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The Impact of Economic Policy Uncertainty on the Performance of New Energy Firms

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Abstract: In China, the development of a new energy sector relies heavily on economic policies. In the strategic context of sustainable development, it possesses profound theoretical and practical values to objectively and quantitatively explore the influences of economic policies on the new energy firms' performance. This paper proposes three hypotheses after conducting a theoretical analysis. This paper regards China's economic policy uncertainty index (EPU) as a policy shock indicator and utilizes the panel data of listed firms in China's new energy sector from 2008 to 2021 to explore the influence of EPU on China's new energy enterprises' performance. The research results show that EPU exerts a negative influence on the performance of new energy companies, and this negative impact is robust after the replacement of the explanatory variables. On this basis, we further investigate the influence of EPU on the new energy enterprises' performance in different ownership systems and different regions. It also shows that the impact of economic uncertainty is more obvious on non-state-owned enterprises and the western and central regions. Finally, countermeasures are proposed based on the study results.

Keywords: economic policy uncertainty; firm performance; heterogeneity

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1. Introduction

Energy is an important foundation and a power source to boost a country's economy and society. To solve the problem of insufficient energy supply, the Chinese government has put forward many measures to facilitate the sustainable development of its new energy sector. This move possesses far-reaching significance and can enhance the sustainability of China's economic and social development. Driven by industrial policies, the country's new energy sector has entered a rapid development track. However, China's new energy policy system is imperfect and changes frequently, facing greater policy uncertainty. This makes the profitability of new energy companies full of uncertainty. Therefore, for both practical and research purposes, it is of great importance to conduct an objective quantitative analysis of how economic policy uncertainty (EPU) influences the new energy companies' performance, which is helpful in achieving the goal of sustainable development.

This research takes the effect of EPU (economic policy uncertainty) imposed on the new energy firms' performance as the theme. First, research hypotheses are proposed based on analyzing the intrinsic mechanism between the two. Tobin's Q ratio is then utilized as the dependent variable to impartially assess company performance. EPU is set as the independent variable, while seven control variables are chosen. Then, empirical analyses are conducted using panel data from new energy companies in Chinese listed firms from 2008 to 2021, in addition to policy uncertainty data. Finally, conclusions and recommendations are made.

This paper has two possible contributions. Firstly, it enriches the research on the relationship between economic uncertainty and the performance of new energy firms. There

are fewer studies available on the correlation between firm performance and economic uncertainty, particularly regarding the performance of new energy firms. Secondly, it provides ideas on how business managers can cope with policy uncertainty and insights into government policies to stabilize the economy.

Scholars have extensively researched the effects of EPU and associated economic concerns through theoretical studies and empirical analyses. These concerns can be classified into two categories: macroeconomic aggregates and microenterprise activities, based on research perspectives.

There is no universally accepted conclusion on the causal correlation between economic activities and EPU [1]. Policy uncertainty impacts Turkey's economic growth steadily. Consumption and investment yield adverse effects [2]. The impact of EPU increases with the size of the economy [3]. Global economic policy uncertainty impacts the foreign exchange market, causing pressure [4]. The sharp increase in domestic EPU after the UK's Brexit referendum has led to a significant depreciation of the pound [5]. The asymmetric impact of EPU affects China's macroeconomy and asset prices [6]. Uncertainty in the country's economic policy has severely hampered the development of the real economy [7]. EPU heightens the possibility and prolongs the duration of ecological recession [8]. Additionally, ecological economic policy uncertainty yields a non-linear impact on economic expansion [9].

Most of the research on the micro side focuses on the impact on production and operation decisions, such as investment and financing, profit distribution, etc., of microenterprises. Due to the prevention motivation of enterprises and a certain degree of investment delay, policy uncertainty is positively correlated with enterprises' cash holdings [10]. A relationship is found among cash holdings, EPU, and the proclivity to cut down cash from operating cash flows [11]. The uncertainty of economic policies is positively correlated with the opacity of bank profits [12]. When encountering higher economic policy uncertainty, enterprises will reduce short-term, long-term, and total investment [13]. Research suggests that EPU exerts an obviously greater positive effect on the decline in the state-owned enterprises' stock prices [14]. The impact of the director network, EPU, and corporate investment is closely related [15]. EPU is positively correlated with corporate innovation, and EPU mainly influences corporate innovation by means of revenue growth rate and cash holdings [16]. The influence of EPU on non-listed financial companies in the United States is significant [17]. The labor investment of enterprises is negatively correlated with the uncertainty of economic policies [18]. EPU positively impacts the cost of debt financing [19]. Heightened economic policy uncertainty results in an increase in corporate tax rates [20]. EPUs can lead to insufficient or excessive investment by enterprises, thereby weakening their investment efficiency [21]. Economic policy uncertainty significantly influences PM2.5 pollution via the channels of innovation and investment [22]. EPU imposes a pronounced negative influence on the performance of companies in the Czech Republic [23]. Companies that raise their cash holdings throughout periods of high EPU possess higher value and are less negatively affected by issues concerning underinvestment [24].

With respect to the influences of EPU on the energy sector, there is a unidirectional causality between EPU and Japan's energy consumption, between CO_2 emissions and EPU in Germany and the United States, and between EPU and both CO_2 emissions and energy consumption in Canada [25]. EPU has an insignificant negative impact on the growth of renewable energy [26]. It is evident that this uncertainty has significant impacts on CO_2 emissions [27]. The uncertainty of oil prices is related to fiscal pressures in some countries but not to the uncertain economic measures [28]. There is a stationarity and cointegration correlation between EPU and energy production [29]. EPU affects per capita final energy consumption [30]. The moderating effect of EPU on the influence of the generation of non-renewable and renewable energy caused a decrease in carbon emission levels in 32 countries in Africa [31]. High energy intensity exacerbates environmental contamination, while renewable energy and high EPU reduce environmental degradation [32].

To conclude, previous research studies mostly explore the effect of EPU on the macroeconomy from a macro scale or examine the influence of EPU on firms' behavior at the micro scale. Researchers have paid attention to the correlation between economic growth and economic uncertainty, foreign exchange markets, corporate investment, cash holdings of enterprises, corporate innovation, and so on. There are fewer studies on the correlation between company performance and economic uncertainty, especially in the new energy firms' performance. The innovation of this research is to choose new energy enterprise performance as the research object. In addition, this paper groups regressions of new energy enterprises of different natures and regional locations, which can provide a reference for the government to formulate differentiated policies.

2. Research Hypotheses

EPU does not enhance corporate performance; however, service transformation can effectively mitigate the negative effects of EPU [33]. Under strong environmental supervision by local governments, a decrease in trade policy uncertainty is beneficial for improving the environmental performance of enterprises [34]. The impact of EPU on a company's financial performance is consistently negative. This effect persists even after controlling for dependent variables and addressing endogeneity concerns [35]. Based on this, the article suggests the hypotheses below:

Hypothesis 1: *EPU negatively influences the new energy enterprises' performance.*

The effect of EPU imposed on a company's performance is possibly influenced by the company's factors, such as location and nature. Chinese listed companies are primarily concentrated in the eastern area, which possesses better economic growth compared to the central and western regions. They have relatively superior material and labor resources and market conditions and have strong adaptability to policy fluctuations. We propose research Hypothesis 2.

Hypothesis 2: *The effects of EPU imposed on corporate performance exhibit clear regional disparities.*

Ownership attributes are closely related to firm heterogeneity in China. SOEs have a pivotal market position in energy, equipment manufacturing, and raw materials and receive a lot of support from the government and other sectors. Non-state-owned enterprises rely more on the market to operate based on a higher sensitivity to the market environment and have a more favorable business environment in the industry, which may buffer them from the negative impact of fluctuations in the economic environment. As a result, the article suggests Hypothesis 3.

Hypothesis 3: *The influence of EPU on company performance shows obvious differences between firms of different natures.*

3. Empirical Research

3.1. Sample Selection

Considering the research theme and data availability, this study's sample solely comprises all new energy firms listed in Shenzhen and Shanghai a-share markets between 2008 and 2021. This selection is underpinned by the following justifications. Firstly, the year selection, 2008, is taken as the starting point of the research. China introduced a series of policy measures to alleviate the negative impacts of economic contraction and rising unemployment caused by the financial crisis in 2008, which brought a greater impact on the stability of macroeconomic policies. Meanwhile, the energy market changed dramatically in 2008, and the new energy industry entered the fast track of development. Secondly, when selecting companies, it is advantageous to focus on newly listed energy companies as they provide accessible data and are representative of the industry. Furthermore, these

companies can be analyzed from various perspectives, including regional location and the nature of property rights.

3.2. Data Sources and Processing

The financial information contained in this paper is primarily sourced from the China Stock Market & Accounting Research Database (CSMAR), supplemented by the Economic Policy Uncertainty (EPU) Index statistics. The economic policy uncertainty index, co-authored by Baker et al., is applied in this research. Annual data were employed to explore the variables of this study, while the frequency of the index is monthly. Annual data were employed to explore the variables of this study, while the frequency of the index is monthly. Consequently, the yearly parameter was obtained by averaging the data monthly. As for the sample data from new energy-listed companies, samples with ST and serious missing data of key variables are removed. To mitigate the impact of outliers, the data underwent 1% two-tailed trimming. This paper mainly uses Stata16 processing.

3.3. Variable Declaration

In this paper, the explanatory variable is new energy enterprise performance. The performance of a firm, in general terms, means a firm's profitability over a certain time. There is no common understanding of how to measure business performance. From the perspective of accounting performance, the main indicators of corporate performance are ROA, ROE, and EPS. From the perspective of market performance, Tobin's Q is mainly used to measure corporate performance because Tobin's Q can reflect the future benefits of a company well, and at the same time, it is less sensitive to inflation, and it can regulate systemic risk. Tobin's Q is applied to measure the relation between a company's market capitalization and the value it brings concerning profits, cash flows, and assets. This paper utilizes the ratio of Tobin's Q to objectively evaluate a firm's performance.

EPU is the explanatory variable. It is difficult to quantify and define the performance of EPU, and scholars at home and abroad have chosen different objects and used different methods to measure EPU. This research adopts the EPU index proposed by Baker [36] and others to measure EPU in China. Scholars have proven the index is a good proxy variable. Since the index is monthly data, its arithmetic mean value is taken on an annual basis to the annual index, and then it is logarithmically processed.

To account for external factors that may affect a company's performance, the model incorporates the following control variables, selected based on relevant literature studies such as Meiwei Deng's [37] research: firm size (Size), gearing ratio (Lev), tangible asset ratio (Tab), firm age (Age), firm growth (Gro), shareholding concentration (Top), and cash content of operating income (Crr).

To differentiate the impact of enterprise ownership and the region in which it is situated on different categories of enterprises, this paper introduces two grouping variables: the nature of enterprise ownership (Cq) and the region where it is located (Rg).

To find the effect of enterprise investment behavior on enterprise performance impact, this paper introduces the investment rate (Ir) to measure enterprise investment behavior. The investment rate is the ratio of purchased fixed assets, construction in progress, and intangible assets to total assets, which represents the level of total capital expenditures of the enterprise; when this indicator rises, it means that the enterprise invests aggressively, and vice versa represents conservatism.

Table 1 shows each variable's specific meaning.

Table 1. Definitions and descriptions of variables.

Variable Category	Name of Variable	Variable Representation	Variable Meaning
Explained Variables	Tobin's Q	Tbq	Measures the performance of a business, Tobin's Q = market capitalization/total assets
	Return on assets	Roa	Measures how much net profit is generated per unit of asset
Explanatory Variables	Economic policy uncertainty	Epu	The index proposed by Baker et al.; published monthly data are summed and averaged to obtain logarithms
Control Variables	Enterprise size	Size	Natural logarithm of total business assets
	gearing ratio	Lev	Total liabilities/total assets
	Ratio of physical assets	Tab	(Total assets—net intangible assets)/total assets
	Age of the enterprise	Age	Logarithmic duration since the founding of the enterprise
	Enterprise growth	Gro	Growth rate of revenue
	Shareholding concentration	Top	The ratio of shareholding held by the largest shareholder
	Cash content of operating income	Crr	Net cash provided by operating activities/income from operations
Grouping Variables	Nature of business owner	Cq	1 for government-owned enterprises 0 for non-government-owned enterprises
	Region	Rg	1 for the Central Region, 2 for the Western Region, 3 for the Eastern Region
Mechanism Variables	Technological Innovation	Ri	Technological innovation is evaluated by the intensity of research and development investment. R&D investment intensity = R&D investment/operating income

3.4. Model Construction

In this research, the following basic regression model was built based on the selection and variable setting for explaining the variables by regression analysis. The model is set as follows:

$$Tbq_{i,t} = \alpha_0 + \beta_1 Epu_{i,t} + \beta_2 Size_{i,t} + \beta_3 Lev_{i,t} + \beta_4 Tab_{i,t} + \beta_5 Age_{i,t} + \beta_6 Gro_{i,t} + \beta_7 Top_{i,t} + \beta_8 Crr_{i,t} + \varepsilon_{i,t} \quad (1)$$

In Equation (1), the enterprise is marked by the subscript i means, and t means time. The explanatory variable of this paper, $Tbq_{i,t}$, represents Tobin's Q value of enterprise i in year t. Epu_t represents the key explanatory variable of this paper, representing the EPU index in year t. Other control variables include $Size_{i,t}$, $Lev_{i,t}$ and so on, and the error disturbance term is represented by $\varepsilon_{i,t}$. Coefficient β_1 is the central variable in this research, measuring the influence of EPU on the new energy companies' performance.

3.5. Descriptive Statistics

After constructing the regression model, we analyzed the sample data using descriptive statistics. Table 2 displays the research results for the major variables.

Table 2. Descriptive data of the major variables.

Name of Variable	Mean Value	Standard Deviation	Minimum Value	Maximum Value
Tbq	1.835	1.033	0.898	6.725
Epu	5.063	0.496	4.523	5.967
Top	38.781	16.064	1.320	87.46
Gro	0.139	0.313	−0.234	2.491
Crr	0.987	0.227	0.447	1.925
Lev	0.508	0.195	0.085	0.888
Size	22.565	1.489	19.475	26.43
Roa	0.025	0.039	−0.111	0.182
Tab	0.944	0.061	0.645	1.000
Age	2.927	0.381	0.000	4.220
Ri	2.410	3.528	0.000	58.820

3.6. Basic Regression

Before conducting the basic regression, a Hausman test was utilized to identify a suitable regression model. The test results displayed a *p*-value under 0.01, which concluded in the rejection of the initial hypothesis of a random effects model. Consequently, a fixed effect model was chosen for the regression. Moreover, the BP test evidenced a *p*-value of 0, signifying the existence of heteroskedasticity in the model. Robust standard errors were employed in the regression to mitigate potential issues with heteroskedasticity and bolster the robustness of the findings.

Table 3 presents the regression analysis findings using Equation (1) to investigate the effect of EPU imposed on the new energy companies' performance. No variables are included in the first column, with control variables included in the second column.

Table 3. Base regression results.

Variable	(1)	(2)
	Tbq	Tbq
Epu	−0.2121 ***	−0.43750 ***
	(0.0643)	(0.0757)
Top		−0.0142 ***
		(0.0041)
Gro		0.4488 ***
		(0.1192)
Crr		−0.0172
		(0.2208)
Lev		0.2643
		(0.2796)
Size		−0.3787 ***
		(0.1044)
Tab		−2.9929 ***
		(0.7717)
Age		1.4527 ***
		(0.3240)
_cons	2.9092 ***	11.5388 ***
	(0.3257)	(2.0366)
Observations	1904	1904
R-squared	0.0185	0.1998

*** $p < 0.01$.

Judging from the results from column (1), the coefficient of economic policy uncertainty and new energy enterprise performance is −0.2121, and the significance is negative at the degree of 1%, indicating that EPU acts as a negative contributing part to the new energy enterprises' performance. From column (2), the coefficient of EPU and performance of firms in the new energy sector is −0.4375 after adding control variables like gearing ratio and firm size, and the significance is negative at the 1% level. The findings show that the coefficient of EPU is negatively and significantly associated at the degree of 1% of statistical significance, irrespective of whether control variables are included. That is, every 1 percent rise in EPU reduces the new energy enterprises' performance by 0.44 percent. This implies that EPU exerts a pronounced negative effect on the new energy enterprises' performance, supporting Hypothesis 1 above.

As for control variables, a significant negative correlation exists between equity concentration, enterprise size, tangible assets ratio, and new energy enterprise performance, indicating that with higher equity concentration, the enterprise size becomes larger, and the ratio of tangible assets becomes higher as well. Besides how it will weaken the new energy companies' performance more, a pronounced positive correlation exists between the enterprise's growth, the age of the enterprise, and the new energy companies' performance, indicating better growth for the company; the longer the enterprise has been established, the more conducive Je performance is to the improvement of the new energy enterprise.

3.7. Robustness Test

To assess the research methodology's non-randomness and credibility, as well as the choice of indicators to explain the results of the study, a non-commerciality test was carried out in this section. The robustness test mainly includes two aspects: model setting and variable selection. In terms of model setting, considering the possible endogeneity of the regression model, lagged explanatory variables are selected for replacement. To choose the variables, this paper employs the approach of substituting explanatory variables for testing.

3.7.1. Utilizing Lagged Terms of Explanatory Variables

To ensure the reliability of the fundamental findings, we included delayed single-cycle replacements of the crucial explanatory variable EPU in place of the explanatory variables. Table 4 presents the robustness test results with the replacement of the explanatory variables. The left column displays the regression analysis results conducted on the entire sample, while the right column exhibits the outcomes of the regression analysis conducted on a one-period lag.

In column (2), the EPU coefficient in the lagged time and the new energy companies' performance is −0.444. The significance is negative at the degree of 1%, indicating that the EPU in the lagged period plays a negative contribution to the performance of new energy firms. After replacing the explanatory variable, it is evident from the results that the lagged period explanatory variable EPU continues to exert a negative effect on the new energy firms' performance. This effect is statistically pronounced at the degree of 1%. The findings after replacing the explanatory variables conform to the major results above, so the empirical analyses above are robust.

3.7.2. Replacement of Explanatory Variables

The closer the EPU occurs, the greater its impact. Referring to Gulen and Ion's study [38], each month's EPU index is assigned different weights. The index is calculated using the weighted shift method, and the average of the four quarterly algorithms serves as a proxy variable for the dependent variable. The specific calculation formula is as follows:

$$Epu_i = \frac{3Epu_m + 2Epu_{m-1} + Epu_{m-2}}{6} \quad (2)$$

To verify the model's robustness, the explanatory term Tbq is substituted by the return on assets (Roa). Table 5 displays the results of the robustness test after substituting the explanatory variables. The first column illustrates the regression results derived from the full sample, while the second column shows results from the regression with explanatory variables being replaced.

Table 4. Results of robustness test by replacing explanatory variables.

Variable	(1)	(2)
	Tbq	**Tbq-1**
Epu	−0.4375 ***	−0.4440 ***
	(0.0757)	(0.0707)
Top	−0.0142 ***	−0.0133 ***
	(0.0041)	(0.0041)
Gro	0.4488 ***	0.4494 ***
	(0.1192)	(0.1178)
Crr	−0.0172	0.0346
	(0.2208)	(0.2248)
Lev	0.2643	0.4058
	(0.2796)	(0.3080)
Size	−0.3787 ***	−0.4544 ***
	(0.1044)	(0.1111)
Tab	−2.9929 ***	−2.9335 ***
	(0.7717)	(0.8830)
Age	1.4527 ***	1.6004 ***
	(0.3240)	(0.3425)
_cons	11.5388 ***	12.6134 ***
	(2.0366)	(2.2053)
Observations	1904	1768
R-squared	0.1998	0.2076

*** $p < 0.01$.

Table 5. Robustness test results with replacement of explanatory variables.

Variable	(1)	(2)
	Tbq	**Roa**
Epu	−0.4375 ***	−2.6376 ***
	(0.0757)	(0.4573)
Top	−0.0142 ***	−0.0142 ***
	(0.0041)	(0.0041)
Gro	0.4488 ***	0.4489 ***
	(0.1192)	(0.1193)
Crr	−0.0172	−0.0196
	(0.2208)	(0.2208)
Lev	0.2643	0.2592
	(0.2796)	(0.2798)
Size	−0.3787 ***	−0.3775 ***
	(0.1044)	(0.1046)
Tab	−2.9929 ***	−2.9884 ***
	(0.7717)	(0.7725)
Age	1.4527 ***	1.4711 ***
	(0.3240)	(0.3274)
_cons	11.5388 ***	13.848 ***
	(2.0366)	(2.0051)
Observations	1904	1904
R-squared	0.1998	0.2007

*** $p < 0.01$.

From the results, the coefficient of weighted EPU and return on assets is −2.6376 in Column (2) species, which is obvious at the degree of 1%, showing that EPU exerts a negative contribution to the new energy firms' performance. After replacing the explanatory variable Tbq with return on assets Roa, the explanatory variable EPU still imposes a negative effect on the new energy firms' performance and is pronounced at the degree of 1%, which does not change the direction of the coefficients on EPU and its significance. This is in line with the findings of scholars such as Yu, W [35] that EPU imposes a negative influence on the listed firms' financial performance, which remains negative after replacing the dependent variable. After replacing the explanatory variables, the positive, negative, and significant coefficients of the variables do not change significantly, and the conclusions remain consistent with the main results above, further proving that the applied model is robust.

3.8. Heterogeneity Analysis

The above benchmark regression analysis was conducted for economic policy uncertainty and new energy firm performance. This full-sample regression is highly susceptible to certain biases. One of the most typical problems is that the heterogeneity of enterprises in different regions and with different attributes can be easily obscured. It is necessary to elaborate on the heterogeneity problem.

3.8.1. Regional Differences in Enterprises

To analyze inter-regional differences, this research introduces the firm grouping variable for the region (Rg), which is regressed on samples of firms in the new energy sector situated in the eastern, western, and central areas. Table 6 displays the regional disparities in the influence of the index on the efficacy of emerging energy companies. The findings of the complete sample regression are presented in the first column, while the second, third, and fourth columns display the regression findings for firms in the central, western, and eastern areas, respectively.

Table 6. Heterogeneity analysis: regional differences.

Variable	(1)	(2)	(3)	(4)
	Tbq	**Tbq**	**Tbq**	**Tbq**
Epu	−0.4375 ***	−0.7145 ***	−0.6265 ***	−0.3329 ***
	−0.0757	−0.2067	−0.1721	−0.0887
Top	−0.0142 ***	−0.0044	−0.0192 **	−0.0152 ***
	−0.0041	−0.0116	−0.0084	−0.0051
Gro	0.4488 ***	0.7001 ***	0.4319 *	0.4016 ***
	−0.1192	−0.2379	−0.2124	−0.1493
Crr	−0.0172	−0.2237	0.0878	0.0362
	−0.2208	−0.3794	−0.2087	−0.2573
Lev	0.2643	−0.1827	1.5880 **	0.0383
	−0.2796	−0.4538	−0.6875	−0.3129
Size	−0.3787 ***	−0.3459 *	−0.3675	−0.3836 ***
	−0.1044	−0.1693	−0.2727	−0.1317
Tab	−2.9929 ***	−2.5423 *	−1.7756	−3.4614 ***
	−0.7717	−1.2712	−1.4038	−1.2607
Age	1.4527 ***	2.1711 ***	1.7141 ***	1.3152 ***
	−0.3240	−0.4574	−0.5906	−0.3708
_cons	11.5388 ***	9.6614 **	9.6701 *	12.0967 ***
	−2.0366	−4.1701	−5.0470	−2.6965
Observations	1904	294	280	1330
R-squared	0.1998	0.2521	0.3252	0.1849

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

From the regression results of the whole company samples in column (1), the companies in the central area in column (2), the companies in the western area in column (3), and the firms in the eastern area in column (4), the EPU coefficients are all negative and pronounced at the degree of 1 percent, suggesting that regardless of the regional differences in new energy companies, the influence of EPU on the new energy companies' performance is negative. In column (2), the EPU coefficient is −0.7145 for the central region firms subgroup and is pronounced at the degree of 1% of statistical significance. In Column (3), Western firms' subgroup, the EPU coefficient is −0.6265 and is obvious at the degree of 1% of statistical significance. In Column (4), Eastern enterprise subgroup, the coefficient of EPU is −0.3329 and is obvious at the degree of 1% of statistical significance, which verifies that the effect of EPU imposed on the new energy companies' performance in different regions is different. It also verifies Hypothesis 2 proposed above. The likely reason for this is that the eastern region is highly marketized, with a more transparent market and higher administrative efficiency; faced with economic policy changes, enterprises in the new energy sector in the eastern area can make effective policy responses quickly to reduce negative impacts.

3.8.2. Differences in Business Ownership

To explore the differences in how the firms' performance in the new energy sector with different ownership is affected when faced with economic policy uncertainty, this paper introduces the grouping variable corporate ownership type (Cq), which is regressed on the samples of government and non-government new energy firms, respectively. Table 7 shows the differences in ownership in the model. The initial column displays the complete sample's regression findings, and the second and third are the regression results for government-owned and non-government-owned new energy enterprises, respectively.

Table 7. Heterogeneity analysis: differences in owners.

Variable	(1)	(2)	(3)
	Tbq	**Tbq**	**Tbq**
Epu	−0.4375 ***	−0.3754 ***	−0.7750 ***
	−0.0757	−0.0837	−0.1503
Top	−0.0142 ***	−0.0127 ***	−0.0055
	−0.0041	−0.0046	−0.0086
Gro	0.4488 ***	0.4707 ***	0.0219
	−0.1192	−0.1241	−0.3228
Crr	−0.0172	−0.1132	0.6247
	−0.2208	−0.2272	−0.6082
Lev	0.2643	0.2663	−0.0187
	−0.2796	−0.3263	−0.3261
Size	−0.3787 ***	0.4678 ***	0.1238
	−0.1044	−0.1138	−0.1828
Tab	−2.9929 ***	−2.834 ***	−1.7710
	−0.7717	−0.8486	−1.2884
Age	1.4527 ***	1.4366 ***	1.4424 ***
	−0.3240	−0.3741	−0.3601
_cons	11.5388 ***	13.1823 ***	0.2915
	−2.0366	−2.1730	−4.2161
Observations	1904	1526	378
R-squared	0.1998	0.2297	0.2251

*** $p < 0.01$.

From the regression outcomes of the whole company sample in column (1), the state-owned companies in the new energy sector in column (2), and the non-state-owned companies in the new energy sector in column (3), the EPU coefficients are obvious and negative at the degree of 1%, implying that regardless of the type of the new energy firms, state-owned or not, the influence of EPU on the new energy firms' performance is negative.

In column (2), the state-owned enterprises subgroup, the EPU coefficient is −0.3754 and pronounced at the 1% degree of statistical significance. In column (3), the EPU coefficient is −0.775 for the subgroup of non-state-owned firms and is pronounced at the degree of 1 percent of statistical significance, which verifies the influence of EPU on the firms with different ownerships' performance in the new energy sector is different. The possible cause for this is that differently from non-state-owned companies in the sector and faced with economic policy adjustments, state-owned new energy enterprises are able to make rapid and effective responses to reduce the negative impacts, and their performance is less affected by economic policy uncertainty, while also verifying Hypothesis 3 proposed above.

3.9. Mechanism Analysis

The existing research generally believes that increasing R&D investment can help enterprises gain market competitiveness, thereby improving their performance level. Research has demonstrated that investing in research and development has a favorable effect on the value of enterprises [39]. Technological innovation capacity significantly motivates enterprise performance [40]. Technological innovation capability enhances enterprise performance by creating new products and processes [41].

More significantly, Epu has the capability to impede corporate innovation. According to the evaluation of real options theory, economic policy uncertainty augments the hazard of innovation. When the index increases, companies often choose to delay R&D investment to avoid losses, thereby suppressing innovation.

The following mechanism verification model is established based on the above analysis.

$$Ri_{i,t} = \alpha_0 + \beta_1 Epu_{i,t} + \beta_2 Size_{i,t} + \beta_3 Lev_{i,t} + \beta_4 Tab_{i,t} + \beta_5 Age_{i,t} + \beta_6 Gro_{i,t} + \beta_7 Top_{i,t} + \beta_8 Crr_{i,t} + \varepsilon_{i,t} \quad (3)$$

The mechanism verification results are shown in Table 8.

Table 8. Mechanism verification results.

Variable	(1)	(2)
	Tbq	Ri
Epu	−0.4370 ***	−0.5340 **
	(−5.78)	(−2.67)
Top	−0.0142 ***	−0.0098
	(−3.50)	(−0.93)
Gro	0.4490 ***	−0.6930
	−3.7700	(−0.93)
Crr	−0.0172	1.3840
	(−0.08)	−1.5000
Lev	0.2640	−3.5150 ***
	−0.9500	(−4.61)
Size	−0.3790 ***	0.3220
	(−3.63)	−1.6600
Tab	−2.9930 ***	−3.5760
	(−3.88)	(−1.13)
Age	1.4530 ***	4.4030 ***
	−4.4800	−5.3800
_Cons	11.5400 ***	−10.7700 **
	−5.6700	(−2.77)
N	1904	1904

*** $p < 0.01$, ** $p < 0.05$.

According to the table above, the coefficient of EPU and technological innovation is −0.534, pronounced at the degree of 5%, implying that EPU imposes a negative impact on the technological innovation of companies in the new energy sector. This conforms to the above analysis, as uncertainty in economic policies hinders corporate innovation.

4. Concluding and Policy Implications

This research examines the influence of EPU imposed on the new energy enterprises' performance by using panel data on newly listed Chinese energy enterprises between 2008 and 2021, in conjunction with the China EPU Index. After empirically examining the sample firms through the data, the paper draws the following key findings.

First, EPU exerts a negative influence on the new energy firms' performance. It is similar to the research by Iqbal, U et al. [17], where EPU imposes a negative and pronounced impact on the US-listed non-financial companies' performance. Nestoroska, I [23] came to a similar research finding that EPU imposes an obvious negative influence on companies' performance in the Czech Republic, and interest rates impose a pronounced positive influence on the companies' performance. This conforms to the research findings by Yu, W.H. et al. [35], who, based on 289 Chinese energy-intensive listed firms from 2003–2018, found that EPU negatively affects firms' financial performance.

Second, EPU imposes a negative influence on the new energy enterprises' performance in different regions and with different property rights, but to different degrees. This is consistent with Feng, X et al., who found that EPU exerts a negative effect on a company's accomplishment and that the negative relationship is weaker for SOEs compared to non-SOEs [42]. Meiwei Deng [37] came to a similar conclusion that the EPU index imposes a more pronounced negative impact on the financial performance of Midwestern, non-SOE energy-intensive firms.

Finally, economic policy uncertainty affects new energy firm performance through technological innovation. Existing studies generally agree that technological innovation imposes a positive influence on a company's performance. The research results show that EPU exerts a negative influence on the technological innovation of new energy companies.

This paper analyses the influence of economic policy uncertainty on companies' performance in the new energy industry by analyzing and summarizing the research findings of others, but there are some limitations in the depth of the problem research. Restricted by data availability, the sample data selected from newly listed energy enterprise data in China did not cover all new energy enterprises, and the research sample lacks comprehensiveness.

Based on these results, we propose the following three policy implications.

Firstly, when introducing or adjusting economic policies, it is important for the government to think about the negative influences of EPU on emerging energy companies and to avoid making substantial policy changes that could harm businesses.

Secondly, the government should prioritize addressing the regional development imbalance by allocating more resources to the central and western areas. Non-government-owned enterprises can imitate the favorable business models of government-owned enterprises, learn from experience, and improve their risk resistance capabilities.

Finally, the government should stabilize economic policy expectations, reduce policy risks for enterprise innovation, and thereby promote the performance improvement of new energy enterprises.

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