AN ANALYSIS ON THE RELATIONSHIP BETWEEN THE EDUCATION CONDITION AND THE UNIVERSITY GRADUATES EMPLOYMENT

By

Miyeon Chung

THESIS

Submitted to
KDI School of Public Policy and Management
in partial fulfillment of the requirements
for the degree of

MASTER OF DEVELOPMENT POLICY

2012

AN ANALYSIS ON THE RELATIONSHIP BETWEEN THE EDUCATION CONDITION AND THE UNIVERSITY GRADUATES EMPLOYMENT

By

Miyeon Chung

THESIS

Submitted to
KDI School of Public Policy and Management
in partial fulfillment of the requirements
for the degree of

MASTER OF DEVELOPMENT POLICY

2012

Professor Kye Woo LEE

AN ANALYSIS ON THE RELATIONSHIP BETWEEN THE EDUCATION CONDITION AND THE UNIVERSITY GRADUATES EMPLOYMENT

By

Miyeon Chung

THESIS

Submitted to
KDI School of Public Policy and Management
in partial fulfillment of the requirements
for the degree of

MASTER OF DEVELOPMENT POLICY

Committee in charge:

Professor Kye Woo LEE, Supervisor

Professor Sung-Joon PAIK

Professor Taejong KIM

Approval as of December, 2012

ABSTRACT

An Analysis on the Relationship between the Education Condition and the University Graduates Employment

By

Miyeon Chung

A rapid increase of the higher education and the low education quality considered one of the reasons of the youth unemployment. In order to solve the problems, the government has been implementing various university funding programs which were consisted of several education indicators. However, few studies have proved the relationship between the education conditions and the employment rate of the university graduates from the government financial supporting projects. Thus, this study aims to find out whether education condition indicators that the government is commonly using in various government financial supporting projects are related to the employment of university graduates or not. This study used ‘Higher education statistics’ produced by the KEDI and regression analysis is applied as a testing method to verify the study. The analysis result revealed that ‘university type’, ‘location of university’, ‘educational expenditure’ and ‘student to full-time faculty ratio’ were significant to the employment of university graduates. In particular, both ‘educational expenditure per student’ and ‘student to full-time faculty ratio’ have positive effects on the graduate employment rate, and its effects may increase as the scale of the expending becomes larger. The result also shows that interaction effect between the ‘educational expenditure’ and ‘student to full-time faculty ratio’ existed. This result provides important policy implication for government to increase the weight of these two indicators in the government financial supporting projects in order to increase the employment rate of the university graduates.

ACKNOWLEDGEMENTS

The two years at KDI School was the most influential period in my life, leading me academically and providing a way of thinking critically and independently. I would like to deliver my heart-felt gratitude to those who have supported me during my study.

First and foremost, I would like to thank the KDI School of Public Policy and Management which allowed me to further my education at the graduate level. I also would like to express my respect to my supervisor, Prof. Kye Woo Lee, who encouraged and motivated me to concentrate on my thesis topic through my studies at KDI with permanent support and constructive comments. Further I also would like to acknowledge Prof. Sung-Joon Paik who prodded me in the right direction and provided valuable comments so that I could make the most out of the knowledge to complete my research. Also, I would like to thank my family; they have been the most trustworthy supporters. Lastly, none of this could have been possible without my husband Sangwook, who patiently helped me throughout this research.

Table of Contents

List of Tables

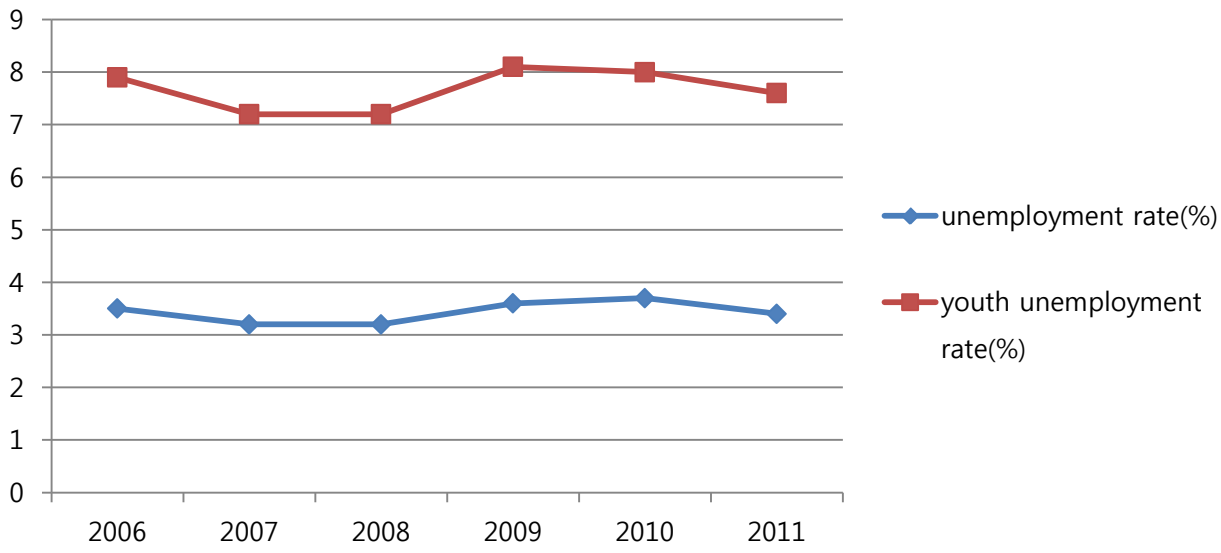
List of Graphs

I. INTRODUCTION

This research aims to find out whether educational indicators that the government is commonly using in various government financial supporting projects are related to the employment rate of university graduates or not.

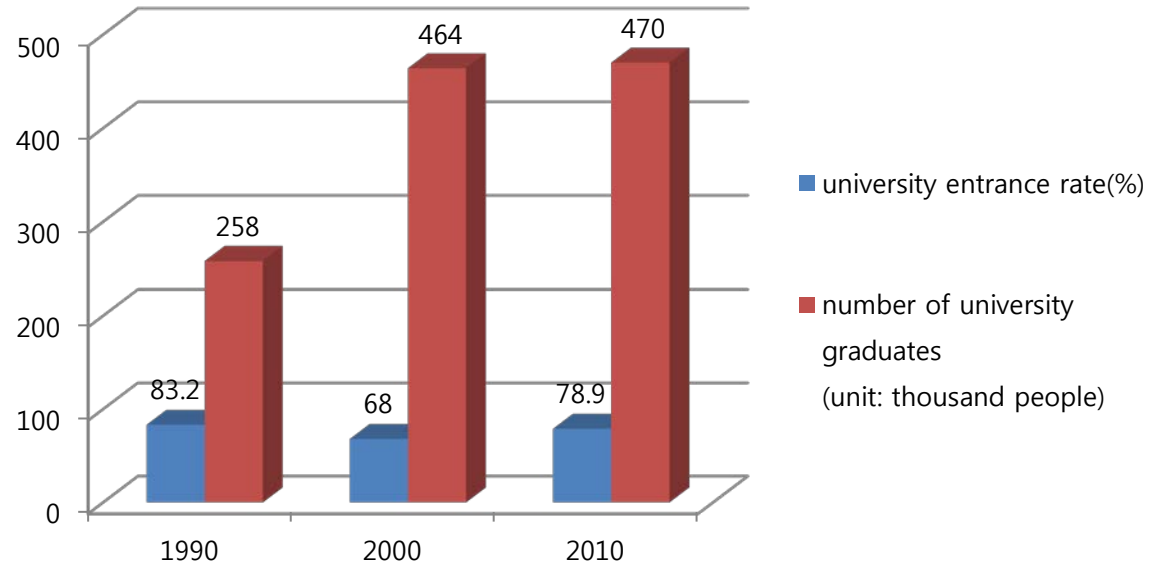
The youth unemployment is a global phenomenon nowadays. Worldwide, youths between the age of 15 and 24 represent nearly 40 percent of the 207 million unemployed people in 2010. The youth unemployment in Korea is also not at a negligible level. <Graph 1> shows that the youth unemployment rate is currently 7.6% as in 2011, which is more than twice of the overall unemployment rate (3.4%). In particular, the unemployment of highly educated labor force threatens the prospective economy in the long term and negatively impact on the competitiveness of the country. Thus, the employment issue is being put as the first priority for the Korean government and the government has been striving in several ways to alleviate the youth unemployment.

Graph 1 Unemployment rate vs Youth unemployment rate



There are several reasons for the unemployment of the youth. Beyond the poor economy itself, one of the reasons could be explained by the rapid expansion of universities and a decline in the quality of higher education. The rising number of youngsters enrolling in schools is continuously increased since 1990s. <Graph 2> exhibits the increasing university entrance rate and the number of university graduates.

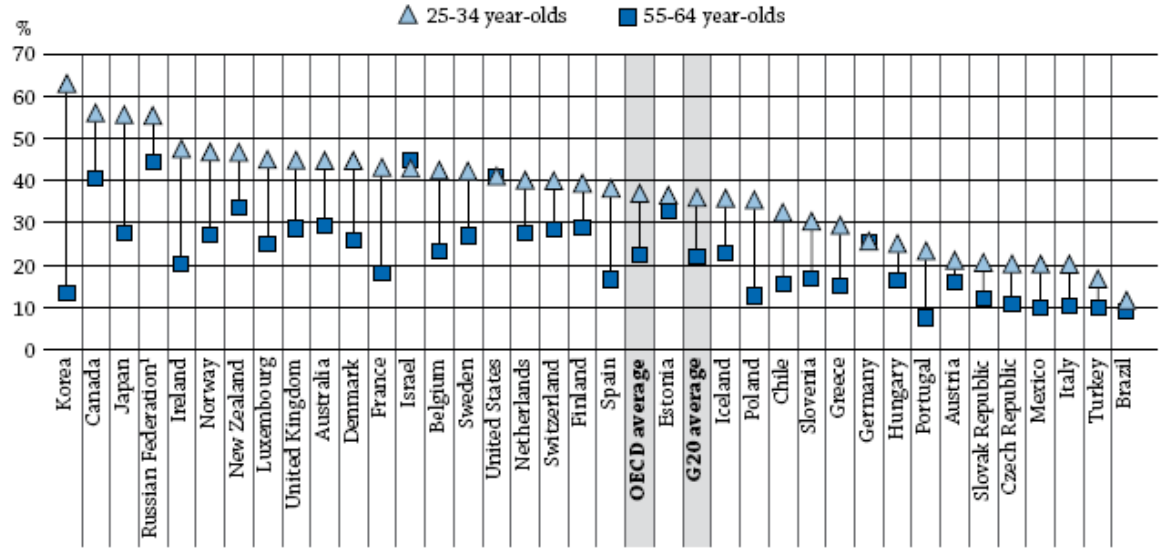
Graph 2 University entrance rate and the number of university graduates



Source: KEDI, Statistical yearbook of Education

According to the “Education at a Glance 2011” published by the OECD, in 2009, Korea ranked first in tertiary education with over 60 percent of people between the ages of 25 and 34 with higher education. The percentage of population that has attained tertiary education, by age group is represented in the <Graph 3>. Also, it demonstrates the drastic increase of tertiary education within a very short period of time.

Graph 3 Percentage of population that has attained tertiary education, by age group



1. Year of reference 2002.

Countries are ranked in descending order of the percentage of 25-34 year-olds who have attained tertiary education.

Source: OECD. Table A1.3a. See Annex 3 for notes (*www.oecd.org/edu/eag2011*).

StatLink http://dx.doi.org/10.1787/888932459831

Compared to the rapid increase in the number of universities and graduated students, the educational quality did not improve that much. Low public expenditure to the higher education from the government worsened the quality of the higher education problem. When discriminating the composition of university type, more than 70 percent of universities are private universities and they heavily depend on the tuition revenue from students (more than 60 percent of the total income). Because of this, the problems such as high cost of tuition, high ratio of the student to faculty became an issue of the education quality.

As a result, the government needed to implement policy measures to solve both the unemployment problem and the quality issue of higher education at the same time. In response, various government financial support measures have been started. The government has been implementing various university funding programs which were consisted of several evaluation indicators by encouraging competitions among universities. Moreover, the promulgation of the 'Higher Education Act' accelerated increasing the budget of higher education continuously. In 2011, the 9.9 percent of the total budget of the government and

five trillion won is allocated to the higher education. By operating the projects, the government primarily put more emphasizes on the ‘employment rate of university graduates’ when they selected and provided the financial funds to universities than any other evaluation indicators. As a result, most of the universities have been striving to increase the employment rate of their students.

This research started from the interest on how the government level of support to universities is related to the employment rate of university graduates. Although the government has been providing subsidies and increasing it annually to those universities, not many studies have been included this issue. Until now, only a handful of government projects have been evaluated to confirm whether they have made any positive impacts on the employment of university graduates by enhancing the universities' education competency. To make such an assessment, it is important to define the determinants of university graduate employment at the university level.

This research will try to answer the question; how and how much the education indicators relate the employment rate of university graduates at the university level. To answer this, this research postulates the following hypothesis and tests the validity of the hypothesis. How the educational indicators in terms of (i) university characteristics (ii) expenditure level (iii) faculty and (iv) industrial collaboration efforts correlate the employment rate of university graduates. To test the hypothesis, this research adopts the OLS regression analysis method. To apply this model, the data from 'Higher education statistics' produced by the Korea Educational Development Institute for the years 2010 and 2011 was used.

This study consists of the following. In Chapter II, this paper provided the theoretical background of the study and reviewed the previous studies regarding the variables that affect

the educational outcome. Also, the introduction of the government financial supporting projects in higher education and related studies will be addressed. In Chapter III, the methodology and data which is used in this study to overcome the problems and limitation of previous studies will be explained. In Chapter IV, the descriptive statistics of the analysis and the overall analysis of the research will be presented. Finally, in Chapter V, it will be concluded with a summary of the results and remarks of the policy implications for improving the employment rate.

II. Literature Review

In this part, the theoretical background of the economic approach to education will be explained. Afterwards, previous studies of education condition indicators and the educational outcomes will be introduced. Then a brief explanation of government financial support projects and related literatures will be addressed.

1. Theoretical Background

(1) Economic approach to Education

1) Concept of education productivity

The objective of the education productivity is to find out the characteristics of productive and educationally effective schools, and identify a way to make schools more productive based on the efficiency. The basic concept of 'education productivity' is based on the human capital theory that the investment in education increases the average income of individuals. In other words, as the educational spending increases, the education quality increases and the productivity of the students increase, as well. In the perspective of economists, schools are considered as the place where educational resources interact to produce an output which is the student outcomes. When the educational investment is adequate, efficient and fair, the educational productivity would increase and it leads to the improvement of quality of education (Ban,1997).[1] The productivity of education is represented as the productivity of education function that quantifies the relationship between the educational inputs and outputs.[2]

---

[1] It also embraces the concept of quality such as educational services, educational quality in education

[2] The education productivity function is to estimate the education productivity with input and output. The education

2) Inputs and Outputs in Education

a. Educational Input

The definition of 'input' in education varies depending on the perspectives of each scholar.[3] When considering input based on the input-output model, Coleman, the renowned education sociologist, summarized the definition of input from the <Table 1>.

Table 1 Inputs based on the input-output model

School related variables	Peer group characteristic variables	Individual intelligence variables	Family background variables
• number of students per class • teaching experiences of teacher • education level of teacher • salary of teacher • class preparedness of teacher • talent of teacher • attitude of teacher • teacher's burden for class • number of students per teacher • number of students • characteristics of school • location and size of school • age of building • number of books per student • library operation cost per student • total cost per student	• academic achievement of peers • desire for higher education of peers • academic motivation of peers • academic aspiration of peers • socio-economic status of parents of peers	• infant intelligence • youth intelligence • adult intelligence • score of vocational aptitude test • score of other aptitude tests	• occupation of parents • education level of parents • income of parents • property of parents • number of siblings • level of books owned • newspaper subscription • nationality of parents

Besides the inputs in <Table 1>, Hadderman(1998) proposed inputs such as

---

production function shows how much educational output can be produced with a certain set of educational inputs (which is borrowed from the concept in economics.) This function also refers as 'input-output analysis' or 'cost-quality approach'. The education function is represented as 'A= f(S,P,I,F)'. where,

A: academic achievement,
S: school related variables,
P: peer related variables,
I: individual intelligence variables,
F: family background variables

[3]The renowned scholars in 'economics in education', Cohn and Geske(1990) indicated the input by 4 categories; school factors, external school factors, measurable factor, and immeasurable factors. Baek(2007) stated school variables, peer group variables, individual variables, and family background variables can be an input for the academic achievement.

educational expenditure per student, student to teacher ratio, educational level of teachers, salary of teachers, school facility, and school administration. Hanushek(1989,1995) defined inputs and he particularly had an interest in 7 inputs; a student to teacher ratio, education level of teachers, working experience of teachers, salary of teachers, educational expenditure per student, better administration, and better facility.

b. Educational Output

The generally accepted 'output' among education scholars is 'academic achievement'. As the different perspectives defining the concept of 'input', the definition of 'output' also perceived differently from scholars. <Table 2> shows various inputs from the previous studies on inputs in education.[4]

Table 2 Outputs from the previous studies

Hanushek(1972)	Burkhead, Fox, & Holland(1967)	Haveman & Wolfe(1984)	Hadderman	Kim, Byung-sung
•verbal skills •math skills	•verbal skills •other academic ability •graduation rate •Entrance rate •drop out rate	• individual income increase • national income increase •productivity of labor market • productivity of non-labor market • improvement of technical skills • saving increase	• graduation rate • drop out rate • college enrollment rate •labor market performance	•educational outcome • college enrollmentrate •employment rates

[4]Baek(2007) pointed out that defining the output is more difficult than defining input. He stated the general education output is 'academic achievement' and he also defined output as basic knowledge, vocation skill, creativity, behavior.

(2) Previous studies on education productivity

Despite the numerous studies on the academic performance, not many studies have been conducted on the analysis of correlation between education condition indicators and the employment rate.[5] Although they may not be directly related to the employment rate, there is a need to look at the related studies between educational outputs and education inputs. Existing studies were mainly focused on improving the education output by investigating the factors that affect the educational output such as academic performance of students, and how those factors are applied in the education sector. Some other studies were focused on return on investment in education as an educational outcome (Ban,1998). Most analysis on the education condition indicators (inputs) were focused on financial variables which is easily measured and accessed such as scholarship provision rate and educational expense per student[6]. The research of 'Equality of Educational Opportunity', otherwise known as the 'Coleman Report', is considered as the monumental study that used the 'education production function'.[7] The author tried to prove how much socio-economic background of students, school finances, school facility, academic curriculum, and composition of students affected the academic achievement. His study stated that academic achievement is more related to the external factors such as family background and peer groups rather than internal factors. To put it differently, the external factors have more influences on the academic achievement rather than school conditions. Among the factors that are related to school, he stated that the school facilities, academic curriculum, quality of teachers are related to the academic achievement. Particularly, the quality of teachers is the most influent compared to other

[5] It is because most of the analysis on efficiency and effectiveness of education were conducted in the US and mainly focus on graduation rate (Ryan, 2004).

[6] Bountiful studies of financial indicators were studied due to the fact that parents and educational policy makers are the stake-holders of the skyrocketing tuition cost. They ask the universities to be responsible for their financial accountability such as how efficiently universities are operating their financial resources and how much the financial resource contributed to the educational outcomes.

[7] This research is the result from the project that pursued equal social opportunities and aimed to find out the source of the unequal and imbalanced opportunities in education among different regions and schools.

school factors. Even though school factors influence academic achievement, they only explain 10 percent of it. Another study by Hanushek (1995) indicated that the seven factors (student to teacher ratio, educational level of teachers, salary of teachers, educational cost per student, better facility and administration) that are expected to be related to the academic achievement did not affect the academic performance of students.[8] However, currently, many researchers doubt the result of it. Hedges, Laine, Greenwald (1994) conducted a meta-analysis with the same hypothesis and they showed different results. According to their analysis, there was a statistically significant increase in academic achievement when spending five hundred dollar more per student. Crampton (1995) proved that educational cost plays an important role in the academic achievement on the basis that the educational cost is spent in investment for lessening the class size, recruiting highly educated teachers who have bountiful teaching experiences. Baek (2007) raised some questions about the Coleman report and the analysis result of the Hanushek study. First, he argued that it is dangerous to conclude that school variables does not affect the education output because 'academic achievement' is only one part of various education outputs. Second, it is natural that the marginal effect of an input is not significant when a certain level has been reached like the US. For example, the difference when the student to faculty ratio is twenty and twenty five will not be much but there is a big difference when it is twenty and forty.

Some domestic studies tried to analyze the effectiveness of universities by using the tool of input-output framework (DEA; Data Encipherment Algorithm) with indicators of education conditions and employment rate. The indicators are summarized in the <Table 3>.

[8]According to the meta-analysis by Hanushek, the previous studies that explained the academic achievement by using the education productive function did not show consecutive consequences. As shown in his studies, the studies in the US were not statistically meaningful to the academic achievement when it comes to the education expenditure. Also, even if there is statistical significance, there are many studies that claim the elements besides the faculty experience shows little correlation.

Table 3 Education indicators from DEA analysis

Researcher	Model	Input	Output
Park, Tae-jong (1997)	DEA1	• number of faculty • number of staff • operational expenses	• number of undergraduates • number of graduates • number of employed
Kim, In-je (2000)	DEA1	• payroll of faculty • maintenance fee per unit of building • research budget per faculty • number of staff • number of books in library • size of library	• graduate's employment rate • opinion on higher education • number of students degree conferred per department • number of publication • number of journals published • total course credit per year • service to public
Na, Minju (2005)	DEA1	• educational expenditure per student, • educational cost per GDP • ratio of faculty/staff payroll costs • research budget per faculty	• graduate's employment rate • graduation rate • student satisfaction
Lee, Hwang-won (2009)	DEA1	• dependent ratio of part-time lecturer • student to faculty ratio • tuition rate from revenue • ratio of payroll from expenditure	• graduate's employment rate

The studies in <Table 3> used the education conditions indicators, however, their studies primarily focused on evaluating the efficiency of the university management. These DEA analysis studies analyzed the efficiency upon the assumption that there is a relation between the input and the output but the relation itself was not statistically proven.

Domestic studies of education condition indicators based on empirical data in Korea are extremely rare because the studies had limitations due to the lack of accumulated data. Recently, few researchers studied about the education indicators. Jeon (2008)'s in-depth analysis showed the co-relation between the faculty and university facilities determinants and

returns on investment in education including financial determinants of education quality. To summarize his analysis, the returns on investment increases as the student to faculty ratio decreases, as the size of university facilities increases and as the library budget increases. However, his study had its limitation that he could not explain the relationship between quality indicators and employment rate.

From 2008, by the introduction of the information disclosure system, the foundation for evaluating the educational performance of universities was established. The accumulated data from the information disclosure system of higher education enabled the research at the university level. In particular, the university level of data provided a way to evaluate the educational performance of each university. Choi et al. (2008) analyzed the quality of education of universities. Choi's study has some values. First, her pioneering study contained the variables that might affect the educational performance of the university at the university level. Second, she analyzed the detailed analysis about the determinants of the employment of university graduates by combining both the university level of data and the individual level of data. The study indicated that the financial indicators such as scholarship provision rate and dependent rate on tuition, faculty indicator such as the number of teaching hours, are the relevant determinants of graduate employment. In particular, scholarship provision rate consistently and positively affected the employment rate. She also stated that private universities tend to have a higher rate of employment. However, her study had some limits in that the data used for analysis only contained one year of data and did not include factors such as industrial collaboration variables. In the study by Jang(2004) regarding 'Assessment on the performance and efficiency of the government financial support projects of higher education', he argued that the investment on faculty is a far better way to improve the efficiency of the financial support programs rather than investing on school facilities. He

suggested a minimal limit on the student to faculty ratio and recommended that it be met. Besides, the amount that is used for personnel expenditure in terms of the educational expenditure per student is substantially significant to the employment rate of graduated students. In addition, increasing the number of students per faculty negatively influences the employment rate. On the contrary, the expenditure on school facilities causes less spending for personnel, therefore it takes away the training opportunities of student and negatively affects the employment in the short term. However, school facilities have a positive relationship with employment in the long term because it improves the quality of education and consequently results in the improvement of the employment rate of students.

2. The government financial support projects in Korea

As many studies on education productivity shows, the efficient-oriented approach that emphasis on maximizing the benefit from minimum cost provided a more quantifiable and realistic way to implement higher education policies for policy makers. From the mid 1990s and early 2000s, the government policy has been changed to promote special characteristics of universities through the linkage between the evaluation of universities and the government financial support. From 2004, the government financial support projects are conducted with the idea of ‘choice and concentration’. The government stopped the support of general support program and instead it has been supporting universities through the process of university evaluation. In this regard, the ‘performance-based’ funding formula is gathering a lot of interest. Currently, the government established systems that promotes ‘restructuring of the university’ and induces ‘improvements in education quality’ which is based on the ‘performance-based’ funding.

The key characteristics of the government policy of higher education could be summarized into four. First, the formula funding method is applied when allocating the

government funds. Several developed countries are already applying government funding formula with quantifiable indicators when allocating education resources.[9] The formula funding method considers university location, number of students in allocation of the block grant which the grantee is free to use as needed. Second, the government has taken the incentive system and supported more funds to the universities which were chosen as so-called 'leading universities'. These universities are selected among the universities that participate in the PEUEC project with the great performance. Third, the government strengthened the policy to increase the employment of the graduates. The biggest portion of the university evaluation is 'employment rate of the graduates'. For example, it accounts for 25 percent in the PEUEC project and 20 percent when selecting the universities that are to be sanctioned as 'student loan restricted universities'. Lastly, the government policy for higher education considers connecting the university restructuring plan and the financial support program. This means that the government strengthened the evaluation system which was linked to 'university information disclosure system' and 'performance evaluation-accreditation evaluation'. To illustrate, for universities which did not get a good evaluation, the government cut off the government financial support program budget.

<Table 4> shows the budget composition according to the category and their evaluation indicators that is related to the competency of universities and industry-university cooperation.[10]

[9] Several studies successfully showed cases of government funding formula system for education. According to the study of Salmi and Hauptman (2006), the amount of financial support from the government is determined by the performance-based funding method. They stated that the indicators that are used for financial support are based on the performance indicators such as fulfillment rate of students and graduation rate. Also, they stated that the formula which is applied to higher education over several decades contributed to the improvement of the core education indicators such as graduation rate and saving budget. Generally, advanced countries have been using the formula funding which consists of objective and quantifiable indicators for a long time. In particular, Higher Education Funding Council for England (HEFCE) in UK has been distributing financial resources through formula funding and the execution of the funding is totally autonomous to each organization. The amount of education support is determined based on standard educational cost and additional distribution indicators. The standard educational cost is calculated considering the characteristics of the departments and the number of students. In the US, the financial supporting program is different for each state. For instance, in Tennessee, the financial support program is conducted by using the performance indicators such as the employment rate, the university accreditation score, and the average GPA of students in liberal arts and major studies. In 2008, OECD has encouraged other countries to use formula funding system which includes input and output indicators in government financial support (Hong, 2012).

[10] The Ministry of Education, Science and Technology is operating approximately 200 government financial support

projects, and list is reorganized according to the relevance to the project and project size.

Table 4 Government financial support project list

(unit: won)

Project	Purpose	Period	Total Budget	Target university	Characteristics	Core evaluation criteria
BK 21	foster research universities	2006~2012	1.5 trillion	Research-oriented univ.		- student to faculty ratio - full-time faculty ratio - above 70% participation of faculty members
PEUEC	establish infrastructure of undergraduate education competency	2008~present	296 billion	All universities	Choice & concentration, formula-funding	- employment rate - fulfillment rate of student - full-time faculty rate - scholarship provision rare - educational expenditure per student
WCU	world-class research universities	2008~2013	625 billion	Research-oriented univ.		- research records - panel review - international peer review - overall review
University Restructuring program	University restructuring and enhance the educational quality	2005~present	321 billion	All universities	Formula-funding	- employment rate - fulfillment rate of student - full-time faculty rate - rate of tuition from educational cost per student
Regional university development	secure the infrastructure and improving competitiveness of regional universities	2009~present	621 billion	Regional Universities	Formula-funding	- employment rate - fulfillment rate of student - full-time faculty rate - scholarship provision rare - educational expenditure per student

LINC (Leaders in Industry-university Cooperation)	foster universities that aims industrial collaboration	2012~present	170 billion* (552 billion**)	Industrial collaboration oriented universities	Existing similar projects were combined into LINC	- employment rate - number of patents per faculty - ratio of practical experience on faculty assessment - number of faculty for industrial collaboration - number of projects and research funds per faculty - number of technology transfer contracts per faculty
NURI (New University for Regional Innovation)	promote regional development through the growth of regional universities	2004~2008	1,240 billion	Industrial collaboration oriented universities	Previous project of LINC	-faculty ratio -freshmen recruit ratio -scholarship -regional employment -curriculum development and improvement record

* includes only the budget of LINC program

** includes budget of previous industry-university cooperation related projects

Since this paper emphasizes the 'employment rate' as an output of education, it is needed to look at the relationship through previous studies between employment rate and several education indicators. Firstly, the studies of NURI project will be introduced because it holds the employment rate indicator and other educational indicators as their evaluation criteria which were focused on the industry-university collaboration. In addition, the NURI project was completed in 2008 and several evaluation research papers exists. Secondly, the PEUEC will be introduced because it applied the organized formula funding method more concisely with meaningful educational indicators and the output indicators.

(1) New University for Regional Innovation (NURI) project

The NURI project is based on the regional development policies of the government through the industrial collaboration between regional universities and the enterprises in suburban region.[11] It aims to promote regional development through the growth of regional universities.[12] The key feature of the NURI project is strengthening the 'industry-university relationship' and the 'employment of students'. The 'Industry-university relationship' included the exchange in human resources and knowledge and technology between universities and companies. For the assistance for student employment, scholarship, study-abroad programs, language training opportunities were provided. The project funding allocation method has deviated from existing resource support method of top-down and university based short term support. Fundamentally, the NURI project adopted the method that seeks 'harmony through balanced development and competition' (Park, 2010). As the NURI project was carried out as part of the National Balanced Development, the resources were allocated to universities in the 13 cities and provinces excluding the Seoul metropolitan

[11] NURI project is reorganized into the 'Leaders in Industry-University Cooperation: LINC' program from 2012.

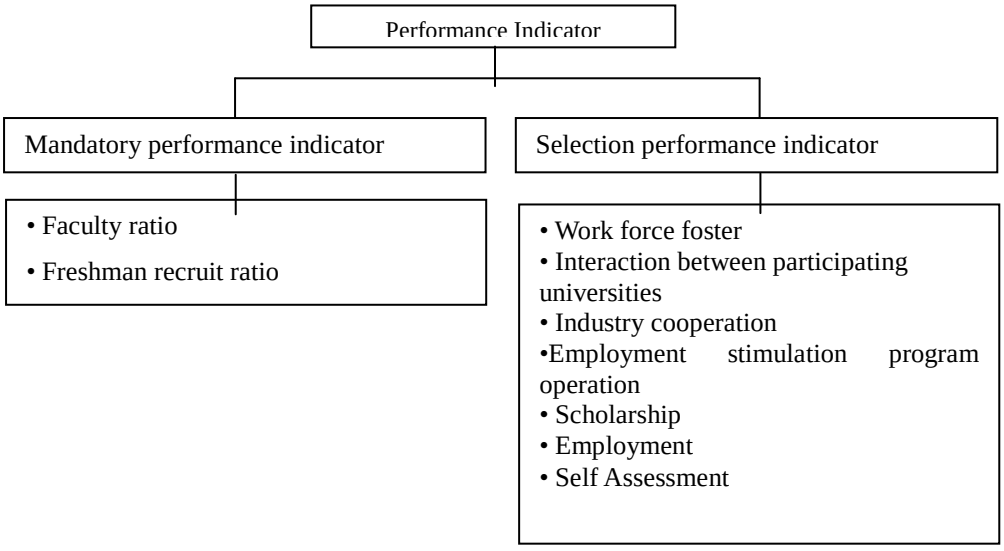
[12] With these purposes, a budget of 1,240 billion KRW was secured from 2004 to 2008 and 112 NURI projects were selected.

area through competition. In this process, the 'balance index' was used in the process of allocating the resource to each region.

1) Composition of education indicators

In order to take part in and keep participating in the project, the faculty and student recruit rate of the university and project team was vital. Universities had to recruit of over 60% of freshman quota and 50% of faculty in order to participate. Also departments directly participating in the project needed to fill over 90% of the freshman quota and secure over 80% of the faculty to continue the project. Participation in the NURI[13] project was limited by setting these conditions. These conditions were set to intensively foster only selected universities with potentials and meet certain conditions. The evaluation indicators are composed of two indicators, ‘mandatory performance indicators’ and ‘selection performance indicators’. The composition of performance indicator is shown in <Table 5>.

Table 5 Composition of performance indicator of NURI project



Source: Ryu(2010), Program Evaluation of NURI project, policy paper

[13] NURI project was relatively less systematic than PEUEC project because it only focused on the education performance, not on the education condition indicators.

The detailed indicators of ‘selection performance indicator’ are as follows.

Table 6 Selection performance indicator

Workforce Foster Indicator	• Curriculum development and improvement record • Teaching material development record • Academic club support record • Capstone design support record
Interaction between participating universities indicator	• Co-operated course creation • Student interaction record • Professor interaction record
Industry cooperation indicator	• Human interaction • Internship status(participating agency, student number) • Industry commissioned education • Professor recruit with industry experience • Co-operation of industry curriculum • Technology education • Intellectual Property • Technology transfer and industrialization
Employment stimulation program operation indicator	• Support of language and IT education • Major related certification acquisition support • Oversea education support • Graduate re-call education
Scholarship indicator	• Scholarship beneficiaries
Employment indicator	• Major related employment • Regional employment
Self-assessment indicator	• Contest winner • Industrial education satisfaction

Source: Ryu(2010), Program Evaluation of NURI project, policy paper

1) Previous studies on the NURI project[14]

Several NURI project evaluation papers and performance evaluation studies exist. Jung and other researchers (2008) looked at the employment rate as a core educational performance indicator during the NURI project. This study found out that the NURI project had a positive effect to the employment rate of students; however, it did not find the correlations between the indicators and the employment rate. Ryu (2010) showed some meaningful results about the relationship between the education condition indicators and the employment rate. Ryu analyzed whether the selection of the project enhanced the employment of students by comparing the NURI teams and comparable groups through the difference-in-difference econometric models. In addition, he analyzed how each control variable is influential to the employment. He proved that the average employment rate of NURI teams was significantly higher than those of the other comparable groups. Also, he revealed that the amount of government financial support per student positively affected the employment rate of students who participated in the NURI project. The employment rate increased over the years and statistical levels went up as well. The reason why the employment rate increased is because the students that benefited from the projects increased as time passes and ultimately resulted in the increase of the employment rate of students. On the other hand, the amount of government financial support per faculty indicator was less significant compared to those of students when it comes to the employment rate. Based on the analysis, Ryu concluded that the government financial support for students is more efficient than providing financial support for faculty. He also exhibited the performance of the

[14] The NURI project showed some tangible results compared to the first year of the project. Student recruit rate and faculty recruit rate showed substantial increases. The employment rate for the large projects increased by 7.6% and medium and small project employment rates increased by 8.1% in comparison to 2004. In comparison to 2004, the faculty ratio for specialized fields in 2005 had increased by 12.4%, and student ratio had achieved 100%. Also, in spite of the economic recession, the employment rate increased by 6.3%. Recently MEST and the National Research Foundation announced the results of the 2008 assessment and also showed the same. The highlight is the increase of graduate employment in the specialized field from 58.9% in 2004 to 74.7% in 2008 which is a 15.8% increase (MEST, 2008).

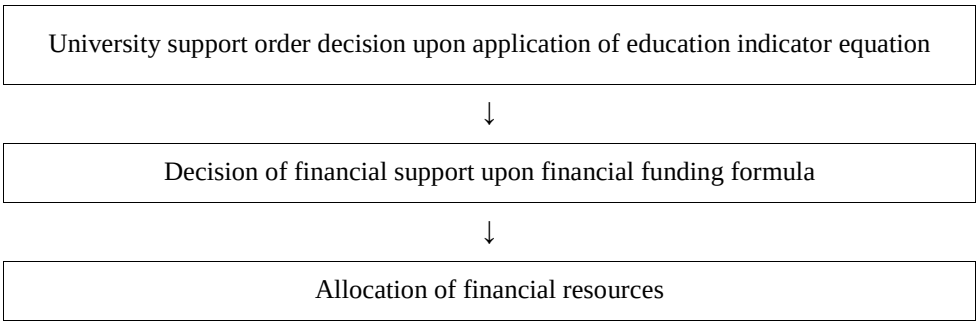
universities whether the university type (private vs public) is significant to the employment rate. In his analysis, the private universities tended to have higher employment rates than public universities.

(2) Project enhancing the universities' education competency (PEUEC) project

PEUEC project was initiated in 2008 with the purpose of promoting the competitiveness of universities, enhancing the autonomy of the university and strengthening the educational capacity at the undergraduate level. Previous projects were selected by looking through business plans that universities submitted, in contrast the PEUEC program applies the formula with indicators that could measure and evaluate the education capacity and performance.[15] In particular, the formula funding method is a very effective measure of universities because the government is able to not only manage universities with the objective and quantifiable indicators but also promote the voluntary competition among universities through financial incentives. In order for more strong competition among universities, the government financial supporting funds are allocated by every year. In the PEUEC program, universities are evaluated based on location, size, and university characteristics. <Table7> shows the process map of the government funding formula project.

[15] From 2010, the PEUEC project was divided and one part became the 30 billion won 'ACE(Advancement of College Education)'.

Table 7 Process map of the government funding formula project



The allocation of financial resources is decided by the formula based on the size, location of universities and the required education indicator score.

1) Composition of education indicators

Educational indicators which were used in the formula-funding method are largely divided by 'educational performance indicators' and 'education condition indicators'. These two indicators are intended to improve the educational conditions of a university and stimulate the educational performance. The education indicator formula has changed its focus on performance indicators and education condition indicators over the years such as change in weight, application of improvement, addition of index.[16] The general indicators of the project are shown in <Table 8>.

Table 8 Evaluation indicators of the PEUEC project

educational performance indicator(2011)		education condition indicator(2011)							
employment rate	fulfillment rate of student	global index	full-time faculty rate	academic management and curriculum	educational expenditure per student	scholarship provision rate	tuition relief index	univ. entrance index	Total
20%	20%	5%	10%	10%	10%	10%	10%	5%	100%

Source: Hong(2012), Improvement of University Assessment Indicators, Higher Education

[16] The proportion of the education indicators are modified and changed based on the opinion of university staff and education specialists.

Among these indicators, the indicators which are weighted the most and important are educational performance indicators such as ‘employment rate’ and ‘fulfillment rate of student’.

2) Previous studies on the PEUEC project

There are not many researches that have assessed the PEUEC (Project Enhancing the Universities Education Competency) project. Park (2010) researched how the PEUEC project improved education condition and performance. His research showed that the government used both performance and condition indicators when selecting and allocating the government funds of the PEUEC project. In the project, several indicators such as employment rate and fulfillment ratio of students were used as the performance and condition indicators. Also indicators such as full-time faculty ratio and educational expenditure per student were applied as well. For this research, he tried to verify whether if the project made any progress in terms of educational conditions and performance by using the panel data for 2007 which was before the project and 2008 which was after the project. The results showed a little difference in employment rate between the universities that participated in the PEUEC project and those that did not.

While the findings summarized above are important, there are clear differences that differentiate this study with previous ones. First, the study contains various indicators that were used for the government financial supporting projects. Second, it embraces diverse variables including an industrial collaboration variable. Third, the data used is beyond that of only the universities that took part in the financial support program and broadens the scope to nationwide universities. Lastly, the study contains the interaction term to figure out whether the interaction effect exists between the two variables that is significant to the employment rate.

III. Methodology

The purpose of this study is to analyze the relationship between the educational indicators that the government is using in the government financial supporting projects and the employment rate of university graduates. Also how the indicators are associated with employment will be studied. In this chapter, firstly, the (i) analysis methodology will be addressed (ii) then; variables and (iii) data will be explained.

1. Analysis Methodology

(1) Multiple Linear Regression

First, OLS (ordinary least squares) regression analysis was performed at the individual university level. In OLS regression analysis,[17] the relationship between input indicators and output indicators were analyzed based on each university's index value. The advantages of OLS regression analysis in this study is that OLS analysis explicitly shows the relations between the input and output indicators by using an university as the unit of analysis and how much inputs influence to output indicators, particularly the structural characteristics of the university. OLS analysis is relatively simple compared to other analysis. As so, it is also easy and clear to deliver information and easier to link research findings to policy issues. In this analysis model, the POLS(pooled OLS) data was used due to the lack of time series.

[17] Multivariate regression analysis is the most popular education analysis model.

The formula of this regression analysis is shown below:

$$Y=a_0+b_1x_1+b_2x_2+b_3x_3+b_4x_4+b_5x_5+b_6x_6+b_7x_7$$

Y: employment rate of university graduates

a_0: constant

x_1: university type (public vs private)

x_2: university location (Seoul Metropolitan area vs Non-Seoul Metropolitan area)

x_3: scholarship provision rate

x_4: educational expenditure per student

x_5: student to full-time faculty ratio

x_6: student to full-time industry experienced faculty ratio

x_7: year (2010, 2011)

2. Variables

(1) Dependent variable

The dependent variable was identified as the employment rate of university graduates.[18] The employment rate is generally considered as the educational outcome (Choi, Ryu et al). Employment rate was calculated based on the health insurance database. The formula of the employment rate of the university graduates is:

$$\text{Employment rate} = \frac{A}{B-(C+D+E+F+G)} \times 100$$

[18] Employment rate cannot be the only indicator representing the overall performance of an university education, but certainly, it is an important goal to raise the employment rate of university graduates for the government through the government financial supporting projects. Thus, the employment rate is determined as a proxy for the educational outcome which has the largest portion among the government financial support projects.

A: the number of employed students based on the health insurance database

B: the number of university graduates

C: the number of students who enter the graduate school

D: the number of students who serve the military service

E: the number of the disabled who could not be employed

F: the number of international students

G: the number of students who are employed but not be provided the health insurance

(2) Independent variable

Independent variables are selected among the indicators that might affect the employment rate. They also include one new variable which was not included in other related studies, but the one which might be related to the employment rate. Also these variables are the government financial support project indicators which are related to the university level of effort. The independent variables include indicators such as faculty, financial, and industrial collaboration variables. Aside from this, university characteristics variables were added because they are not included in the government financial project, however, the government considered those characteristics when distributing the government funds. <Table 9> shows the descriptive statistics of variables.

Table 9 Descriptive statistics of independent variables

University characteristic	private vs. public(dummy)	private=0, public=1
	location(dummy)	Seoul metropolitan area=0, Others=1
Financial	scholarship provision rate	total scholarship amount divided by tuition per student
	educational expenditure per student	total expenditure divided by the number of students who attend the institution
Faculty	student to full-time faculty ratio	total number of students divided by the total number of full-time faculties
Industrial collaboration	student to full-time industry experienced faculty ratio	total number of students divided by the total number of industry experienced full-time faculties
Year	Dummy	2010=0, 2011=1

These independent variables are basically modified from the study of Choi (2008) who studied the effect of educational quality indicators and the educational outcomes. On the basis of variables in her study, this study includes an industrial collaboration indicator.

1) University characteristic variables

(i) University type

Universities are divided into two groups; private university and public university. This paper will use dummy variable as follows: private university= 0, public university= 1.

(ii) Location of university

In this research, universities are also divided into two groups, the universities depending on the location, the universities within Seoul metropolitan area and the universities outskirt of Seoul metropolitan area. In this study, the dummy variables are marked as follows: universities within Seoul metropolitan area= 0, universities which are not in Seoul metropolitan area= 1.

2) Financial variables

(i) Scholarship provision rate

The scholarship provision rate[19] means how much a student is funded in terms of scholarships compared to the tuition fee that the student paid. It is perceived that the higher the scholarship provision rate, the better for the students. Also, it can be a measure of the attractiveness for students. This indicator is widely used in the government financial support project such as PEUEC project, and university restructuring project.

• (total amount of scholarship / tuition revenue) *100

(ii) Educational expenditure per student[20]

The educational expenditure per student is a core and primary indicator among educational indicators which also represents the quality of education. It is the indicator to measure the overall educational cost for per student on the yearly basis and it is commonly used in education research reports from the OECD. To illustrate, a lower amount of educational expenditure per student means that the university invests less compared to the amount that the student paid to the university. In general, the higher the educational expenditure per student, the more benefit a student enjoys in terms of educational service. This indicator is a meaningful indicator for students when selecting universities. This indicator is also used in the PEUEC project and university restructuring program.

• (net operation cost + depreciation cost)/ number of students

[19] The reason why the scholarship amount per student was not used in this research is the scholarship amount is related to the tuition fee. In general, the scholarship amount is the calculated by certain portion of tuition amount. Thus, this indicator might result in negative toward public universities which have relatively low tuition.

[20] The classification of 'educational expenditure per student' is different from OECD and KEDI(Korea Educational Development Institution). The data in this study, it is followed by the same classification of KEDI.

3) Faculty variable

(i) Student to full-time faculty ratio

The student to full-time faculty ratio is another core education indicator which is used in the OECD and PEUEC project. It refers the number of students per full-time faculty. Faculty indicators are one of the core educational indicators. It is explained that the faculty indicator is closely linked with the performance of the university (Choi, 2010).

• total number of students / total number of full-time faculties

4) Industrial collaboration variable

(i) Student to industry experienced full-time faculty ratio

The student to industry experienced full-time faculty ratio was adopted by the newly started industrial collaboration promotion project called 'Leaders in Industry-university Cooperation (LINC)' project[21] which was followed by NURI project. This new variable newly added which was not included in other related studies.

• total number of students / total number of industry experienced full-time faculties

In addition to these variables, dummy variable for each year (2010=0, 2011=1) was added as a controlled variable to see whether the year itself had any affect the employment rate.

3. Data

Regarding the data, this paper used 'Higher education statistics' produced by the Korea Educational Development Institute for the years of 2010 and 2011, as it contains the university quality indicators and as the unit of observation is 'university level' which is

[21] The detailed evaluation indicators are described in Annex II.

contrary to the individual unit of previous data. In this study, 2010 and 2011 data was used which is referred as POLS data. The data of 2009 was not included because it was incomplete in terms of expenditure per student and the formula calculating the employment rate has changed from the year of 2010.

The total number of universities in 2010 and 2011 are 268. Universities with an entrance quota of less than 300 students or the universities less than 1,000 students were excluded. Universities with single department were defined as micro universities and were excluded as well. Special purposed university such as education, religious, and medical universities were also excluded (such as Korea Maritime University, Korea Sport University, Korean National University of Education, POSTECH, and Cha medical university). A newly established university which does not possess any university graduates was also excluded (Ulsan National Institute of Science and Technology). Due to the fact that special universities make the regression analysis difficult, only general universities were set as the analysis pool. The reason these micro universities were excluded was because many of these micro universities had extreme values which distorted the regression analysis. As a result, 268 universities were set as the analysis pool. The composition of universities is shown as below:

Table 10 Composition of universities

Category		university location		Total
		Seoul metropolitan area	Non-Seoul metropolitan area	
university type	private	91	134	225
	public	6	37	43
Total		97	171	268

IV. Analysis Result

1. Descriptive Statistics

<Table 11> shows the descriptive statistics of the regression result. The average percentage of employment rate of university graduates is 53.5.

Table 11 Descriptive statistics of regression analysis

	Obs.	Mean	Std. Deviation
Employment rate(%) (unit: number of university)	268	53.48	8.837
University type(dummy)	268	0.16	0.368
University location(dummy)	268	0.64	0.481
Scholarship provision rate (unit: percent)	268	20.70	28.110
Expenditure per student (unit: thousand won)	268	9174.94	3681.794
Student to full-time faculty ratio (unit: number of students)	268	32.92	7.923
Student to full-time industry-experienced faculty ratio (unit: number of students)	268	414.01	868.838
Year(dummy)	268	0.50	0.501

The interpretation of the descriptive statistics is as follows: The average employment of university graduates is 53.5%. The average scholarship provision rate is 20%, the expenditure per student is 9,175 thousand won. The student to full-time faculty ratio is 32.9 which means 32.9 students are assigned to one faculty on average. Also, the student to full-time industry-experienced faculty ratio is 414.01. It stands for one industry-experienced faculty has 414 students.

The next table shows the detailed information about the employment rate of university graduates based on the ‘university type’ and ‘location of university’.

Table 12 Employment rate by category

(unit:%)

Variables	Category	2010		2011	
		Obs.	employment rate	Obs.	employment rate
University type	Public	22	53.0	21	55.3
	Private	112	51.7	113	55.0
Location of university	Seoul metropolitan area	48	50.8	49	53.4
	Non-Seoul metropolitan area	86	52.5	85	56.0
Average		268	51.9	268	55.1

In the case of regional universities, they had higher employment rate compared to the universities in Seoul metropolitan area. In terms of university type, private universities had higher rate of employment rate than public universities.

This result shows the same result from the previous studies that universities located in suburban area has higher employment rate than universities in urban areas. Furthermore, as the previous studies(Choi,Ryu) revealed, private universities show higher employment rate than public universities.

2. Regression Result

The analysis focused on how education condition indicators of university are related to the employment rate which is reflected in the performance dimension. In addition, how university characteristics, faculty, financial conditions, and industrial collaboration variables are related to the output process was focused upon. Results from OLS analysis can be summarized as follows.

(1) Regression Analysis 1: OLS regression analysis

This part shows the result of the multiple regression analysis to find out which indicator is related to the employment rate of students. <Table 13> shows the correlation coefficient[22] between independent variables.

Table 13 Correlation coefficient analysis

Variables	1	2	3	4	5	6	7	8
1. employment rate	1							
2. university type	.032	1						
3. university location	.117	.202***	1					
4. scholarship provision rate	.056	.237***	.091	1				
5. expenditure per student	.340***	.232***	-.243***	-.073	1			
6. student to full -time faculty ratio	-.369***	-.259***	-.145*	-.146**	-.544***	1		
7. student to full-time industry-experienced faculty ratio	-.114	-.041*	.022**	.032	-.135	.183**	1	
8. year(dummy)	.179**	.010	-.008	-.060	.066	-.028	-.036	1

[22] It means the degree of association between two variables. The value ranges from -1 to 1. When a correlation coefficient approaches -1 to 1, it shows a strong relationship between the two independent variables. Negative values of the correlation coefficient mean an inverse relationship between two variables. In other words, the values of one variable decrease as the values of the other variables increase.

According to the correlation coefficient, the strongest correlation coefficient is found between 'expenditure per student' and 'student to full-time faculty ratio'. It means that these two variables are associated with the employment rate. Also, the coefficient is statistically valid at one percent significance. Moreover, the figure shows the negative relationship. It is explained that the student to full-time faculty ratio decreases as educational expenditure per student increase. In addition, dummy year variable are statistically valid by five percent which means that the employment rate is changeable based on the year difference.

Table 14 Regression Analysis Model 1: Multiple regression R^2=0.228

Independent Variable	OLS	
	B	beta
constant	50.374	
University type (private vs public)	-3.475 (1.447)	-.145*
University location (Metropolitan area vs Non Metropolitan area)	3.462 (1.131)	.189**
Scholarship provision rate	2.376E-02 (.018)	.076
Educational expenditure per student	7.336E-04 (.000)	.306***
Student to full-time faculty ratio	-.212 (.079)	-.190**
Student to full-time industry-experienced faculty ratio	-2.09E-04 (.001)	-.040
Year (2010,2011)	2.757 (.956)	.156*

Note: The independent variable is employment rate.
Standard errors are in parentheses.
*** p<.001, ** p<.01, * p<.05

According to the <Table 14>, the R^2 of this analysis data is 0.228 and it can be interpreted that 22.8 percent is explained by independent variables. Many studies show that a large portion of the employment rate of university graduates is explained by various factors

such as the individual human capacity and job preparedness (Coleman, 1996, Kim, 2010). As shown in the data, however, several indicators such as 'educational expenditure per student' and 'student to full-time faculty ratio' was influential to employment rate of universities. From the <Table 14>, it is interpreted that the employment rate increases as the expenditure per student increases and the lower the student to full-time faculty ratio. Also, the location of university and university type and 'year' [23] variables were in the significant level.[24] It exhibits that the universities in the suburban region and the private universities tend to have a higher rate of the employment of the students.

(2) Regression Analysis 2: increasing return of the employment rate and interaction effect

1) Increasing return of the employment rate

According to the production function in economics, the output may increase by the same proportion or a greater portion, a smaller proportion of its input in many cases. Then, one question arises; the effects of 'educational expenditure per student' and 'student to full-time faculty ratio' on employment rates are linear. In other words, do the effects of educational expense per student and student to full-time faculty ratio increase constantly at the same ratio infinitely? The effects of educational expense per student and student to full-time faculty ratio may decrease or increase. To test the linearity between the employment rate on the one hand and the educational expense per student and student to full-time faculty ratio on the other hand, two variables were added to the Regression Analysis Model 1: the square of the 'educational expense per student' variable and the square of the 'student to full-time faculty ratio' variable.

[23] It is presumed that the economic environment has an effect on the employment rate.
[24] As a result of implementing regression analysis for 2010 and 2011, the type of university does not have a noticeable amount of effect on the employment rate.

2) Interaction effect

Baek (2007) stated that human capital and physical capital contribute to the education productivity, not only by the substitution effect but also by the complementary effect. From Regression Analysis 1, the two most significant factors to the employment rate were found to be 'student to full-time faculty ratio' and 'educational expenditure per student'. The graduate employment rate is positively dependent on the per student expenses, and negatively related to the student to full-time faculty ratio based on the previous regression analysis. Therefore, to increase on the employment rate, it speculates that per student expenses should be increased and student per teacher should be reduced. However, a policy question is faced: what categories of expenses should be increased to increase per student expenses. Should the personnel expenses (such as number of teachers per student and salaries per teacher) or non-personnel expenses (such as buildings, materials, equipment) be increased?

On the one hand, if the per student educational expenditure increases through the increases in the number of teachers, the student teacher ratio is also effected to decline. Therefore, it will increase the graduate employment rate. On the other hand, if the per student educational expense increases through the increases in the salary of individual teachers without increasing the number of teachers, the student teacher ratio would not be affected at all, and therefore, it would not affect the graduate employment rate.[25] Therefore, the expenses per student variable and the student to full-time faculty ratio variable would interact, depending on which categories expenses per student increases, and it would be appropriate to include in the model an additional variable showing the interaction between the educational expenditure per student variable and the student to full-time faculty ratio variable. Therefore, in the Regression Analysis 2, an interaction term is included. The 'interaction effect' shows

[25] Based on the correlation coefficient analysis in Table 13, the correlation coefficient between 'educational expenditure per student' and 'student to full-time ratio' was statistically significant.

whether the effect on the dependent variable strengthens when one independent combines with another independent variable. The regression model which includes ‘interaction term’ and ‘squared term’ is represented as the following function.

$$Y=a_0+b_1x_1+b_2x_2+b_3x_3+b_4x_4+b_5x_5+b_6x_6+b_7x_7+b_8x_4^2+b_9x_5^2+b_{10}x_4x_5$$

Y: employment rate of university graduates

a_0: constant

x_1: university type (public vs private)

x_2: university location (Seoul Metropolitan area vs Non-Seoul Metropolitan area)

x_3: scholarship provision rate

x_4: educational expenditure per student

x_5: student to full-time faculty ratio

x_6: student to full-time industry experienced faculty ratio

x_7: year (2010, 2011)

x_4^2: educational expenditure per student × educational expenditure per student

x_5^2: student to full-time faculty ratio × student to full-time faculty ratio

x_4x_5: student to full-time faculty ratio × educational expenditure per student

Table 15 Regression Analysis Model 2: Two squared terms and interaction effect

Independent Variable	Model 1	Model 2
	R^2=.228	***R^2=.324***
University type (private vs public)	-.145* (1.447)	-.159** (1.364)
University location (Metropolitan area vs Non Metropolitan area)	.189** (1.131)	.241*** (1.060)
Scholarship provision rate	.076 (.018)	-.052 (.021)
Educational expenditure per student	.306*** (.000)	0.193 (.001)
Student to full-time faculty ratio	-.190** (.079)	-.964** (.0430)
Student to full-time industry-experienced faculty ratio	-.040 (.001)	-.006 (.001)
Year (2010,2011)	.156* (.956)	.127** (.895)
Educational expenditure per student × educational expenditure per student		.797** (.000)
Student to full-time faculty ratio × student to full-time faculty ratio		.891** (.007)
Educational expenditure per student × student to full-time faculty ratio		.861*** (.000)

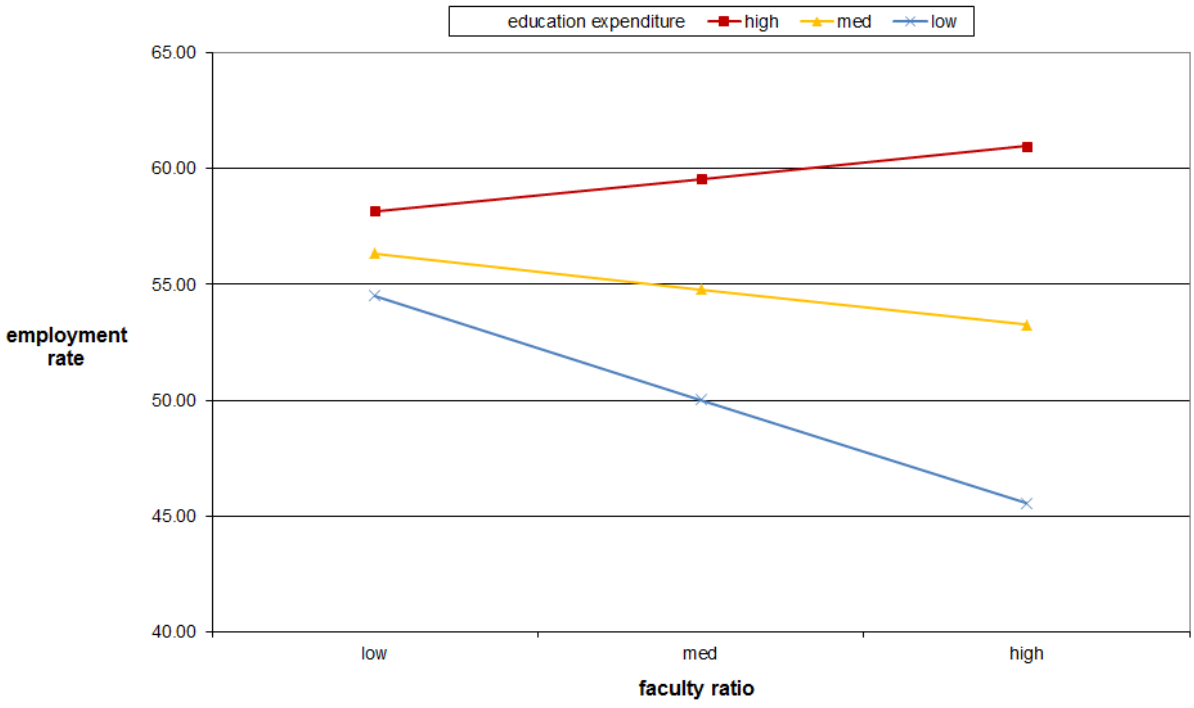
Note: The independent variable is employment rate.
Standard errors are in parentheses.
$^{***}p<.001$, $^{**}p<.01$, $^{*}p<.05$

When the squared terms and interactive term are applied, it is interpreted that the interaction effect appears as the value of $\boldsymbol{R^2}$ increases ($\Delta\boldsymbol{R^2}$=0.096). It is 9.6 percent of explanatory power increased from 22.8 percent to 32.4 percent compared to the analysis before applying the two squared terms and interaction term in one percent significance level. From <Table 15>, the coefficient of the squared term 'expenditure per student' and the 'student to full-time faculty ratio variables' shows both positive signs and turned out to be statistically significant. It means that the expenses per student and student to full-time faculty ratio variables have increasing return; i.e., their effects on the graduate employment rate will increase at an increasing rate. To put it differently, educational expenditure per student have

positive effects on the graduate employment rate, and its effects may increase as the scale of the expending becomes larger. From the analysis, it is defined that the employment rate is increasing as more expenditure on educational expenditure per student is provided. In the same way, the increase in spending on the faculties which means the low student to full-time faculty ratio, results in higher employment of the university graduates.

The Regression Analysis Model 2 also exhibits the 'interaction effect' existed. The <Graph 4> visualizes the interaction effect. The interaction effect is represented as the slope difference.

Graph 4 Interaction effect between the 'student to full-time faculty ratio' and the 'education expenditure per student'



<Graph 4> shows that the 'educational expenditure per student' factor controls the employment rate when combined with the indicator of 'the student to full-time faculty ratio'. In the case where the educational expenditure per student is high (above 12,800 thousand KRW), the employment rate still goes up despite the high faculty ratio. However, the

employment rate dramatically goes down when educational expenditure per student is low (below 5,500 thousand KRW) and the faculty ratio is high. From the results, it can be seen that high educational expenditure per student offsets the negative effects of the high number of students per faculty when these two variables are combined. On the other hand, the universities with a low level of educational expenditure per student show a sharp decrease in the employment rate when the number of students per faculty increases. This indicates that the low educational expenditure per student deteriorates the employment rate when combined with a large number of students per faculty. When discriminating by educational expenditure through the interaction effect, universities with high level of educational expenditure per student are found to be mainly big-sized private universities located in the Seoul metropolitan area or public universities that the government strategically supports. The universities on the other end were small-sized private universities located in suburban areas. In the same way, the universities with a low level of student to full-time faculty ratio identified as the universities with the affluent financial investment from the government or financially independent.

The effect of ‘educational expenditure per student’ to the employment rate was valid in the regression analysis model 1. However, its effect no longer exists in the regression analysis model 2. However, this variable was significant when combining with the student to full-time faculty ratio variable. Due to the inconsistency, it is hard to say that the ‘educational expenditure per student’ itself directly influences the employment rate of the graduates. Nonetheless, it can be interpreted that the effect of ‘educational expenditure per student’ was revealed through the interaction effect in that the coefficient value of the interaction term was biggest among other variables and the statistically significant.

V. Conclusion

1. Summary and Policy Implication

This study aimed to find the determinants of university graduate employment by using the indicators of the government financial support programs. In particular, this study focused on figuring out the determinants at the university level. First, multiple linear regression was performed. According to the POLS multiple regression, the educational expenditure per student and student to full-time faculty ratio had a significant effect on the employment of university graduates. In particular, the effect of educational expenditure per student and the student to full-time faculty ratio on employment rate was valid after controlling the variables of location and university type. In order to verify the slope change of the ‘educational expenditure per student’ and ‘student to full-time faculty ratio’, the squared terms was used. From the analysis, the employment rate increased as more was spent on these variables. Moreover, the interaction effect from these two factors existed. According to the interaction effect, the employment rate goes up when the level of education expenditure per student is high, regardless of student to full-time faculty ratio. The employment rate decreases when the level of educational expenditure per student is low and the ratio of student to full-time faculty ratio is high. On the other hand, student to full-time industry experienced faculty ratio (industrial collaboration related variable) and scholarship provision rate did not significantly affect the employment of university graduates. Also, the regression analysis result with two squared terms indicates that educational expenditure per student has positive effects on the graduate employment rate, and its effects may increase as the scale of the expending becomes larger. The employment rate goes up as the ratio of the student to full-time faculty ratio is getting lower. Based on the findings in this study, the following suggestions for the government policy were drawn;

The government should inspect and modify evaluation indicators and guidelines of the project according to the purpose of each university supporting program to increase the impact on the employment rate. The essence in government educational expenditure is to improve the efficiency of the government supporting financial projects. Currently, several government financial support projects (LINC, ACE, PEUEC, and so forth) have been operating with different purposes. Due to the traits of each program, a composition of indicators is needed to contain all of the values and rationales. Therefore, the government supporting projects should be designed to maximize the outcome of each program. If a certain financial support project aims to improve the employment students, the government should use indicators that are related to the employment rate. In this regard, the government has to put more emphasize on both 'educational expenditure per student' and 'the student to full-time faculty ratio' indicator. As a result from the interaction effect analysis exhibits, the employment rate increases when the 'educational expenditure per student' and the 'student to full-time faculty ratio' combined. Thus, the government needs to increase the weight of these two indicators to fortify the effect on the employment rate. In particular, the government should be more emphasized the student to full-time faculty ratio. To illustrate, increasing the ratio of the student to full-time faculty in the supporting funds projects of the government will lead to the expanding budget of universities to secure the full-time faculty. The increased number of faculty will reduce the number of students per faculty, and simultaneously bring out the increase of the educational expenditure per student by expanding the spending of full-time faculties. In fact, all this process is for increasing the employment rate. In other words, raising the weight of the 'student to full-time faculty ratio' results in the improvement of the unemployment through the interaction effect between the 'educational expenditure per student' and 'student to full-time ratio'. Furthermore, the government should expand the university supporting funds to enjoy the benefits of

increasing the rate of the employment rate. It means expanding the government funds itself helps the improving the employment rate. The analysis result shows that when the spending on the educational expenditure and faculties is increased, the employment rate of the university graduates is also getting larger. This result provides the policy implementation for the government to expand the financial support for universities. Since the public expenditure is relatively low compared than other OECD countries, the strong motivation of the government to expand the public expenditure exists. Thus, the government could find the rationale of expanding the support for higher education not only to improve the quality of education but to increase the employment rate of university students.

2. Future Research

Although this study provides meaningful information regarding the education indicators and the employment rate, there is room for improvements. First, the employment rate used in the study did not consider the quality of the employment of graduates such as full time and part time positions. Second, this study could not fully explain the reason why industrial collaboration related variable is not significant to the employment rate. Also future researches may consider a time-serious analysis with accumulated data to figure out which determinants consistently affect the employment of university graduates. Nevertheless, this paper offers a direction to efficiently allocate support to universities to maximize the employment of graduate student.

REFERENCES

<References>

Ahn, Min-seok(2010), The reality and improvement of government financial support projects of Lee Myungbak administration, the policy paper of parliamentary inspection of the government offices vol.2.

Bae, Jong-geun (1992), Economics of education: concept and theoretical background, the problem of Economics and Finance of Education in Korea, Jiam Baejongjeun education discussion collection, 14-19

Baek, Il-woo (2000), Economics of education, Seoul: Hakjisa, 318-320

Ban, Sang-jin(1997), "Micro-approach in education investment", Journal of Korean society for the Economics and Finance of Education, 6(2), The Korean Society for the Economics and Finance of Education, 276~277

Ban, Sang-jin (1998), Investment in education and efficient school

Burke,J.C. (2005), Achieving Accountability in Higher Education: Balancing Public, Academic and Market demand(ed.). San Fransico: Jossey-Bass

Choi, Jungyun et al., (2008), Analysis on the determinants of education quality in Korean universities (II), Korean Educational Development Institute

Choi, Eun-ok (2012), Regional Development through Industrial Collaboration, 'University Education', v.177 p.16-26

Cohn, E. & Geske, T.G. (1990), The economics of education (3rd ed.), New York: Pergamon Press, pp.127~131

Coleman, J.S., et.al (1996), *Equality of educational opportunity,* Washington D.C.: Government Printing Office

Crampton, Faith E. (1995), "Is the production function dead?" An analysis of the relationship of educational inputs on school outcomes." (A presentation to the Annual Conference of the American Education Finance Association)

Dale, S.B. and Krueger, A.B. (2002). "Estimating the Payoff to Attending a More Selective College: an application of Selection on Observables and Unobservables", Quarterly Journal of Economics. Vol.117

Hadderman, Margaret (1998), School productivity (ED420092). ERIC Clearinghouse on Educational Management Eugene

Hanushek, E.A, (1986), "The Economics of Schooling: Production and Efficiency in Public Schools"

Hanushek, E.A. (1989), The Impact of Differential Expenditures on School Performance. Educational Researcher, 18(4), 45-51

Hanushek, E.A., & Pace. R.R (1995), Who Chooses To Teach (and Why)? Economics of Education Review, 14(2), 101-117. Oxford: Pergamon Press

Hedges, Larry V., Laine, Richard D., & Greenwald, Rob (1994), "Does matter money? A Meta-analysis of the effects of differential school inputs on student outcomes?", Educational Research 23(3), 5-14

Hong, Min-sik (2012), Improvement of University Assessment Indicators, Higher Education, v.175, 68-75

Jang, Su-myung(2004), Assessment on the performance and efficiency of the government financial support projects of higher education

Jeon, Jae-sik, Ju-hong Min (2009), Education and Educational Performance in the labor market (I): rate of return on investment in higher education, Korea Research Institute for Vocational Education and Training

Jeong, Jin-hwa (2008), 3-year Comprehensive Performance Analysis of NURI Project, Korea Research Foundation of Korea

Jung, Jin-whan, Kyujin Lim, Il-yong Lee, Sangjin Ban (2006), A Research of the Development of Mid-term Evaluation Indicators for NURI project, National Research Foundation of Korea policy

Kaufman.R. (1988) 'Preparing useful performance indicators' Training and development Journal(September), 80-83

Kim, Min-kyung, Ji-young Ryu (2010), The Determinants of the college graduate's decision to employment, 6th KEEP conference no.20

Kuh, G.D. (2001), Assesing what really matters to student learning: Inside the national survey of student engagement, Change, 33(3), 10-17

Lim, Kyeong-geun (2005), A Study of universitty enterprise through industrial collaboration, Mokpo University Desseration

Education statistics (2011), Ministry of Education, Science and Technology, KEDI

Lee, Jae-hoon (2012), Regional private university, the Uncomfortable truth and the way of improvement, Higher Education, vol.177, 34-41

Lomas, L. (2002). Does the Development of Mass Education Necessarily Mean the End of Quality. Quality in Higher Education, Vol 8, No 1.

Ministry of Education, Science and Technology, Ministry of Knowledge Economy, Korea Institute for Advancement of Technology (2009), 1 stage of Successful case study of Hub university for industrial collaboration

Ministry of Education, Science and Technology (2008), 2008 Annual report of NURI project

OECD (2011), Education at a glance 2011

Park, Sang-kyu (2012), The limitation and the improvement of University Assessment indicators, Higher Education, v.175, 76-89

Park, Sung-ik, Jang-su Ryu, Jangsik Cho, Jonghan Kim(2010), Analysis of the improvement of the employment rate of NURI project based on Double-Difference Method, Journal of Korean

Association of Applied Economics Vol. 12 no.2, 137-166

Park, Kyeong-ho (2010), Does the PEUEC have influenced on the universities' educational competency?, Journal of Educational Administration, Vol.28, No.4, 63-82

Park, Kyeong-ho(2010), Analysis of the validity and reliability of the education condition indicators and performance indicators of PEUEC, The Journal of Economics and Finance of Education, Vol.19, No.4, December 2010, 135~151

Pike, G.R.(2004), Measuring Quality: A Comparison of U.S. News Rankings and NSSE Bandchmarks, Research in Higher Education, 45(2), 193-208

Ryan,J.F. (2004),The relationship between institutional expenditures and degree attainment at baccalaureate colleges, Research in Higher Education, 47(5)

Ryu, Jang-su (2006), The Role of Higher Education for Regional Development, research paper, National Research Foundation of Korea policy

Ryu, Jang-su et al. (2010), Program Evaluation of NURI project, policy research paper, National Research Foundation of Korea, 105-165

Shin, Ha-young(2012), 'Employment rate Exaggeration of Three percent leads to Support Cut, news release, Aug,23, 2012 University News Network

ANNEXES

<Annex I>

Evaluation indicators of three government financial supporting projects (with 2012 indicators)

Indicators	PEUEC		Government Financial support limitation		Student Loan limitation
	weight	indicators	weight	indicators	indicators
Employment rate	20	male/Female employment rate (consider the traits of art and physical education)	20	same as PEUEC	same as PEUEC (absolute standard)
fulfillment rate of students	20	expand the ratio of current students within the student quota	30	same as PEUEC	same as PEUEC (absolute standard)
full-time faculty rate	10	faculty rate(including Adjunt, visiting professors)	7.5	full-time faculty rate	full-time faculty rate (absolute standard)
Education restitution rate	10	-change from the educational expenditure per student to education restitution rate -include performance of donation	7.5	except the amount of donation	except the amount of donation absolute standard
academic management and curriculum	20	-GPA management -ratio of small lectures -ratio of lectures from full-time faculty -part-time lecturer salary - globalization index - college entrance admission index	10	same as PEUEC (Except globalization index, college entrance admission index)	same as PEUEC (Except globalization index, college entrance admission index)
scholarship provision rate	10	separate tuition reduction and outward scholarships	10	contain the performance of tuition reduction	contain the performance of tuition reduction
Tuition level	10	-increase rate of tuition fee of 2011 - increase rate of tuition fee of 2011	10	same as PEUEC	
Repayment rate	-	-	-		
Corporation index	-	-	5	-transferred money by law -legal contribution	same as left
Total	100		100		

Source: MEST (2012), improvement of the university financial funding formula, public release material

<Annex II>

The financial funding formula of ‘University Restructuring Project’

Year	Indicators	
	university not be provided by the government financial support	**university not allowing student loan**
2011	employment rate(20%), fulfillment rate of students(30%) full-time faculty rate(5%) Academic curriculum management(5%) scholarship provision rate(10%) Rate of tuition from educational cost per student (10%) tuition increase ratio index(10%), repayment rate(10%)	employment rate(45%), fulfillment rate of student(90%), full-time faculty rate(61%), Rate of tuition from educational cost per student (90%)
2012	employment rate(20%), fulfillment rate of students(30%) full-time faculty rate(7.5%) Academic curriculum management(10%) scholarship provision rate(10%) Rate of tuition from educational cost per student (7.5%) tuition relief index(10%) corporation index(5%)	employment rate(45%), fulfillment rate of student(90%), full-time faculty rate(61%), Rate of tuition from educational cost per student (90%)

Source: MEST (2012), the financial funding formula of ‘university restructuring project’, press release

<Annex III>

The financial funding formula of 'LINC: Leaders in Industry-University Cooperation' project

Education - Research performance (20%)	employment rate **7%**
	the number of patents per faculty **7%**
	fulfillment rate of student **6%**
Education - Research condition (10%)	full-time faculty ratio **5%**
	Rate of tuition from educational cost per student **5%**
System of Industrial collaboration (40%)	Infrastructure - Ratio of practical experience on faculty assessment **15%** - operational revenue of research equipment **5%**
	Human resource - student to full-time industry experienced faculty ratio **5%** - the number of faculty for industrial collaboration **10%** - Ratio of professionals and full-time staff in industrial collaboration department **5%**
Contents of Industrial collaboration (30%)	Work force & employment - Ratio of students who experienced field training **5%** - Startup incubation **5%**
	Technology development and Transfer - the number of projects and research funds per faculty **10%** - the number of technology transfer contracts per faculty **10%**

Source: MEST (2012), the financial funding formula of ' LINC project', press release