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Determinants of University Tuition in Japan

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Determinants of University Tuition in Japan

[Abstract]: The main purpose of this study is to find the factors involved in determining private university tuition level. Furthermore, we test whether or not university tuition of prestigious (higher standard deviation score) private universities is lower than that of less prestigious private universities. Japanese researchers have drawn conflicting conclusions about this issue. We obtain the following results. First, important factors affecting tuition are (i) the size of university (i.e. the number of attending students), (ii) the quality of the university (i.e. standard deviation scores), (iii) urban and competition factors (i.e. the inverse of HHI), and (iv) subsidies to private universities. Second, empirical results show that university tuition is higher at very prestigious universities, a tendency similar to that in the US. Third, bigger university size and greater availability of subsidies tend to reduce the tuition level.

[Key Words]: Determinants of tuition, Universities, Quality of education, Competition

[JEL Classification]: I21, I22, I23

1. Introduction

Because of recent serial reforms implemented by the Ministry of Education, Culture, Sports, Science and Technology (hereafter MEXT), universities in Japan face a difficult situation. Further reforms may become necessary in order to address various problems resulting from previous reforms and other environmental factors.

The main purpose of this study is to identify the factors that currently determine private university tuition cost. Furthermore, we test whether or not the tuition of highly competitive private universities is lower than that of less academically competitive private universities. While the tuition at prestigious private universities in the US is higher than at less prestigious private universities, in Japan, the opposite is the case. It is the national, or public, universities that are considered the most prestigious. While in the US, Ivy League universities have historically been considered the most prestigious and selective, in Japan the seven national former imperial universities[1] are considered the most desirable, and all have a long history of educating leaders in many fields. Students at national universities in Japan pay much lower tuition than their counterparts at private universities,

[1] The seven national universities are the University of Tokyo, Kyoto University, Tohoku University, Kyushu University, Hokkaido University, Osaka University and Nagoya University. Alumni of these universities include high-achieving scientists, engineers, government officials, and corporate leaders.

so that the nation's top students almost invariably aim to matriculate at these low-cost, high-prestige national universities. This situation has created a dilemma for prestigious private universities, which, because they are competing with national universities to attract the same low-tuition seeking, high-achieving students, are unable to impose high tuition costs. Therefore, even as the quality of education at prestigious private universities increases, their tuition costs must remain low if these institutions are to attract the best students.

Regarding the question of whether or not prestigious private universities charge lower tuition rates than less prestigious universities, empirical studies show different results. Maruyama (1991, 1994) obtains the result that it is not true that prestigious universities have lower tuition in Japan. He maintains that the tuition level of private universities in Japan can be explained as a "market result" rather than as a form of "scholarship." On the other hand, Urata (1998) obtains totally different results, finding that universities with better conditions and higher selectivity tend to have lower tuition and fees. Thus, it is not clear whether private universities' tuition increases are proportionate with national universities' competitiveness.

This paper consists of six parts after the introduction. The second section summarizes characteristics of universities in Japan by comparing the Japanese university system with systems in other industrial countries. The third section evaluates factors which previous studies have shown to have an effect on university tuition. Based on previous studies, we build empirical models in the fourth section. In this section, three equations are built: (i) the university tuition equation, (ii) the number of students equation, and (iii) the standard deviation score equation. In the fifth section, data for the estimation are explained. The section six shows empirical results. In this section, the simultaneous approach is used. The last section summarizes the major findings.

2. Overview of Universities in Japan

2.1 International Comparison Among Selected Countries

First, we will explain the current situation of universities in Japan. Table 1 shows an international comparison of universities. Selected countries for comparison are the US, the UK, France and Germany.

In Japan, there are 752 universities, a large number when compared with the number in European countries. The number of universities per capita is almost the same as in the US. Furthermore, private universities in Japan account for 79%, similar to the percentage in the US. In contrast, most universities in European countries are public institutions.

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Table 1

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The number of students per capita in Japan is similar to that in France and Germany, while in the US and the UK, these numbers are relatively larger, presumably because the US and UK attract many foreign students.

The second important point is that public expenditure on higher education in Japan is lower than in other countries, as Table 2 shows. As for this measure, the ratio in both per GDP and per total public expenditure in Japan is significantly low. In Japan, expenditures on higher education are covered to a large extent by households, which contribute about 50% of the total.

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Table 2

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Information on university tuition is not available for all countries. However, when we compare university tuition in Japan with that in the US, the following result can be seen. Public universities in Japan charge tuition almost equivalent to that in the US, but tuition at private universities in Japan is much lower than in the US. In fact, there is an important reason that tuition at Japanese private universities is kept low: student scholarships are almost nonexistent in Japan. As Table 3 shows, scholarships account for only 0.6% of total support. Direct support to private universities from the government is lower than in continental European countries.

From these results, it can be seen that the organizational structure of universities in Japan is relatively similar to that in the US. The feature showing the most difference between the two countries is the tuition costs at private universities.

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Table 3

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2.2 Private-National University Comparison of Tuition Level in Japan

A comparison of the current level of university tuition at private and national universities

is shown in Table 4. In Japan, university tuition covers three main categories. Tuition is mainly for lectures and experiments. Admission fees are paid only once at the time of enrollment in a university. Facility maintenance fees are charged by private universities, but not by national universities, which include these in tuition.

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Table 4

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This table shows that the tuition at a private university is about 60% higher than at a national university. While there are still big differences between the two kinds of universities, the difference was formerly much greater. Figure 1 shows trends in university tuition. However, in this figure, the facility maintenance fees of private universities are not included because this measure is not available. For example, in 1975, the tuition level of private universities was 5.1 times higher than that of national universities. Since then, the difference has been amended by increasing tuition costs at national universities. Since 1986, the tuition difference has been suppressed less than twice.

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Figure 1

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3. Previous Studies

3.1 Previous Studies

In this section, we will overview previous studies analyzing the determinants of university tuition. There are numerous studies, such as Hartford and Marcus (1986), Koshal and Koshal (1998, 2001), Dimkpah et al. (2004) and Elliot and Soo (2013) in the US and Maruyama (1991, 1994), Yonezawa (1994), Urata (1998) and Funabashi (2008) in Japan.

Harford and Marcus (1986) investigate what kinds of factors determine university tuition level. They apply the hedonic approach to tuition for U.S. private colleges by using data from 1982-1983. They find that a college's tuition tends to become higher concomitant with an increase in student quality as expressed by SAT scores, and with an increase in teaching quality as expressed by an increased ratio of PhD holders. From these results, they conclude that the determinants of college

tuition are the quality of both students and teachers.

In contrast to the situation in the US, prestigious universities in Japan have lower tuition rates. Maruyama (1991, 1994) examines whether the tuition of prestigious private universities is actually low, and he investigates the determinants of tuition in Japan. By applying regression to the data of Japanese private universities in the year 1989, he obtains the following results. First, it is not true that prestigious universities have lower tuition in Japan; rather, the tuition level has a positive relationship with the difficulty of entrance into a university. He maintains that the tuition level of private universities in Japan can be explained as a "market result" rather than as a form of "scholarship."

Yonezawa (1994) also investigates the determinants of college tuition. His approach is similar to Harford and Marcus (1986), which uses the hedonic approach but investigates Japanese private universities and colleges for the academic year 1991-92. However, his findings are not as simple as those of the previous Harford and Marcus (1986) study. He concludes that there are several patterns in the economic behavior of Japan's private universities, and that the behavioral patterns and tuition levels are substantially influenced by a university's competence or position in the higher education market.

Urata (1998) investigates what would be factors affecting the tuition at private universities in Japan. He analyzes 1997 data of private universities in Japan and obtains the results that universities with better conditions and higher selectivity tend to have lower tuition and fees. These results are different from Maruyama's (1991), and the tendency he describes is different from the situation at private universities in the U.S. He offers the following reasons for his results. First, in Japan, it is students' parents who pay university tuition, so that it tends to be necessarily suppressed. Second, prestigious universities are in general established institutions with a long history and stable management conditions, making tuition increases unnecessary. It is also possible that there is a widespread and self-fulfilling view in Japan that high-quality higher education should be provided at lower cost. This philosophy seems to have been put into practice at private universities as well.

Koshal and Koshal (1998) analyze the determinants of tuitions. They build and estimate a model of supply and demand functions for university education in the U.S. The data used are 360 comprehensive universities for the year 1990-91. They estimate simultaneous equations for the model by applying the 2SLS and obtain the result that there exists a perfectly competitive market for university education. The quality of students, cost of education, average SAT score, class size, level of highest degree offered, and tier of the institution are the main factors accounting for tuition cost.

Koshal and Koshal (2000)'s study investigates the relationship between state

appropriation and tuition costs. They apply a simultaneous equation model by using 1990 data on 47 continental states in the US. They obtain the results that tuition depends on state appropriation, median family income, out-of-state enrollment and regional factors.

Dimkpah et al. (2004) analyze the impacts of university quality and location attributes on university tuition by using four-year private universities in the U.S. Observations in this study are 684 for 1999-2000, and they estimate the hedonic price equation. They conclude that the quality attributes (i.e. highly and moderately competitive university, percentage of faculty with doctoral degree, student/faculty ratio, age of university) of a university are the important determinants of tuition.

Funabashi (2008) investigates the factors affecting private university tuition level by using data on Japanese private universities in 2004, and applying regressions. He obtains the results that factors affecting tuition are (i) the level of difficulty of the entrance examination (+), (ii) the history of the university (-), (iii) the number of students per teacher (+), (iv) the size of the university (+), and (v) tuition costs at neighboring universities (+)[2].

Elliott and Soo (2013) investigate the relationship between tuition fees of MBA programs and the number of applications to these programs. They apply Three-Stage-Least-Squares methods for simultaneous equations by using a panel dataset comprising universities from countries across the world. They find that higher application numbers encourage universities to charge higher fees in the future, but higher fees in turn curtail application numbers.

Although his study does not focus on the determinants of tuition, McDuff (2007) uses US data to investigate the determinants of the number of applications to in-state public colleges and universities. He finds that student willingness to pay for quality is quite large.

Heath and Tuckman (1987) also maintain that tuition levels are more likely to affect applications, while financial aid, since it is usually awarded after acceptance, is more likely to affect choice at the point of matriculation, at least at the undergraduate level.

Noorbakhsh and Culp (2002), by using data from Pennsylvania, analyze how tuition increases affect enrollment in higher education. They conclude that a large tuition increase coupled with an elastic demand caused a significant loss of nonresident enrollment and tuition revenue in the State System of Higher Education.

Fethke (2005) takes a theoretical approach to exploring the strategic interactions of subsidies and tuition in public higher education. He explains that when the revenue of the university

[2] The sign of these five factors shows the relationship of the university tuition. The plus (+) sign shows that the factor works to increase tuition.

is important relative to students' welfare in legislative preferences, commitment to the subsidy prior to the setting of tuition leads to a lower subsidy and a higher tuition than will occur if legislatures determine tuition.

Neill (2009) investigates the effect of tuition fee increases on demand for a university education. He uses data on Canadian universities and makes both single equation estimates and system estimates. He concludes that system estimates that take into account endogeneity of fees show large effects relative to single equation estimates. And he obtains the result that an increase of one thousand Canadian dollars in university tuition fees reduces enrollment rate by 2.5 – 5%.

Finally, although not primarily about determinants of university tuition, research has been done on outside budget purchasing behavior (e.g. Yoshida (2007)), quality assurance (e.g. Toma and Naruo (2009)), and university administrators' behavior (e.g. Coates and Humphreys (2002), Coates et al. (2004)).

3.2 Summary of Previous Studies

Here we will summarize the main features of previous studies, regarding such matters as analytical methods used, data, important factors determined to affect tuition levels, and so on.

First, most studies use regression analysis, but there are some variations. The majority of studies use single equation for the tuition model, such as Harford and Marcus (1986), Maruyama (1991, 1994), Yonezawa (1994), Urata (1998) and Dimkppah et al. (2004). Of these, some studies, such as Harford and Marcus (1986), Yonezawa (1994) and Dimkpah et al., use hedonic specification of university tuition. These studies suggest that university tuition can be explained as quality of university service.

Some studies, such as Koshal and Koshal (1998, 2000) and Elliot and Soo (2013), use simultaneous equations, indicating that university tuition is considered an endogenous variable. In fact, there is no guarantee that tuition is an exogenous variable from other quality variables of education. Therefore, the simultaneous equation approach could be better than the single equation approach.

Second, data for analysis in most previous studies have comprised a pooling of individual universities. However, some studies use a cumulated data set. Koshal and Koshal (2000) estimate tuition based on the state data set. This approach focuses on the demand side and factors affecting regional difference. As we focus more on a university's behavior in pricing, we use a data set of individual universities.

Third, as for factors affecting tuition level, there are six categories. The first category is

university size. For example, Funabashi (2008) takes this factor. A big university might have a scale advantage in cost, or this might be a disadvantage.

The second category is the age of the university. Dimkpah et al. (2004) and Fubabashi (2008) take this factor. Older universities have a bigger stock of education facilities so that they might be able to provide better services with relatively lower costs.

The third category is the university's competitiveness factor. Prestigious universities, having built excellent reputations, are able to attract more applicants, creating a demand that allows them to charge higher tuition than universities perceived to be less prestigious. This has been the case with prestigious private universities in the US. In fact, many previous studies, such as Maruyama (1991, 1994), Urata (1998) and Funabashi (2008) in Japan and Koshal and Koshal (1998) and Dimkpah et al. (2004) in the US, include the competitiveness factor.

The fourth category is education quality. Student-teacher ratio, class size, the percentage of doctoral degree holders among teaching staff, and so on, are typical variables used in studies by Harford and Marcus (1986), Koshal and Koshal (1998), Dimkpah et al. (2008).

The fifth category is the competition factor with other universities. Funabashi (2008), for example, includes this factor when he examines tuition at universities in close proximity, who set tuition at levels allowing them to compete with each other for applicants.

The sixth category is the availability of subsidies from government. The more subsidies a university can receive from the government, the more it is able to suppress tuition rates.

It is also important to consider universities' costs, information about which is unfortunately unavailable in Japan. However, on average, this cost might be correlated with university size.

4. Empirical Model

Based on previous studies, we will build the structure of the model. The model consists of three equations: (i) the university tuition equation, (ii) the number of students equation, and (iii) the standard deviation score equation. These three equations are explained as follows.

$$ln\ P_{TUI} = \alpha_0 + \alpha_1\ ln\ Q_{ATS} + \alpha_2\ ln\ SDS + \alpha_3\ ln\ (1/HHI) + \alpha_4\ ln\ SUB + \alpha_5\ ln\ SAL \quad (1)$$

$$ln\ Q_{ATS} = \beta_0 + \beta_1\ ln\ SDS + \beta_2\ ln\ P_{TUI} + \beta_3\ DUM_{LMA} \quad (2)$$

$$ln\ SDS = \gamma_0 + \gamma_1\ ln\ P_{TUI} + \gamma_2\ ln\ Q_{ATS} + \gamma_3\ ln\ AGE_{UNIV} + \gamma_4\ ln\ RSC_{SC} + \gamma_5\ ln\ EDC_{STS} + \gamma_6\ ln\ EDC_{STA} \quad (3)$$

Where, P_{TUI}: university tuition,

Q_{ATS} : number of attending students,

SDS : standard deviation scores,

HHI : Herfindahl-Hirschman index,

SUB : subsidies to private universities per student,

SAL : annual salary of a professor,

DUM_{LMA} : large metropolitan area dummy,

AGE_{UNIV} : age of university,

RSC_{SC} : science research fund per academic staff,

EDC_{STS} : number of students per academic staff,

EDC_{STA} : number of students per campus areas.

As these equations show, the university tuition, the number of students and the standard deviation scores are all endogenous variables, and the other variables are exogenous. We explain the meaning of these equations in Figure 2.

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Figure 2

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First, university tuition equation explains how the university tuition is determined. The level of university tuition is affected by several factors, among which the most important is the number of attending students ($ln\ Q_{ATS}$). A university with more students might enjoy scale merit. Or, to the contrary, there might be scale demerit. University tuition can be considered a proxy variable of the unit cost of university education. As revenue sources are limited at private universities in Japan, the number of students is the most important factor affecting tuition at those institutions.

Second, top private universities such as Waseda University and Keio University are competing with top national universities such as the University of Tokyo and Kyoto University. Furthermore, private universities of the first tier (i.e. higher than 56 points in standard deviation scores) are competing with national and municipal universities to acquire high school students with higher grades. Therefore, the standard deviation score (*ln SDS*) could affect the level of tuition. Both signs are possible for this variable. If a university provides a better quality of university education to attract excellent students, the coefficient should be plus. However, if first tier private universities compete with national universities, the coefficient should be negative because the tuitions of national

and municipal universities are much lower than those of private universities. In fact, the empirical results for the coefficient of this variable are controversial (see, for example, Maruyama (1991, 1994) and Urata (1998)).

Third, we introduce the inverse of Herfindahl-Hirschman index (*ln* (1/*HHI)*) as a competition variable in this equation. However, in this equation, we divided the higher education market into three tier groups in each region. In general, the more competition there is, the more likely tuition levels are to be suppressed.

Fourth, the availability of subsidies from the government (*ln SUB*) also affects the level of tuition. If the subsidies are larger, the tuition becomes lower.

Last, the annual salary of a professor (*ln SAL*) is also important. The coefficient of this variable could be positive.

Therefore, by evaluating the sign of these variables, we can see the effects of these factors.

5. Data and Definition of Variables

5.1 Data

As the main purpose of this study is to find the determinants of university tuition, we collected observations from private universities in Japan. Because tuition at public universities such as national universities and municipal universities is decided by the government and set at almost uniform levels, we limited our sample to private universities only. Furthermore, as there is much variation among major subjects of study, we focused here on social science majors such as economics, management, commerce, law, government and public policy. We selected faculties/schools of social science from 165 universities in 2010. As a result, the total sample size is 297.

5.2 Definition of Variables

Table 5 shows the definition of all variables used in this study. First, university tuition ($P_{TUI)}$ in this study is defined as the sum of annual tuition, facility fees, training fees and various miscellaneous fees for undergraduate education. As there is wide regional variation in prices, university tuition is adjusted according to *The Consumer Price Index Regional Differentials (Shohisya Bukka Chiikisa Shisu).*

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Table 5

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As for the total number of attending students (Q_{ATS}), we use total full time undergraduate students of each faculty for this variable. Graduate students, research students, part-time students and so on are not included in this variable. Data for this variable are obtained from Asahi Shinbun Publications (2010).

As for a measure of difficulty of entrance to a university, we use the *Standard Deviation Score (SDS)*, known as "Hensachi" in Japan. The *SDS* is often used in Japan to measure how difficult it is to enter individual universities based on data from trial entrance examinations conducted by preparatory schools for these universities. The score, *T* of the *SDS* is measured as $T = 10\ (x - \mu_x)/\sigma_x + 50$, where x: individual's raw score, μ_x: mean of raw score, σ_x: standard deviation of raw score. The expected required score of *SDS* to enter each university is reported by several preparatory schools. The *SDS* is based on Asahi Shinbun Publications (2010).

As for competition factor, we choose the Herfindahl-Hirschman index (*HHI*). We divide Japan into 8 regions[3] in terms of area, and divide into 3 academic levels[4] in terms of *SDS*, calculating *HHI* based on the number of students.

Subsidies to a private university also affect the level of tuition. In this study, we define subsidies to a private university (*SUB*) as the sum of general subsidies and special subsidies divided by total number of students. The *SUB* is also adjusted according to *The Consumer Price Index Regional Differentials (Shohisya Bukka Chiikisa Shisu)*. Data on subsidies are obtained from *The Promotion and Mutual Aid Corporation for Private Schools in Japan (Kyosai Jigyodan Shigaku Shinko Jigyo Honbu)*.

Salary of a professor (*SAL*) is the sum of annual salary and bonus and is also adjusted by *The Consumer Price Index Regional Differentials (Shohisya Bukka Chiikisa Shisu)*. Data on salary are obtained from *The Basic Survey of Wage Structure (Chingin Kozo Kihon Tokei Chosa)*.

[3] 8 regions are Hokkaido, Tohoku, Kanto, Koshinetsu-Hokuriku, Chubu, Kansai, Chugoku-Shikoku, and Kyushu-Okinawa.

[4] Three academic levels in SDS in this study are (i) higher than 56 point, (ii) between 55 and 46 point, (iii) lower than 45 point, in *SDS* score.

Large metropolitan area dummy *(DUM_{LMA})* is a dummy variable to show large metropolitan areas in Japan. In this study, the Tokyo and Osaka metopolitan areas are considered[5]. Therefore, universities located in these metropolitan areas are taking one in this dummy variable.

The age of the university (AGE_{UNV}) is defined as the number of years having elapsed between the university's establishment and 2009. Data for each university's year of establishment are obtained from Asahi Shinbun Publications (2010).

Science research fund per academic staff (RSC_{SC}) is obtained by dividing scientific research fund from the Ministry of Education, Culture, Sports, Science and Technology by the number of academic staff at a university. This variable is also adjusted by each region's consumer price index. Data for both scientific research fund and number of academic staff of a university are obtained from Asahi Shinbun Publications (2010), and consumer price index is obtained from the Ministry of Internal Affairs and Communications.

Number of students per academic staff *(EDC_{STS})* and number of students per campus area *(EDC_{STA})* are obtained by dividing the number of students by the number of academic staff and total land area of campus individually. Data on the number of students, number of academic staff and total land areas of campus are obtained from Asahi Shinbun Publications (2010).

6. Empirical Analysis

6.1 Relations Among Key Variables

Although the main purpose of this study is to find the determinants of university tuition by using regression analysis, first we can look at the sample distribution of key variables. In this case, by picking up three variables such as university tuition, number of attending students, and standard deviation scores, we can detect a relationship among them, which can be seen in Figure 3 to Figure 5. First of all, the relationship between university tuition and the number of attending students (Figure 4) seems to be negative; that is, the bigger the university, the lower the university tuition per student. As for the relationship between the standard deviation score and the number of attending students (Figure 5), the standard deviation score seems to be positively related to the size of a university. However, there seems to be a clear relationship between university tuition and the standard deviation score, as Figure 3 shows. It is necessary to control other conditions in order to find the real

[5] In this study, Tokyo metropolitan area includes the prefectures of Ibaraki, Tochigi, Gunma, Chiba, Tokyo, Kanagawa, and Yamanashi. Osaka metropolitan area includes the prefectures of Shiga, Kyoto, Osaka, Hyogo and Wakayama.

relationship among these variables. Therefore, we apply regressions.

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Figure 3

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Figure 4

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Figure 5

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6.2 Regression Results

The main purpose of this study is to find the determinants of university tuition ($ln\ P_{TUI}$). Our study is characterized by the fact that we specify three variables (i.e. university tuition ($ln\ P_{TUI}$), number of attending students ($ln\ Q_{ATS}$), and standard deviation scores ($ln\ SDS$)) as endogenous variables. Therefore, these three dependent variables are estimated by the use of the simultaneous equation model. The estimation method of these equations is the three stage least square method (3SLS). We also estimate these three dependent variables one by one in single equations in order to compare the results to those from the simultaneous equations. The estimation method for the single equation is the ordinary least square method (OLS). The estimation results of the regressions are shown in Table 6.

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Table 6

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From these results, sign and magnitude of coefficients in most variables are similar between these models. However, some variables are different in significance level, sign of coefficients (e.g. standard deviation scores ($ln\ SDS$) in the university tuition equation, large metropolitan area dummy (DUM_{LMA}) in the number of attending students equation).

One reason why there are differences in these models is that the single equation model does not consider endogeneity conditions. Therefore, we test whether or not three variables, university tuition ($ln\ P_{TUI}$), number of attending students ($ln\ Q_{ATS}$), and standard deviation scores ($ln\ SDS$), are really endogenous variables, by using the so called endgeneity test. We apply the Hausman Test for these three equations. Test results show that these three variables are not considered exogenous variables[6]. From this result, as the simultaneous equation models are better, we interpret the coefficients based on the simultaneous equation models.

First, in the university tuition model, the important factors affecting tuition are numbers of attending students, standard deviation scores, inverse of HHI, and subsidies to private universities. As the number of attending students and subsidies to private universities increase, the university tuition decreases. On the other hand, as the standard deviation scores (i.e. difficulty of entering the university) and the inverse of HHI (i.e. more competition in the region) increase, the university tuition increases. These results, except for the inverse of HHI, seem reasonable factors in the pricing of university tuition. Among these variables, based on the degree of their coefficients, standard deviation scores and the number of attending students most affect university tuition. The inverse of HHI shows a positive relationship is that this perhaps reflects the urban rather than the competition factor.

Second, in the number of attending students equation, the important factors are the university tuition and standard deviation. As university tuition increases, the number of attending students decreases. On the other hand, as the standard deviation scores (i.e. greater difficulty of entering the university) increases, the number of attending students increases. From these results, the size of university (i.e. number of attending students) has a positive relationship not with university tuition but with the standard deviation scores. In fact, highly competitive private universities such as Waseda University and Keio University are very large. Therefore, we can get these results.

Third, in the standard deviation scores equation, the important factors are both number of attending students and age of university. These variables both have a positive relationship. These results show that as the university size increases and the university becomes old, the standard deviation scores (i.e. difficulty of entering the university) become higher.

[6] Wald statistics (W) for each equation are 6.444 for the university tuition equation, 32.454 for the number of students equation, and 43.314 for the standard deviation score equation. Null hypothesis that university tuition, number of attending students and standard deviation scores are exogenous variables is rejected at a significance of 5% (the university tuition equation) and 1% (both the number of students equation and the standard deviation score equation).

7. Conclusion

The main purpose of this study is to find the factors to determine private university tuition level. Furthermore, because previous researchers have drawn conflicting conclusions, we test whether or not university tuition of prestigious (higher standard deviation score) private universities is lower than that of less prestigious private universities, (see, for example, Maruyama (1991, 1994) and Urata (1998)). From our results, we obtain the following findings.

(1) Important factors affecting tuition are (i) the size of a university (i.e. number of attending students), (ii) the quality of a university (i.e. standard deviation scores), (iii) the urban and competition factors (i.e. inverse of HHI), and (iv) subsidies to private universities.

(2) University tuition is not negatively related to the difficulty of entering the university (i.e. higher standard deviation score). Some argue that tuition of very prestigious (i.e. higher standard deviation score) private universities is not high because these universities are really competing with top national universities to enroll excellent students. Based on our results, this perception is wrong. The empirical result is the same as for the US: university tuition is higher in very prestigious universities. The misconception about Japanese universities might be based on faulty estimation results. For example, in our single equation model, the relationship between these variables is negative, although not to a statistically significant degree.

(3) The size of a university has a negative relationship with university tuition. This result might show that university tuition has a scale effect. When other conditions are held, bigger universities can reduce tuition.

(4) The availability of subsidies to private universities has a negative relationship with university tuition. Subsidies decrease tuition cost.

(5) “Competition” among universities is also important in determining university tuition. But this is not exactly same as the real competition factor. The urban factor has the effect of increasing pressure on tuition. On the other hand, the competition factor has the effect of decreasing pressure on tuition. Unfortunately, these factors are not separated in the explanation variable (i.e. the inverse of HHI).

(6) Important factors affecting the size of a university are tuition and standard deviation.

(7) Important factors affecting the quality of university are both the number of attending students and the age of the university.

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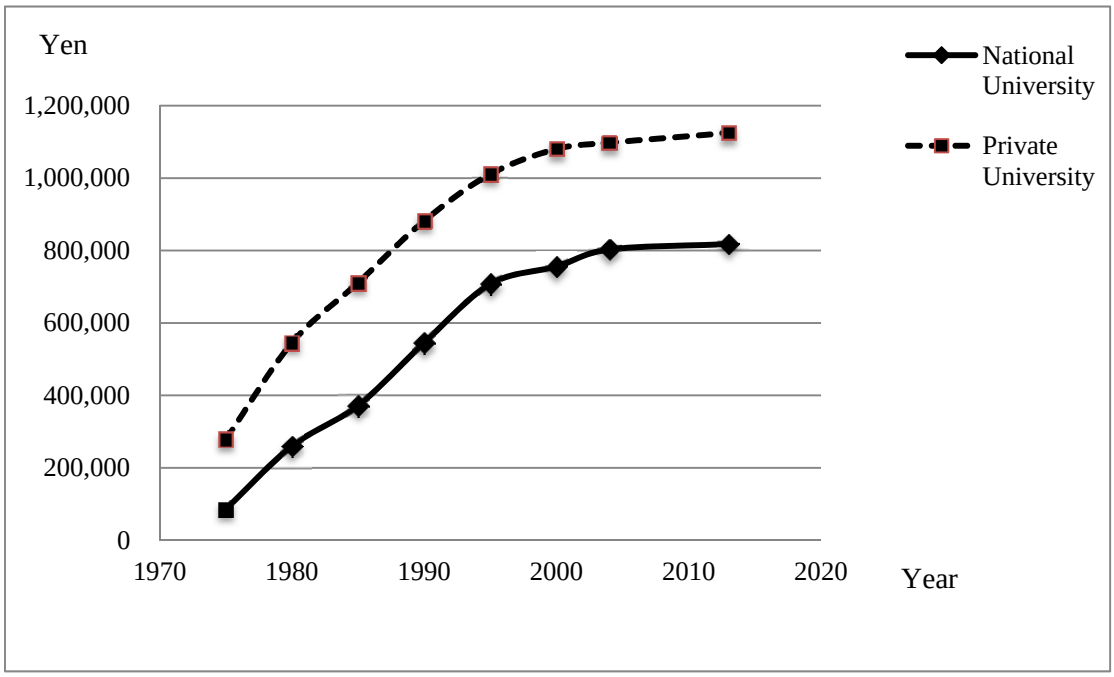

Figure 1 Tuition of National and Private Universities in Japan

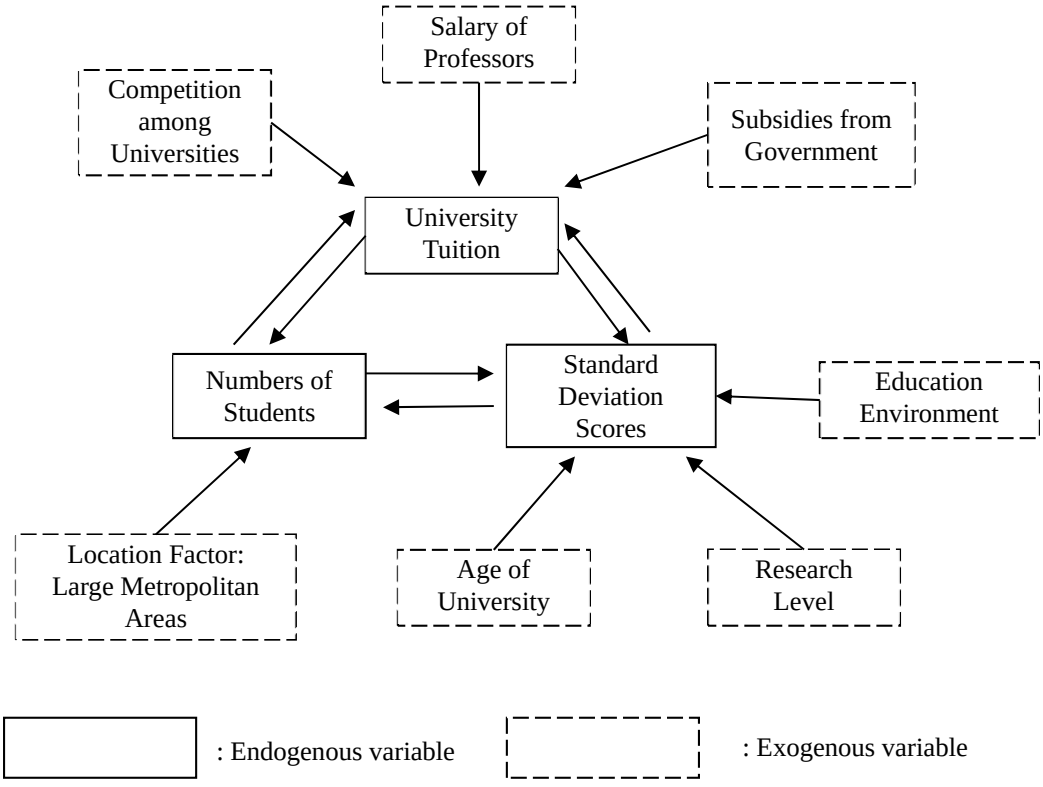

Figure 2 Structure of the Model

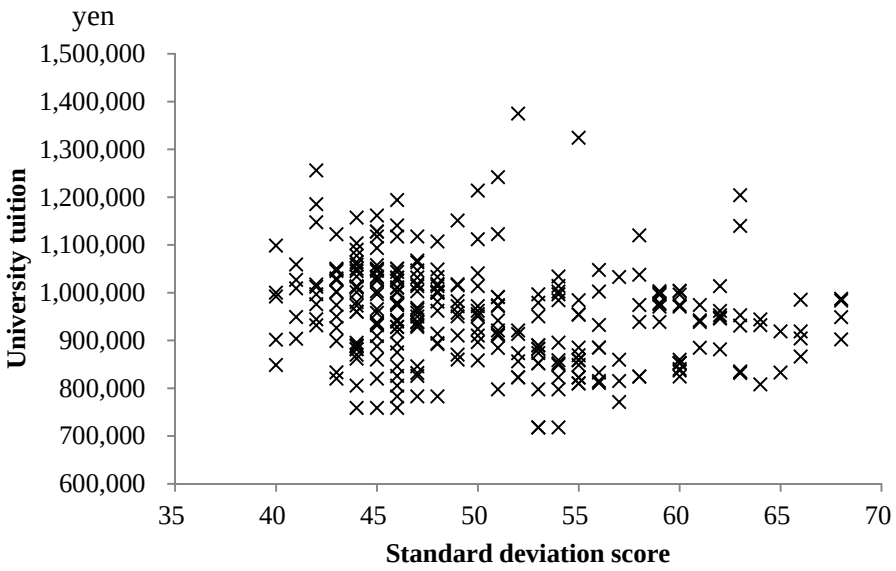

Figure 3 Relationship between University Tuition and Standard Deviation Score

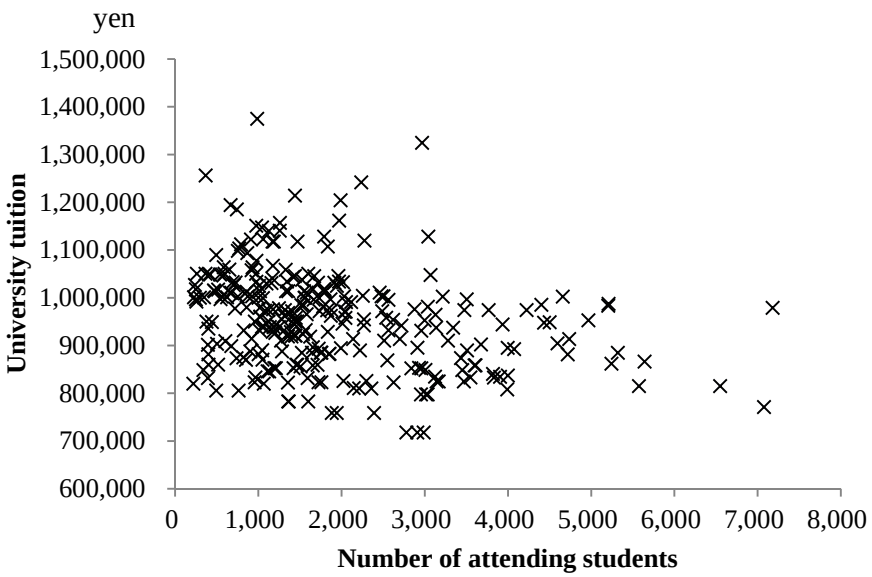

Figure 4 Relationship between University Tuition and Number of Attending Students

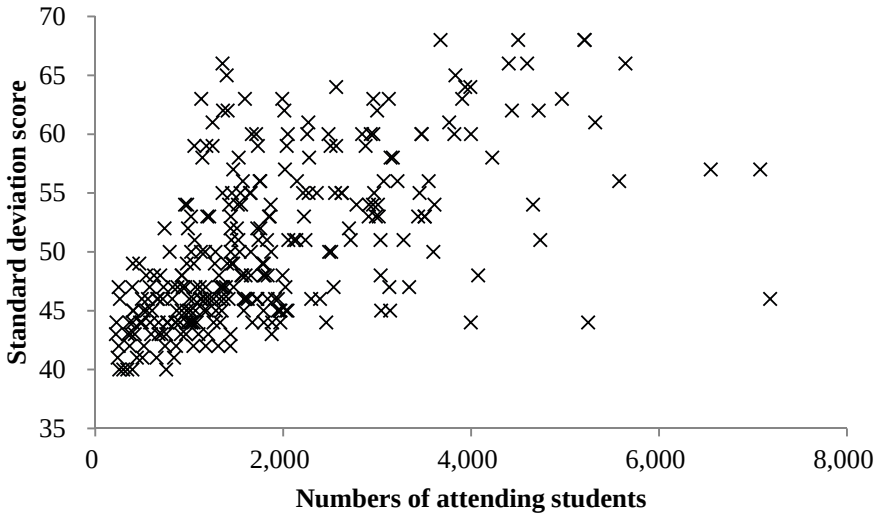

Figure 5 Relationship between Standard Deviation Score and Number of Attending Students

Table 1 International Comparison of Universities

Country		Japan	US	UK	France	Germany
Number of Universities	Total	752	2,579	169	94	376
	Public	21%	25%	99%	86%	82%
	Private	79%	75%	1%	14%	18%
College Enrollment Rate		49%	64%	57%	41%	37%
Number of Students (thousand)	Total	2,780	11,000	2,360	1,400	1,990
	Undergraduate	2,520	8,480	1,800	880	-
	Graduate	260	2,520	560	520	-
Number of Students per 1,000 Population	Total	22	37	39	23	24
	Undergraduate	20	29	30	14	-
	Graduate	2	9	9	9	-
Foreign Students (thousand)		91	565	249	210	190

(Source): Ministry of Education, Culture, Sports, Science and Technology (2009, p.41)

Table 2 International Comparison of Public Expenditure on Higher Education and Annual Tuition

Country		Japan	US	UK	France	Germany	OECD Average
Public Expenditure on Higher Education[(a)]	Per GDP	0.8	1.3	1.3	1.3	1.4	1.4
	Per Total Public Expenditure	1.8	3.5	2.7	2.3	3.1	3.2
Proportion of Expenditures on Higher Education[(a)]	Public Sources	34.5	34.8	30.2	80.8	84.7	69.2
	Household Expenditure	50.9	47.8	60.7	10.4	15.3	30.8
	Other Private Sources	14.6	17.4	9.1	8.8		
Annual Tuition Fee[(b)]	Public	5,019	5,402	-	200 to 1,402	-	-
	Private	8,039	17,163	-	-	-	-

(Source): OECD (2014, p.245, p.257, p.271)
(Note):
(1) Unit: % for item (a), US dollar for item (b).
(2) Statistics are from 2011.

Table 3 International Comparison of Public Support for Households and Other Private Universities

Country		Japan	US	UK	France	Germany	OECD Average
Direct Public Expenditure for Institutions		70.4	70.8	26.2	92.0	78.1	78.5
Financial Aid to Students	Scholarships/ Other Grants to Households	0.6	27.9	7.5	8.0	16.3	11.6
	Student Loans	29.0	1.3	31.7	-	5.6	9.2
	Others	-	-	34.7	-	-	5.1
	Total	29.6	29.2	73.8	8.0	21.9	21.5
Public Support for Education to Private Universities as a Percentage of GDP		0.23	0.39	0.99	0.10	0.31	0.31

(Source): OECD (2014, p.276)
(Note):
(1) Unit: %
(2) Statistics are from 2011.

Table 4 University Tuition Comparison between National and Private Universities in FY 2013

Kind of University	National University	Private University	Private/National Ratio
Tuition	535,800	860,072	1.61
Admission Fees	282,000	264,390	0.94
Facility Maintenance Fees	-	188,063	-
Total	817,000	1,312,526	1.61

(Note):
(1) These figures are obtained from several sources from the Ministry of Education, Culture, Sports, Science and Technology.
(2) These are for undergraduate education only.
(3) Facility maintenance fees in national universities are included in tuition.
(4) Numbers for private universities are the mean of 574 private universities but numbers for national universities are the same values for all national universities.

Table 5 Statistics of Used Variables

Variable	Unit	Mean	Standard Deviation	Minimum	Maximum
P_{TUI} (university tuition)	yen	956,112	102,795	717,910	1,374,751
Q_{ATS} (number of students)	person	1,859	1,269	220	7,182
SDS (standard deviation scores)	-	50.488	6.795	40.000	68.000
HHI (Herfindahl-Hirschman index)	-	0.075	0.110	0.022	1.000
SUB (subsidies to private universities per student)	yen/person	120,528	57,795	0	373,041
SAL (annual salary of a professor)	thousand yen	11,744	1,094	8,819	13,028
DUM_{LMA} (large metropolitan area dummy)	-	0.660	0.475	0.000	1.000
AGE_{UNV} (age of university)	year	51.896	22.802	7.000	89.000
RSC_{SC} (science research fund per academic staff)	yen/person	304,367	372,787	0	2,255,708
EDC_{STS} (number of students per academic staff)	-	45.613	17.179	10.000	97.270
EDC_{STA} (number of students per campus areas)	person/m^2	0.026	0.015	0.002	0.097

Table 6 Estimation Results

Case	Case 1			Case 2		
Model	Single equation			Simultaneous equation		
Estimation Method	OLS			3SLS		
Dependent Variable	*ln* P_{TU} (tuition)	*ln* Q_{ATS} (student)	*ln SDS* (standard deviation scores)	*ln* P_{TU} (tuition)	*ln* Q_{ATS} (student)	*ln SDS* (standard deviation scores)
ln P_{TUI} (tuition)	-	-1.418*** (0.315)	0.001 (0.055)	-	-2.471*** (0.705)	-0.011 (0.170)
ln Q_{ATS} (# of attending students)	-0.055*** (0.011)	-	0.066*** (0.011)	-0.125*** (0.015)	-	0.158*** (0.017)
ln SDS (standard deviation scores)	-0.084 (0.057)	2.782*** (0.253)	-	0.206*** (0.070)	3.896*** (0.311)	-
ln (1/HHI) (1 / Herfindahl-Hirschman index)	0.041*** (0.010)	-	-	0.028*** (0.006)	-	-
ln *SUB* (subsidies to private universities per student)	-0.002*** (0.0004)	-	-	-0.001* (0.001)	-	-
ln SAL (annual salary of a professor)	0.104 (0.111)	-	-	0.060 (0.039)	-	-
DUM_{LMA} (large metro. area dummy)	-	0.427*** (0.067)	-	-	0.053 (0.049)	-
ln AGE_{UNV} (age of university)	-	-	0.092*** (0.013)	-	-	0.043** (0.018)
ln RSC_{SC} (research fund / acad. staff)	-	-	0.001 (0.001)	-	-	-0.001 (0.001)
ln EDC_{STS} (# of students / academic staff)	-	-	0.003 (0.010)	-	-	-0.007 (0.009)
ln EDC_{STA} (# of students / campus area)	-	-	0.008 (0.007)	-	-	0.002 (0.006)
Constant	13.420*** (0.908)	15.645*** (4.833)-	3.079*** (0.778)	13.238*** (0.405)	26.035** (10.317)	2.790 (2.351)
Adjusted R^2	0.197	0.486	0.504	-		
Log of likelihood	-	-	-	279.429		

(Note):
(1) Numbers in parentheses are standard errors.
(2) Statistical significance in 1% (***), 5% (**) and 10% (*).
(3) OLS estimations are White modification.

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