
Empirical Analysis of Starting Salaries of College Graduates based on Their University-Industry Cooperation Activities

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ARTICLE INFO

Article history:

Received 23 December 2022

Revised 01 January 2022

Accepted 04 January 2022

Keywords:

University-Industry Cooperation,
Starting Salaries,
GOMS,
Qualitative Performance,
College Graduates

ABSTRACT

Fifteen years have passed since the enactment of the Industrial Technology Innovation Promotion Act, which promoted industry cooperation activities for universities. Therefore, the study analyzes the relationship between the university's industrial cooperation activities and the college graduates' starting salaries and provides policy suggestions on improving the direction of university-industry cooperation. The study used nine-year panel data from Graduates Occupational Mobility Survey (GOMS) to conduct an empirical analysis and found that starting salaries of college graduates were not significantly higher if the university only participated in basic industry cooperation activities. On the other hand, when the quality of university-industry cooperation activities was higher, such as job search support, the starting salary of college graduates was higher. The findings suggest that university-industry cooperation activities must focus on qualitative performances rather than quantitative approaches.

1. Introduction

Fifteen years have passed since the enactment of the Industrial Technology Innovation Promotion Act, which promoted industry cooperation activities for universities. During that time, Korean government agencies, such as the Ministry of Education (MOE), the Ministry of Trade, Industry and Energy (MOTIE), and the university-industry cooperation organizations, focused on expanding and systematizing industrial cooperation activities of universities through various support and strategies. One of the major projects that MOTIE is putting its efforts into is the leaders in industry-university cooperation (LINC) project, which was implemented to strengthen university-industry cooperation through an industrial-academic convergence complex project.

As a result, the number of university-industry cooperation foundation staff has increased by 22.3%, and the number of capstone design courses, where students work as a team to build and test prototypes with real-world applications, has increased by 21.1% over the past five years. In addition, 160,000 students completed on-site practical training in 2016 (MOE, 2020). However, it is necessary to review

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International Journal of Knowledge Content Development & Technology, 13(1): 101-109, 2023.
<http://dx.doi.org/10.5865/IJKCT.2023.13.1.101>

and examine whether university-industry cooperation activities focus on strengthening practical skills and the quantitative performance of students and how it affects the starting salaries of college graduates.

The policy goal of the Industrial Technology Innovation Promotion Act is to strengthen students' practical skills, not on the number of university-industry cooperation cases. For example, prior research shows that employment rate and wage level can naturally increase if students' practical skills are enhanced. Based on this research outcome, it is necessary to review and analyze the effect of the fifteen years of the Industrial Technology Innovation Promotion Act. Therefore, the study uses nine-year panel data from Graduates Occupational Mobility Survey (GOMS) to conduct an empirical analysis. The study analyzes the relationship between the university's industrial cooperation activities and the college graduates' starting salaries and provides policy suggestions on improving the direction of university-industry cooperation.

2. Literature Review

2.1 University-Industry Cooperation Activities in University Life

The study uses the definitions of university-industry cooperation activities under the Industrial Technology Innovation Promotion Act. The act defines university-industry cooperation activities in three ways. First, it is to develop and educate students to become productive members of society and helps meet human resource development requirements in various industries. Second, it is to conduct R&D to create and diffuse new knowledge and innovation to society. Lastly, it is to provide technology transfer and consultation. In general, university-industry cooperation is a strategic partnership between universities and firms to identify new market opportunities through the mutual exchange of human resources, knowledge, and equipment. University-industry cooperation activities for students include on-site practical training through education specific for developing practical skills for jobs, capstone design courses, and university-industry joint seminars and conferences (MOE, 2020).

2.2 Factors Affecting the Starting Salary of College Graduates

Prior research has made efforts to theorize, empirically analyze, and examine various factors affecting college graduates' starting salaries, as wage determination has emerged as a key concern in the labor market and industries. For example, Lee and Hong (2008) examined human characteristics, household characteristics, job attributes, and workplace attributes and their effect on wage determination and found that gender, age, educational background, gross household income in the previous year, higher grade professional and managerial occupations, job tenure, and job commitment to be significantly correlated to wage determination.

In addition, Kwon and Kim (2021) also analyzed the individual and university-level factors that influence the wage levels of college graduates. The authors found that gender, age, parent assets, the field of study, grade point average (GPA), and language experience were all significant in terms

of individual factors, and university location, types of universities and financial support amount per student were significant in terms of university-level factors. The results show that factors affecting college graduates' wage levels are diverse, from individual to social-economic factors. Therefore, this study explains the relationship between students' university-industry cooperation activities and their starting salaries.

2.3 Research Gap

So far, there has been relatively little research on university-industry cooperation activities and starting salaries of college graduates. However, studies have suggested that university-industry cooperation activities positively affect the employment rate and the wage level of college graduates. For example, Park, Park and Son (2015) found that university-level factors partially affect the wage levels of college graduates. In addition, Cho (2018) stated that the quality of on-the-job training and university-industry cooperation activities are highly correlated with students' employment rate and school loyalty.

However, one of the limitations of past research was that they did not conduct a trend analysis of how university-industry cooperation activities affect the starting salaries of college graduates using multi-year data set. Therefore, after examining the limitations of past studies, this study uses a multi-year data set from GOMS to conduct a statistical analysis on college graduates and their starting salary. By focusing on college graduates and their starting salaries, the study can overcome the discrepancies in the student's college life and wage levels.

3. Research Methodology

3.1 Variable Settings

The study defines students' university-industry cooperation activities during their college life as courses related to career development and employment as well as on-site practical training sessions and conducts an empirical analysis on the starting salaries of college graduates. The study focuses on college graduates with full-time employment and uses the average monthly salary as the variable for starting salaries.

Table 1 shows the research analysis framework regarding the relationship between university-industry cooperation activities of college graduates during their college life and their starting salaries. The study uses two independent variables (IVs). First, IV is a binary variable that describes the participation status of courses such as on-site training for college graduates during their college life. The second IV is also a binary variable that describes the level of job search support. The original variable was coded as an ordinal variable (a 5-point Likert scale that ranged from Extremely helpful (1) to Not-at-all helpful). The study recorded this variable into a binary variable using extremely helpful and somewhat helpful as helpful, and Not-at-all helpful and slightly unhelpful as not helpful.

Table 1. Analysis Framework and Variable Composition

	Spec	Variable Description	Variable Type
Independent Variable (IV)	University-Industry Cooperation (UIC) activities	1) Participation status of courses related to on-site training and UIC 2) Job search support level	Binary
Dependent Variable (DV)	Starting Salary	Average monthly salary for College Graduates (in ₩10,000)	Continuous

3.2 Research Data

The study uses Graduates Occupational Mobility Survey GOMS questionnaire results, a time-series data that includes wage levels of college graduates in South Korea. GOMS questionnaire surveys college graduates with a two-year college degree or higher every year and is conducted six months after graduation. Therefore, the study collected the starting salary of college graduates from 2011 to 2019.

4. Research Findings

4.1 Descriptive Statistics

The study conducted a basic descriptive statistic of the dataset and found a total of 88,037 college graduates from 2011-2019, of which 55% (49,193) were male and 45% (38,844). Therefore, the average number of respondents per year was 9,781 college graduates. The breakdown of the respondent is shown in Table 2.

Table 2. Number of gender respondents per year (person)

Student Gender	Year									Total
	2011	2012	2013	2014	2015	2016	2017	2018	2019	
Male	6345	5565	5398	5463	5411	5581	5396	5662	4372	49193
Female	4969	4759	4424	4289	4457	4098	3962	3923	3963	38844
Total	11314	10324	9822	9752	9868	9679	9358	9585	8335	88037

The study examined the data according to the school type and found that 65% of all college graduates who participated in the GOMS questionnaire from 2011 to 2019 were four-year university graduates. Only 26% of the respondents graduated from junior colleges. In addition, it was surprising that 77% of the respondents graduated from private universities, compared to national universities (22%) and public universities (1%). Also, most college graduates went to schools in Gyeongsang and Gyeonggi provinces, with 23,372 and 20,755 respondents, respectively. There was a total of 18,652 college graduates from universities in Seoul. Lastly, 27,335 graduates majored in engineering, while 19,561

and 10,330 majored in social science and natural sciences, respectively.

Table 3 shows the starting salaries of college graduates from 2011 to 2019. The average starting salary of the respondents from 2011 to 2019 is about ₩2,298,000. The highest starting salary (average) was in 2018, and the lowest was in 2012. Furthermore, the study found that most of the respondents were employed in small-and-medium enterprises (SMEs) with 10 to 29 employees, but there were also college graduates employed at big firms.

Table 3. The Annual Starting Salary of College Graduates (KRW 10,000) from 2011 to 2019

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	Mean
Starting Salary	6345	5565	5398	5463	5411	5581	5396	5662	4372	49193

4.2 Comparative Analysis of Starting Salary of College Graduates and Their University-Industry Cooperation Activities

4.2.1 Analysis Results of University-Industry Cooperation Activities

Before conducting the comparative analysis, the study found that 45% of the college graduates over the nine years participated in university-industry cooperation activities such as on-site practical training during their college life. College graduates in 2017 showed the highest percentage at 48%, and in 2019 had the lowest at 40%. Concerning whether the university-industry cooperation activities helped find a job after graduation, 74%, on average, of college graduates found it to be helpful. The study believes that analyzing the level of helpfulness of the university-industry cooperation activities can provide not only the educational level of the university but also the college graduates' UIC participation. Table 4 shows the questionnaire results of college graduates and their participation in university-industry cooperation activities from 2011 to 2019.

Table 4. Current status of college graduates in university-industry cooperation activities

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total	
Total	5001	4690	4692	4471	4187	4536	4527	4446	3295	36,550	
Participated	Helpful	3845	3591	3513	1972	1861	1945	1880	2091	1430	22,128 (74%)
	Not Helpful	1156	1099	1179	724	753	801	812	688	615	7,827 (26%)
Did not Participated	6313	5634	5130	5281	5681	5143	4831	5139	5040	43,152	
Participation Rate	44%	45%	48%	46%	42%	47%	48%	46%	40%	45%	
Total College Graduates	11314	10324	9822	9752	9868	9679	9358	9585	8335	88037	

4.2.2 Relationship Between Starting Salary of College Graduates and Their Participation in UIC Activities

The study conducted a t-test to examine the relationship between college graduates' starting salary and their participation in UIC activities during their college life. Table 5 shows the results of the analysis. The result tells that the starting salary of college graduates who participated in UIC activities was statistically lower than those who did not participate in UIC activities. The result can be understood that participating in UIC activities alone does not affect or even can negatively affect the starting salary. The study assumes that the starting salaries for college graduates participating in the UIC activities were lower because the on-site practical training was centered around small and medium enterprises (SMEs).

Table 5. Statistical Result of Average Starting Salary of College Graduates Grouped by Their UIC Activity Participation (KRW 10,000)

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019
Participated	216.7	214.6	215.2	217.8	217.8	229.8	241.4	250.7	245.7
Did Not Participated	220.8	219.5	217.8	223.8	221.2	236.8	248.4	257.3	250.2
T-Value	-2.41*	-2.88**	-1.42	-3.65***	-2.16*	-4.2***	-4***	-3.84***	-2.7**

note1: *** p<0.001 **p<0.01 *<0.05 †<0.1

Furthermore, the study conducted a t-test analysis of college graduates who participated in UIC activities and whether they thought the UIC activities helped them during their job search process. The results show that college graduates who thought the UIC activities were helpful during their job search process earned a higher starting salary than those who did not think that the UIC activities were helpful during their job search process. Table 6 shows the t-test results in detail.

From the analysis results, it can be understood that the UIC activities do not increase the starting salary of college graduates. In addition, the results show a difference in starting salaries of college graduates depending on how active the college graduates participated in UIC activities and whether the college graduates took advantage of participating in such activities.

Table 6. Statistical Result of Average Starting Salary of College Graduates and Their Level of Helpfulness in terms of Job Searchinga

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019
Helpful	221.4	216.3	217.7	219.8	223.4	235.4	247.7	256.5	253.4
Not Helpful	201.1	209.4	207.6	218	217.1	227.5	239.7	244.9	242.1
T-Value	7.32***	2.52*	3.02**	0.54	2.06*	2.56*	2.52*	3.3***	3.44***

note1: *** p<0.001 **p<0.01 *<0.05 †<0.1

note2: From 2014, the questionnaire for the level of helpfulness of UIC activities in the job search process was changed to a 5-point Likert scale. Therefore, in order to unify with the previous three years, the study recoded the survey results on a two-point scale

4.3 Discussion

The analysis results are summarized as follows. First, the empirical analysis results explain that college graduates have utilized their opportunities during college life and participated in various UIC activities. The study found, on average, 45% of the total college graduates from 2011 to 2019 have participated in UIC activities such as on-site practical training in SMEs. It was also interesting that the participation rate did not greatly increase or decrease from the average in the nine years.

Second, participating in UIC activities alone does not increase the starting salaries of college graduates, as college graduates who participated in UIC activities during their college life showed similar or even lower starting salary ranges than those who did not participate.

Lastly, participating in UIC activities showed no or even a negative impact on the starting salary. However, college graduates who actively participated and got the most out of their opportunity and found the UIC activities helpful in their job search process showed a higher starting salary than those who did not believe UIC activities were helpful in their job search.

5. Conclusion

After enacting the Industrial Technology Innovation Promotion Act, the Korean government invested heavily in revitalizing university-industry cooperation activities. Due to the effort, the quantitative growth of college students participating in UIC activities and courses has continuously increased.

This study analyzed whether the Korean government's effort in promoting UIC activities to college students has led to any positive impact, as the policy goal for the Industrial Technology Innovation Promotion Act is not to increase the scale of UIC activities but to strengthen the practical skills of college graduates. Therefore, the study deemed the starting salaries after graduating from university a good dependent variable for the analysis.

The study conducted a t-test on College Graduates Occupational Migration Survey (GOMS) data accumulated over nine years to analyze the relationship between college graduates starting salaries and their participation in UIC activities during college life. The study found that starting salary of college graduates was not statistically significantly higher if they participated in UIC activities. On the other hand, those who actively participated in UIC activities and found it helpful in their job search showed higher starting salaries than those who did not.

The university's major purpose in participating in industry cooperation activities should be to help students prepare for employment and assist in their job search process. Therefore, the study used the starting salary of college graduates, an objective indicator of employment performance,

to examine the effect of UIC activities in universities. While the findings show that participating in UIC activities alone does not increase the starting salary of college graduates, how active the college graduates participated and their opinion on the level of helpfulness can raise the starting salary.

The findings show that university-industry cooperation activities must focus on qualitative performances rather than quantitative approaches. In order to improve the qualitative performance of college graduates is to focus on 1) improving the university's UIC programs and 2) increasing the readiness level and classroom focus of college students. These improvements cannot be easily achieved without a one-sided effort from the university. Both actors must put more effort into improving UIC programs' qualitative performance. The universities must find programs that can improve the students' practical skills and prepare them for their journeys after graduation. The students must make the most of their opportunities through various UIC programs during their college life.

There are several limitations. First, the relationship between starting salaries of college graduates and UIC activity participation is much more complex; therefore, explaining this complex relationship with a simple regression analysis is one of the study's limitations. Second, the study used the GOMS data from 2011 to 2019. GOMS data was available only up to 2019; therefore, the study could not carry out an analysis to examine whether the pandemic affected the starting salaries of college graduates after 2019.

Nonetheless, the study successfully analyzed the relationship between the starting salary of college graduates and their participation in UIC activities yearly over nine years. Furthermore, the study provided policy implications for improving UIC activities so that universities and students can be more prepared in the future.

Conflict of Interest Statement

The author declares that: (i) no support, financial or otherwise, has been received from any organization that may have an interest in the submitted work; and (ii) there are no other relationships or activities that could appear to have influenced the submitted work.

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