Data Analysis of Economic Policy Uncertainty and the Number of Enterprise Employees based on Panel Regression Model -Taking China's A-share Listed Companies as an Example

Yifan Zhou[*]

School of Mathematics and Statistics, Jiangsu Normal University, Shanghai Road, Xuzhou, China

Abstract: To make a systematic analysis of the uncertainty of economic policy and then to propose effective countermeasures has been an important subject of business management for many years. This paper selects the asset data of China's A-share listed companies from 2011 to 2020 and the economic policy uncertainty index EPU formulated by Baker to create a panel regression model, focusing on studying the impact of economic policy uncertainty on the number of employees, and trying to find out the factors that inhibit the impacts of economic policy uncertainty on employment. EPU is an uncertainty index constructed by Baker based on keywords in the South China Evening News, using technical means such as big data crawlers and text analysis. The data results show that economic policy uncertainty is negatively correlated with the number of employees. It is further found that enterprises with large financing constraints and non-state-owned enterprises are more affected by economic policy uncertainty. Finally, based on this conclusion, suggestions and countermeasures are made to relevant policy makers.

1 INTRODUCTION

Since the development of the Economic Policy Uncertainty Index, scholars worldwide have conducted research on the index and multiple aspects of economic performance, especially on the correlation between the index and the aspects of macroeconomic growth. The Economic Policy Uncertainty Index was developed by three researchers including Scott R. Baker of Stanford University, and is mainly used to measure the economic conditions and policy uncertainty of major economies in the world (Hao Xiaoyan, 2018). Their research results point out that there is a clear correlation between the EPU index and macro indicators such as China's macroeconomic growth rate and employment rate.

The analysis of the correlation between economic policy uncertainty and investment has always been a hot topic in economic research and study. The research mainly focuses on the impact of economic policy uncertainty on corporate fixed asset investment (Li Fengyu, 2015) (Han Guogao, 2016), innovation and R&D investment (Chen Juanjuan, 2021). Meanwhile, lots of research focuses on the

moderating effect of other variables such as investment efficiency (Rao Pingui, 2017), entrepreneurial subjective factors (Han Guogao, 2016), cash holdings (Wang Yizhong, 2017). The impact of economic policy uncertainty on enterprise investment and business environment will inevitably lead to an impact on the ability of enterprises to absorb employment. Qian Xueya (2018) found that economic policy uncertainty has a significant negative impact on the employment rate. Xin Daleng (2018) found that when economic policy uncertainty increases, manufacturing jobs will decrease significantly. Foreign scholars Saud Asaad Al-Thaqeb et al. (2019) found that the economic policy uncertainty of their country is negatively correlated with the productive investment of enterprises and employment.

It is the common goal of China and all world economies to maintain sustainable economic development, improve the external business environment of enterprises, and allow employees as the main body of enterprises to receive decent wages to improve well-being. Existing studies on economic policy uncertainty pay more attentions to its impact on corporate investment behavior, and most studies

on the relationship between policy uncertainty and employment are conducted at the national macro level. This paper attempts to explore the substantial impact of economic policy uncertainty on employment in a bottom-up method by analyzing the changes in the scale of employees in China's A-share listed companies. At the same time, it also aims to put forward constructive suggestions on maintaining job security, which is one of the most important factors for people's well-being.

2 RESEARCH HYPOTHESES

2.1 Economic Policy Uncertainty and Scale of Enterprise Employees

Many studies have shown that economic policy uncertainty will increase the difficulty of business operations. The bigger the uncertainty is, the more difficulties to obtain funds from outside and the less internal willingness to actively invest. Enterprises often adopt defensive strategies to reduce expenditures and control costs. As big part of the operation cost, headcounts are in high likelihood to be cut or frozen. Based on this, this paper proposes the first research hypothesis:

H1: Economic policy uncertainty is negatively related to the number of corporate employees.

2.2 The Moderating Effect of Financing Constraints

Financing ability varies significantly with the scale of the enterprise, the nature of the ownership of the enterprise and the level of financial development in the region where it is located. In China, private enterprises, especially small and medium-sized enterprises, are with much more difficulties to obtain financing support than large state-owned enterprises (Zou Yao, 2015). From a risk perspective, companies with financing difficulties often choose to downsize their business or cancel investment when facing the challenges. Therefore, the total employment is downsized or frozen accordingly. Based on this, this paper proposes the second research hypothesis:

H2: The higher the degree of corporate financing constraints is, the higher the negative correlation is between economic policy uncertainty and the number of corporate employees.

2.3 Moderating Effect of Ownership Concentration

Research shows that sufficient voting rights can ensure the company's shareholder's high participation in company's operations. The higher level they are involved in the business, the more the company stick to the value, mission and vision which are in large degree aligned to owner's individual pursuit.

When companies can more consider and follow long-term goals, companies tend to pay more attentions to sustainable development, establish more people-oriented values, and increase their own investment in human development costs. The importance of stability on human resources are usually given high weight by those enterprises on business long term strategy. Based on this, this paper proposes the third research hypothesis:

H3: The higher level the ownership concentration is, the smaller the negative correlation is between economic policy uncertainty and employee size.

2.4 The Effect of Equity Nature

In this paper, listed companies are divided into state-owned enterprises and non-state-owned enterprises according to the nature of equity. The existing state-owned enterprises in China have relatively large scale of assets and number of employees. The state-owned enterprises are one of the fundamental forces to the national economy and people's livelihood. Under the circumstance of high economic policy uncertainty, state-owned enterprises have the higher ability and responsibility of achieving the goals not only on economy and but also on social employment stability. Comparing to the other type of enterprise, state-owned enterprises are in general with good conditions on financing. Based on this, this paper proposes the fourth hypothesis:

H4: Compared with non-state-owned enterprises, the number of employees in state-owned enterprises is less affected by economic policy uncertainty.

3 RESEARCH DESIGN

3.1 Sample Selection and Data Sources

This paper selects the data of listed companies in Shanghai and Shenzhen A-share companies from 2011 to 2020, and draws on other research (Xu Yekun, 2020) to process the selected data as follows: (1) exclude ST and ST* companies; (2) exclude

financial enterprises; (3) eliminate corporate data with missing or obviously wrong main variable information, and perform 1% abbreviated processing for all continuous variables. This method refers to the practice of Chen Juanjuan et al. (2021) and reduces the impact of extreme values on the regression results by shortening the tail.

It ends up with 13760 sample observations by using this methodology. The above enterprise data all come from the CSMAR database. The economic policy uncertainty index selects the EPU index formulated and published by Baker et al. The index data is downloaded from the PU website (http://www.policyuncertainty.com).

3.2 Definition and Measurement of Variables

3.2.1 Explained Variables

Number of employees of the enterprise (STAFF). Because the number of employees of listed companies in China varies greatly, this paper adopts the method of calculating the natural logarithm of the number of employees to measure the number of employees in the enterprise.

3.2.2 Explanatory Variables

(1) Economic Policy Uncertainty (EPU). This index (EPU) is constructed by Baker et al. based on the news index of two major newspapers in China. This paper refers to Qi Jianhong et al. (2020) to calculate the arithmetic mean of the monthly EPU index to obtain the annual EPU index and adopts the one-period lag EPU index as an indicator of economic uncertainty for robustness testing.

(2) Financing constraints (SA). This variable (SA) is the corporate financing constraint index, which is collected from the Cathay Pacific database. The higher the SA index, the greater the corporate financing constraint.

(3) Equity concentration (H). This variable (H) is the sum of the squares of the shareholding ratios of the top 5 major shareholders of the company. The larger the h index, the higher the ownership concentration.

3.2.3 Control Variables

This paper refers to previous studies to determine macro-level control variables and enterprise-level control variables respectively. The macro control variable is the per capita GDP of the province where each enterprise is located; the enterprise control variable includes enterprise scale (SIZE), enterprise leverage ratio (LEV), enterprise return on assets (ROA), and enterprise scale is measured by the logarithm of the total enterprise assets. Corporate leverage is measured by the ratio of total liabilities to total assets and return on assets is measured by the ratio of after-tax net profit to total assets.

3.3 Empirical Model

In order to study the impact of economic policy uncertainty on the number of corporate employees, this paper uses the following model to test the assumptions proposed above.

$$STAFF_{i,t} = \alpha_0 + \alpha_1 EPU_t + \alpha_2 Z_{i,t} + \mu_i + \gamma_i + \varepsilon_{i,t} \quad (1)$$

Model (1) is the basic model to test the research focus of this paper: the correlation test between economic policy uncertainty and the number of corporate employees, where i represents an individual, namely a listed company, t represents the year, α_0 represents a constant term, and μ_i represents a fixed term effect, γ_i stands for time effect, $\varepsilon_{i,t}$ stands for random error, and $Z_{i,t}$ stands for a series of control variables, namely firm size, leverage ratio, financing constraints, and per capita GDP. According to H1, this paper expects the model (1) variable EPU coefficient to be negative, that is, there is a negative correlation between economic policy uncertainty and the number of corporate employees.

And according to H2 and H3 respectively, namely examining the moderating effects of corporate financing constraints and equity concentration on the number of employees from economic policy uncertainty, the model is further adjusted to obtain:

$$STAFF_{i,t} = \alpha_0 + \beta_1 EPU_t + \beta_2 SA_{i,t} + \beta_3 SA_{i,t}*EPU_t + \beta_4 Z_{i,t} + \mu_i + \gamma_i + \varepsilon_{i,t} \quad (2)$$

$$STAFF_{i,t} = \alpha_0 + \eta_1 EPU_t + \eta_2 H_{i,t} + \eta_3 H_{i,t}*EPU_t + \eta_4 Z_{i,t} + \mu_i + \gamma_i + \varepsilon_{i,t} \quad (3)$$

In model (2), $SA_{i,t}*EPU_t$ represents the interaction term between economic policy uncertainty and corporate financing constraints.

In model (3), $H_{i,t}*EPU_t$ represents the interaction term between economic policy uncertainty and corporate ownership concentration.

Referring to the practice of Jiang Teng et al. (2018), when the interaction term is significant, the higher the coefficient of the interaction term, the stronger the moderating effect.

Table 1: Benchmark regression results.

	(1) lnY	(2) lnY	(3) lnY	(4) lnY
EPU	-0.025***	-0.021***	-0.038***	-0.038***
	(-18.513)	(-11.136)	(-9.387)	(-4.710)
SIZE	0.423***	0.432***	0.447***	0.447***
	(78.638)	(72.198)	(71.024)	(26.911)
LEV	0.224***	0.214***	0.186***	0.186**
	(6.957)	(6.621)	(5.708)	(2.513)
ROA	-0.165**	-0.190***	-0.182**	-0.182
	(-2.335)	(-2.677)	(-2.551)	(-1.516)
lnK		-0.075***	0.095***	0.095
		(-3.274)	(2.676)	(1.381)
_cons	-5.827***	-5.282***	-7.595***	-7.595***
	(-34.868)	(-22.397)	(-18.057)	(-8.197)
N	13760	13760	13760	13760
r2	0.439	0.439	0.445	0.445
F	2418.405	1938.385	763.371	126.413
model selection	FE	FE	FE	FE
time fixed effects	NO	NO	YES	YES
firm fixed effects	NO	NO	NO	YES

*** 1% ** 5% * 10%

4 EMPIRICAL ANALYSIS

4.1 Results of Regression Analysis

4.1.1 Economic Policy Uncertainty and Number of Employees

Using the model (1) formulated in Section 3.3 to test, the regression results of the impact of economic policy uncertainty on the number of employees of enterprises are shown in Table 1. The basic model of per capita GDP, the data results show that the economic policy uncertainty is negatively correlated with the number of employees, the preliminary verification H1, columns (2) (3) (4) are all added to the macro control variables, columns (3) (4) is added to the time fixed effect, and column (4) is added to the firm fixed effect. As can be seen from the figure, after adding control variables and fixed effects in turn, economic policy uncertainty is still negatively correlated with the number of employees, so hypothesis 1 can be tested.

4.1.2 The Moderating Effect of Financing Constraints

According to the model (2), the moderating effect of financing constraints on the correlation between economic policy uncertainty and the number of employees is tested, and the SA index is used as a measure of corporate financing constraints. In the case that SA is negative, the closer SA is to 0, the greater the financing constraints faced by enterprises can be considered. Therefore, in order to test the moderating effect of financing constraints, the interaction term between financing constraints and economic policy uncertainty index is added to the model. The larger the coefficient of the interaction term, the greater the moderating effect (Jiang Teng, 2018). The index in column (1) of Table 2 shows that the coefficient of EPU is -0.038, which is significantly negative at the 1% level. Meanwhile, the interaction term of economic policy uncertainty and corporate financing constraint (SA index) (SA*EPU) coefficient is 0.016, which is significantly positive at the 10% level, indicating that with the increase of corporate financing constraints, economic policy

uncertainty has a greater negative effect on the number of companies. So, hypothesis 2 can be tested.

4.1.3 The Moderating Effect of Ownership Concentration

According to the model (3), the moderating effect of ownership concentration on the correlation between economic policy uncertainty and the number of employees is tested. The moderating effect of ownership concentration is shown in the second column of Table 2. The coefficient of EPU is -0.036, which is significantly negative at the level of 1%, but the coefficient of interaction between ownership concentration and economic policy uncertainty index is -0.01, which is not significant, indicating that ownership concentration has no moderating effect on the correlation between economic policy uncertainty and number of corporate employees, so hypothesis 3 cannot be tested.

4.1.4 The Effect of Equity Nature

According to the different nature of equity, this paper divides the enterprise samples into two groups of 6350 state-owned enterprises and 7030 non-state-owned enterprises. According to H4, this paper assumes that the different nature of the company's equity will affect the company's business strategy when facing increasing economic policy uncertainty and consequently enterprise take varies of approaches on employment. From the regression data in Table 3, it can be seen that among state-owned enterprises and non-state-owned enterprises, the coefficients of EPU are -0.030 and -0.051 respectively, and they are significantly negatively correlated at the 1% level. Therefore, economic policy uncertainty has an inhibitory effect on the number of employees in both types of enterprises, however non-state-owned enterprises are more affected by economic policy uncertainty. So, hypothesis 4 can be tested.

Table 2: Moderating effect test.

	(1) lnY	(2) lnY
EPU	-0.038***	-0.036***
	(-3.282)	(-4.221)
SA index	-0.084	
	(-0.574)	
EPU*SA	0.016*	
	(1.809)	
EPU*H		-0.010
		(-0.488)
H		0.078
		(0.474)
SIZE	0.445***	0.447***
	(26.745)	(26.941)
LEV	0.171**	0.184**
	(2.280)	(2.490)
ROA	-0.179	-0.182
	(-1.488)	(-1.534)
lnK	0.092	0.095
	(1.332)	(1.387)
_cons	-7.495***	-7.614***
	(-8.082)	(-8.276)
N	13760	13760
r2	0.446	0.445
F	109.685	110.316
time fixed effects	YES	YES
firm fixed effects	YES	YES

*** 1% ** 5% * 10%

Table 3: The effect of equity nature.

	state-owned enterprise lnY	non-state-owned enterprise lnY
EPU	-0.030***	-0.051***
	(-3.020)	(-3.665)
SIZE	0.429***	0.464***
	(15.072)	(21.731)
LEV	0.054	0.212**
	(0.437)	(2.034)
ROA	-0.273	-0.168
	(-1.146)	(-1.263)
lnK	0.001	0.219*
	(0.015)	(1.785)
_cons	-5.952***	-9.464***
N	6350	7030
r2	0.349	0.501
F	35.431	88.647
time fixed effects	YES	YES
firm fixed effects	YES	YES

*** 1% ** 5% * 10%

4.2 Robustness Check

This paper refers to previous studies to solve the endogeneity problem by using lagged variables. Using the variable of economic policy uncertainty with a lag of one period, and using the method of negative binomial regression data, the results show that after excluding the endogeneity problem, the economic policy uncertainty and the number of employees still show a significant negative correlation. Secondly, this paper uses the method of expanding the sample size to test the robustness of the overall regression results. The sample in this paper comes from the data of listed companies in China's A-shares from 2011 to 2020. In order to expand the sample size, this paper adds the data of B-share listed companies in China. It shows that even if the sample size is expanded, economic policy uncertainty is still significantly negatively correlated with the number of employees, so the basic hypothesis of H1 is tested again.

5 CONCLUSIONS

The analysis above draws the following conclusions: Firstly, economic policy uncertainty has a significant negative correlation with the number of corporate employees i.e., the higher the EPU is, the lower the scale of enterprise employment goes. Secondly, the bigger the financings are constrained, the more negative correlation goes between the number of

employees and the uncertainty of economic policy. Thirdly, the level of ownership concentration has no significant effect on the negative correlation between the uncertainty of economic policy and the number of enterprise employees. Fourthly, differences in equity ownership can also effectively moderate the negative correlation between economic policy uncertainty and the number of employees. The state-owned enterprises are less affected by economic policy uncertainty than non-state-owned enterprises.

Based on the above analysis, in order to minimize impact of the economic policy uncertainty on employments, this study propose to the policy makers the followings

1. Strengthen the communication mechanism between the government and enterprises in order to reduce the uncertainty of economic policies. Establish green channels for effective and efficient communication. Dynamically track the uncertainty of economic policies and set up warning mechanisms. Policy makers can take countermeasures before the policy uncertainty index reaches the specified limit and thus to reduce the EPU

2. Strengthen the balance of the financial market development. In China there is still a big gap on the degree of financial market development between the coastal areas and the central & western regions. Provide more support to the less developed regions and small-medium sized enterprises. Consequently, the national economic development gets more balanced and employment gets more stabilized.

3. Strengthen the research at the macro level on the impact of enterprise ownership difference on

employment and economic development. With the rapid changes of the world, the uncertainties will continue to bring challenges to enterprises. The government should examine and redefine the role of state-owned enterprises in safeguarding the country's core interests, stabilizing the economic foundation, and maintaining employment.

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