



University Students' Demand Function of Private Education

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Abstract

Background/Objectives: The purpose of this research is to determine the function of domestic university students' demand and expenditure on private education.

Methods/Statistical analysis: The Tobit model and the double-hurdle model were implemented in the analysis. Each analysis was conducted utilizing both models whereby the results of the analysis were applied to determine the most compatible model in the interpretation of the demand function of private education. A comparison of the log-likelihood function of each model were carried out and the log-likelihood ratio test was conducted to evaluate the compatibility of the models.

Findings: According to the double-hurdle model, it could be determined that the participation level and the expenditure level respectively were making progression differently. The variables which were determined to be influential on participation level were university types, students' major, parents' income type, as well as the variables of the parents' monthly income. In terms of expenditure level, parents' income level was analyzed to have influence.

Improvements/Applications: As a result of the analysis, the double-hurdle model was determined to be more

compatible than the Tobit model.

Key Words : Private Education, Determinants, Tobit Model, Double-Hurdle Model, Log Likelihood Ratio Test.

1 Introduction

Research in regards to private education debate has been conducted both domestically and internationally continuously. In the past, such a debate was relegated to only a minority of nations; in the past several years, it has been rapidly expanding in not only eastern European countries but also Africa and Asia countries. There exists a conventional view that the transition to market economy in China, Vietnam, several African nations, and many eastern European countries and the intimate connection between education and labor have incurred vigorous competition in the education industry leading to private education¹. In addition to the aforementioned background, the factors which elicit demand for private education overseas were determined to be inclusive of personal educational endeavors and cultural content regarding economic factors², high-stakes public examinations and competition for limited admission to universities; the organizational characteristics of low public school expenditure in national educational system is also analyzed to affect the participation level in private education sector³. However, such interest in private education is taken up by studies majority of which focus on junior and high school students at the stage before university. Differences are considered to exist between junior and high school private education and university-level private education due to their characteristics; although junior and high school students focus on learning various subjects in college prep for admission to prestigious universities, in accordance to general expectation, the university students focus on mastering their major courses and preparing for their careers. In actuality, according to 2015 survey conducted by Sugnyunkwan University, 257 respondents (49.7%) out of 517 respondents admitted that they had received private education after matriculation into university; of these, most of the respondents (54.2%) have had received private education in order to increase their language test scores such as TOEIC and TOEFL (<http://news.heraldcorp.com>). Among the

257 respondents who had received private education, 38.9% had received major-related private education. 4 out of 10 students who had received private education have had major-related private education.

In the past, only the most outstanding students were expected to be selected for admission to a university since it had been rather easy to attract new students. However, with the reduction of school-age population due to the change of the times, there has been unprecedented restructuring in universities due to the increase in the number of students universities seek to attract than the number of students they are able to recruit in actuality. The university restructuring standard administers various disadvantages to the graduates who are unable to meet the criteria on the basis of rate of employment, recruitment, and tuition reduction. Due to the current predicament of the universities, the precarious domestic economy, and the assessment of the universities being based on the employment rate by the Ministry of Education; the universities have been led to encourage their students to obtain private education in order to improve employment rate. Given this overall situation, in the same way as the secondary school students' private education market, the private education market of the future university students can progress to become a great social problem.

Based on such articles which reflect the current situation nationwide, it can be inferred that the form of learning which depended on private education in secondary schools have been spreading to university-level higher education. Based on this fact, this study utilizes Korean Education and Employment Panel: KEEP data conducted by Korea Research Institute for Vocational Education & Training to provide an estimation of the function of university students' private education. Furthermore, another aim of this research is to provide the most compatible model for the most effective interpretation of the function of university students' private education by using the econometric models the Tobit model and the double-hurdle model through conducting the analysis using each model. The results of the study are expected to provide an estimation of the current status of domestic university students' private education.

2 Data and Model Specification

2.1 Data

The data used in the analysis is the Korean Education and Employment Panel (KEEP) data provided by Korea Research Institute for Vocational Education & Training. KEEP data is comprised of survey data completed by junior and high school students who have done follow-up questionnaire surveys; compared to the existing studies, it has the advantage of ensuring reliability as it contains the data of all students enrolled in universities nationwide regarding students' personal information, information regarding the enrolled college and major, and satisfaction with college life. The dependent and independent variables were differentiated from the raw data; the dependent variables were the status of participation regarding private education, and average monthly amount spent on private education during the past year. The dependent variables applied by Korea Research Institute for Vocational Education & Training were categorized and estimated as private education related to college major excluding college courses, english private education, foreign language private education, private education related to civil service employment, and education related to entrepreneurship. However, with respect to this study, due to the unclear amount of expenditure on entrepreneurship and civil service training related private education by the student or the student's family, these have been eliminated. That is, for the dependent variable, the sum of the expenditure on the three domains above in regards to participation status, college major private education, and english and foreign language education have been used as the dependent variable.

The independent variables used to measure the effect relationship were students' gender, type of university (junior college or 4-year university), year of study, college major, place of residence, parents' income type (single or dual-income), and monthly income amount. Depending on the characteristics of the variables, they were categorized as 1 and 0, then classified as reference variables and dummy variables in order to carry out the measurement. For instance, in terms of gender, male students were assigned 1, female students 0. In terms of year of study, sophomore, junior, and senior were assigned 1, freshmen was assigned 0 in verifying the

influence of the dependent and independent variables; in the case of major, Humanities (languages, literature, etc.), Social sciences (management, business, sociology), Education (preschool and primary education, etc.), Engineering (architecture, transportation, electric, electronics, etc.), Sciences (agriculture, marine biology, biology, chemistry, etc.), Medicine (medical treatment, nursing, therapy, health care, etc.) were assigned 1 and Arts and Physical Education major was assigned 0. In terms of place of residence, these were categorized as Seoul, metropolitan cities (Busan, Daegu, Gwangju, Incheon, Daejeon) and mid- and small-sized provincial cities (countryside). In the case of income, these were categorized as households with lower than 2million won, 2million- 4million won, 4million to 6million won, and at least 6million won (refer to Table 2 for the definition and description of the variables)

2.2 Model Specification

The analysis model for estimating the variables which affect university private education has also been applied in various ways. For instance, Tobit and Probit models were used to conduct regression analysis (Kim, 2006), profile analysis⁴, and chi-square test⁵ to analyze participation and expenditure levels; and the Heckman model, in which participation and expenditure levels can be applied in two stages was used in the results of the study by⁶. These findings show that the study results targeting primary and secondary students have been carried out in similar ways. For example, the study by⁷ applied the Heckman model to estimate the use of private education by pre-schoolers under the age of seven; the Tobit model is applied in the estimation of expenditure on junior high English subject in the study by⁸. However, in this study, in addition to the purpose of estimating the variables which affect college students' private education, this study has been carried out using a differentiated method of analysis. In other words, this study may be differentiated in that in order to estimate the factors influencing private education, comparative analysis of the appropriate modelsthe Tobit and the double-hurdle models were carried out and the most compatible model was selected for estimating the effect relationship between the dependent and independent variables.

The Tobit model is a regression model which can be applied

when the range of values taken by the dependent variable is partially deleted or truncated and can't be observed below or above a certain value⁹. The Tobit expenditure function assumes that consumer demand or expenditure on commodities and services form a group within a limited value. In other words, it is assumed that all consumers are potential users of commodities and are influenced by variable such as market participation and consumption level¹⁰. The assumption in the double-hurdle model is that in order to observe positive (+) consumption, the consumer must become the potential buyer of the given commodity and it assumes that the given commodity actually be consumed¹¹. Unlike the Heckman model, in the double-hurdle model, the consumption of 0 can become the determiner of participation or the determiner of consumption. Commonly, both the Heckman and the double-hurdle models are useful methods in modeling the demand regarding the commodities when the separation of determinants of consumption and participation is an important concern. Nonetheless, the double-hurdle model does not impose any particular restrictions on the variables which influence the two results of the determinants. According to sample utility theory, all people are assumed to be potential consumers regarding all commodities¹². However, this may not hold true for such commodity as private education. In other words, some university students do not spend on private education at all price and income levels. Accordingly, by conducting the analysis using the Tobit and the double-hurdle model, this study aims to determine which model is more effective for determining the variables which affect private education.

3 Results and Discussion

The descriptive statistics of the sample used in the analysis is shown in Table 1. Gender and year of study were determined to have no effect on private education expenditure. However, for college types which had been categorized into junior and 4-year universities, 4-year university students were analyzed to be statistically significant at 1% significance level compared to the 2-year junior college students. In terms of place of residence, although the university students residing in Seoul, other metropolitan cities, and provin-

cial cities were determined to have no influence regarding private education, the students residing in Seoul were found to be close to the significance level (1.541). In regard to major types, Humanities (significance level of 1%), Social Sciences (10% significance level), Education (1% significance level) and Natural Sciences (5% significance level) were determined to have positive influence while Medicine and Arts and Physical Education were found to have no influence. In case of parents' income types, dual-income parents were found to be statistically significant at 5% significance level. In terms of monthly income, except for households earning less than 2 million won, it was found to have positive influence on private education expenditure at 1% significance level respectively.

Table 1: Descriptive statistics of the sample (N=915)

Characteristics		Frequency (%)	Characteristics		Frequency (%)
Gender	Male	666(72.8)	Major types	Humanities	88(9.6)
	Female	249(27.2)		Social sciences	258(28.2)
School types	University	732(80.0)		Education	28(3.1)
	College	(20.0)		Engineering	316(34.5)
Year of study	Freshman	106(11.6)		Natural sciences	80(8.7)
	Sophomore	199(21.7)		Medicine	50(5.5)
	Junior	253(27.7)		Art & Physical	95(10.4)
	Senior	357(39.0)	Residential districts	Seoul	272(29.7)
Monthly income (Million Won)	Under 2M. Won	350(38.2)		Metropolitan	254(27.8)
	2.5-4M. Won	300(32.8)		Countryside	389(42.5)
	4.5-6M. Won	175(19.1)	Monthly income types	Dual-income family	547(59.8)
	Over 6M. Won	90(9.8)		Single-income family	368(40.2)

In terms of the double-hurdle model in which the analysis is divided into two stages (as shown in Table 3), the variables which affect the level of participation in private education is as follows. Gender and year of study were found to have no influence on the determinant of participation. Students enrolled in four-year universities were determined to have positive influence (1% significance level) on participation in private education compared to the students enrolled in two-year junior colleges. For the variable in which the place of residence has been differentiated, even though the students living in Seoul exhibited the highest level (1.619), if it is not statistically significant, the students in metropolitan cities and

provincial areas were shown to be without any statistical significance. Level of participation in regards to major types such as Humanities, Social Sciences, Education, Natural Sciences have positive influence at 1% significance level; while Engineering is statistically significant at 5% significance level. However, Medicine and Arts and Physical Education were found to be without any influence on participation in private education. In the case of income type, dual-income household has a positive influence on participation in private education at 5% significance level, except for households with less than two million won monthly income, all other income levels have positive influence at 1% significance level.

In terms of the analysis of the level of expenditure in the second stage; Humanities and the Natural Sciences major students (classified according to types of major) were determined to have negative influence at 1% and 5% significance levels respectively. Moreover, in terms of monthly income variable, households with 2 million-4million won income were found to have positive influence on private education expenditure at 5% significance level while households with income of at least 6 million won was found to have positive influence on expenditure at 1% significance level.

Results of the analysis conducted using each model the Tobit model and the double-hurdle model respectively show that as a whole, the same independent variables have influence on the dependent variables. A number of methods can be applied in order to determine the goodness of fit of the model. First, as a result of comparing the log-likelihood function of both models, the Tobit model was 806.6492 and the double-hurdle model was calculated as 423.7932, -180.1457, and 603.9389 respectively; thus the double-hurdle model appeared to be higher than the Tobit model. Then, as the second method, the likelihood ratio test suggested by [13] was performed. The likelihood ratio test statistic takes the value of X^2 . If there is no difference between the two models, the X^2 value would be less than or equal to the threshold; if differences exist between the two models, the X^2 value will exceed the threshold value. As a result of the analysis, it was determined that there were differences between the two models as the X^2 value was bigger than the threshold value (36.41). Therefore, the null hypothesis which assumes that the double hurdle model and the Tobit model are statistically identical was dismissed; it can be determined that

the estimation of the function of university students' expenditure on private education does not have basis in decision-making framework such as determinant factors of participation and expenditure. Therefore, in the case of this study, it can be concluded that the estimation results of the double-hurdle model would be desirable for interpreting the influence of the independent variables.

4 Conclusion

The results of the analysis using the double-hurdle model can be summarized as follows. Gender and year of study regarding private education were determined to be without any influence on levels of participation and expenditure. However, there were differences between the students attending four-year universities and two-year junior colleges; the students enrolled in four-year universities had positive influence (1% significance level) on level of participation in private education. As a result of carrying out the estimation by categorizing the location of the universities into Seoul, metropolitan, and provincial cities, regardless of location, it did not have any influence on the levels of participation and expenditure on private education. This only showed that university students in Seoul exhibited high level of participation but it was found to be not statistically significant.

Table 2: Definition of variables used (N=915)

	Variables	Definition	Mean (Standard deviation)
Independent variables	Gender	Male=1, Else=0	0.727(0.445)
	Year of Study	Sophomore=1, Else=0	0.217(0.412)
		Junior=1, Else=0	0.276(0.447)
		Senior=1, Else=0	0.390(0.488)
	School types	University=1, Else=0	0.8(0.400219)
	Residential districts	Seoul=1, Else=0	0.297(0.457)
		Metropolitan=1, Else=0	0.277(0.448)
	Major types	Humanities=1, Else=0	0.096(0.294)
		Social Sciences=1, Else=0	0.281(0.450)
		Education=1, Else=0	0.030(0.172)
		Engineering=1, Else=0	0.345(0.475)
		Natural Sciences=1, Else=0	0.087(0.282)
		Medicine=1, Else=0	0.054(0.227)

Dependent variable	Income types	Dual-income family=1, Else=0	0.402(0.490)
	Monthly income	2~4 Million Won, Else=0	0.327(0.469)
		4~6 Million Won, Else=0	0.191(0.393)
		Over 6 Million Won, Else=0	0.098(0.297)
		Expenditures	0.658(1.313)

Table 3: Results of the analysis using the Tobit and the Double-hurdle model

	Tobit	Double-hurdle	
	Coefficient(t-ratio)	Coefficient(t-ratio)	Coefficient(t-ratio)
Variables	Expenditures	Participation	Expenditures
Male	-0.666(-1.363)	-0.165(-1.332)	-0.004(-0.039)
Sophomore	0.355(0.436)	0.104(0.508)	-0.174(-0.799)
Junior	0.623(0.794)	0.146(0.737)	0.115(0.576)
Senior	0.545(0.705)	0.126(0.649)	0.124(0.622)
University	2.439(3.411)***	0.591(3.356)***	0.035(0.165)
Seoul	0.721(1.541)	0.192(1.619)	-0.092(-0.857)
Metropolitan	0.460(0.952)	0.122(1.003)	-0.121(-1.019)
Humanities	3.257(3.424)***	0.866(3.641)***	-0.518(-2.038)***
Social sciences	1.634(1.930)*	0.408(1.923)***	-0.221(-0.901)
Education	3.348(2.709)***	0.824(2.629)***	-0.111(-0.366)
Engineering	1.919(2.276)**	0.491(2.333)**	-0.388(-1.620)
Natural sciences	2.404(2.456)**	0.638(2.602)***	-0.524(-2.000)**
Medicine	1.423(1.210)	0.344(1.168)	-0.295(-0.898)
Dual-income family	1.040(2.560)**	0.254(2.479)**	0.090(0.946)
2~4 Mill. Won	1.448(2.889)***	0.334(2.663)***	0.270(2.136)**
4~6 Mill. Won	2.294(4.093)***	0.569(4.075)***	0.124(0.942)
Over 6 Mill. Won	2.355(3.461)***	0.569(3.311)***	0.321(2.064)**
Constant	-9.242(-7.067)***	-2.309(-7.828)***	0.618(19.593)***
Sigma	4.206(16.019)***	0.618(19.593)***	
Log likelihood function	-806.6492	-423.7932	-180.1457
Degrees of freedom	18	17	
Chi square		92.55669 P>.000	

Note: *, **, ***, 10%, 5% and 1% indicate significance levels respectively.

As a result of carrying out the analysis after differentiating the university students' majors, the students' whose majors were in Humanities (significance level of 1%), Social Sciences (1% significance level), Education (1% significance level), Engineering (significance level of 5%), and Natural Sciences (1% significance level) were found to have positive influence on the level of participation in private education. In terms of the level of expenditure, students' whose majors were in Humanities (1% significance level) and Natural Sci-

ences (5% significance level) were determined to have negative (-) influence. In case of income, households with relatively low income of less than 2 million won were analyzed to not have any influence on levels of participation and expenditure; all households, except for those with less than 2 million won and those with 4million-6million won, were determined to have positive influence on the level of expenditure. In case of dual-income households, they had positive influence (5% significance level) on the level of participation in private education although it can't be assumed that dual-income household earnings are always high. It can be inferred from the analysis so far, that regardless of major, Korean university students from all majors participate in English, foreign language, major-related, and civil service training related private education for the purpose of employment. Even for income, except for the relatively low income group, it can be seen that there is participation. The main variables of university students' private education for the purpose of employment have been derived. This is not a step that requires personal approach for troubleshooting as long as the fact that these variables do exist are considered. Now, assertive approach at the level of institutions of higher education such as the university is needed. Additionally, regular and ongoing countermeasure such as educational courses which counteract private education sought by university students are required.

In the present study, there may be greater significance in that comparative analysis of the double-hurdle model and the Tobit model were carried out in order to estimate the university students' demand function of private education. The analysis results obtained from each model and the comparative analysis of the two models could be applied in education and other related fields in the future.

The limitations of this study may be described in the following manner. On the basis of the year being 2015, the most recent data, due to the characteristics of the Korean Education and Employment Panel data, is from 2013. For this reason, in light of the rapidly progressing domestic economic situation coupled with the global economy, the data from 2013 is bound to reflect the characteristics of the university students' private education three years ago. Furthermore, the independent variables applied in the analysis were processed in a very limited way due to the characteristics of the

investigation. In order to understand the status of the university students' private education more deeply, there is a need to estimate the factors that influence demand and expenditure by correctly applying the aspect of definition regarding private education. In other words, it is determined that there will be a need for the university students' private education to be defined at a national level, rather than rely on a variety of definitions generated by researchers as well as unified research on expenditure and participation. In addition, data that reflect variety of students' situations such as students' psychological state, learning motivation, and selection attributes regarding learning is needed. In future research, such data which requires research design and development through national survey is expected.

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