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The Long-Term Labor Market Effects of Economic Policy Uncertainty at the Time of Graduation

Hye Yoon Chung* · Youjin Hahn** · Seung Phil Lim***

Abstract

We investigate the long-term effects of economic policy uncertainty on employment and wage for those who entered the Korean labor market between 1990 and 2014. Policy uncertainty has heterogeneous effects across education and gender. Male high school graduates experience stronger negative effects on employment in terms of both magnitude and duration compared to male college graduates. Among employed males, two-year college graduates experience a persistent negative effect on wages. Female high school graduates undergo an initial decrease in employment and female four-year college graduates suffer from a wage loss in their late career stage due to high policy uncertainty.

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* First Author, Ph.D. Student, School of Economics, Yonsei University, e-mail: h.chung@yonsei.ac.kr
** Second and Corresponding Author, Associate Professor, School of Economics, Yonsei University, 82-2-2123-2474, e-mail: youjin.hahn@yonsei.ac.kr
*** Third Author, Master's Student, School of Economics, Yonsei University, e-mail: splim@yonsei.ac.kr

Ⅰ. Introduction

Entering the labor force in a stagnant economy can adversely affect the experiences of young workers as companies are less likely to hire workers, which can therefore particularly dampen those in their early career. If the initial labor market conditions at the time of graduation continue to affect individual's experiences in the labor market even after the market recovery, graduates who enter the labor force in a recession may experience long-lasting negative effects on their careers. Furthermore, even under a certain stage of the economy, individuals with different educational attainment can face different labor market conditions when graduating.

This study concerns the long-term effects of economic policy *uncertainty* at the time of graduation by educational attainment on labor market outcomes in Korea. We use the Economic Policy Uncertainty (EPU) index as a measure of uncertainty that considers several aspects to quantify policy-related economic uncertainty.[1] While it is well documented in various countries that entering the labor force in a bad economy has long-lasting negative effects, the measure of economic conditions used in these studies is limited to the unemployment rate.[2] Our study thus contributes to, but departs from, earlier literature by introducing a measure of characterizing economic conditions other than the unemployment rate.

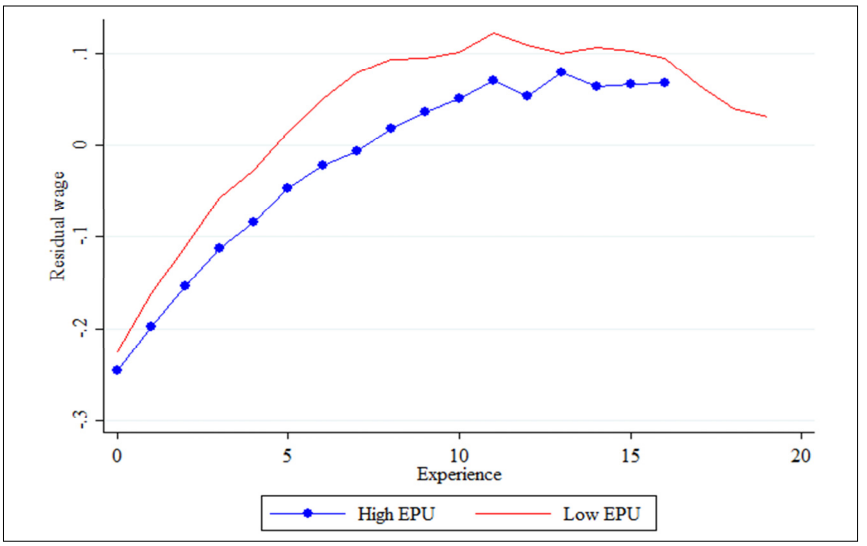
To motivate the idea that whether the EPU matters for labor

1) For instance, it quantifies uncertainty about "who will make economic policy decisions, what economic policy actions will be undertaken and when, and the economic effects of policy actions (or inaction)" (Baker et al., 2016)

2) These studies include: Kahn (2010) for the United States; Genda et al. (2010) for Japan and the United States; Oreopoulos et al. (2012) for Canada; Brunner and Khun (2014) for Austria; Cockx and Ghirelli (2016) for Belgium; Schwandt and von Watcher (2019) for the United States; van den Berge (2018) for Netherlands; and Han (2018) for South Korea. All of these studies use the unemployment rate as a measure of economic condition when entering the labor force.

market outcomes, Figure 1 shows the wage profile of workers by two different cohorts. The high EPU group indicates those who faced higher than the median EPU at the time of graduation, and the low EPU group represents those who were exposed to lower than the median EPU at the time of graduation. The graph shows that the high EPU group had lower residual wages than the low EPU group throughout their career, where residual wages are obtained after taking into account the year fixed effects and the unemployment rate at the time of gradation.

〈Figure 1〉 Comparing those who face high EPU and low EPU at the time of graduation



The EPU can affect the labor market outcomes through several channels. First, Bordo et al. (2016) find that EPU is strongly associated with slower loan growth at both an aggregate level and across individual banks, suggesting that EPU affects the economy through a bank lending channel. Second, Baker et al. (2016) find that the elevated policy uncertainty is associated with decreased investment and outputs. These findings imply that firms would have

difficulty getting loans or expanding their business when the uncertainty level is high, and therefore high EPU would have adverse effects on workers' labor market outcomes.

One potential concern with using EPU as a measure of economic condition rather than the unemployment rate is that it may also be closely related to unemployment. However, in the case of Korea, EPU is not associated with unemployment rate. We run a simple test and find that the EPU is not statistically correlated with future and past unemployment rates (Appendix Table A1). Choi and Shim (2019) also show that, unlike in the US case, the effect of EPU on unemployment is not statistically significant in Korea by using the Vector Autoregression (VAR) models. This implies that policy-related uncertainty is likely to have an effect on workers' labor market experiences, and this effect would be independent from the effect coming from the unemployment rate. Therefore, evaluating the role of uncertainty has important policy implications because early labor market performance has long-term consequences (Kahn, 2010; Wee, 2016).

Ⅱ. Data

We use the Korean Labor & Income Panel Study(KLIPS) from 1998 to 2016.[3] Individuals in the top and bottom one percentile of the wage distribution are trimmed to remove outliers. As we are interested in the labor market performance of those who officially graduated and are currently in the labor force, we only include individuals in the sample if we can identify their latest graduation year. In order to capture the effects by educational attainment, we

3) The KLIPS is publicly available data and can be downloaded from here: https://www.kli.re.kr/klips_eng/contents.do?key=251

split the sample into three groups: high school graduates, two-year college graduates and four-year college graduates. For high school graduates, we include those between the ages of 17 and 22 at the time of graduation for college graduates, we include those between the ages of 20 and 35 at the time of graduation. These restrictions are made to rule out those who graduated at a much older age than their similarly-educated counterparts because their career trajectory or decision to pursue higher education may differ from their counterparts. Our final sample consists of individuals who entered the labor market between 1990 and 2014, and the sample size is 60,326. Sample means of the key variables that describe the individuals' socioeconomic characteristics and the economic conditions are presented in <Table 1> by each gender. Except for the portion of employed individuals and their log average monthly wage, men and women are similar in their characteristics.

We use the EPU index of Korea as a measure of the economic situation at the time of graduation while controlling for the unemployment rate at the time of graduation as well. The index weights the frequencies of terms related to policy uncertainty that appear in newspapers, following the methodology described by Baker et al. (2016).[4] EPU has been used in various contexts to explain economic activities such as firm investment, industrial production, and employment (e.g., Kang et al., 2014; Colombo, 2013). Using this measure, Baker et al. (2016) analyze firm-level data and find that policy uncertainty is associated with higher stock price

4) South Korea's EPU index is constructed based on six newspapers, Donga Ilbo, Kyunghyang, Maeil Economic, Hankyoreh, Hankook Ilboand Korea Economic Daily. It counts the number of newspaper articles containing the following terms: uncertain or uncertainty; economic, economy or commerce; and one or more of the following policy-relevant terms: government, "Blue House", congress, authorities, legislation, tax, regulation, "Bank of Korea", "central bank", deficit, WTO, law/bill or "ministry of finance" (Source: http://www.policyuncertainty.com/korea_monthly.html).

volatility and lower levels of investment and employment in policy-related sectors such as defense, health, and finance.

Appendix Figure A1 shows the EPU for Korea over time and reports concurrent important events happening at the time. As the figure indicates, EPU appears to be affected by various domestic and international events, including the Gulf War, the Lehman Brothers crisis in the US, and domestic political scandals. The EPU index is normalized to have a mean of 100, however, in this study we divide the index by 10 to make it more comparable in magnitude to the unemployment rate.

〈Table 1〉 Summary statistics

	(1) Male		(2) Female	
Variable	Mean	SD	Mean	SD.
Age	33.28	6.42	31.26	6.26
Education	2.10	0.86	1.95	0.85
Father's Education	2.35	1.20	2.43	1.19
Graduation year	1999	5.86	1999	5.76
EPU_c	8.96	3.35	8.83	3.30
Unemployment $rate_c$	3.35	1.33	3.44	1.38
Years of experience	9.60	6.24	9.48	6.32
Employed (dummy)	0.83	0.37	0.52	0.50
ln(average monthly wage)	5.47	0.44	5.07	0.45
Observations	29,084		31,242	

Note: The EPU index has a mean of 100, however, we divide it by 10 to make it more comparable to the unemployment rate in terms of magnitude. Education indicates the highest level of schooling and is coded by three integers where 1 indicates high school, 2 and 3 each indicates college and four-year university respectively. Father's education also represents the father's highest level of education and is coded as following: 1 = elementary, 2 = middle school, 3 = high school, 4 = college, 5 = four-year university. The sample size of the log average monthly wage is smaller than the number of observations reported in the table. The average monthly wage contains only 20,313 and 14,316 observations for male and female respectively.

Ⅲ. Empirical Strategy

We use the following model to estimate the effect of the economic policy uncertainty on individual i's labor market outcomes in year t, with i graduating in year c in region r.

$$\begin{aligned} Y_{icrt} = \alpha_0 \sum_{k=0}^{n} \beta_k EPU_{ic} \times e_{k,ict} + \sum_{k=0}^{n} \gamma_k UR_{ic} \times e_{k,ict} \\ + \theta e_{ict} + X_i' \delta + \lambda_r + \mu_t + \epsilon_{icrt}, \end{aligned} \quad \text{(Eq 1)}$$

where Y is an outcome variable, (1) an indicator of employed or not or (2) log real monthly wage in 2015 South Korean Won (KRW). The regression equation is similar in spirit to the one used in Khan (2010). The expected (potential) years of experience of individual i at year t is calculated by $t-c$, e_{ict}. Based on e_{ict}, eleven binary variables indicating k expected years of experience are generated for each individual i, $e_{k,ict}$, namely 0-1 year of experience, 2-3 years of experience, 4-5 years of experience and so forth, and these are used for constructing interaction terms with EPU_{ic}, the economic policy uncertainty index, and UR_{ic}, the unemployment rate at the time of graduation for i.[5] Unemployment rate at current year t is subsumed under year fixed effects. The vector of covariates X includes i's current age and father's years of education. λ_r and μ_t are the fixed

5) We generate binary variables for eleven intervals of expected years of experience. Starting from less than one year of expected experience, we cut the interval by every two years until the expected years of experience reaches between eighteen and nineteen years and the last interval includes all those who have twenty or longer years of expected experience. While we use these eleven binary variables ($e_{k,ict}$) for the interaction term, as the main effect of experience, we control for e_{ict} as a continuous variable since our model already contains many fixed effects. However, even when controlling for e_{ict} as eleven discrete experience variables as the main effect of experience do not change our results qualitatively.

effects of the graduate region and current year. Standard errors are clustered at the graduate region and graduate year level.

In addition to the baseline model, we run a two stage least squares (2SLS) regression by instrumenting the interaction term of the EPU index variable and the potential experience dummies. We use the instrumental variable (IV) approach to address potential endogeneity issues associated with the timing of graduation. Since individuals may adjust their graduation year based on the economic situation, for example delaying graduation in bad economy, the EPU index at the year of graduation and the potential years of experience may both be endogenous in the baseline model. The IV is constructed by first calculating individual i's predicted graduation year based on the educational system in Korea, and then by interacting the reassigned EPU and e variable which corresponds to the predicted graduation year.[6)]

The South Korean educational system consists of six years of primary school, three years of middle school, and three years of high school. For tertiary education, there are two-year colleges and four-year colleges, where four-year colleges are more academic-oriented than two-year colleges. Primary schooling typically begins at age 7. Thus, we calculate the predicted graduation year by adding 19 years for high school graduates, 21 years for two-year college graduates, and 23 years for four-year college graduates to birth year. We also add another three years for those who served in the military.

EPU is then matched to individual data based on the predicted graduation year to get the adjusted $\widehat{EPU}$. The predicted years of experience $\hat{e}$ is also calculated by subtracting the predicted graduation year from the current year. We use $\hat{e}$ and the interaction terms between $\widehat{EPU}$ and experience dummies (i.e. $\sum_{k=0}^{n}\beta_k \widehat{EPU}_{ic}\times$

6) We follow the strategy used in Kahn (2010).

$\widehat{e_{k,ict}}$) to instrument potentially endogenous e and the interaction terms between EPU and experience dummies (i.e. $\sum_{k=0}^{n}\beta_k EPU_{ic} \times e_{k,ict}$). The IV regression controls for the unemployment rate at the time of graduation by eleven experience intervals, father's years of education, graduate region fixed effects and current year fixed effects. Age is not controlled for in the IV regression due to multicollinearity with the instruments. Standard errors are clustered at the graduate region and graduate year level.

Ⅳ. Results

We first show the results for the baseline specification by gender. From <Table 2>, we can see that the effect of economic uncertainty on employment probability and log monthly wage differs across genders, especially in their early stages of career.

In what follows, we allow for heterogeneous effects and show the results by gender and education status, using both the OLS and the instrumental variable (IV) approach. We first discuss the effects on employment and then show the effects on wage.

1. Results on Employment

<Table 3> and <Table 4> present the effect of economic uncertainty, measured by the EPU index, on employment probability by male and female. The first three columns in <Table 3> reports the OLS regression results for male by their educational attainment, categorized into three groups, and the remaining three columns show the estimation results using the IV approach.

The OLS results suggest that greater economic uncertainty negatively influences employment during the early career period

〈Table 2〉 OLS and IV results by gender

	OLS				IV			
	Employed		Log monthly wage		Employed		Log monthly wage	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Male	Female	Male	Female	Male	Female	Male	Female
EPU*Exp0-1	-0.016***	0.001	-0.008**	0.002	-0.079***	-0.019***	-0.035**	-0.020***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.014)	(0.006)	(0.014)	(0.006)
EPU*Exp2-3	-0.005**	0.003	-0.001	0.003	0.025	0.018***	-0.025	-0.000
	(0.002)	(0.003)	(0.003)	(0.003)	(0.036)	(0.007)	(0.039)	(0.007)
EPU*Exp4-5	-0.001	0.005*	-0.001	0.003	0.061**	0.015**	0.043	0.002
	(0.002)	(0.003)	(0.003)	(0.003)	(0.030)	(0.007)	(0.028)	(0.007)
EPU*Exp6-7	0.001	0.005*	-0.004	-0.001	-0.017	0.010	0.039	-0.003
	(0.002)	(0.003)	(0.003)	(0.003)	(0.033)	(0.009)	(0.032)	(0.008)
EPU*Exp8-9	0.001	-0.000	-0.001	-0.001	-0.009	-0.016**	-0.023	0.004
	(0.002)	(0.003)	(0.003)	(0.005)	(0.023)	(0.008)	(0.024)	(0.011)
EPU*Exp10-11	-0.001	-0.001	0.000	0.000	0.014	-0.021**	0.018	-0.015
	(0.002)	(0.003)	(0.003)	(0.004)	(0.023)	(0.008)	(0.023)	(0.013)
EPU*Exp12-13	0.000	0.001	0.003	-0.005	0.001	-0.013	0.022	-0.014
	(0.002)	(0.003)	(0.004)	(0.005)	(0.017)	(0.008)	(0.021)	(0.011)
EPU*Exp14-15	-0.003	0.002	0.004	-0.012**	0.047	-0.002	-0.065	-0.012
	(0.002)	(0.004)	(0.005)	(0.006)	(0.068)	(0.010)	(0.069)	(0.014)
EPU*Exp16-17	-0.008***	0.007	-0.001	-0.026***	0.002	0.025**	0.065	-0.083***
	(0.003)	(0.006)	(0.006)	(0.009)	(0.121)	(0.013)	(0.101)	(0.021)
EPU*Exp18-19	-0.014***	0.019**	-0.008	-0.032***	-0.086*	0.039*	-0.083	-0.124***
	(0.005)	(0.010)	(0.008)	(0.011)	(0.049)	(0.021)	(0.055)	(0.036)
EPU*Exp20plus	-0.012	0.060	0.038	-0.085	-0.303*	0.060	-0.151	-0.101
	(0.021)	(0.039)	(0.031)	(0.056)	(0.183)	(0.229)	(0.191)	(0.358)
Observations	29084	31242	20313	14316	29084	31242	20313	14316

Note: In addition to the control variables specified in eq (1), we control for educational attainment by using binary indicators for two-year and four-year college graduates. * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

regardless of one's educational attainment. The increase in 1 unit of our EPU measure (which is divided by 10 from the original EPU index so that the mean is about 9 and standard deviation is 3.3, as shown in Table 1) corresponds to roughly 0.3 standard deviations. Thus, the coefficient estimate of 0.03 in the first row in column (1)indicates that when EPU increases by 0.3 standard deviations, employment probability decreases by 3 percentage points in the first year. Considering the average employment rate of male is 0.83, an increase in EPU by one standard deviation leads to 10 percentage points (1/0.3*3) decrease in employment probability, which amounts to 12 percent (0.1/0.83*100) reduction in the employment rate. The negative effects of EPU seem to disappear after a couple of years, but column (1) shows that high school graduates take longer years to recover from this initial employment shock (seven years), compared to two-year or four-year college graduates (one to three years). Although the IV estimates are less precise, the sign and the magnitude are similar to the OLS results.

The finding that male high school graduates experience stronger negative effects on employment compared to males who graduated from college is consistent with Genda et al. (2010) who use unemployment rate as a measure of economic condition at labor market entry. In particular, Genda et al. (2010) find that, for less-educated Japanese men, a one percentage point rise in the unemployment rate at entry reduces the likelihood of employment by 3-4 percentage points for over twelve years. Cockx and Chirelli (2016) find that a typical recession (which increases the unemployment rate by 1.4 percentage point) would induce the annual hours worked of the low-educated to decrease by about 4.5 percent up to twelve years after graduation, while they find no effect on employment.

〈Table 3〉 Effect of uncertainty on employment probability on male, by education

	(1)	(2)	(3)	(4)	(5)	(6)
	Low	Mid	High	Low	Mid	High
		OLS			IV	
EPU*Exp0-1	-0.030***	-0.016***	-0.010***	-0.039	-0.127	-0.038
	(0.005)	(0.004)	(0.003)	(0.024)	(0.160)	(0.030)
EPU*Exp2-3	-0.018***	-0.006*	-0.003	-0.023	-0.159	-0.084
	(0.006)	(0.004)	(0.003)	(0.019)	(0.222)	(0.103)
EPU*Exp4-5	-0.008*	-0.003	0.002	0.001	0.241	0.110
	(0.004)	(0.003)	(0.003)	(0.025)	(0.423)	(0.085)
EPU*Exp6-7	-0.010**	-0.001	0.005**	-0.019	-0.487	0.025
	(0.005)	(0.003)	(0.002)	(0.069)	(0.947)	(0.077)
EPU*Exp8-9	0.006	-0.001	0.000	-0.022	0.192	-0.054
	(0.005)	(0.003)	(0.002)	(0.148)	(0.639)	(0.051)
EPU*Exp10-11	0.003	-0.003	-0.002	0.032	0.026	-0.008
	(0.004)	(0.003)	(0.002)	(0.040)	(0.339)	(0.046)
EPU*Exp12-13	0.004	-0.003	0.001	0.082	-0.308	0.006
	(0.004)	(0.003)	(0.002)	(0.456)	(0.494)	(0.022)
EPU*Exp14-15	0.004	-0.004	-0.006**	-0.178	0.262	0.017
	(0.004)	(0.006)	(0.003)	(0.874)	(0.976)	(0.019)
EPU*Exp16-17	-0.002	-0.006	-0.013***	0.151	0.126	-0.005
	(0.005)	(0.005)	(0.005)	(0.512)	(0.430)	(0.039)
EPU*Exp18-19	-0.007	-0.013*	-0.023***	0.010	-0.038	-0.041
	(0.007)	(0.008)	(0.007)	(0.132)	(0.386)	(0.037)
EPU*Exp20plus	-0.015	-0.017	-0.027	-0.074	1.548	0.042
	(0.016)	(0.028)	(0.041)	(0.274)	(2.946)	(0.553)
Observations	9494	7214	12376	9494	7214	12376

Note: 'Low' indicates those with high school degree; 'Mid' indicates those who went to two-year college; 'High' indicates those who went to four-year college. * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

According to <Table 4>, the pattern of the effect of economic uncertainty on female high school graduates' employment probability is similar to their male counterparts but with a faster recovery, experiencing two years of negative effect of EPU. However, based on the OLS results, college-graduate females do not seem to be affected by the EPU much and the effect is less precisely estimated. Although the magnitude of the effect for women in column (1)is half of those of the males, it is still an equally sizable effect in terms of the effect in percent of the employment rate of the female, which is 0.52. For

instance, for females, an increase in EPU by one standard deviation in the first two years after the graduation leads to 4.2 percentage points (3*0.014) reduction in employment probability, which amounts to roughly 8percent (0.042/0.52*100) decrease in the employment rate.

The finding that negative effects last longer for less educated workers is consistent with Hoynes et al. (2012) and Schwandt and von Watcher (2019), who find that more disadvantaged groups, such as low-education workers or minorities, experience larger increases in unemployment during recessions.

〈Table 4〉 Effect of uncertainty on employment probability on female, by education

	(1)	(2)	(3)	(4)	(5)	(6)
	Low	Mid	High	Low	Mid	High
		OLS			IV	
EPU*Exp0-1	-0.014**	0.005	0.002	-0.018***	-0.013	-0.026**
	(0.005)	(0.004)	(0.004)	(0.007)	(0.014)	(0.013)
EPU*Exp2-3	-0.005	0.006	0.004	-0.001	0.020	0.012
	(0.006)	(0.004)	(0.004)	(0.009)	(0.015)	(0.014)
EPU*Exp4-5	0.005	0.006	0.005	0.014*	0.025	-0.003
	(0.006)	(0.005)	(0.004)	(0.009)	(0.015)	(0.011)
EPU*Exp6-7	0.010	0.010**	-0.000	0.018	0.027	-0.015
	(0.007)	(0.005)	(0.005)	(0.011)	(0.017)	(0.014)
EPU*Exp8-9	0.001	0.003	-0.004	-0.004	-0.034*	-0.021
	(0.007)	(0.005)	(0.005)	(0.011)	(0.021)	(0.013)
EPU*Exp10-11	-0.007	0.004	-0.002	-0.017**	-0.001	-0.031**
	(0.005)	(0.006)	(0.005)	(0.008)	(0.020)	(0.015)
EPU*Exp12-13	-0.000	0.006	-0.002	-0.007	-0.018	-0.018
	(0.006)	(0.006)	(0.005)	(0.009)	(0.023)	(0.015)
EPU*Exp14-15	0.006	0.006	-0.003	-0.002	0.033	-0.016
	(0.007)	(0.008)	(0.009)	(0.011)	(0.032)	(0.021)
EPU*Exp16-17	0.016	0.003	0.001	0.021	0.055	0.011
	(0.010)	(0.011)	(0.011)	(0.016)	(0.039)	(0.027)
EPU*Exp18-19	0.022	0.026	0.013	0.042*	0.082	0.007
	(0.014)	(0.016)	(0.016)	(0.025)	(0.069)	(0.050)
EPU*Exp20plus	0.020	0.106	0.126**	0.028	1.159	-0.310
	(0.049)	(0.075)	(0.057)	(0.136)	(1.523)	(0.548)
Observations	11957	8810	10475	11957	8810	10475

Note: 'Low' indicates those with high school degree; 'Mid' indicates those who went to two-year college; 'High' indicates those who went to four-year college. * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

The regression results concerning the likelihood of employment for each of the three graduate groups for each gender are summarized in <Figure 2>. We can observe that the negative impact of an increased economic uncertainty on male employment probability and female high school graduates' employment probability fades out as expected years of experience increases. Yet, female two-year and four-year college graduates' employment probabilities are not affected much by an increase in the EPU index at the time of their graduation.

〈Figure 2〉 Effects of the EPU on employment, by education and gender

Note: From left to right: High school graduates, two-year college graduates and four-year college graduates.

2. Results on wages

The OLS and IV regression results of the effect of economic uncertainty on log monthly wage by educational attainment and gender are reported in <Table 5> and <Table 6>. For males, as shown in <Table 5> and in the top panel of <Figure 3>, it is the

two-year college graduates who experience the negative effect of the EPU the most, for nearly eight years. Although the IV estimates are less precise, they are consistent with the OLS results in terms of the sign. For high school graduates and four-year college graduates, the OLS and IV results are mostly not statistically significant.

For females, as shown in <Table 6> and in the bottom panel of <Figure 3>, it is the four-year college graduates who feel the greatest adverse effect of high economic uncertainty, particularly in the later years of their career.

〈Table 5〉 Effect of uncertainty on log monthly wage on male, by education

	(1)	(2)	(3)	(4)	(5)	(6)
	Low	Mid	High	Low	Mid	High
		OLS			IV	
EPU*Exp0-1	-0.013**	-0.012***	-0.005	-0.065	-0.118*	-0.053*
	(0.006)	(0.004)	(0.005)	(0.999)	(0.061)	(0.027)
EPU*Exp2-3	-0.000	-0.007	0.001	-0.042	-0.040	-0.047
	(0.007)	(0.004)	(0.004)	(0.591)	(0.092)	(0.051)
EPU*Exp4-5	0.002	-0.004	-0.000	-0.023	-0.047	0.077
	(0.006)	(0.004)	(0.004)	(0.778)	(0.174)	(0.081)
EPU*Exp6-7	0.003	-0.010**	-0.002	0.046	-0.010	0.056
	(0.005)	(0.004)	(0.004)	(1.116)	(0.343)	(0.054)
EPU*Exp8-9	0.005	-0.008*	0.001	-0.195	-0.171	-0.046
	(0.006)	(0.005)	(0.004)	(3.704)	(0.311)	(0.041)
EPU*Exp10-11	0.011*	-0.004	-0.002	0.129	0.006	-0.024
	(0.007)	(0.005)	(0.004)	(1.844)	(0.192)	(0.038)
EPU*Exp12-13	0.017**	-0.008	0.003	0.461	-0.090	0.018
	(0.007)	(0.005)	(0.005)	(7.409)	(0.086)	(0.038)
EPU*Exp14-15	0.014*	-0.000	-0.001	-0.988	-0.075	-0.027
	(0.008)	(0.007)	(0.007)	(17.241)	(0.134)	(0.044)
EPU*Exp16-17	0.016	-0.008	-0.009	0.635	-0.123	-0.004
	(0.010)	(0.010)	(0.009)	(10.862)	(0.120)	(0.058)
EPU*Exp18-19	0.014	-0.031**	-0.020	0.220	-0.256*	-0.081
	(0.012)	(0.014)	(0.013)	(2.475)	(0.144)	(0.068)
EPU*Exp20plus	0.057*	0.074	-0.041	0.448	0.043	1.166
	(0.035)	(0.094)	(0.076)	(5.456)	(0.933)	(1.330)
Observations	5918	5374	9021	5918	5374	9021

Note: 'Low' indicates those with high school degree; 'Mid' indicates those who went to two-year college; 'High' indicates those who went to four-year college. * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

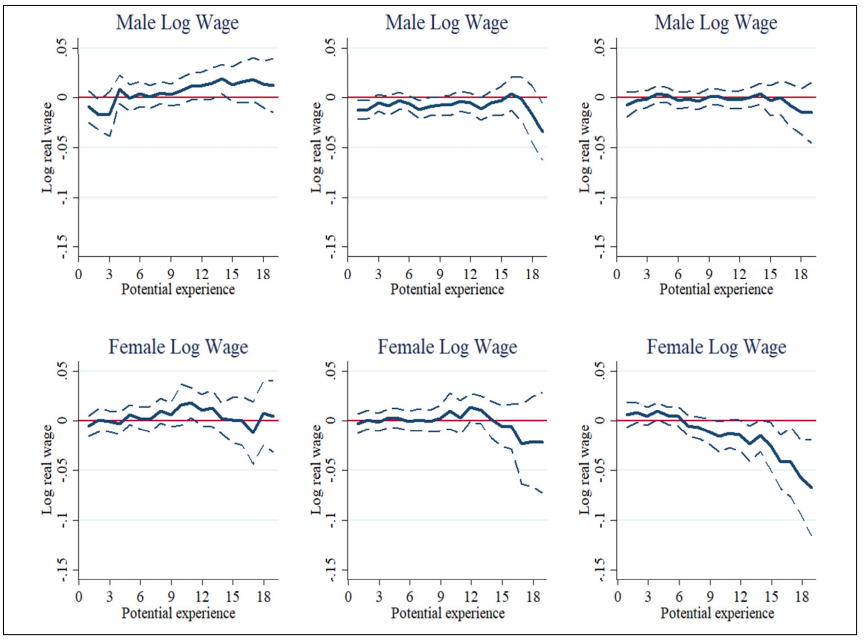
〈Table 6〉 Effect of uncertainty on log monthly wage on female, by education

	(1)	(2)	(3)	(4)	(5)	(6)
	Low	Mid	High	Low	Mid	High
		OLS			IV	
EPU*Exp0-1	-0.002	-0.001	0.006	0.001	-0.027**	-0.032**
	(0.005)	(0.004)	(0.005)	(0.007)	(0.012)	(0.013)
EPU*Exp2-3	-0.001	-0.000	0.007	-0.005	0.006	-0.004
	(0.005)	(0.004)	(0.004)	(0.009)	(0.015)	(0.013)
EPU*Exp4-5	0.005	0.000	0.004	0.011	-0.006	-0.000
	(0.005)	(0.005)	(0.005)	(0.008)	(0.016)	(0.012)
EPU*Exp6-7	0.006	0.001	-0.006	0.004	-0.001	-0.009
	(0.006)	(0.005)	(0.005)	(0.009)	(0.016)	(0.016)
EPU*Exp8-9	0.010	0.005	-0.013*	0.027**	0.000	-0.016
	(0.008)	(0.007)	(0.007)	(0.013)	(0.021)	(0.021)
EPU*Exp10-11	0.013*	0.008	-0.014*	0.018	-0.035	-0.037*
	(0.007)	(0.007)	(0.007)	(0.012)	(0.030)	(0.022)
EPU*Exp12-13	0.006	0.007	-0.019**	-0.007	0.008	-0.035*
	(0.007)	(0.007)	(0.008)	(0.012)	(0.032)	(0.020)
EPU*Exp14-15	-0.001	-0.005	-0.031***	0.019	-0.059	-0.043
	(0.010)	(0.009)	(0.011)	(0.016)	(0.054)	(0.028)
EPU*Exp16-17	-0.005	-0.022	-0.044***	-0.036	-0.143*	-0.097**
	(0.014)	(0.018)	(0.015)	(0.028)	(0.080)	(0.045)
EPU*Exp18-19	-0.002	-0.019	-0.064***	-0.000	-0.178	-0.274***
	(0.018)	(0.021)	(0.024)	(0.046)	(0.113)	(0.088)
EPU*Exp20plus	-0.013	0.078	-0.313***	-0.233	0.067	-0.008
	(0.072)	(0.117)	(0.117)	(0.259)	(1.416)	(0.918)
Observations	4621	4381	5314	4621	4381	5314

Note: 'Low' indicates those with high school degree; 'Mid' indicates those who went to two-year college; 'High' indicates those who went to four-year college. * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Our results on wage are comparable with the previous literature using the unemployment rate as a measure of economic condition at entry. For instance, graduating from college during a recession imposes the negative long-lasting effect on wages up to ten years or longer (for Austria, Brunner and Kuhn, 2014 for Canada, Oreopoulos et al., 2012for the US, Kahn, 2010; and for Japan and the US, Genda et al., 2010). In particular, Brunner and Khun (2014) find that an increase in the initial local unemployment rate by one percentage point results in a decrease in starting wages by about 0.9 percent and a lifetime loss in wages of about 1.3 percent. Oreopoulos et al. (2012)

〈Figure 3〉 Effects of the EPU on wages, by education and gender



Note: From left to right: High school graduates, two-year college graduates and four-year college graduates.

find a substantial initial wage penalty of about 9 percent that lasts up to the first decade of a worker's career. Kahn (2010) finds that in response to a 1 percentage point increase in national unemployment rate, the initial effect is a wage loss of 0.062 log points and this negative effect lasts up to the tenth year after college graduation. Similarly, for Japanese men, Genda et al. (2010) find that a one percentage point rise in the unemployment rate at entry decreases earning losses by 5-7 percent for over 12 years for the group without college education and by 5 percent for more-educated Japanese, where the gap gradually fades up to 2.3 percent. For American men, they find only a temporary effect for the less-educated group and for more-educated Americans, the effect gradually disappears in about ten years.

3. Robustness Checks

Finally, we offer three specifications to check robustness of our results and report them in Appendix Tables A2 to A5. First, we control for GDP growth rate at the time of graduation in our baseline specification to address the concern that GDP growth rate may also be correlated with EPU and can influence labor market outcomes of the individuals (Model 1). Second, we control for time-varying region level economic conditions by including fully interacted terms between time and region fixed effects (Model 2). Third, youth unemployment rate may better capture the economic condition of young workers at the time of labor market entry than the overall unemployment rate. To check whether our results are sensitive to using youth unemployment rate, we use youth unemployment rate instead of the overall unemployment rate (Model 3). Our results are qualitatively similar to the baseline results in all three specifications.

Ⅴ. Conclusions

We study the time-varying effects of policy-related economic uncertainty at the beginning of individuals' careers on their labor market outcomes, both the extensive margins of getting employed or not and wage. Our analysis is pertinent given that the youth unemployment rate in South Korea has steadily increased during the past decade, from 8.7 percent in 2007 to 10.5 percent in 2018. OECD (2019), Youth unemployment rate (indicator). doi: 10.1787/c3634df7-en (Accessed on 25 February 2019) Despite its importance, there has been no systematic evaluation of the effects of uncertainty during graduates' early careers on their long-term labor market performance. Our findings suggest heterogeneous effects of policy-related economic

uncertainty on employment and wage. For males, we find stronger negative employment effects for high school graduates than for college graduates. However, among those employed, the persistent negative wage effect for males is observed for two-year college graduates mostly. For females, we find some evidence that high school graduate females suffer from an initial decrease in employment as a result of high uncertainty. Among employed females, four-year college graduates exhibit negative wage effects as a result of uncertainty at later years of their career. With regard to the role of public programs in buffering the negative effects of graduating during a recession, Schwandt and von Watcher (2019) find that the benefits of social insurance, such as Medicaid and Supplemental Nutrition Assistance Program (SNAP), may partially cancel thenegative impacts of a recession. Investigating the role of social insurance and other government-provided support programs in mitigating the negative effects of uncertainty would be a fruitful avenue for future research.

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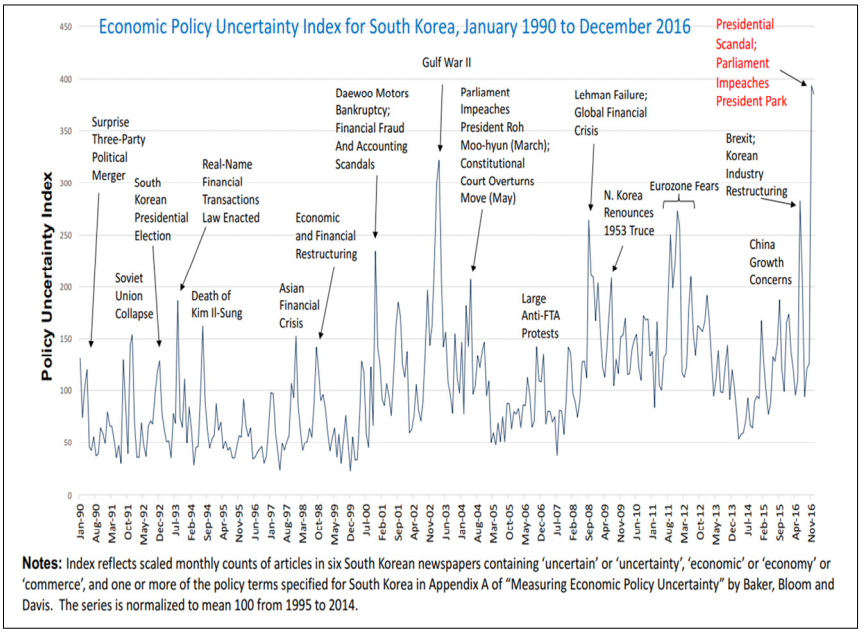
Appendix

〈Figure A1〉



Source: https://www.policyuncertainty.com/.

〈Table A1〉 The relation between EPU and future/past unemployment rate

	(1) EPU	(2) EPU	(3) EPU	(4) EPU	(5) EPU
URt	-0.090			-0.054	0.147
	(0.706)			(1.206)	(1.366)
URt-1		-0.037		-0.027	-1.136
		(0.712)		(0.997)	(1.289)
URt+1			-0.168	-0.248	0.353
			(0.727)	(1.011)	(1.288)
URt-2					1.384
					(1.005)
URt+2					-0.985
					(1.026)
Constant	10.296***	10.257***	10.632***	11.318***	11.071**
	(2.445)	(2.473)	(2.545)	(3.657)	(4.898)
Observations	25	24	24	23	21

Note: * p<0.10, ** p<0.05, *** p<0.01.

〈Table A2〉 Effect of uncertainty on employment probability on male, by education

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Low	Mid	High	Low	Mid	High	Low	Mid	High
		Model 1			Model 2			Model 3	
EPU*Exp0-1	-0.030***	-0.015***	-0.010***	-0.029***	-0.016***	-0.010***	-0.028***	-0.017***	-0.007*
	(0.005)	(0.004)	(0.003)	(0.005)	(0.004)	(0.003)	(0.005)	(0.004)	(0.004)
EPU*Exp2-3	-0.018***	-0.006	-0.003	-0.019***	-0.006*	-0.003	-0.015**	-0.006	-0.004
	(0.006)	(0.004)	(0.003)	(0.006)	(0.004)	(0.003)	(0.007)	(0.004)	(0.004)
EPU*Exp4-5	-0.008*	-0.003	0.001	-0.008*	-0.003	0.002	-0.008	-0.003	0.000
	(0.005)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.005)	(0.004)	(0.003)
EPU*Exp6-7	-0.010**	-0.000	0.004*	-0.010**	-0.001	0.005*	-0.015***	-0.000	0.005*
	(0.005)	(0.003)	(0.002)	(0.005)	(0.003)	(0.003)	(0.006)	(0.003)	(0.003)
EPU*Exp8-9	0.006	-0.000	-0.001	0.005	-0.000	-0.000	0.006	0.000	-0.001
	(0.005)	(0.003)	(0.002)	(0.005)	(0.003)	(0.002)	(0.006)	(0.003)	(0.002)
EPU*Exp10-11	0.003	-0.003	-0.002	0.003	-0.004	-0.002	0.002	-0.004	-0.003
	(0.004)	(0.003)	(0.002)	(0.004)	(0.003)	(0.002)	(0.005)	(0.003)	(0.002)
EPU*Exp12-13	0.004	-0.003	0.001	0.004	-0.003	0.001	0.003	-0.003	0.003
	(0.004)	(0.004)	(0.002)	(0.004)	(0.003)	(0.002)	(0.004)	(0.004)	(0.002)
EPU*Exp14-15	0.004	-0.003	-0.007**	0.003	-0.003	-0.005*	0.005	-0.003	-0.005
	(0.005)	(0.006)	(0.003)	(0.005)	(0.006)	(0.003)	(0.005)	(0.007)	(0.003)
EPU*Exp16-17	-0.001	-0.005	-0.014***	-0.002	-0.006	-0.011**	-0.000	-0.005	-0.011**
	(0.005)	(0.006)	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)	(0.006)	(0.005)
EPU*Exp18-19	-0.007	-0.013	-0.023***	-0.008	-0.013	-0.020***	-0.005	-0.012	-0.020**
	(0.007)	(0.008)	(0.007)	(0.008)	(0.008)	(0.007)	(0.009)	(0.009)	(0.008)
EPU*Exp20plus	-0.015	-0.018	-0.024	-0.013	-0.017	-0.030	-0.011	-0.015	-0.023
	(0.016)	(0.028)	(0.041)	(0.017)	(0.029)	(0.042)	(0.015)	(0.026)	(0.040)
Observations	9494	7214	12376	9494	7214	12376	9494	7214	12376

Note: 'Low'indicates those with high school degree; 'Mid' indicates those who went to two-year college; 'High'indicates those who went to four-year college. Model 1 shows the results after including real GDP growth rate as a control variable to the baseline model. Model 2 shows the results after including fully interacted terms between time and region fixed effects. Model 3 shows the results of using youth unemployment rate instead of overall unemployment rate. * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

〈Table A3〉 Effect of uncertainty on employment probability on female, by education

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Low	Mid	High	Low	Mid	High	Low	Mid	High
		Model 1			Model 2			Model 3	
EPU*Exp0-1	-0.012**	0.006	0.005	-0.014**	0.005	0.002	-0.016***	0.003	0.002
	(0.006)	(0.005)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)	(0.005)	(0.004)
EPU*Exp2-3	-0.003	0.007	0.007*	-0.004	0.006	0.004	-0.010	0.004	0.004
	(0.007)	(0.005)	(0.004)	(0.006)	(0.004)	(0.004)	(0.007)	(0.005)	(0.004)
EPU*Exp4-5	0.007	0.006	0.007*	0.005	0.006	0.004	0.002	0.005	0.004
	(0.007)	(0.005)	(0.004)	(0.006)	(0.005)	(0.004)	(0.007)	(0.005)	(0.004)
EPU*Exp6-7	0.012*	0.011**	0.002	0.011*	0.011**	-0.001	0.011	0.012**	-0.001
	(0.007)	(0.005)	(0.005)	(0.007)	(0.005)	(0.005)	(0.007)	(0.006)	(0.005)
EPU*Exp8-9	0.003	0.004	-0.001	0.002	0.003	-0.004	-0.000	0.004	-0.004
	(0.007)	(0.005)	(0.005)	(0.007)	(0.006)	(0.005)	(0.008)	(0.006)	(0.006)
EPU*Exp10-11	-0.004	0.005	0.000	-0.007	0.004	-0.003	-0.009	0.006	-0.001
	(0.006)	(0.006)	(0.005)	(0.005)	(0.006)	(0.005)	(0.006)	(0.006)	(0.006)
EPU*Exp12-13	0.002	0.007	0.001	-0.001	0.006	-0.002	-0.000	0.008	-0.002
	(0.007)	(0.006)	(0.005)	(0.006)	(0.006)	(0.005)	(0.007)	(0.006)	(0.005)
EPU*Exp14-15	0.008	0.007	-0.000	0.005	0.007	-0.002	0.008	0.006	-0.002
	(0.008)	(0.008)	(0.009)	(0.007)	(0.008)	(0.009)	(0.008)	(0.009)	(0.010)
EPU*Exp16-17	0.018*	0.004	0.006	0.015	0.004	0.001	0.017	-0.001	0.005
	(0.010)	(0.011)	(0.012)	(0.010)	(0.011)	(0.011)	(0.010)	(0.012)	(0.012)
EPU*Exp18-19	0.021	0.026	0.013	0.019	0.027	0.011	0.022	0.026	0.020
	(0.014)	(0.016)	(0.016)	(0.014)	(0.017)	(0.017)	(0.017)	(0.021)	(0.020)
EPU*Exp20plus	0.013	0.104	0.117**	0.015	0.104	0.119**	0.027	0.102	0.114**
	(0.049)	(0.075)	(0.057)	(0.046)	(0.074)	(0.058)	(0.045)	(0.066)	(0.054)
Observations	11957	8810	10475	11957	8810	10475	11957	8810	10475

Note: 'Low'indicates those with high school degree; 'Mid' indicates those who went to two-year college; 'High' indicates those who went to four-year college. Model 1 shows the results after including real GDP growth rate as a control variable to the baseline model. Model 2 shows the results after including fully interacted terms between time and region fixed effects. Model 3 shows the results of using youth unemployment rate instead of overall unemployment rate. * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

〈Table A4〉 Effect of uncertainty on log monthly wage on male, by education

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Low	Mid	High	Low	Mid	High	Low	Mid	High
		Model 1			Model 2			Model 3	
EPU*Exp0-1	-0.012*	-0.013***	-0.006	-0.013**	-0.011**	-0.004	-0.015**	-0.010**	-0.004
	(0.007)	(0.004)	(0.005)	(0.006)	(0.004)	(0.005)	(0.007)	(0.004)	(0.005)
EPU*Exp2-3	0.001	-0.007	0.000	-0.000	-0.007*	0.000	0.003	-0.006	0.003
	(0.008)	(0.004)	(0.004)	(0.007)	(0.004)	(0.004)	(0.009)	(0.004)	(0.004)
EPU*Exp4-5	0.003	-0.005	-0.001	0.003	-0.004	-0.001	0.003	-0.004	-0.001
	(0.006)	(0.004)	(0.004)	(0.006)	(0.004)	(0.004)	(0.006)	(0.004)	(0.004)
EPU*Exp6-7	0.004	-0.011**	-0.003	0.005	-0.011**	-0.002	0.003	-0.012**	-0.004
	(0.006)	(0.005)	(0.004)	(0.006)	(0.005)	(0.004)	(0.006)	(0.005)	(0.004)
EPU*Exp8-9	0.006	-0.008*	0.000	0.005	-0.008*	0.002	0.004	-0.010**	0.001
	(0.006)	(0.005)	(0.004)	(0.006)	(0.005)	(0.004)	(0.006)	(0.005)	(0.004)
EPU*Exp10-11	0.012*	-0.004	-0.003	0.012*	-0.005	-0.002	0.011	-0.005	-0.004
	(0.007)	(0.005)	(0.004)	(0.006)	(0.005)	(0.004)	(0.007)	(0.005)	(0.004)
EPU*Exp12-13	0.017**	-0.008	0.002	0.015**	-0.009*	0.003	0.017**	-0.009	0.003
	(0.007)	(0.006)	(0.005)	(0.007)	(0.005)	(0.005)	(0.008)	(0.006)	(0.005)
EPU*Exp14-15	0.015*	-0.001	-0.002	0.013	0.000	-0.002	0.013	0.003	0.000
	(0.008)	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)	(0.009)	(0.007)	(0.008)
EPU*Exp16-17	0.016*	-0.009	-0.011	0.015	-0.009	-0.011	0.018*	-0.004	-0.010
	(0.010)	(0.011)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.012)	(0.011)
EPU*Exp18-19	0.014	-0.031**	-0.020	0.012	-0.032**	-0.022*	0.017	-0.029*	-0.021
	(0.012)	(0.014)	(0.013)	(0.013)	(0.014)	(0.014)	(0.014)	(0.016)	(0.015)
EPU*Exp20plus	0.053	0.076	-0.038	0.057	0.071	-0.052	0.053*	0.082	-0.043
	(0.034)	(0.094)	(0.076)	(0.036)	(0.097)	(0.076)	(0.032)	(0.093)	(0.071)
Observations	5918	5374	9021	5918	5374	9021	5918	5374	9021

Note: 'Low'indicates those with high school degree; 'Mid' indicates those who went to two-year college; 'High'indicates those who went to four-year college. Model 1 shows the results after including real GDP growth rate as a control variable to the baseline model. Model 2 shows the results after including fully interacted terms between time and region fixed effects. Model 3 shows the results of using youth unemployment rate instead of overall unemployment rate. * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

〈Table A5〉 Effect of uncertainty on log monthly wage on female, by education

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Low	Mid	High	Low	Mid	High	Low	Mid	High
		Model 1			Model 2			Model 3	
EPU*Exp0-1	-0.001	-0.003	0.007	-0.001	-0.001	0.007	-0.000	-0.000	0.007
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)
EPU*Exp2-3	-0.001	-0.002	0.008*	-0.001	0.002	0.007*	-0.002	-0.000	0.006
	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)
EPU*Exp4-5	0.005	-0.001	0.005	0.004	0.001	0.005	0.005	-0.000	0.003
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
EPU*Exp6-7	0.006	-0.001	-0.005	0.005	0.001	-0.005	0.005	-0.000	-0.008
	(0.006)	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)	(0.007)	(0.006)	(0.005)
EPU*Exp8-9	0.010	0.004	-0.011*	0.009	0.005	-0.011	0.009	0.006	-0.014*
	(0.007)	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)	(0.009)	(0.008)	(0.007)
EPU*Exp10-11	0.013*	0.006	-0.012*	0.012*	0.008	-0.014*	0.014*	0.009	-0.013*
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)	(0.007)
EPU*Exp12-13	0.006	0.005	-0.018**	0.006	0.007	-0.019**	0.005	0.008	-0.018**
	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)	(0.008)	(0.007)	(0.008)	(0.009)
EPU*Exp14-15	-0.000	-0.007	-0.029***	-0.003	-0.006	-0.032***	-0.001	-0.007	-0.032**
	(0.011)	(0.009)	(0.011)	(0.010)	(0.009)	(0.012)	(0.011)	(0.009)	(0.013)
EPU*Exp16-17	-0.004	-0.025	-0.043***	-0.006	-0.021	-0.046***	-0.005	-0.028	-0.047***
	(0.014)	(0.019)	(0.016)	(0.015)	(0.019)	(0.015)	(0.016)	(0.021)	(0.017)
EPU*Exp18-19	-0.002	-0.019	-0.065***	-0.005	-0.023	-0.063***	0.000	-0.027	-0.066**
	(0.017)	(0.021)	(0.024)	(0.019)	(0.024)	(0.024)	(0.021)	(0.027)	(0.031)
EPU*Exp20plus	-0.014	0.082	-0.318***	-0.012	0.108	-0.329***	-0.015	0.072	-0.297***
	(0.072)	(0.118)	(0.117)	(0.075)	(0.118)	(0.119)	(0.067)	(0.118)	(0.109)
Observations	4621	4381	5314	4621	4381	5314	4621	4381	5314

Note: 'Low' indicates those with high school degree; 'Mid' indicates those who went to two-year college; 'High'indicates those who went to four-year college. Model 1 shows the results after including real GDP growth rate as a control variable to the baseline model. Model 2 shows the results after including fully interacted terms between time and region fixed effects. Model 3 shows the results of using youth unemployment rate instead of overall unemployment rate. * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

졸업 당시 경제 정책 불확실성이 개인의 장기 노동 시장에 미치는 영향

정 혜 윤* · 한 유 진** · 임 승 필***

논문초록

본 논문은 한국노동패널조사 자료를 이용하여 1990-2014년도에 노동시장에 진입한 사람들을 대상으로 졸업 당시의 경제 정책 불확실성(EPU)이 고용과 임금에 어떤 장기적 영향을 미치는지 분석한다. 본 논문에서는 성별, 학력별 효과의 이질성을 확인한다. 남성의 경우, 졸업 당시의 경제 정책 불확실성이 대졸자들보다는 고졸자들의 고용 확률에 더 부정적 영향을 주는 것으로 나타났고, 그 영향 또한 더 오래 지속되는 것으로 나타났다. 반면에 임금 측면에서는 2년제 졸업 남성들이 지속적으로 졸업 당시의 경제 정책 불확실성에 부정적인 영향을 받았다. 여성의 경우, 졸업 당시 경제 정책 불확실성이 높을 경우 고졸자들의 초기 고용 확률이 감소하고 고학력 여성들은 경력 후반부에 임금 손실을 경험하는 것으로 나타난다.

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* 제1저자, 연세대학교 경제학부 박사과정, e-mail: h.chung@yonsei.ac.kr
** 제2저자 및 교신저자, 연세대학교 경제학부 부교수, e-mail: youjin.hahn@yonsei.ac.kr
*** 제3저자, 연세대학교 경제학부 석사과정, e-mail: splim@yonsei.ac.kr