International Journal of u- and e- Service, Science and Technology
Vol.9, No. 6 (2016), pp.365-376
http://dx.doi.org/10.14257/ijunesst.2016.9.6.33

Analysis of the Effect of University Specialization of Academic Fields on University Education Outcomes *

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Abstract

The purpose of this study is to analyze the effects of university specialization of academic fields on the key education outcomes: the graduate employment rate and student enrollment rate. The results are as follows. First, the influence of the university specialization variable on the student enrollment rate and graduate employment rate is non-significant. Second, analysis of the university department and specialization show partial positive influences for the natural sciences and medicine, the humanities and social sciences show contradictory influences of both positive and negative effects for specialization indicators, and other departments did not have a significant impact. The implications of this study are as follows. First, regarding future studies for university specialization, there is a need to develop variables that can be applied to the changing state of university education regarding university specialization, in addition to its external aspects. Second, to enhance the competitiveness of a university through university specialization in South Korea, the direction and implementation of higher education and university evaluation policies need to be reviewed regarding university specialization policies.

Keywords*: university education, higher education, university specialization, university education outcomes, university competitiveness*

1. Introduction

The view that a university's competitiveness influences the future of the nation has already become generalized and widely accepted. Many developed countries have increased the competitiveness of their universities through university specialization utilizing the strengths of the university [1-3]. Similarly, South Korea has increased the nation's competitiveness by promoting university specialization as the power and capacity to effectively propel national development [4-5]. In particular, participating governments have promoted local industries in conjunction with university specialization in each region for balanced regional development. Even with the introduction of the Park Geun Hye administration, there is an emphasis on university specialization for university survival and competitiveness due to a reduction in the university admission pool [6-7]. In the case of South Korea, university specialization has been strengthened for a considerable length of time; each university has been implementing university specialization according to its strengths, and it is difficult to properly determine the

* funding for this paper was provided by Namseoul University

ISSN: 2005-4246 IJUNESST

overall degree to which university specialization has been promoted [4]. Hyun-Seok Shin presented research on a definition and concept of specialization, and developed specialization indicators to assess university specialization [7]. The future task is to improve university competitiveness by taking the definition of 'selection and concentration' of specialization. Accordingly, there is a need to examine the status and performance of university specialization; in particular there is a need for empirical analysis examining whether the university specialization program has any effect on improving the competitiveness of the university [8].

Existing studies are (1) analysis on the effects of government funded specialization-related programs, (2) analysis of specialization outcomes for specialized fields, and (3) analysis of specializations and non-specializations within a university or department [1-4]. However these studies are limited as they do not analyze the overall impact of the specialization variables on university education. Therefore, this study selects variables representative of the status of the promotion of university specialization, and aims to examine the relationship between these and the key university performance indicators. Through such research findings, the overall future direction of promoting specialization policies of the government can be reviewed as well as university specialization strategies [9].

2. Research Methodology

The research subjects and methodology are presented in Table 1. University Information Disclosure materials and documents were utilized for analysis [10]. The specialization variable used for the university specialization analysis model was the data from the university specialization information notification system [11]. Indicators of university specialization include the number of programs promoting specialization (number), support funds for specialization (unit: 1,000 won), average time of promoting specialization (unit: years), and number of specialization programs applying for support (number). Various performance indicators of university evaluation used within South Korea were set as performance variables of university education: the student enrollment rate, employment rate, and the constancy of the employment rate. For analysis, descriptive statistic analysis and generalized linear fixed model was applied using SPSS 21.

Table 1. Analysis Model

Control Variable		Independent Variable	Dependent Variable
Location (16 cities and provinces), Year (2010~2014)	Institute (Public, Private), Region (Capital, Central, Provincial city, Provincial other) Scale (Large, Medium, Small, Very Small 4 tier ranking), Affiliation (Humanities and Social Sciences, Natural Sciences, Performing Arts, Medicine, Interdisciplinary, *etc.*)	Number of corporations promoting specialization (number), support funds for specialization (1,000 won), average time of promoting specialization (year), number of specialization corporations eligible for support (number) * Materials and data of specialization related variables collected in 6	- Student Enrollment Rate -Employment Rate - Employment Rate Constancy

		academic fields	
Random Effect, Repeated Measures Variable	Fixed Effect		

*University Size: Very Small (Less than 1,000 students), Small (Between 1,000- 5,000 students), Medium (Between 5,000-10,000 students), Large (More than 10,000 students)

3. Research Outcome

3.1. Status of University Specialization

The analysis of university specialization promotion at 4-year universities in South Korea are presented in <Table 2>, <Table 3>, and <Table 4>. Although the scale of specialization programs have been reduced for 4 year-university specialization since 2010 and 2011, the number of funding programs for specialization have been increasing.

This phenomenon can be explained due to selection and concentration – emphasized within university specialization – not being implemented and universities choosing new diverse fields of specialization depending on the government distribution of educational funding for universities.

An overview of departmental characteristics show university specialization promotion within this country as primarily centered on engineering departments, followed by specialization of the humanities including integration of other departments. When examining the specialization of 4-year universities, there is the tendency for the specialization of engineering or medicine to be implemented by large-scale universities, and humanities-focused specialization by medium sized universities. Although showing university specialization is operating centered on departments of engineering or medicine, with regards to departmental performance, it provides an explanation why the proportion of specialization for humanities and social sciences is low.

Therefore, in reviewing specialization promotion programs and the number of programs receiving funding by distribution for each department, it was found that the proportion of engineering and natural science departments are high; in particular the funding benefits for engineering and natural science specialization programs, including fusion and other departments, are proportionately high. Thus, there is a need to diversify the areas and fields, and it can be seen the overall scale and funding benefits are centered and prioritized on engineering, natural sciences and fusion areas.

Table 2. Area of Specialization Promotion

Year	Area of Specialization Promotion						
	Humanities	Natural Sciences	Engineering	Performing Arts	Medicine	Fusion & Other	Total
2010	64 (23.02)	50 (17.99)	67 (24.10)	25 (8.99)	16 (5.76)	56 (20.14)	278 (100.00)
2011	78 (28.16)	60 (21.66)	75 (27.08)	24 (8.66)	13 (4.69)	27 (9.75)	277 (100.00)
2012	68 (27.20)	47 (18.80)	67 (26.80)	17 (6.80)	11 (4.40)	40 (16.00)	250 (100.00)
2013	73 (27.97)	47 (18.01)	73 (27.97)	18 (6.90)	11 (4.21)	39 (14.94)	261 (100.00)

Table 3. Number of University Specialization Programs

Year	Number of Specialization Funding Programs						
	Humanities	Natural Sciences	Engineering	Performing Arts	Medicine	Fusion & Other	Total
2010	138 (24.73)	92 (16.49)	173 (31.00)	33 (5.91)	17 (3.05)	105 (18.82)	558 (100.00)
2011	157 (28.97)	102 (18.82)	193 (35.61)	34 (6.27)	16 (2.95)	40 (7.38)	542 (100.00)
2012	145 (26.85)	100 (18.52)	190 (35.19)	22 (4.07)	14 (2.59)	69 (12.78)	540 (100.00)
2013	138 (29.05)	77 (16.21)	155 (32.63)	21 (4.42)	11 (2.32)	73 (15.37)	475 (100.00)

Table 4. Number of University Specialization Funding Programs

Year	Number of Specialization Funding Programs						
	Humanities	Natural Sciences	Engineering	Performing Arts	Medicine	Fusion & Other	Total
2010	139 (6.41)	333 (15.36)	952 (43.91)	31 (1.43)	117 (5.40)	596 (27.49)	2168 (100.00)
2011	383 (12.94)	628 (21.22)	1325 (44.78)	69 (2.33)	237 (8.01)	317 (10.71)	2959 (100.00)
2012	521 (12.66)	726 (17.65)	1792 (43.56)	58 (1.41)	172 (4.18)	845 (20.50)	4114 (100.00)
2013	613 (12.76)	909 (18.92)	1898 (39.50)	56 (1.17)	208 (4.33)	1121 (23.33)	4805 (100.00)

3.2. Analysis of the Influence of Specialization Variables on University Education Outcomes

Analysis of the university performance variables, the student enrollment rate, graduate employment rate and graduate employment rate consistency, influencing the specialization variable is presented in <Table 5>. Although the expansion of the student enrollment rate takes the character of an input variable, the fact that enrolled students are able to realize the level of satisfaction in education and the effect of educational funding within student life, is inherent within the output variable. The effect of the university specialization variable on the student enrollment rate and the graduate employment rate does not appear to be statistically significant. In the case of the graduate employment rate constancy, there was a positive effect for engineering programs and a negative effect of supporting funds for the natural sciences.

The analysis of the influence of the specialization variables for each department's student enrollment rate, graduate employment rate and the graduate employment rate constancy are presented in <Table 6>. University specialization variables appear to have a statistically significant positive effect on the student enrollment rate for engineering and medicine. There was a positive effect for engineering by specialization funding, and for medicine the specialization program number and specialization funding program application had a positive effect. Other departments showed statistically non-significant effects. In the case of the graduate employment rate, there was a positive impact of specialization funding for the humanities and social sciences, a negative impact of the number of specialization funding programs, showing a conflicting influence of the specialization variable. Specialization funding exhibited a positive influence for engineering, and the number of specialization funding programs had a positive influence for medicine. In the case of the graduate employment rate constancy, there was a positive influence of specialization funding on engineering departments only, there was no statistically significant impact for other fields or areas. Thus, specialization variables are categorized as an evaluation indicator part of the university's calculation variable, and in the case of engineering and medicine, there is a partially positive influence, while in the

case of humanities and social sciences there are conflicting results for specialization indicators, and for other areas and fields the effect was analyzed to be statistically non-significant.

Table 5. Impact of University Specialization Variable on University Outcomes

Category	Enrolled Student Rate	Employment Rate	Employment Rate Constancy
Public	.006	.003	.031
National	.027	**-.057****	.010
Private	0	0	0
Other Regions	-.019	.011	-.002
Capital	**.049***	.019	**.027****
Central Districts	.008	.002	.002
Regional	0	0	0
Scale 1	**.154****	-.014	.033
Scale 2	.047	.017	.013
Scale 3	.029	.010	.001
Scale 4	0	0	0
Humanities/Social Sciences Enrolled Students	.002	**-.059****	.001
Natural Sciences Enrolled Students	.005	**.020****	-.000
Performing Arts	**-.017****	**-.019****	**-.010****
Engineering Enrolled Students	-.001	.003	.002
Medicine Enrolled Students	**-.010***	-.003	.004
Total Enrolled Students	**.187****	.053	.020
Humanities And Social Sciences, Number Of Specialization Programs	-.001	-.004	-.001
Natural Sciences	-.000	.002	-.003
Engineering	-.000	.002	**.002***

Performing Arts	-.003	-.015	.066
Medicine	-.001	.022	.005
Other	.000	-.000	-.003
Total Number Of Specialization Programs	0	0	0
Humanities And Social Sciences Specialization Funding	.000	-.001	.001
Natural Sciences	.000	.000	**-.002***
Engineering	-.000	-.001	.001
Performing Arts	.001	.006	-.000
Medicine	-.000	-.003	.000
Other	.000	.001	.000
Total Funding For Specialization	.001	.005	.005
Specialization Promotion Time	-.000	.001	-.001
Humanities And Social Sciences Applying For Specialization	.000	.001	-.000
Natural Sciences	-.000	-.000	.000*
Engineering	.000	.000	.000
Performing Arts	.000	-.005	-.001
Medicine	.000	-.001	-.000
Other	-.000	.000	-.000
Total Number Of Programs Applying For Specialization	0	0	0

※ '*' P<.05, '' P<.01**

Table 6. Influence of Main Calculation Variables for Each Field On Specialization Variables

Recruitment Rate	Humanities And Social Sciences	Natural Sciences	Engineering	Performing Arts	Medicine
National	**.042****	.010	.012	**.057****	**-.132****
Private	0	0	0	0	0
Capital	**.046****	**.040****	**.055****	**.039****	**.122****
Central District	-.008	-.006	**.017***	-.006	**.117****
Regional	**-.041****	**-.028***	**-.016***	-.009	**.048***
Regional Cities	0	0	0	0	0
Scale 1	.051	**.154****	-	-	-
Scale 2	-.062**	.008	-.019	**-.084****	-.085
Scale 3	.011	**.028****	**.015***	.002	-.003
Scale 4	0	0	0	0	0
Scale Of Enrolled Students	**.075****	**.110****	**.067****	.028	**-.098****
Number Of Specialization Programs	.007	.002	-.015	-.048	**.348****
Specialization Funding	.007	.009	**.022****	.013	**-.065****
Number Of Specialization Programs Applications	.014	.001	.008	.015	**.089****

※ '*' P<.05, '' P<.01**

Graduate Employment Rate	Humanities And Social Sciences	Natural Sciences	Engineering	Performing Arts	Medicine
National	**-.061****	**-.059****	-.003	-.009	-.139**
Private	0	0	0	0	0
Capital	.016	.012	**.031****	-.003	**-.092****
Central District	-.009	.022	-.006	.006	-.031

Regional	.006	.009	-.009	.002	-.001
Regional Cities	0	0	0	0	0
Scale 1	**-.123****	**.173****	-	-	-
Scale 2	-.010	**.085****	**.054****	.010	.017
Scale 3	-.008	**.033****	.011	**.084***	-.014
Scale 4	0	0	0	0	0
Scale Of Enrolled Students	**-.070****	.043	**.041****	**.208****	**-.130****
Number Of Specialization Programs	.015	-.012	.010	-.041	.065
Specialization Funding	**.032****	-.001	**.017***	.011	.015
Number Of Specialization Programs Applications	**-.043****	-.000	-.013	-.068	**.023***

※ '*' P<.05, '' P<.01**

Graduate Employment Rate Constancy	Humanities and social sciences	Natural Sciences	Engineering	Performing Arts	Medicine
National	**.017***	.005	.001	**.117****	-.027
Private	0	0	0	0	0
Capital	**.021****	**.041****	**.024****	.037	-.010
Central District	.002	-.004	-.004	.043	.043
Regional	-.001	-.017	-.008	.046	.020
Regional Cities	0	0	0	0	0
Scale 1	.025	**.091****	-	-	-
Scale 2	.003	**.037****	.008	**-.090***	-.018
Scale 3	-.004	**.020***	.004	.013	-.042
Scale 4	0	0	0	0	0
Scale of	.005	**.061****	.004	**.191****	-.043

Enrolled Students					
Number of Specialization Programs	.017	.004	.007	.056	-.055
Specialization Funding	.003	.009	**.017****	.028	.003
Number of Specialization Programs applications	-.009	-.014	-.009	-.035	.018

※ '*' P<.05, '' P<.01**

4. Conclusion and Discussion

This study analyzes the degree of impact that the promotion of university specialization based on department has on the university education performance indicators. The results of this study show that the promotion of university specialization does not have a significant effect on the variables set as universities' education performance indicators of student enrollment rate, graduate employment rate, and the employment rate constancy. However, there were partial positive effects on performance variables for a few variables for the enrolled student rate, graduate employment rate and employment rate constancy, yet the size of the effect is weak. Therefore, it is difficult to claim the indicators of university specialization as a significant variable for education performance outcomes as the effect, both positive and negative, has been weak.

These results can be interpreted by two approaches. First, there is a possibility that the effect of university specialization variable did not appear as significant due to a limitation of the university specialization variable applied to this study. This interpretation is possible when taking into consideration our nation's university specialization funding program selection process and the programs' outgoing expenses. University specialization in South Korea has already been implemented within universities through internal departmental competition as the aspect of comparative input and output of each department and major determines whether they are selected for specialization. Therefore, departments and majors that have already secured funding and support are taking up most of funding.

Instead of distributing funding and financial support to the university to improve its overall outcome and performance, it is invested into certain departments and majors. In addition, the probability of the proportion of funding assigned to university specialization does not reflect the effect or influence university specialization has on the key education outcomes and performance indicators. It is possible the specialization variables of this study do not adequately reflect such parameters of the current situation of university specialization. In other words, according to the operational definition of a quantitative variable, the specialization variable may have been limited to accurately represent university specialization, thus the possibility exists that the real effect of specialization may not have been properly measured. Therefore, for future studies on university specialization, variables appropriately incorporating the educational developments and changes created by specialization, in addition to the external aspects of specialization, need to be developed.

Second, despite the limitations of the specialization variable, when considering the ultimate goal of university specialization promotion, which is not only the development of

field specialization but securing an overall advantage, development and competitiveness for the university, it can be seen that university specialization has not had a significant effect on the current education performance indicators from 2010 until 2013. This needs to be considered when implementing future relevant policies of higher education and university evaluation.

This study has the limitation of having not analyzed the influence of university specialization exerted on the results and outcome of each department. Therefore, specialization is contributing to the field of specialization; it is difficult to determine its effect and contribution on the university overall in terms of development and improvement. As such, future analysis needs to focus on the calculation variable, and included in the area of specialization and non-specialization to analyze the difference in the calculation variable. Through this, there is a need to analyze the effects of specialization for each department and for the university overall in a multi-layered analysis.

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