068	-1.33
<i>GR</i>	0.0030	0.67	0.0017	0.36
<i>GWILL</i>	-0.0499 ^{***}	-3.17	-0.0495 ^{***}	-3.13
<i>TORATE</i>	-0.3666	-1.04	-0.3610	-1.01
<i>HERFDAL</i>	6.0469 ^{***}	2.73	5.6789 ^{**}	2.55
<i>MARKET</i>	1.6089 ^{***}	4.85	1.5636 ^{***}	4.68
<i>GDP</i>	0.1386 ^{***}	4.26	0.1368 ^{***}	4.16
<i>FDI</i>	-3.2998 ^{***}	-3.93	-3.2393 ^{***}	-3.83
<i>Cons</i>	-95.0495 ^{***}	-4.40	-221.7704 ^{***}	-4.41
<i>YEAR</i>	Control		Control	
<i>INDUSTRY</i>	Control		Control	
<i>N</i>	9606		9498	
<i>R²</i>	0.191		0.188	

note: ^{***}, ^{**} and ^{*} represent the significance level of 1%, 5% and 10% respectively

CSR represents Corporate social responsibility. *EPU_t* represents the economic policy uncertainty index in the t year. *EPU_{t-1}* represents the economic policy uncertainty index in the t-1 year.

regression coefficient of ownership concentration (*HERFDAL*) is significantly positive at the level of 1%, indicating that the ownership concentration has a positive on CSR. The regression coefficient of the degree of marketization (*MARKET*) is positively significant at the level of 1%, indicating that the higher the level of marketization, the stronger the will of enterprises to fulfill their social responsibility.

4.2 Mediating mechanism regression results

To test that corporate financial performance and corporate business risk play a mediating role in the economic policy uncertainty and corporate social responsibility, this paper performs the following regression. Table 5 shows the test results of the mediating effect of corporate business risk,

and Table 6 shows the test results of the mediating effect of corporate financial performance.

- (1) The mediating mechanism test results of corporate business risk

Table 5 shows the test results of the corporate business risk of mediating variables. Columns M3-1, M3-2, and M3-3 in Table 5 are the test results of mediating effect in the short-term period. Columns M4-1, M4-2, and M4-3 are listed as the test results of mediating effect in the long-term period. The results show that the indirect effect is significant, indicating that corporate business risk is the mediating path through which economic policy uncertainty affects CSR performance. In the short-term period, the indirect effect was 0.205, accounting for 3.178% of the total effect. The direct effect was -4.8022, accounting for 74.330% of the total effect. In the long-term period, the indirect effect was 1.635, accounting for 6.669% of the total effect, and the direct effect was 17.4126, accounting for 71.045% of the total effect.

- (2) The mediating effect test results of corporate financial performance

Table 6 shows the test results of the financial performance of enterprises with mediating variables. Columns M3-1, M3-2, and M3-3 are listed as the mediating effect test results of the short-term period, and columns M4-1, M4-2, and M4-3 are listed as the mediating effect test results of the long-term period. The results show that the indirect effect is significant, indicating that corporate financial performance is the mediating path of economic policy uncertainty affecting CSR performance. In the short-term period, the indirect effect of the short-term period is 1.268, accounting for 19.628% of the total effect. The direct effect was -5.1846, accounting for 80.245% of the total effect. In the long-term period, the indirect effect was 4.643, accounting for 18.946% of the total effect, and the direct effect was 19.8390, accounting for 80.945% of the total effect.

- (3) The parallel mediating effect test results of corporate business risk and corporate financial performance

In order to explore whether corporate business risk and corporate financial performance play the same mediating role, this paper conducted the parallel mediating effect. Table 7 shows the test results of the parallel mediating effect test results of the short-term period, and column M5-2 is listed as the parallel mediating effect test results of the long-term period. As shown in the column M5-1, π , ρ , and σ in the formula are significant. The results show that the indirect effect is significant, indicating that corporate financial performance

Table 5 Test of the mediating effect of the corporate business risk

CSR	M3			M4		
	M3-1	M3-2	M3-3	M4-1	M4-2	M4-3
<i>EPU_t</i>	-6.4610^{***} (-3.40)	-0.2594^{**} (-2.06)	-4.8022^{**} (-2.43)			
<i>EPU_{t-1}</i>				24.5092^{***} (3.43)	0.9560^{***} (2.74)	17.4126^{**} (2.35)
<i>CBR</i>			0.7915^{***} (4.38)			1.7098^{***} (6.95)
<i>Cons</i>	Control			Control		
<i>YEAR</i>	Control			Control		
<i>INDUSTRY</i>	Control			Control		
<i>N</i>	9606	9594	9589	9498	9486	9481
<i>R²</i>	0.191	0.233	0.176	0.188	0.271	0.178

note: ^{***}, ^{**} and ^{*} represent the significance level of 1%, 5% and 10% respectively

CSR represents Corporate social responsibility. *EPU_t* represents the economic policy uncertainty index in the t year. *EPU_{t-1}* represents the economic policy uncertainty index in the t-1 year. *CBR* represents corporate business risk.

and corporate business risk play a parallel mediating effect in the short-term period. As shown in the Column M5-1, τ , ϕ , and ω in the formula are significant, it indicates that corporate financial performance and corporate business risk play a parallel mediating role in the long-term period.

To ensure the robustness of the test results, this section conducted the robustness test by changing the measurement method of independent variables and instrumental variables. Regression results show that this conclusion is robust. Specific results are attached in the appendix.

5 Heterogeneity test

As mentioned above, economic policy uncertainty will affect the future decisions of listed enterprises, and the decisions of enterprises are made by the management. Therefore, the heterogeneity of the management will certainly have a significant impact on CSR.

5.1 The overseas background of senior executives

Overseas background is one of the important characteristics of executives. Executives who have received overseas education are greatly influenced by foreign culture and attach more importance to the input of CSR. Therefore, whether the executives had an overseas background may have a

Table 6 Test of mediating effect of corporate financial performance

CSR	M3			M4		
	M3-1	M3-2	M3-3	M4-1	M4-2	M4-3
<i>EPU_t</i>	-6.4610^{***} (-3.40)	-0.0128^{***} (-3.22)	-5.1846^{***} (-2.79)			
<i>EPU_{t-1}</i>				24.5092^{***} (3.43)	0.0460^{***} (3.12)	19.8390^{***} (2.84)
<i>CFP</i>			99.0767^{***} (18.48)			100.9446^{***} (18.41)
<i>Cons</i>	Control			Control		
<i>YEAR</i>	Control			Control		
<i>INDUSTRY</i>	Control			Control		
<i>N</i>	9606	9611	9606	9498	9503	9498
<i>R²</i>	0.191	0.476	0.216	0.188	0.485	0.218

note: ^{***}, ^{**} and ^{*} represent the significance level of 1%, 5% and 10% respectively

CSR represents Corporate social responsibility. *EPU_t* represents the economic policy uncertainty index in the t year. *EPU_{t-1}* represents the economic policy uncertainty index in the t-1 year. *CFP* represents corporate financial performance.

Table 7 Test of parallel mediating effect

CSR	M5-1		M5-2	
	Coefficient	t-Statistic	Coefficient	t-Statistic
EPU_t	-4.777**	-2.42		
EPU_{t-1}			17.324**	2.34
<i>CBR</i>	0.790***	4.29	1.658***	6.67
<i>CFP</i>	65.625*	1.69	109.9**	1.98
<i>Cons</i>	Control		Control	
<i>YEAR</i>	Control		Control	
<i>INDUSTRY</i>	Control		Control	
<i>N</i>	9606		9498	
R^2	0.191		0.288	

note: ***, ** and * represent the significance level of 1%, 5% and 10% respectively

CSR represents Corporate social responsibility. EPU_t represents the economic policy uncertainty index in the t year. EPU_{t-1} represents the economic policy uncertainty index in the t-1 year. CBR represents corporate business risk. CFP represents corporate financial performance.

differential impact on CSR when facing economic policy uncertainty.

As shown in Table 8, the regression coefficient of EPU_t and EPU_{t-1} in no overseas background group is significant, while the result is not significant in overseas background group. Compared with enterprises whose executives have no overseas background, enterprises whose executives have overseas background pay more attention to the stability of CSR and may not significantly adjust CSR due to the fluctuation of economic policies.

Table 8 Heterogeneity test results based on the overseas background of senior executives

	M1		M2	
	No overseas background	Overseas background	No overseas background	Overseas background
	CSR	CSR	CSR	CSR
EPU_t	-7.2941***	0.4242		
	(-3.62)	(0.07)		
EPU_{t-1}			27.6138***	4.9894
			(3.64)	(0.20)
<i>Cons</i>	Control		Control	
<i>YEAR</i>	Control		Control	
<i>INDUSTRY</i>	Control		Control	
<i>N</i>	8888	718	8784	714
R^2	0.178	0.056	0.175	0.084

note: ***, ** and * represent the significance level of 1%, 5% and 10% respectively

Table 9 Heterogeneity test results based on the proportion of independent directors

	M1		M2	
	IF $IDP > IDP_{Mean}$	IF $IDP < IDP_{Mean}$	IF $IDP > IDP_{Mean}$	IF $IDP < IDP_{Mean}$
EPU_t	-4.6169	-5.7984**		
	(-1.35)	(-2.27)		
EPU_{t-1}			17.3638	21.7304**
			(1.35)	(2.26)
<i>Cons</i>	Control		Control	
<i>YEAR</i>	Control		Control	
<i>INDUSTRY</i>	Control		Control	
<i>N</i>	3913	5693	3867	5631
R^2	0.1559	0.1793	0.1516	0.1674

note: ***, ** and * represent the significance level of 1%, 5% and 10% respectively

5.2 Proportion of independent directors

Independent directors play the role of supervisors and resource suppliers in enterprises. Scholars believe that independent directors are more active than internal directors in supervising managers and protecting shareholders' interests. From the perspective of motivation, independent directors with the executive backgrounds are also more motivated to perform supervision functions and maintain "independence". When the proportion of independent directors is large, enterprises are more inclined to fulfill CSR to achieve sustainable development under the influence of independent directors' personal quality and moral pursuit, economic incentive, reputation consideration, and avoidance of legal risk. Therefore, enterprises with a small proportion of independent directors and a large proportion of independent directors may have great differences when faced with high economic policy uncertainty, and the impact of economic policy uncertainty on CSR fulfillment may also be heterogeneous.

This paper uses the ratio of the number of independent directors to the number of directors to calculate the proportion of independent directors (IDP), and then divides the proportion of independent directors into groups with a large proportion of independent directors and groups with a small proportion of independent directors according to the mean value of the proportion of independent directors. As shown in Table 9, for enterprises with a small proportion of independent directors, the regression coefficients of EPU_t and EPU_{t-1} are significant, while the regression coefficients of EPU_t and EPU_{t-1} in enterprises with a large proportion of independent directors groups are not significantly. That means that enterprises with a large proportion of independent directors may not be affected by the economic policy

uncertainty in their CSR. This indicates that when the proportion of independent directors is high, independent directors influenced by spontaneity and external motives pay more attention to CSR and do not adjust CSR fulfillment significantly when economic policies fluctuate.

6 Conclusions and suggestions

Firstly, this paper uses data of Chinese listed companies to test the impact of economic policy uncertainty on CSR. The results show that economic policy uncertainty has a significant negative impact on CSR in the short-term period, and has a significant positive impact on CSR in the long-term period. Secondly, corporate financial performance and corporate business risk play a parallel mediating role between economic policy uncertainty and CSR. Furthermore, from the perspective of management characteristics, enterprises with no overseas background and a low proportion of independent directors are more vulnerable to the impact of economic policy uncertainty on CSR.

This research also brings us some theoretical enlightenments and policy suggestions. Firstly, as an economy in transition, China needs to introduce targeted economic policies as soon as possible according to the actual situation in recent years, in the process of formulating economic policies, the government must thoroughly investigate the reality of the market, make full use of the two-way communication platform between online and offline, avoid the panic of enterprises at present and reduce CSR so as to achieve long-term period health of enterprises and the development of the market. Secondly, enterprises should take the initiative to assume CSR. The change of the government's economic policy is in order to better improve the economic operation environment. Facing the uncertainty of economic policy, enterprises should not be too conservative and pay too much attention to the current profit. Enterprises should elevate CSR to the height of corporate development strategy, take the initiative to assume social responsibility, enhance social influence, and promote sustainable development of enterprises. Especially for enterprises with no overseas background and a small proportion of independent directors, more attention should be paid to the long-term period positive impact of CSR on enterprises.

Based on the background of China, this paper explores the relationship between economic policy uncertainty and CSR. However, as a transition economy, China has its own special economic characteristics, which will affect the choice enterprises make when facing economic policy uncertainty. Therefore, the conclusions drawn in this paper still need to be tested in more economies.

Appendix 1

Table 10 Robustness test of alternative measures of independent variables (quarterly weighted economic policy uncertainty)

CSR	M1		M2	
	Coefficient	t-Statistic	Coefficient	t-Statistic
EPU_{2t}	-6.1758***	-3.40		
EPU_{2t-1}			19.3663***	3.41
Cons	Control		Control	
YEAR	Control		Control	
INDUSTRY	Control		Control	
N	9606		9498	
R ²	0.191		0.190	

note: ***, ** and * represent the significance level of 1%, 5% and 10% respectively

CSR represents Corporate social responsibility. EPU_{2t} represents the economic policy uncertainty index in the t year. EPU_{2t-1} represents the economic policy uncertainty index in the t-1 year.

Replace the measurement method of independent variables

Referring to the study of Gulen and Ion (2016) this paper adopts weighted average as a substitute indicator of economic policy uncertainty to conduct a robustness test. And the calculation formula of the quarterly economic policy uncertainty index is as follows: $EPU_t = (3EPU_m + 2EPU_{m-1} + EPU_{m-2})/6$. The regression results are shown in Tables 10, which confirms H1 and H2, indicating that the above research conclusions are robust.

Table 11 Use the global economic policy uncertainty index as an instrumental variable

CSR	M1		M2	
	Coefficient	t-Statistic	Coefficient	t-Statistic
$GEPU_t$	-0.3721***	-3.40		
$GEPU_{t-1}$			0.4081*	1.95
Cons	Control		Control	
YEAR	Control		Control	
INDUSTRY	Control		Control	
N	9606		9408	
R ²	0.191		0.191	

note: ***, ** and * represent the significance level of 1%, 5% and 10% respectively

CSR represents Corporate social responsibility. $GEPU_t$ represents the global economic policy uncertainty index in the t year. $GEPU_{t-1}$ represents the global economic policy uncertainty index in the t-1 year.

Robustness test of instrumental variable

Considering that Chinese listed companies are mainly affected by China's economic policy uncertainty, and China's economic policy is closely related to global economic policy, therefore this paper uses the global economic policy uncertainty index (*GPEU*) as the proxy variable of China's economic policy uncertainty level. The test results are shown in Table 11. The results also confirm H1 and H2.

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Declarations

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

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