



2017

Quality Measures of Universities and the Determinants of Tuition in South Korea

Young Hoon Ko

University of Kentucky, eternal1127@uky.edu

Right click to open a feedback form in a new tab to let us know how this document benefits you.

Recommended Citation

Ko, Young Hoon, "Quality Measures of Universities and the Determinants of Tuition in South Korea" (2017). *MPA/MPP Capstone Projects*. 275.

https://uknowledge.uky.edu/mpampp_etds/275

This Graduate Capstone Project is brought to you for free and open access by the Martin School of Public Policy and Administration at UKnowledge. It has been accepted for inclusion in MPA/MPP Capstone Projects by an authorized administrator of UKnowledge. For more information, please contact UKnowledge@lsv.uky.edu.

**Quality Measures of Universities
and the Determinants of Tuition in South Korea**

Young Hoon Ko

April, 2017

Martin School of Public Policy and Administration

Graduate Capstone

Advisor: J. S. Butler, PhD

Table of Contents

<i>Abstract</i>	4
1. Introduction	5
2. Literature review	9
1) <i>How can we measure the quality of university education?</i>	9
2) <i>Can the quality measures predict tuition level?</i>	10
3) <i>Is regulation policy necessary?</i>	11
3. Unit of analysis	13
4. Variables	14
5. Empirical strategy	17
6. Estimation results and Findings	18
7. Limitation	20
8. Policy implication	21
<i>Acknowledgement</i>	25
<i>References</i>	26
<i>Appendix</i>	28

Figures and Tables

Table 1: Rate of advanced school entrance	6
Figure 1.1: Comparison between Tuition increase rate and Inflation rate	7
Figure 1.2: Tuition dependency ratio	8
Table 2: Comparison between tuition increase rate and college entrance rate.....	12
Table 3: The present condition of four-year universities in Korea.....	13
Table 4.1: The first category of independent variables.....	15
Table 4.2: The second category of independent variables.....	16
Table 5: Estimating equation.....	17
Table 6.1: Estimation results of first category, educational inputs.....	18
Table 6.2: Estimation results of second category, educational outputs.....	19
Table 6.3: Estimation results of the policy of regulating tuition level.....	20
Table 7: Equations for verification of reverse causation.....	21
Figure 8.1: Government subsidy to private universities.....	23
Figure 8.2: Government funding for higher education compared to GDP.....	23
Table 8: Operating revenue of private university in 2014 fiscal year.....	24
Figure 8.3: Donations to private universities	24

Abstract

University tuition had increased in highly excess of the inflation rate from 1990s until 2008. Many people are wondering whether the quality of university education is proportional to the tuition level. Thus, this capstone project examines whether the quality measures in higher education can predict the tuition level.

After analyzing eight-year data of 146 private universities in South Korea, I get the result that university tuition is not a function of quality measures in terms of educational costs. However, tuition is a function of quality measures related with attractiveness, accomplishment, and satisfaction. Incoming student recruitment rate, and drop-out rate have significant impact on the tuition level at a 99 percent confidence level. Admission competition and research funding per faculty from internal sources also have statistically significant impact on the tuition level at a 95 percent confidence level.

Even though the tuition level has increased continuously, the rate of university entrance in terms of high school graduates also increased. The cost of college education impacts society broadly, especially under these circumstances. Thus, governmental intervention may be necessary. Actually, the Korean government has tried to stabilize the level of tuition since 2011. So this study also examines policy effectiveness and gets the result that tuition is reduced by the policy as intended.

Considering the result that the quality measures representing educational costs cannot predict the tuition level, universities should make an effort to relieve tuition burden by setting rational criteria of tuition level and reflecting all cost factors in this criteria. In the light of the result that tuition is a function of quality measures related with attractiveness, accomplishment, and satisfaction, government must be careful when it tries to regulate university tuition because there might be a possibility that the policy of tuition regulation would lead to deterioration in education quality.

1. Introduction

After the liberation from Japanese colonial rule, Korea was one of the poorest nations in the world. But it has developed very fast. Korea hosted the Summer Olympic Games in 1988 and became a member of the Organization for Economic Cooperation and Development (OECD) in 1995. In terms of the total size of GDP, it ranked eighth out of 34 OECD countries in 2015. (Chosun, 2016)

The energy of Korea's success was education. Traditionally Korean people have been putting emphasis on education. Even during the undeveloped ages, although there was no food at home, there might be some books for children's education. The people's passion for education in Korea has been very famous. And the accomplishment has been recognized by other countries. The text here was from The Washington Post.

By the numbers, the South Korean system is the envy of the world: The nation regularly places among the top five countries on international math and reading tests, the high school dropout rate is less than 4 percent, and the college completion rate among young adults is among the highest in the world.¹

Over 99 percent of middle school graduates go to high school.² Even though the university entrance rate has been reduced since 2012, over 70 percent of students among high school graduates go to higher education institutions which include both 2-year colleges and 4-year universities. The level of university entrance rate was ranked in first place among OECD

¹ Michael Alison Chandler, S. Korea tries to wrest control from booming private tutoring industry The Washington Post, April 3, 2011

² Korean education statistics service, <http://kess.kedi.re.kr/index>

countries. (News one, 2014).

Table 1: Rate of advanced school entrance³ (%)

year	High school graduate	Students going to college	Ratio of high school graduate to students going to college	GDP per capita
1990	761,922	206,790	27.1 %	\$6,514
2000	764,712	473,803	62.0 %	\$11,951
2010	633,539	477,384	75.4%	\$22,147
2011	648,468	469,961	72.5%	\$24,159
2012	636,724	453,899	71.3%	\$24,445
2013	631,197	446,474	70.7%	\$25,993
2014	632,983	448,817	70.9%	\$27,982
2015	615,462	435,650	70.8%	\$27,213

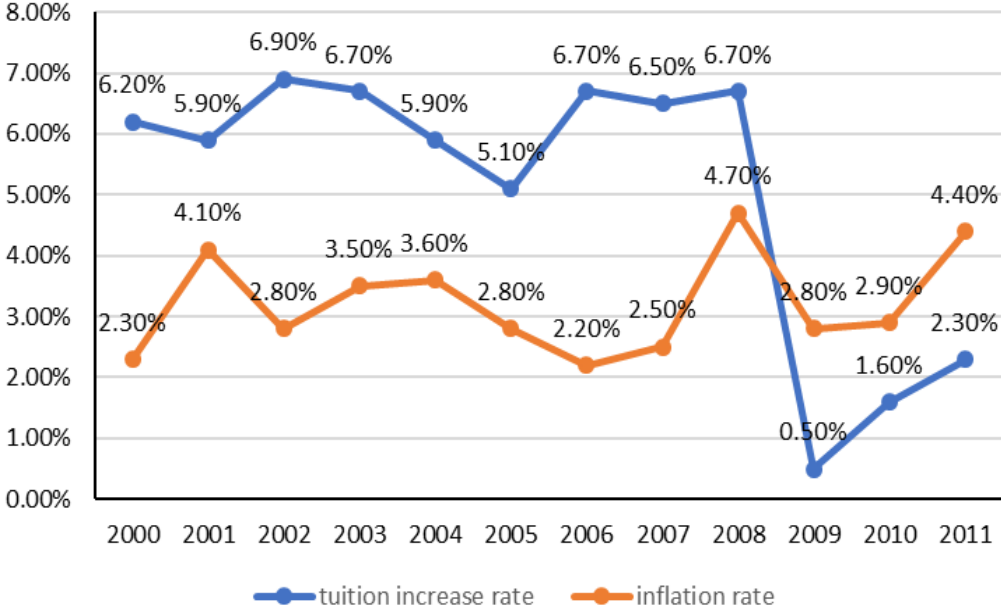
However, unfortunately there is an unpleasant side effect which is called academic elitism. Korean society regards educational background as being very important. There are a lot of discriminations on the grounds of the level of education, especially related with whether graduating university or not. Lee et al. (2011) stated that people in South Korea have experienced discrimination based on their education level. It is more difficult for less educated people to be hired than educated people. They normally earn less income. In Korean society, less educated persons also have difficulty in getting married. Thus, Korean people have considered going to universities as an instrument to get privileges such as getting a good job and reputation from others. Most parents want their sons and daughters to go to university. In short, higher education has been considered as a critical mechanism for socioeconomic advancement in Korean society.

³ I merged data from Korean education statistics service (<http://kess.kedi.re.kr/index>) and Korean Statistical Information Service (<http://www.kosis.kr>)

Parents are willing to sacrifice for the cost of higher education of their children. Although they could face financial hardships, they eagerly pay a lot of money for tuition. As I mentioned above, because about 70 percent of graduates of high school go to universities, the burden of university tuition is not the problem related with a certain group but the problem which the entire nation is interested in.

Many people have hoped that the tuition level was stabilized. But university tuition had increased in excess of the inflation rate from 1990s until 2008. In the 2000s, the situation was getting worse. From 2009, the newly inaugurated administration tried to stabilize the level of tuition. As shown below, it was effective. But the level of university tuition was ranked in fourth place among OECD countries based on real GDP as of 2011. (OECD, 2013) Thus, the government established the law to regulate the tuition level in 2011.

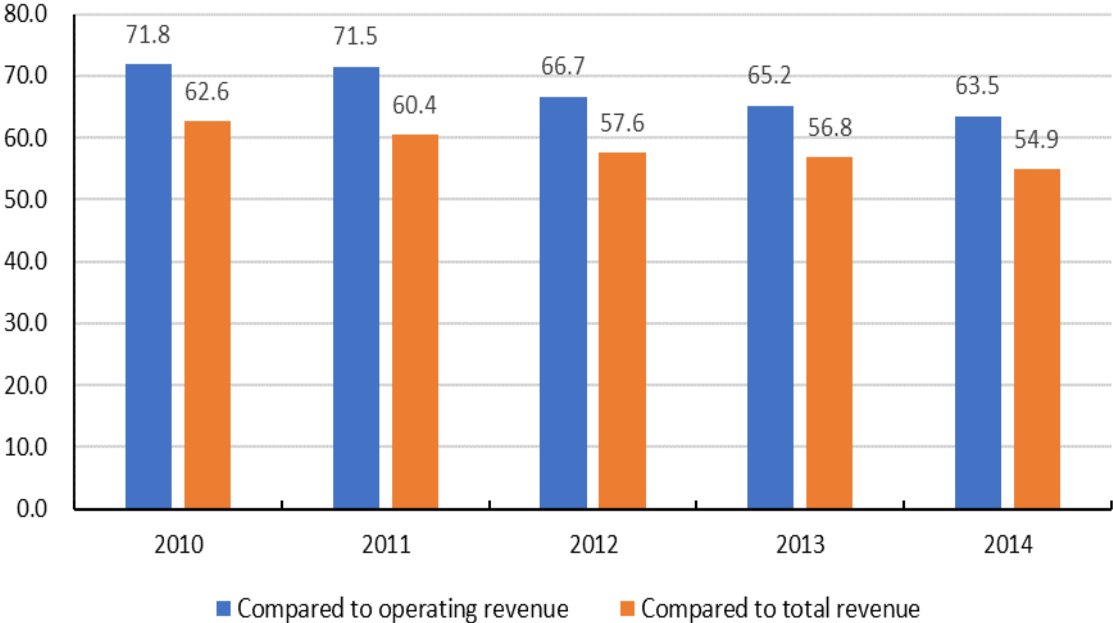
Figure 1.1: Comparison between Tuition increase rate and Inflation rate



Song (2013) cast doubt on the appropriateness of universities’ setting their tuition level. She considered private universities’ poor financial status as the reason for the excessive increase in tuition. Actually, according to statistics of higher education in Korea, the financial

resources of private universities have come mainly from tuition which students gave. The portion which the tuition occupies in the total financial resources of private universities has continuously declined but the below graph shows that tuition dependency ratio compared to total revenue is still very big.

Figure 1.2: Tuition dependency ratio⁴ (%)



When we think about buying something, price plays an important role in our decision. Markman (2011) stated that we might use price information to judge the quality. Actually, we commonly assume that the price is proportionate to the quality. If tuition of the university can be considered as the price for the education that universities provide, it seems reasonable to think that a university with higher quality education may set higher tuition level. But many people in South Korea are wondering whether the tuition level is proportional to their educational quality. Therefore, this capstone project examines whether the quality measures in higher education can predict the tuition level. And as I mentioned

⁴ I modified the statistics released by KHEI (Korea Higher Education Research Institution, <http://khei-khei.tistory.com>)

above, the Korean government established the law to stabilize the level of tuition since 2011. So this study also examines whether tuition is reduced by the policy as intended.

2. Literature review

1) How can we measure the quality of university education?

Bennett (2012) answered this question by saying that “value added” is the appropriate approach, which means measuring value added by comparing students’ intellectual status as they begin university to that of the same students as they graduate university. It might be ideal to measure by using the criteria of what is improved about the capabilities or knowledge through their education at a certain university. But it seems to be difficult to apply that in practice. Archibald and Feldman (2010) stated that it is not possible to measure the educational quality in this regard, such as the amount of knowledge transmitted, the usefulness of that knowledge, or the extent to which students' problem-solving skills and love of learning are improving over time. Bennett (2012) also acknowledged that there was no reliable measures about these.

If so, what is the second-best way to measure university quality? Moon (2012) stated that assessing the measures which represent the condition of education and outputs of education, such as student faculty ratio, graduate employment rate, and performance of research can be an alternative, even though there is no clear consensus about what university quality is. Kim (2016) classified the quality measures into three categories. The first category is concerned with the inputs which represent the investment for improving the learning environment. Second is about the process of teaching and learning. Some examples introduced by Kim (2016) are as follows: quality of curriculum and class, support system for student academic performance, the degree of participation in class, degree of student

satisfaction about education. Third is about educational outcomes which are related with the students' learning and performance itself.

From the viewpoint of educational costs, if universities spend money on hiring faculty members, giving more scholarships to their students, and expanding educational facilities, it is natural to assume that the educational quality measured may be enhanced. Thus, educational costs can be used as the proxy of educational quality in regard of educational input.

Some outcome measures such as retention rate, employment rate of graduates, publications of full time faculty, and the institution's reputation can also be used as variables which represents the quality of education (Kim, 2016). Bennett (2001) said retention rate shows what percentage of university's students were satisfied enough to continue at a college and capable of continuing. If students are satisfied with the quality of education, they do not drop out from the university. Thus, retention rate can represent educational output.

2) Can the quality measures predict tuition level?

Mizutani, Nakayama, & Tanaka suggested that educational quality of a university affects the tuition level of private universities in Japan. But this result might have some limitations, because the variable which represents the educational quality was only SDC (Standard Deviation Score) of the National Center Test of University Admission.⁵ Seneca & Taussing (1987) showed the opposite result. This result has also same limitation, because they also used SAT scores as the only variable to represent the educational quality of university.

Koshal and Koshal (1998) found that the quantity of students, cost of education, average SAT score, class size, level of highest degree offered, and tier of institutions can

⁵ It may be more difficult to enter the university with higher average SDC of new students.

explain the variations in tuition at comprehensive universities. Cost of education and class size, tier of institution can be quality factors of university education in regard to inputs. The tier of the institution can be a quality factor in regard to outputs. Lee, et al. (2011) explained that universities normally set their tuition based on inflation rates, faculty costs, basic operating expenses, and equipment costs for maintaining facilities, such as classrooms, libraries and research labs. On the contrary, Song & Yun (2011) showed that learning environments expenditures such as students per professor, research funds, and student welfare costs have no statistically significant effect on tuition.

3) High tuition cannot reduce demand. Is regulation policy necessary?

Tuition is the price of university education. Price is the key mechanism to control supply and demand. In terms of demand, price especially changes quantity demanded through the substitution effect and the income effect. The increased tuition reduces the real income of students who have the intention to enter university. This is the income effect that may cause them to give up entering university. This should be prevented by the government or university giving scholarships or loans. This can be a justification for tuition regulation policy.

Of greatest interest here is the fact that changes in price also bring the substitution effect. If tuition plays the role of a mechanism controlling demand, increased tuition may reduce university enrollment. Sillers (2016) said some students who have the intention to enter university respond by going to a vocational training institute instead of entering university. They may think that university education has become more expensive compared to potential substitutes, such as a vocational training institute. This means that the substitution effect may make students think reasonably when they decide whether to enter university or not. They may compare the cost and benefit of each case – entering university or going to a vocational training center. If the increase in tuition can deter unnecessary enrollment in

university, tuition increase can be justified by controlling demand to some degree, as mentioned above. In the case of increases in tuition in Korea, however, there is very little substitution effect. Korea seems to have very low price elasticity where higher education is concerned. It is obvious that a tuition increase would not deter university enrollment in South Korea. The table below shows that even though the tuition level has increased continuously from 2000 to 2008, the rate of university entrance in terms of high school graduates also increased.

Table 2: Comparison between tuition increase rate and college entrance rate

year	2000	2001	2002	2003	2004	2005	2006	2007	2008
tuition increase rate (%)	6.2	5.9	6.9	6.7	5.9	5.1	6.7	6.5	6.7
college entrance rate (%)	62.0	70.5	74.2	79.7	81.3	82.1	82.1	82.8	83.8

Universities seem to increase their tuition without concern about declining enrollment. Thus, we notice that the price elasticity in higher education of Korea is obviously very low. Korean people want to have the opportunity for higher education regardless of how much they have to pay for it. Lee, et al. (2011) told a story to explain this:

Traditionally tuition has not been affordable in Korea. In the past, universities were referred to as 'wu-gol-tap', a tower made up of cattle bones alluding that tuition was so expensive that the biggest property of a household, a cow, had to be sold in order to afford it.

In Korea, like other countries in the world, university education is not compulsory. Individuals can choose to enter university if they want to maximize their utility, which suggests that university tuition is not a matter of public policy or government concern. But the price of higher education, tuition, cannot be the mechanism for controlling demand of

higher education, which is a kind of market failure. It is obvious that people in South Korea feel that university tuition is burdensome because most people are not likely to change their intention to enter university based on the tuition level. Song & Yun (2011) said that the cost of college education impacts society broadly, especially under these circumstances. Lee et al. (2011) introduced this situation as below. In order to solve this problematic situation, governmental intervention may be necessary.

Recently, the media has reported numerous unfortunate stories of students quitting or taking time off from school due to the burden of tuition. The current situation is making a four-year graduation almost an exceptional case

3. Unit of analysis

There are 189 four-year universities. Among them, private universities are predominant. About 81.5 percent of universities are private. Different from the United States, public universities were established as a national university and there is just one municipal university which was established by the Seoul metropolitan government.

Table3: The present condition of four-year university in South Korea

Category	National	Municipality	Private	Total
Number	34	1	154	189
Ratio	17.99%	0.53%	81.48%	100%

Koshal et al. (1994) suggested that focusing on a homogeneous group made it possible to gain better insight into the determinants of tuition. In Korea, national and municipal universities have been subsidized by government more than private universities and their tuition level is much cheaper than private universities.⁶ In addition, governmental

⁶ In 2016, the average tuition of private university was 7,370 dollars and the average tuition of public and national university was 4,210 dollars.

authority has controlled their educational condition such as the number of students per faculty based on laws and many regulations.⁷ Because they differ in many ways, it is difficult to analyze private universities and public universities in the same sense. Thus, I limit my analysis to private universities. I collected eight consecutive year (2009-2016) data of four-year private universities in South Korea. Thus, the unit of my analysis is each private university in South Korea.

4. Variables

The dependent variable of my analysis is tuition of each university. Korean universities usually have two semesters a year, the tuition of each university in this model indicates the summation of tuitions for two semesters of each year. The monetary unit of my analysis hereafter is 1,000 Korean Won (KRW). The exchange rate between KRW and U.S. dollar is about 1,000 KRW per dollar.⁸

Independent variables are representatives of quality factors of university education. I referred to the classification of Kim (2016). She categorized the quality factors into three categories: input, process and output. The first category is concerned with the input which represents the investment for improving learning environment. The second is about the process of teaching and learning. Some examples in terms of process are as follows: quality of curriculum and class, the degree of participation in class, degree of student satisfaction about education. The third is about educational outputs which are related with the students' learning and performance.

⁷ Lee et al. (2011) indicated that the government-subsidized portion of a national university's accounting system is appropriated and executed partly from government budgets. Therefore, national universities are strictly controlled by the National Finance Act and the National Accounting Act.

⁸ This is based on the average exchange rate over a span of 8 years (2009~2016), which is a rough value for the convenience sake.

I modified Kim (2016)'s division of category because the concept of the input, process and output was a little bit vague and measuring the process which means how student capabilities and knowledge improved through higher education was not available in this study. Thus, I have two categories. First is measures related with financial investment, and second is measures related with educational accomplishment, attractiveness, and satisfaction. The first category is concerned with university's effort to improve learning environment. The second category includes the indicators reflecting external evaluations. Each measure has been used as the indicators of education quality in previous researches (Kim, 2016; Song & Yun, 2011)

In terms of the first category, financial investment, I will use three variables like these: scholarship per student, student faculty ratio, research funding from internal sources per full time faculty. These may represent the cost of university education. In order to increase the amount of scholarship per student and research funding per faculty from internal financial resources and decrease the ratio of student per faculty, universities should invest financially. University should spend more money on giving scholarship to students, giving research funding to faculties using internal financial resources and recruiting faculties.

Table 4.1: The first category of independent variables: financial investment

Variables	Formula
Scholarship per student	$\frac{\text{total amount of scholarship}}{\text{the numebr of total enrolled student}}$
Student faculty ratio	$\frac{\text{total enrolled students}}{\text{the number of full time faculty}}$
Research funding per full time faculty from internal sources	$\frac{\text{total amount of research funding from internal sources}}{\text{the number of full time faculty}}$

With regards to the second category, educational accomplishment, attractiveness, and satisfaction, I will use five variables: incoming student recruitment rate, admission competition ratio, publication in SCI level journal per full time faculty, publication in NRF⁹ registered journal, research funding from external sources per full time faculty, and drop-out rate.

Table 4.2: The second category of independent variables: attractiveness, accomplishment, and satisfaction

Variables	Formula
Incoming student recruitment rate	$\frac{\text{the number of students who enrolled as freshmen}}{\text{Incoming student quota}} \times 100$
Admission competition	$\frac{\text{the number of application}}{\text{student quota}^{10}}$
Publication in SCI level Journal per faculty	$\frac{\text{the number of publication in SCI or SCOPUS journal}}{\text{the number of faculty}}$
Publication in NRF registered Journal per faculty	$\frac{\text{the number of publication in NRF registered journal}}{\text{the number of faculty}}$
Research funding per full time faculty from external sources	$\frac{\text{the amount of funding for research}}{\text{the number of full time faculty}}$
Drop-out rate	$\frac{\text{the number of students who dropped out}}{\text{the number of registered students}} \times 100$

⁹ The NRF (National Research Foundation) was founded on June 26, 2009, as a specialized research funding agency through a merger of the Korea Science and Engineering Foundation (KOSEF), the Korea Research Foundation (KRF), and the Korea Foundation for International Cooperation of Science and Technology (KICOS). The aim of the NRF is to optimize and advance the national basic research funding system that encompasses all academic research fields, <http://nrf.re.kr>

¹⁰ In Korea, each college has the fixed number of student quota, which is approved by the government.

Incoming student recruitment rate and admission competition ratio can be considered as the indicators representing attractiveness. Unlike research funding from internal sources, that from external sources has a tendency to depend on their academic accomplishments. Thus, research funding from external sources can be a variable to represent the educational accomplishment. Bennett (2001) said drop-out rate shows what percentage of students were not satisfied enough to continue at a college. Thus, this variable represents the educational satisfaction.

5. Estimation equation and Empirical strategy

I will use fixed effects panel regression because I think something that characterizes the individual unit but does not change over time may impact or bias the explanatory variables. Those might be a vision, culture, and location of each university. I need to control for these. By using fixed effects panel regression, I can control for the average differences across universities in any observable or unobservable predictors across the universities. The estimation equation of interest is as below.

Table 5: Estimating equation

$$Tui_{it} = \alpha_i + \beta_1 SPS_{it} + \beta_2 SFR_{it} + \beta_3 RFI_{it} + \beta_4 DO_{it} + \beta_5 IRR_{it} + \beta_6 AC_{it} + \beta_7 SCI_{it} + \beta_8 NRF_{it} + \beta_9 RFE_{it} + \beta_{10} POL_{it} + \varepsilon_{it} \quad (i = \text{entity}, t = \text{time})$$

Explanation about abbreviation

Tui_{it} : Tuition level	SPS_{it} : Scholarship per one student
SFR_{it} : Student faculty ratio	RFI_{it} : Research funding per full faculty from internal sources
DO_{it} : Drop-out rate	IRR_{it} : Incoming student recruitment rate
AC_{it} : admission competition	SCI_{it} : Publication in SCI level Journal per faculty
NRF_{it} : Publication in NRF registered Journal per faculty	
RFE_{it} : Research funding per full faculty from external sources	
POL_{it} : Policy of regulating tuition level	
α_i : unknown intercept for each entity	ε_{it} : error term β_k : the coefficient for IVs

Blumenstock (2016) stated that the fixed effect coefficients absorb all the across-group action, what is left over is the within-group action. The fixed effect model allows for heterogeneity among panel by allowing each university to have its own intercept value. In short, the fixed-effects model controls for unmeasured time-invariant differences between the individuals, so the omitted time-invariant characteristics cannot bias the estimated coefficients of the fixed-effects model. Through this mechanism, the threat of omitted variable bias is greatly reduced.

6. Estimation results and Findings

The tables below show the estimation results for the determinants of tuition level. Table 6.1 is the estimation result summarizing whether tuition is a function of quality measures with regards to financial investment. Table 6.2 is the estimation results showing whether tuition is a function of quality measures in term of attractiveness, accomplishment, and satisfaction. Even though I estimated one equation with all variables, I used three tables in order to facilitate understanding of my division of independent variables.

Table 6.1: Estimation results of first category, financial investment

VARIABLES	Tuition	P-value
SPS	-0.030	0.107
<i>Amount of scholarship per student</i>	(0.187)	
SFR	-0.126	0.901
<i>Student faculty ratio</i>	(1.018)	
RFI	-0.003	0.673
<i>Research funding per faculty from internal sources</i>	(0.007)	

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 6.2: Estimation results of second category, attractiveness, accomplishment, and satisfaction

VARIABLES	Tuition	P-value
DO <i>Drop-out rate</i>	-52.080*** (6.302)	≤0.001
IRR <i>Incoming student recruitment rate</i>	4.367*** (1.612)	0.007
AC <i>Admission competition</i>	15.261** (6.506)	0.019
SCI <i>Publication in SCI level Journal per faculty</i>	297.324 (256.463)	0.247
NRF <i>Publication in NRF registered Journal per faculty</i>	-32.658 (107.273)	0.761
RFE <i>Research funding per faculty from external sources</i>	0.002** (0.001)	0.029

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

According to the results of table 6.1, the quality measures which represent financial investment, the amount of scholarship per student, student faculty ratio, and research funding per full faculty from internal sources have no significant impact on the tuition level. These variables cannot predict the tuition level. Thus, university tuition is not a function of quality measures in terms of financial investment (educational costs), as described in the literature review.

However, as shown in table 6.2, I found that tuition is a function of quality measures in the aspect of attractiveness, accomplishment, and satisfaction. Incoming student recruitment rate, and drop-out¹¹ rate have statistically significant impact on the tuition level

¹¹ Drop-out rate is reversed. The less drop-out rate, the better quality.

at a 99 percent confidence level. Admission competition ratio and research funding per full faculty from external sources also have statistically significant impact on the tuition level at a 95 percent confidence level.

Tuition is reduced by the policy as intended. Around 2011, the complaints about the burden of university tuition reached its peak and government considered this problem very serious. Since then, the Ministry of Education of Korean government has tried to stabilize university tuitions. The representative policy which was introduced to regulate the tuition level in 2011 is so called CTI (Cap of Tuition Increase). This policy requires universities in Korea not to increase their tuition in excess of one and half times of the inflation rate of consumer price. According to the result of this study, most of universities seem to observe this policy since then.

Table 6.3: Estimation results about policy of regulating tuition level

VARIABLES	Tuition	P-value
POL <i>Policy of regulating tuition level</i>	-180.903*** (37.038)	≤0.001

Standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

7. Limitation

First of all, I would like to mention about the measurement of the educational quality. I think it is very essential to measure the achievement after the students took the educational services from the universities and to measure the quality of the process on which the students take the educational services from the universities, in order to identify the educational quality of a certain university. My research, however, does not include these

measurements of students' development and the quality of learning process due to the difficulty of collecting data.

Second, the question can be raised whether education quality is possibly caused by tuition level. Thus, in order to test this question, I selected most direct measure of quality which is admission competition (selectivity). The following two equations ask whether last year's tuition predicts this year's selectivity controlling for the relationship between the two, and whether last year's selectivity predicts this year's tuition, controlling for the relationship between the two.

Table 7: Equations for verification of reverse causation

(Equation 1) $Selectivity_{it} = \beta_1 Selectivity_{i,t-1} + \beta_2 Tuition_{i,t-1} + \beta_3 Tuition_{it} + \epsilon_{it}$

(Equation 2) $Tuition_{it} = \beta_1 Tuition_{i,t-1} + \beta_2 Selectivity_{it} + \beta_3 Selectivity_{i,t-1} + \epsilon_{it}$

(i: entity, t: time, ϵ_{it} : error term)

I did not find any statistically significant effect of last year's tuition on selectivity. I also did not find any statistically significant effect of last year's selectivity on this year's tuition. However, if I analyze more extended data than those of my capstone project, tuition may affect some of my independent variables. Further studies need to address the possibility that causation runs in the opposite direction.

8. Policy implication

When I began this capstone project, I was doubtful whether there is a proper relationship between the level of university tuition and the quality of education. Especially, when I asked someone whether universities invest properly on education with financial resources gained from tuition, they are not sure about it or answered negatively. This study

also shows that university tuition is not a function of quality measures in terms of financial investment, which is related with educational cost.

Many education experts insisted that universities should set their tuition based on their educational quality especially in terms of cost base. Song & Yun (2011) insisted that tuition level should be determined by cost analysis. Similarly, Lee, et al. (2011) suggested that tuition level should be determined by the issues of whether all cost factors are accurately reflected and whether the tuition is used as originally intended at the time of calculation. As a government officer who works for Ministry of Education, I agree with this opinion. If there is no functional relationship between quality measured in terms of educational cost and tuition level, government could find the justification to regulate universities' increasing tuition.

Considering the situation where most of Korean people have suffered from the burden of university tuition, university should make an effort to relieve this burden by setting rational criteria of tuition level. The criteria should reflect all cost factors as well as they can. By doing so, they can convince customers (students and families) of their tuition setting.

On the other hand, this study shows that tuition is a function of quality measures in terms of attractiveness, accomplishment, and satisfaction. This means there might be a possibility that the policy of tuition regulation would lead to deterioration in education quality. What is more, government policy is very powerful. This study shows that tuition is reduced by the policy as intended. Thus, government must be careful when it tries to regulate university tuition. For the purpose of tuition relief, it seems to be more desirable to use other tools. Lee et al. (2011) said Korean government is putting various kinds of effort to stabilize the university tuition. The government has been continuing to extend national scholarship according to the needs and conditions of students. It also has been trying to improve the

student loan system. And the government has tried to invest more on higher education. The government subsidies to private universities keeps increasing in South Korea. This policy direction seems to be proper. But the government funding for higher education is still lower than the average of OECD countries. Thus, Korean government should keep expanding investment on higher education.

Figure 8.1: Government subsidy (unit: 100,000 dollars)

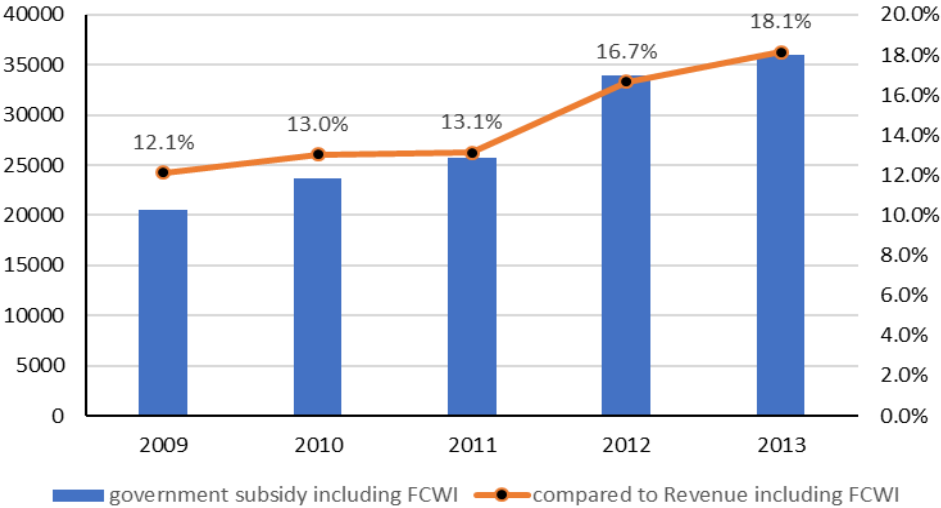
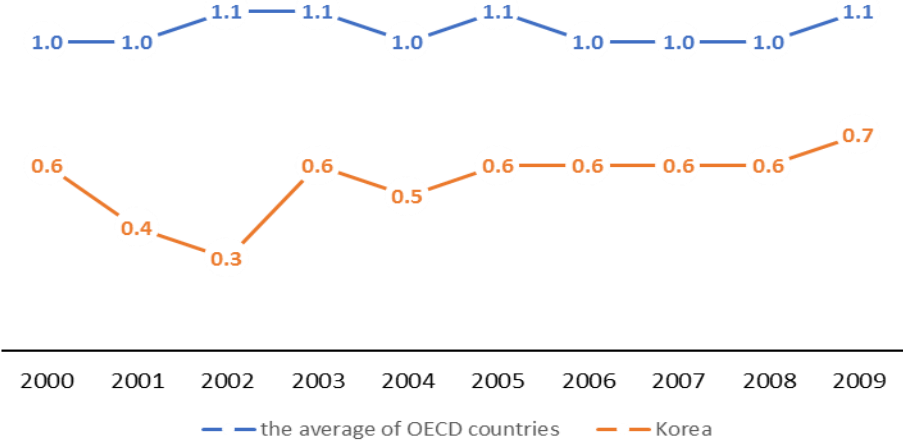


Figure 8.2: Government funding for higher education compared to GDP (%)



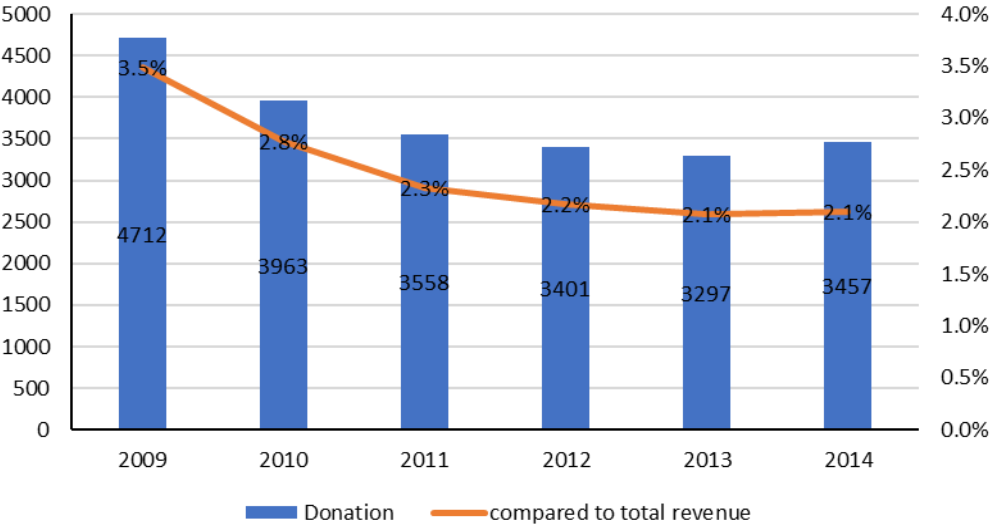
Source: Korean education statistics service, <http://khei-khei.tistory.com/600>, accessed April 6

Lastly, I want to comment one more thing related with universities' effort to reduce tuition burden. As shown in the table below, the tuition dependence rate of private universities in South Korea is over 60 percent. Donations for private universities have even decreased.

Table 8: Operating revenue of Private university in 2014 fiscal year (unit: 1,000 dollars)

Category	Tuition	Government subsidy	Donation	Transferred money	others	total
Amount	10,390,484	2,292,895	397,550	1,548,516	1,721,429	14,217,839
Ratio	63.5%	14.0%	2.4%	9.5%	10.5%	100%

Figure 8.3: Donation (unit: 100,000 dollars)



Along with the efforts of making standards for reasonable tuition level, universities should try to diversify their sources of revenue. If they can get more government subsidies, donations, and research funding from outside, it becomes easier for them to set a reasonable, lower tuition level.

Acknowledgement

I would like to give special thanks to Dr. J. S. Butler, who worked on this capstone project with me. I also would like to thank Dr. Edward Jennings and Dr. Jeremy Hall. They provide excellent lectures which make me know how to do my capstone project.

References

- Art Markman (2011) Price, Quality, and Value: How do shoppers use price to judge quality and value, <https://www.psychologytoday.com/blog/ulterior-motives/201111/price-quality-and-value>, Accessed Feb 5, 2017
- Bo-eun Moon (2012) Analysis of the relative efficiency between the quality of university and the tuition of university, Sookmyung Women's University, 2012
- Chosun biz, Twenty years since Korea's joining of the OECD, December 12, 2016, Accessed March 13, 2017, http://biz.chosun.com/site/data/html_dir/2016/12/12/2016121200024.html
- Douglas C. Bennett (2001) Accessing Quality in Higher Education, Liberal Education Vol 87; Association of American College & Universities
- Don Sillers (2016) How do changes in price affect quantity demanded? (<https://www.quora.com/How-do-changes-in-price-affect-the-quantity-demanded>)
- Eojin Kim (2016) Analysis on the relationship between the quality factors of university and the tuition of university, Graduate school of education, Korea university
- Fuitoshi Mizutani, Noriyoshi Nakayama, Tomoyasu Tanaka (2015) "Determinants of University Tuition in Japan", Graduate School of Business Administration, Kobe university (Rokko Kobe Japan)
- Higher Education in Korea, <http://heik.academyinfo.go.kr>
- Joseph J. Seneca & Michael K. Taussing. Educational Quality (1987) Access, and Tuition Policy at State University, The Journal of higher Education Vol 58, pp. 25-37
- Ju-ho Lee, et al. Positive Change (2011) Ministry of Education, Science and Technology of South Korea, pp. 438-469
- Kichang Song, Hongju Yun (2011) A study on analyzing the determinants of university tuition and establishing policy directions, The journal of education administration Vol. 29. No. 4, pp 487-512
- Koshal, R. K. and Koshal, M., Boyd, R. and Levine (1994) Tuition at Ph. D gathering

- institutions: A supply and demand model, *Education Economics*, pp. 29-44
- Korean Educational Statistics System, <http://kess.kedi.re.kr/index>
- Korean Statistical Information Service, <http://kosis.kr>
- Korea Higher Education Research Institute Statistics, <http://khei-khei.tistory.com>
- Michael Alison Chandler, S. Korea tries to wrest control from booming private tutoring industry, *The Washington Post*, April 3, 2011, <https://www.washingtonpost.com/people/michael-alison-chandler>, Accessed Feb 10, 2017
- News one, Korea's university entrance rate is ranked first place among OECD countries, September 9, 2014, <http://www.news1.kr/articles/?1850003>, Accessed Feb 10, 2017
- Noah Berger and Peter Fisher (2013) A well-educated workforce is key to state prosperity, *Economic Analysis and Research Network*
- OECD indicators, *Education at a glance 2013*, p232
- Rajindar K. Koshal and Manjulika Koshal (1998) Determinants of tuition at comprehensive universities, *Applied Economics*
- Robert B. Archibald and David H. Feldman (2011) *Why does college cost so much?* Oxford university press Inc
- Seung-Hee Song (2013), Study on the auditing of private universities by the Korean board of auditing and inspection: focusing on the 2011 inspection of fiscal transparency of universities, *Korea University*, PP. 74-75
- Joshua blumenstock, fixed effect model, 2016, <http://www.jblumenstock.com/files/courses/econ174/FEModels.pdf>, Accessed Feb 5, 2017

Appendix

Descriptive Statistics

Category	Mean	Standard Deviation	Min	Max
Tuition (dollars)	7088.37	1031.35	1,680	10090
Scholarship per student (dollars)	2216.80	1201.29	0	8829
Student Faculty ratio (%)	34.46	14.09	1.4	100
Research funding per faculty from internal resources (dollars)	3046.41	4217.79	0	60720.9
Drop-out rate (%)	5.40	3.16	0	33.9
Admission competition ¹²	7.60	5.47	0	35.2
Incoming student recruitment rate	94.85	14.97	0	117
Publication in SCI level Journal per faculty	0.133	0.201	0	1.5
Publication in NRF registered Journal per faculty	0.479	0.234	0	1.1
Research funding per full faculty from external sources (dollars)	29043.02	56181.19	0	735938.7

¹² the numbe of application
student quota