Hierarchy and Market Competition
in South Korea's Higher Education Sector

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March 2003
Working Paper 03-04

KDI 국 제 정 책 대 학 원
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Abstract

This paper confirms that Korean higher education sector is highly hierarchical in which public and private institutions compete. In general, 4-year institutions (universities) specialize in higher quality spectrum, whereas 2-year institutions (colleges) specialize in lower quality spectrum with a substantial overlap of the two types institutions in the middle spectrum achievement. We also found that institutions located in Seoul or surrounding Kyunggi Province are able to attract better students and that there is a substantial premium for public universities even after controlling for net tuition and non-tuition subsidy.

JEL Codes: I0, I2, H4

Key Words: Higher Education, University, Hierarchy, Competition, South Korea

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1. Introduction

During the last few decades, the expansion of higher education in South Korea (Korea hereafter) has been quite spectacular. In 1960, the number of students enrolled in higher educational institutions in Korea was only about 100,000. Forty-two years later in 2002, the enrollment has increased to more than 3.5 million.[1]   More than 70% of the high school graduates advance to some sort of higher education institution. As of April 2002, there are 159 2-year technical colleges (colleges hereafter) and 163 4-year colleges and universities (universities hereafter) in Korea. In addition, there are 11 4-year national teachers' universities,[2] and 19 4-year technical universities.

In contrast to the government's commitment to public education in primary and secondary schools, Korea's higher education is predominantly private.[3] Out of 159 colleges, 143 institutions are private, and out of 163 regular universities, 137 are private. 11 of the 19 technical universities are also private. Excluding more than 300,000 students in the Korea National Open University, there are 2 million students are enrolled in 4-year universities, and about three quarters of them are in private schools. At the same time, about one million students are enrolled in colleges, and more than 95% of them are in private institutions. In terms of expenditure, Korea spends about 2.51% of GDP in higher education in 1998, and the figure is one of the highest in the OECD countries. However, the government's share is only 16.7%, and it is the lowest among them (OECD, 2002). Most of government expenditure in higher education in Korea is disbursed as a subsidy to the public universities, and there are virtually no direct financial aids to students. Most of public universities are national universities that are directly governed by the Ministry of Education and Human Resources Development (MOEHRD, formerly Ministry of Education). Some non-national public universities include universities run by local or provincial governments, other central ministries, or independent government agencies.

Despite the fact that private sector has been the major provider of higher education, the extent of market competition among universities and colleges has been strongly controlled by the government. Up until 1995, MOEHRD not only maintained strict guidelines regarding how to establish and operate the institution, it also controlled number of students for each department for each school as well as student selection methods and the amount of tuition. Despite the fierce competition among students to

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[1] Since the establishment of the nation state in 1948, South Korea has adopted a 6-3-3-4 educational system. Education over grade 12 is considered higher education in this paper.   In 1950, there were 11,358 students in higher education institutions. The number has increased to 101,014 in 1960, to 201,436 in 1970, to 647,505 in 1980, to 1,691,681 in 1990, and 3,383,293 in 2000. Currently, Korea's enrollment rate in higher education is among the highest in the world, and given the high enrollment rate, it would be safe to say that Korea's higher education is saturated, and it is unlikely that the rate would continuously increase in the future.

[2] All teachers' colleges had been 2-year institutions until they were converted to 4-year since early 1980s.

[3] In 2003, primary schools (grades 1-6) and middle schools (grades 7-9) are free and compulsory. Though high schools (grades 9-12) require modest tuition payment, the government subsidizes all private middle schools and high schools since she implemented the "equalization policy" that prohibits the schools to select students. As a result, the enrollment rates for middle and high schools are close to 100%. See Kim and Lee (2002b) for more detail regarding the "equalization policy."

enter better school, competition among universities to recruit better students was limited because it is difficult for each institution to become different from others due to the heavy regulations applied across the board. The government has not allowed for-profit institutions in higher education. However, some of the private institutions may have been established and operated mainly by profit motives.[4]

Recognizing various problems resulting from the heavy regulation in the education sector, the Presidential Commission on Education strongly recommended market-based approaches to education policy in 1995. Following the Commission's recommendations, the government started to loosen up the regulations. Private institutions outside of Seoul metropolitan area are free to choose the number of incoming class as well as the distribution of students within the institution.[5] Establishment of new schools was liberalized to enable any institutions above minimum standards to establish schools. Also, the government started to implement discriminatory subsidy policy based on comprehensive evaluation of universities. In short, the government tried to introduce market competition both by making higher educational institutions more autonomous and by requiring them more competitive. The shift in the paradigm of the government's policy creates both opportunities and challenges in higher education in Korea.

In this paper we examine the market structure of higher education sector in Korea. In particular, we recognize the fact that higher education is provided private sector as well as by the government. Depending on the political and economic environment, the supply and finance of higher education vary a lot across countries. In Switzerland, Germany and Austria, higher education is mostly financed and provided by the government, and students pay very little for attending universities. In the U.K., higher education is supplied by the government, but the level of tuition is considerable and the households as well as the government pay some portion of the expense. In the U.S., Japan and France, both government and private sector provides higher education with mixed financing between households and government. Korea resembles the last group, though the government's share in expenditure is lower than the other countries.

The paper is organized as follows. The next section briefly describes our theoretical framework. In particular, we adopt the hierarchical education market model proposed by Epple and Romano (1996), and modify it to suit the economic and regulatory environment of the Korean higher education sector. In Section 3, we consider the ramifications of one of our modifications by allowing different types of governance structure (for-profit private, non-profit private, and public) for the supply of higher education. The discussions in these sections would be applicable to higher education sector in many countries in which there exists substantial number of private institutions. In the next section, we analyze the assets and strategies for market competition by each type of institution in the Korean environment. The remainder of the paper is focused on the empirical analyses. The empirical evidence strongly support our characterization of the Korean higher education market structure, in which ranking plays a key role in

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[4] However, there are more than 15,000 for-profit educational institutions (*hakwons*) in Korea. Though the majority of *hakwons* specialize in the preparation of college entrance examination, many compete with technical colleges in the area of professional and occupational training. See Kim and Lee (2002a) for more detail.

[5] However, the institutions in the Seoul metropolitan area still have to get explicit permission from the MOEHRD as a part of the government's decentralization policy that attempts to disperse economic activities to outside of the area.

matching institutions of different quality and students of various ability. Conclusions and policy implications of the study are offered at the end.

2. The Basic Theoretical Framework

In this section, we propose a theoretical framework to evaluate the competition among students and institutions in higher education market. Our starting point is the theoretical set up by Epple and Romano (1998). They (referred to as ER hereafter) developed a hierarchical model in the education market in order to examine the effects of voucher system in secondary education system in the U.S. However ER model provides a useful starting point for the characterization of higher education system that is dominated by the private sector such as in Korea. After briefly reviewing the model, we propose several modifications to the ER model in order to make the model more suitable for the analysis of higher education in Korea.

The ER model can be briefly summarized as follows. Households (or students) vary according to income (y) and ability (b), and the probability density function of the households is represented by f(y, b). The support for income and ability is $(0, y_{max}]$ x $(0, b_{max}]$. Each household has the utility function U(x, e) on x (the Hicksian composite good) and educational achievement (e). The educational achievement is determined by the quality of the institution θ and the student's ability b, in the form e = e(θ, b). The price of the composite good is normalized to one. All schools have the same cost structure that includes a large fixed cost. Public schools charge no tuition, but private schools determine profit maximizing tuition schedules according to each student's income and ability. The equilibrium is characterized by the tuition schedules of private schools and resulting allocation of students of different income and different ability to different quality schools. In equilibrium, all private schools maximize profits and all students maximize utilities. In the long run, the maximum profits of private schools are zero because of the free entry and exit in the market.

Under these assumptions, ER proved the following statements hold in equilibrium:

1. A strict hierarchy of quality of schools would emerge with the public school at the bottom, and the higher the quality of the school, the higher the tuition for a given student;
2. Schools would be stratified by income, i.e., a higher quality school would have a higher average student income;
3. Schools would be stratified by ability, i.e., a higher quality school would have a higher average student ability provided that higher income students have higher marginal rate of substitution of education with respect to the composite good;
4. Each institution charges effective marginal cost to each of its students, which is the sum of out-of-pocket marginal cost of running the school plus peer group externality cost.
5. The resulting outcome is efficient.

In order to analyze higher education sector in Korea, we modify the ER model as follows. First, we assume that the provision of high quality education costs more (both in fixed cost and variable cost) than low quality education. In ER model, school quality is solely determined by the student characteristics. Although, the quality of students is an

important input for the quality of education service provided by the school, certainly it is not the only input. The quality of teaching staff and school facilities such as laboratory and library are also important inputs for the education process, and it would be safe to assume that the education costs are higher for higher quality institutions. Later in the empirical section, we will provide the evidence that quality is indeed associated with operating expenditure.

Second, we incorporate a competitive student selection process by institutions. In ER model, student allocation is done through a price mechanism, in which each institution is allowed to discriminate students according to their ability and income. Therefore, in equilibrium a higher ability student pays a lower tuition than a lower ability student if both attend the same school and their incomes are identical. Also, if two students with identical ability attend the same school, the student with higher income would pay higher tuition. The ability to price discriminate in ER model is the key assumption for the efficiency result. Without the price discrimination assumption, the equilibrium will not be efficient, because both schools and students may be better off if high quality institutions lower tuitions to lower-income-high-ability students. However, as both the income and ability are not readily observable, the assumption of perfect information seems unrealistic. Furthermore, price discrimination may be politically and socially unacceptable. For example, there has been a great deal of debate on whether the government should allow the "admission for donation" scheme that some high-ranked private institutions favor. Also, historically higher learning institutions traditionally have very little need-based scholarships in Korea.

Thirdly, we envision three different types of ownership structure and consider explicitly incentives and behavior of the different types. Typically in the provision of higher education services, there exist non-profit private institutions as well as for-profit institutions and public institutions, all of which compete in the same education market by providing comparable education services. It would be fair to assume all institutions, no matter what their types are, are concerned about financial security (or profit), to provide quality educational services to the students, and to generate knowledge to the whole society. However, depending on the type of institution, the institutions would have different incentives, and consequently may behave differently in the same environment. In the next section we shall examine the incentives of the three different types in more detail.

Lastly, we incorporate an element of reputation and prestige in the ER model in order to examine competitive strategies that institutions of different type may take in Korea. Being a static model, ER model does not specify the process in which how students congregate around different peer group. We view that the essential mechanism is the prestige and reputation of institutions by which students sort themselves. We recognize the fact that quality of the institution is built through a long time period, and any change in reputation can only occur slowly with substantial investment by the institution.[6] We shall follow the framework by Brewer et al. (2002) that provide a comprehensive and qualitative study on the nature of the competition among higher education institutions in the U.S. They argued the pursuit of prestige is the most important planning objective for many high quality institutions whereas reputation (meeting student's expectation) is the most important objective for lower quality

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[6] For a study of stable hierarchy in US higher education market, see Mayer-Foulkes (2002).

education. Another reason for our specific concern for the competitive strategy is that it will enable us to analyze how changing market situation affect the entry and exit of institutions. For example, if the number of potential students increases, what do existing institutions will behave in order to take advantage of the growing market? Furthermore, it will help us to examine what types of institutions are likely to enter the market. We shall analyze assets and strategies of higher education institutions for market competition in Section 5.

3. Incentives and Behavior of Different Types of Institutions

In this section, we shall discuss the implications of having different types of institutions in the provision of higher education. We shall discuss private institutions first and public institutions later. Although for-profit private institutions are not allowed in higher education sector by law in Korea, many institutions are de facto for-profit, and the illegal transfer of resources to the owner from the institutions has been one of the most important perennial issues of campus dispute in many private institutions and government regulations. Therefore, we include for-profit institutions in our analysis. For-profit institutions exist in order to make profit. Either it is a corporation or a sole proprietorship, for-profit institution would be expected to be sensitive to the profit motive. There are certain social benefits of having for-profit supplier in higher education. Since student satisfaction is very important to them, they would be more flexible and more responsive to the changes in the student preference or economic environment in which they operate. For example, the quickness in setting up a new program or eliminating an existing program in order to meet the new market demand would be their strength. Also, for-profit institutions would have strong incentives for cost cutting in order to increase production efficiency. However, they would be less concerned about the activities that do not yield direct financial benefits. For example, research activities of the institutions would be minimal, and faculty members would not be encouraged to perform research activities or community services. As far as the revenue structure is concerned, it is unlikely to expect for-profit institutions would generate substantial public donations or government subsidy, as the potential donors would suspect that the owner rather than the students would ultimately benefit by such donations. Therefore, it is likely that they would offer education programs that are popular and inexpensive to provide. They would minimize the size of teaching staff that specialize in teaching, as the instructional personnel is the major component in the cost structure of higher education. Their entry and exit would be flexible and would be driven by profits and losses.

Non-profit private institutions commonly exist in higher education market. The suppliers of higher education cannot effectively communicate the information regarding the quality of service they provide beforehand. Students need to attend schools in order to fully evaluate the quality of the education they receive. Ridding the residual claim of the institution, the institution can send more effective signal to potential students that the institutions is more concerned about stated mission rather than the resulting profits of the activities. Furthermore, without the residual claimant of earnings, the stakeholders in non-profit institutions would have stronger incentive to seek prestige than for-profit institutions, which depends on the quality of faculty, facility, and students.

The status of non-profit organization gives clear advantage in raising donations, as potential donors would consider the non-profit status of the institution as assuring

signal that the donations would ultimately benefit students (Hansmann, 1980, 1990). Furthermore, the Korean government tax codes stipulate that donations to non-profit higher education institution can be deducted from income taxes. Since non-profit institutions do not distribute residual claim for every fiscal year, they can retain the operational earnings. Over a long time period, non-profit institutions may generate large sums of endowment. The possibility of private donation and accumulation of endowment gives non-profit institutions distinctive advantages over non-profit institutions in providing students with more financial aid. In order to attract more donations and sponsored research funds, these institutions would seek to hire more renowned faculty and encourage them to engage in research activities. However, these activities are costly and the strategy to seek prestige would be constrained by the financial stability of the individual institutions. On the contrary, by lowering the admission standards, they would be able to increase the size of incoming class and consequently tuition revenue. They have to balance the two somewhat conflicting objectives of "the pursuit of prestige" and "securing financial stability".

　　　Based on the arguments above, we can conclude two things. First, we would expect that the non-profit institutions dominate the upper layer of the quality spectrum and for-profit institutions dominate the lower layer among private institutions. Second, the higher quality institutions would attract more donations, possess higher endowments, attracts higher quality faculty and students.[7]

　　　In ER model, public schools charge no tuition, and occupy the lowest end of the quality spectrum. In secondary education in the U.S., this may be a reasonable assumption, particularly in the large urban areas where voucher program is debated. However, in Korea, as in many other countries, there are several reasons why public higher education institutions occupy high quality spectrum. First, unlike U.S. high schools, public universities in Korea have student choice. If the public institutions are allowed to select students, there is no reason that public institutions would be the lowest quality. In fact, quite the opposite would be true, as they would be able to offer lower tuition than private institutions because of the public subsidy. When the size of the subsidy is substantial, public institutions may have distinctive financial advantage over private institutions, particularly compared to private institutions with weak endowments. Second, in many countries where the history of high education is relatively short, public institutions may have longer history than private institutions. In fact, to a large degree, Korea followed Japanese model of higher education in which the government recruits and educates highest quality students so that they can be the ruling elite of the later generation. In order to accomplish this objective, the government maintained low tuitions along with competitive entrance examinations. The long history and extensive network of successful graduates in addition to lower tuition contributed higher standing of public institutions.

　　　As public institutions rely substantial portion of their revenue on government, they would be more sensitive to the political as well as educational needs, which include accessibility, community service, and/or research activities. Although the degree in

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[7] However, the size of endowments in Korean private higher education institutions is relatively small compared to, say, the U.S. There are several reasons for it. First, the history of higher education institutions is relatively short. Second, the country's average income has been quite low until recently. Third, the government has been actively controlling the tuition level in order to make high education more accessible.

which these different objectives imposed on each institution may vary according to the individual charter, the diversity among public institutions would be smaller than that within private institutions. Also, the bureaucratic rent-seeking among public institutions, and the political nature of the decision making process within and between public institutions would restrict their autonomy. However we would expect that the bureaucratic rent-seeking would tend to create an incentive for control and size over to satisfying market demand. Therefore, while public institutions may be the slowest in adjusting the changing market environment, they tend to exploit the change in promoting the institutions position for more control and bigger size.

For some high rank public institutions, the extensive network of graduates and high quality faculty may generate substantial donations and extramural research fund as well. However, since these institutions are fundamentally public, the control of the extra revenue would be restricted. Therefore, it would be difficult to imagine they can develop endowments as large as high quality private institutions. Table 1 lists other aspects of institutional objectives and behavior in addition to the ones discussed above.

Table 1 about here.

Our modifications will not change the conclusion of the ER model that the hierarchy of schools will emerge in equilibrium. However, the characteristic of the hierarchy would be different. First, public institutions would not be at the bottom of the quality spectrum, but will at the top. Also, non-profit private institutions will be in the higher hierarchy than for-profit institutions. The competition between the public and non-profit private institutions would depend on the size of public subsidy, and the operational autonomy of public institutions. Second, the stratification by income in the modified model is expected to be more extreme compared to the original ER model. The average income for high quality institutions would be higher in our model compared to the ER model, as high-income-low-ability (low-income-high-ability) students are now faced with lower (higher) tuitions from high quality institutions, as they are not allowed to price discriminate. Similarly, stratification by ability would be less extreme, as high-ability-lower-income students would settle for lower quality schools in the absence of reduced tuition from the high quality institutions. However, the higher quality schools would still charge higher tuitions than lower quality schools, not only because high income students have higher marginal rate of substitution of education but also because it is more costly to provide high quality education.

4. Resources and Strategies for Competition in Hierarchical Market
How higher education institutions of different types would compete in the hierarchical market structure? If the number of potential students increases like in Korea, what do existing institutions will behave in order to take advantage of the growing market? How would changing market situation affect entry of new institutions and exit of existing institutions? In this section, we shall discuss the ramification of our model in the context of Korea in order to answer the questions raised above.

The expansion of higher education demand creates opportunities for all existing institutions, but the incentive would vary among different types of institutions. As previously discussed, higher learning institutions have multiple objectives, and those

objectives are sometimes conflicting to one another. In order to simplify the analysis, we focus on key objectives of each institutional type, that is to say, we assume that for-profit private institutions seek higher profit, non-profit private institutions seek higher quality, and public institutions seek more expenditure. Regardless of the institutional types, as the prestige and reputation of an institution can only be built through a substantial time period, the institution that has been around longer would have natural advantage in higher quality spectrum. Students would recognize the name of the institution with longer history better than a start-up. Also, older institutions have produced more graduates, and these graduates would provide some support for the school individually or collectively. In particular, the more influential figures in the society the institution produces, the higher the reputation will be.

   Existing for-profit universities would increase enrollment in order to increase tuition revenue and profit. Since the marginal cost per student is relatively small, existing low-ranking for-profit institutions would have particularly strong incentive to increase enrollment. The high-ranking non-profit universities would also like to increase enrollment, but their incentives for increased enrollment would be smaller. First, profit and earning is less important for them. Second, they rely less on tuition revenue. Third, they may want to increase its prestige by being more selective in admission process rather than to increase the enrollment. The public institution would also like to increase enrollment, but its incentive would be smaller than private universities. Although higher enrollment may generate more tuition revenue, government subsidy may not increase as much the increase of enrollment. Consequently, the workload for faculty and administration may worsen by admitting more students. Instead, they may try to use the opportunity to improve their administrative standing in the bureaucracy, such as the conversion from 2-year to 4-year institution.

   As the capacity constraints of the existing institutions become more binding, one would expect entry into higher education sector. For-profit institutions would be most responsive in meeting the increased demand, and public institutions would be the least responsive. Also, the entry would be heavily focused on the lowest quality spectrum, not only because providing lower quality education is cheaper but because the new startups would not have a good reputation to attract high quality students.

   Improving the ranking in the hierarchy would require substantial efforts and resources. In order to increase the institutional prestige or reputation, it needs to do the following: 1) to increase the quality of students; 2) to increase the quality of teaching and research staff; 3) to improve the facility; 4) to increase the visibility of the institution by investing in more sports, arts or entertainment; and 5) to increase the quality of student service including the quality of teaching and better job placement. The first three strategies would increase prestige, while the last two would increase reputation.

   Attracting high quality students into a low quality institution would not be an easy task. Merit scholarship would be the most relevant tool, and even with the merit scholarship it would be more and more difficult to dip into the higher quality student, particularly if the tuition for high ranked public institutions are already low. It will be difficult as well as expensive to recruit high quality faculty. High quality professors may not be willing to come to low ranked institutions because of the fear that they may not get professionally productive interactions with the existing faculty and students. Also, salary for higher quality faculty is likely to be higher. Improving the physical facility may be

the most straightforward, and can be done in a reasonably short time period.

All these strategies to improve prestige are risky as well as expensive. Furthermore, they may not yield a tangible effect unless the amount of financial resource committed is quite large. Such large commitments will be unlikely to come from yearly operating budgets. Therefore, if the institution relies heavily on tuition for its revenue, any significant improvement in ranking in the upper spectrum is unlikely. Large influx of financial resources to non-profit private and public institutions may be a great asset for an attempt to increase prestige.[8]

The institution may want to focus on the strategy to increase its reputation by satisfying the education demand of the students more effectively. This strategy involves more flexibility regarding the declaration of the major, international exposure such as study abroad program, better teaching and student services, better job placement assistance, and so on. Increasing the institution's visibility through more active marketing and sponsorship for arts, sports, and entertainment activities may also be useful. These strategies would be cheaper and less risky to implement than the strategies seeking higher prestige. Therefore, they would be more popular to the institutions ranked lower in the hierarchy. Effective administration and internal governance structure would be an asset in pursuing such objectives.

Although public institutions have substantial advantage regarding the cost of tuition, their autonomy for competition is quite restricted. As was mentioned above, most public higher education institutions are national universities that are governed directly by the MOEHRD, and much of their operations are to a large extent regulated. Although the key administrative posts (presidents, deans, and so on) are occupied by faculty, most of the staffs in national universities are civil servants so that the president of the university cannot hire or fire his subordinates not to mention deciding their salaries. Due to historical reasons, national universities are distributed throughout the nation in provincial capitals. Often they are the oldest and the most prestigious institution in the province. Since most of the nationally ranked private universities are located in Seoul metropolitan area, most public universities have strong monopoly of good students. The local monopoly is accentuated by the fact that the public universities have substantially lower tuition than private universities.

Since the deregulation, the government rely more on selective support based on evaluation outcome. Though the nominal amount of the support may be relatively small compared to the total budgets of the institutions, institutions would be quite keen to the evaluation outcomes because there are substantial promotional effects of these evaluations.   Recently, there are also private evaluations on departments, schools, and institutions. Most notably, Joong-Ang Daily Newspaper provides annual ranking for major disciplines among universities, similar to the US News and World Report's ranking on US universities. (More on recent competition and BK21 possibly?)

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[8] The large endowment to Pohang Institute of Technology (PIT) by Pohang Steel Corporation (POSCO) made PIT a top ranking research school in science and technology. The KAIST, established by the Ministry of Science and Technology also made into top rank school quickly. Both schools are relatively small, and have virtually no tuition. An improvement in ranking among large comprehensive universities would be more difficult, and it is unlikely that many institutions would try unless there is a substantial influx of resources such as the recent acquisition of Sungkyunkwan University by Samsung Foundation. Also, when Daewoo Foundation took control of Ajou University, it tried successfully improve its ranking by hiring high quality faculty and providing full merit-based scholarships for a quarter of incoming students.

5. Empirical Analyses on Hierarchy in Korean Higher Education Sector

Data

We set out to collect a variety of institutional characteristics for all colleges and universities in Korea for the academic year of 1999-2000. There were 158 colleges and 161 universities at that time. Out of this universe, we managed to collect information on 132 colleges and 124 universities. Unfortunately, some key variables on financial information and/or school quality were not available for some institutions.[9]

Korean government has conducted annual mandatory joint entrance examinations for all applicants for colleges and universities for more than a decade. Each institutions are required to use the test score along with other information about the student, such as high school transcripts, recommendations, personal interviews, and so on. However, traditionally the test score has been regarded the most important determinant of the admission decision for most institutions. The information regarding minimum acceptable test scores and average scores for admitted students for each institution are well publicized, and students use them quite extensively in their application decision making process. In some cases, departments (or schools) within an institution are allowed to have different minimum scores depending on their popularity. For this study, we obtained the average scores for successful admissions from Jinhaksa, a private information service company specializing in entrance examinations for higher education institutions. The scores were then standardized from 0 to 100, 100 being the highest.

Information regarding the finance and facilities is obtained from Sul (1999, 2000, 2001). Financial information includes total operating cost, tuition revenue, government subsidy, private donation, and net transfer from/to the mother institutions (when applicable) for the fiscal year of 1999. These figures are standardized per student. Unfortunately, we were not able to obtain important financial stock information, such as net wealth or endowments. School facility information is based on the MOEHRD's guidelines for required number of teaching staff, floor space of building, and land area per student.[10] The facility information also includes the number of books in the library and value of laboratory facilities per student.

One of the issues in collecting the information is how to treat the branch campuses. Since MOEHRD has not permitted the expansion of private universities in Seoul metropolitan area, many large private universities in Seoul set out branch campuses outside of the area. Since these branch campuses have separate faculty and admission criteria as well as different physical facility, it seems natural to treat them separate institutions. Unfortunately, these campuses do not have separate financial statements, even though there are substantial quality differences between the main campuses and branch campuses. Therefore, we drop the branch campuses in the regression analyses later. 13 of these branch campuses are included in the university sample.

The location and the year of establishment of institutions, and whether it is

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[9] All 11 teachers' universities and 18 open universities (8 national and 10 private) are excluded. Other special purpose institutions such as The Korea Advanced Institute of Science and Technology (KAIST), The Korea National University of Arts (KNUA), police and military academies are excluded in the sample.
[10] The guidelines stipulate higher requirements for medical and engineering students than humanities or social sciences. We calculated the facility information by taking the weighted average over different majors.

private are obtained by visiting each institution's home pages. For universities that have converted into 4-year institutions from 2-year, the year of establishment is when the institutions made the formal transition. The number of graduates listed in the Who's Who databases for four major daily newspapers (Chosun, Joong-Ang, Donga, and Moonwha) are enumerated. The following is the abbreviations of the variables and their exact definitions.

SCORE: The average standardized test score (0 to 100) of the admitted students in the government administered college entrance examination for the entering class of 2000.

EXP: Annual operating expenditure per student that includes costs for personnel, administration, laboratory, research, student service, acquisition of books and laboratory instruments.

COST: Net tuition per student, i.e., tuition – scholarship.

SUBSIDY: Education subsidy per student, calculated as EXP – COST.

STUDENT: Total umber of students in the institution (including graduate students).

HIST: The age of the institution, calculated by1999 – the year of establishment. When the institution was converted from a 2-year to a 4-year, the year of the change was used for the year of establishment.

SSI: The number of journal articles listed in Social Science Index per full time faculty.

R_BLDG: Ratio of the floor area of all school buildings to the MOEHRD guidelines.

R_TEACH: Ratio of the number of full time faculty to the MOEHRD guidelines.

WHOS: logarithm of the number of people listed in the Who's Who databases in 4 major daily newspapers.

TWO_YEAR: 1 if the institution is a two-year college, 0 otherwise.

SEOUL: 1 if it is located in the City of Seoul, 0 otherwise.

METRO: 1 if it is located in the Seoul metropolitan area, which includes the City of Seoul and the surrounding Kyunggi Province, 0 otherwise.

The Table 2 describes some descriptive statistics of the variables listed above. Two outliers in the sample, Pohang Institute of Technology (PIT) and Agricultural Cooperative College spent exceptional amount of money per student, because these two institutions are unusually well endowed whereas the number of students are extremely small. Therefore, in the Table, we provide some statistics excluding these two institutions in the parentheses. Notice the maximum values in EXP and SUBSDY drastically lowers when the two institutions are dropped. The regression analyses in the next sub-section are conducted without these two outliers.

Table 2 about here.

In order to show the hierarchical nature of the higher education market, we arrange the data in 10 categories of deciles in SCORE, the single most important indicator for the hierarchy. Overall, public universities specialize in higher quality spectrum, and private colleges specialize in lower quality spectrum. Private universities distributed from the 1st decile to the 10th decile, though they are more in the upper quality level. Therefore, it seems that public institutions and private universities compete in the

higher rank spectrum, all three types of institutions compete in the middle rank, and the private universities and private colleges compete in the lower rank.

Table 3 about here.

In general, public institutions, particularly the ones in higher ranks, are larger than private institutions. Also, higher ranked institutions are generally larger than the lower ranked institutions except for private colleges, which size and rank seems independent to each other. It seems quite clear that per student operating expenditure is higher as the rank is higher in private universities. The difference in operating expenditure across ranks is relatively small for public universities and private colleges. Based on the theoretical consideration, we suspect the lack of difference is mainly due to the rent seeking activities among public institutions, and profit motivations among private colleges. Students in public institutions enjoy substantial amount of subsidy (in the form of lower tuition), but top ranked private universities also have substantial amount of subsidy (financed by donation and endowment revenue). However, the level of subsidy in private institutions is relatively smaller than those to public universities suggesting that public universities still have substantial advantage in term of finance.

The subsidies become negative for private institutions below the 4th decile. This contrasts sharply to the similar table in Winston (1999), which shows that subsidy for all levels of hierarchy in higher education institution in the U.S. is positive and quite substantial. The fact that most private institutions spend less to students than their tuition revenue clearly suggests that financial situation for most private institutions are much worse than public institutions. As our operating expenditure does not include capital cost, the negative subsidy does not necessarily mean that the institutions make money. However, it suggests that many of such institutions are de facto for-profit institutions.

Figure 1 shows the relationship between the annual operating expenditure per student for three different types of institutions: public university, private university and private college. As expected, the scatter diagram shows a quite strong positive relationship between the academic strength of entering class and the teaching expenditure per student among institutions. Overall, it seems that the three types of institutions compete one another in the homogenous environment. Although private colleges are more heavily concentrated in the region with low student expenditure and low student quality, there are substantial overlap between low-end private universities and high-end private universities. It is observed that public universities do not serve lower half of student quality. This phenomenon seems to be mainly due to the fact that public universities offer lower tuition because of the government subsidy so that they are able to attract high quality students.

Figure 1 about here.

Figure 2 depicts the relationship between the student admission score and net tuition per student, which is the average of tuition revenue minus scholarship distributed to students. Notice that there is a clear distinction between the public institutions and private institutions, whereas the universities and colleges seem to be in one group.

Figure 2 about here.

Regression analyses

        In this subsection, we report the results of the regression analysis using the data described previously. There are two main concerns regarding the specification of the regression model. First, although we suspect that many private institutions, particularly in the lower rank in the hierarchy, are for-profit institutions, we cannot distinguish them from non-profit institutions. Therefore, we did not to distinguish for-profit and non-profit a priori. Rather, we include SUBSIDY variable so that it reflects the amount of educational subsidy provided by the institution. The second problem is that the student's admission score, education expenditure of the institution, and the subsidy to the student may be endogenous so that single equation regression may create a simultaneity bias. Therefore, we specified a system of three simultaneous equations, and estimate the system with three stage least square (3SLS) estimation.

        Based on the theoretical discussion and the incentives and behavior of the three types of higher education institutions, we specify the following system.

    (1) EXP = f (SCORE, PUBLIC, SCI, TWO_YEAR, R_TEACH, R_BLDG, LAB, LIB)
    (2) COST = f (SCORE, SUBSIDY, TWO_YEAR, WHOS, HIST, SEOUL, METRO)
    (3) SUBSIDY = f (SCORE, PUBLIC, TWO_YEAR)
    (4) EXP = COST + SUBSIDY

        The first equation reflects the supply of the hierarchy of education services. More specifically, we envision that per student expenditure of an institution is a function of quantity and quality of inputs for education services. The quality of education service here is measured by the average test score of the incoming students reflecting peer-group effect and research productivity of the faculty measured by the per faculty number of articles per year listed in Science Citation Index. Also, quantity and quality of teaching is measured in the number of teachers, the size of floor space, the amount of laboratory equipments and the number of library books. We also include dummy variables for public university and private college in order to control for any technological differences between the types of institutions.

        The second equation reflects the students' demand for the hierarchy of higher education service. Here we assume that the net tuition (tuition minus scholarship) is a function of average test score, the amount of institutional subsidy per student, log of number of graduates listed in Who's Who in Korea, dummy variables for whether the institution is a public or private college, whether it is located in Seoul or in the Seoul metropolitan area. Since there has been a restriction on the number of students in for the institutions in Seoul metropolitan area even since the deregulation started, we expect the excess demand in the area would drive up the admission scores for the institutions located there.

        The third equation is a representation of how institutions obtain non-tuition revenue. The public institutions receive the large subsidy from the government.

Although private institutions receive some direct subsidy from the government through various government initiatives, they are relatively small portion of the budget. For non-profit institution received revenue from donation by the alums and general public. In order to simplify the estimation, we aggregate all types of non-tuition revenue into a single category of subsidy. The fourth equation is just the identify stating that the total expenditure must sum to the tuition revenue and non-tuition revenue.

We estimated the system of three equations by using three different estimation techniques for comparison. First, we used 3SLS estimation. Here, we estimate the whole system simultaneously by using full information estimation method. We take EXP, SCORE, and SUBSIDY endogenous, and all other variables exogenous. Also, we take into the cross equation identity constraint between EXP, COST, and SUBSIDY. Second, we provide estimates by ordinary least square (OLS). OLS estimates each equation separately without considering the simultaneity bias and the cross equation restriction. Third, we estimate the three equation system with seemingly unrelated regression estimation (SURE) in order to take advantage of potential correlation among the error terms. But, SURE does not take into account the cross equation restriction.

We ran the three estimations on two separate samples. The first sample contains the whole sample, and the second sample contains only the 4-year universities. The reason for the two sets of estimations is two-fold. First, we have some additional information for universities regarding the research performance of faculty and (SCI) and the quality and extent of the graduates (WHOS), which are not available for colleges. Second, we would like to examine whether there are substantial differences in the 4-year sub-market and the whole higher education market. Tables 4 shows the results of the estimation with the whole sample, and Table 5 shows the results with the university sample only. Because of the lack of separate financial information, branch campuses are excluded. Also, two institutions, PIT and ACC, are excluded, because these two institutions have much higher expenditure per student than the rest. The usable number of observations is 190 for the first sample, and 100 for the second sample.

Tables 4 and 5 about here.

Overall, the models fit data very well. Most of the variables identified in the theoretical discussion turned out to be statistically significant at 1% level or 5% level. In all three estimations for the two samples, the goodness-for-fit measures, r-squared, are generally quite high. The sizes of the estimates differ substantially among the three estimations indicating that the simultaneity bias may be significant. For example, in Table 4, the estimate for SCORE in the net tuition equation is 20.43 in 3SLS, but only 10.17 in OLS. However, it seems that there is no clear directions of the bias. In the following, we shall examine the results of the 3SLS in more detail.

For the whole sample, the estimated results of the expenditure function clearly shows that providing quality education is costly. Attracting more able students, providing more professors, producing more research activities, providing more laboratory facilities and library books are expensive. However, per student floor space turns out to be not significant. Controlling for other variables, public universities seem to spend more than private universities. The difference is 480,000 won, and it is a substantial amount compared to the sample mean of 3,010,000 won. This may be due to the lax financial

control in public universities. Two-year private colleges also have substantial additional expenditure than four-year private universities.

At the same time students are willing to pay higher net tuitions for higher rank institutions. Holding other things constant, one percentage point increase in test score is associated with additional net tuition of 24,300. On the other hand, one-dollar increase in student subsidy is associated with 56 cents decrease in net tuition. This suggests that students are sensitive to the subsidy given by the institution, but not to the fullest amount. There is a significant location premium. Students are willing to pay 192,000 more for a comparable institution located in Seoul metropolitan area. The additional premium for the City of Seoul is only 15,000, and it is not statistically significant. The location premium would reflect the desirability of Seoul as the place for the student's higher education as well as the government's enrollment restriction for the institutions in the region. There is no significant premium for four-year university over two-year college holding other things constant.

The result of the subsidy equation estimation shows that non-tuition revenue of public institutions is substantial. Also, it shows higher quality of students is an import determinant for non-tuition revenue. However, there is no premium or penalty for two-year institution in raising the non-tuition revenue. Another interesting finding is that the quality premium for non-tuition revenue does not depend on whether the institution is public or private.

6. Conclusions and Policy Implications.

The supply of higher education in Korea is predominantly provided by private sector. However, because of the public subsidy and the tradition of government financed elite higher education with competitive entrance examinations, public universities have advantages of attracting high ability students. Since the public institutions would not have any organization incentives to cater for low-ability students, they specialize in higher quality spectrum. Although no for-profit institutions are legally allowed, many private institutions in higher education in Korea are de facto for-profit. Our theoretical consideration suggests that the newer private institutions created to meet the expanding demand for higher education tend to be for-profit, and these institutions are likely to specialize in low quality spectrum, whereas older, more established, non-profit institutions specialize in high quality spectrum.

The empirical analysis reported in this paper confirms that Korean higher education sector is highly hierarchical in which public and private institutions compete. In general, 4-year institutions (universities) specialize in higher quality spectrum, whereas 2-year institutions (colleges) specialize in lower quality spectrum. However, there is a substantial overlap of the two types institutions in the middle spectrum achievement. This indicates that these students can be attracted to either universities geared to general education or colleges specializing in professional training.

The institutions located in Seoul or surrounding Kyunggi Province are able to attract better students. This is in part due to the government's regulation that restricts the increase of enrollment in the institutions located near Seoul as an attempt to decentralize population. There is a substantial premium for public universities even after controlling for net tuition and non-tuition subsidy. This may be due to the fact that most of the high ranked private institutions are located in Seoul, and the public institutions located outside

of Kyunggi Province do not have any effective competitors.

Since 1995 education reform, a great deal of regulations on the establishment and operation on higher education institutions has been relaxed. However, under the current situation, the room for competition both by public and private institutions is still quite restricted. For public institutions, the central control by the MOEHRD is the most limiting restrictions. For private institutions, lack of financial resources is the key restriction, as most of them rely heavily on tuition revenue.

With the proliferation of higher education and the rising education costs, the Korean government is likely to be faced with a large political pressure to increase the government funding to higher education sector. This political pressure will be both a challenge and an opportunity. The increase in public support would inevitably create competitive rent seeking activities among higher education institutions. Public institutions would ask for larger supports in order to serve more students. Private institutions would like to institute direct support mechanism similar to the Japanese model established in the seventies and eighties.

At this point, the government's role in higher education should be redefined and clarified. In the current situation, there is no longer a compelling reason for supporting elite public universities. Private institutions can provide quality education as competitive as public institutions. The ability to draw quality students by public universities is largely due to their cheaper tuitions. The price subsidy via lower tuition in public universities is likely to be in inequitable, as they tend to be attended by higher income students. In the current situation in which the large private tutoring expenses are required in order to gain an admission to a high rank university, high incomes students are more likely to succeed in the admission game.

Research and graduate education has not been the major responsibility for the majority of professors in Korea. Throughout the period of rapid economic development, Korea relied her graduate educations on foreign research universities, particularly in the U.S. It may have been an optimal policy given the fact that graduate education is expensive and the social return to graduate education in Korea was low. However, as the Korean economy transforms more to a knowledge based economy, and the domestic production of research and development output increases, the demand for research and graduate education will increase.   Therefore, funding mechanism for top ranked universities that specialize in those activities has to be considered. Donation for admission, which has been quite controversial, needs to be examined more carefully. Efficient allocation mechanisms for research funds, government or private, need to be examined as well.

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Table 1

Objectives and Behavior by Types of Higher Education Institutions

	For-Profit Private	Non-Profit Private	Public
Objectives			
Financial security	Very important	Very important	Not important
To provide quality education	Important	Very Important	Important
To meet student demand	Very important	Important	Not important
To provide research product	Not important	Important	Important
To seek prestige	Not important	Very important	Important
To provide community service	Not important	Important	Not Important
To increase the institutional size	Not important	Not important	Very important
Behavior			
Response to change	Very important	Important	Not important
Non-educational income generation	Very important	Very important	Not important
Response to student teaching	Very important	Important	Not important
Rent seeking through government	Not important	Important	Very important
Recruit top quality professors	Not important	Very Important	Important
Facility management	Not important	Very important	Important
Alum maintenance	Important	Very important	Not important
Seeking publicity	Very important	Very important	Not important
Operational transparency	Very important	Important	Important
Accountability	Very important	Important	Not important
Internal governance	Owner controlled	Board controlled	Public agency

Table 2

Major Descriptive Statistics of the Data

	Number of observation	Mean	Standard Deviation	Minimum	Maximum
SCORE	256(254)	54.71(54.40)	22.68(22.50)	6.55(6.55)	99.57(99.57)
EXP	253(251)	3152(2969)	2359(1215)	820(820)	25893(8577)
SUBSIDY	253(251)	138(-52)	2454(1229)	-2046(-2046)	23926(5575)
COST	253(251)	3013(3020)	673(673)	940(940)	4446(4446)
WHOS	111(110)	5.50(5.51)	2.83(2.84)	0(0)	11.54(11.54)
STUDENT	256(254)	6870(6912)	5222(5220)	200(360)	29341(29341)
HIST	256(254)	25.0(25.0)	15.5(155.5)	0(0)	60(60)
SCI	111(110)	.128(.111)	.220(.133)	0(0)	1.972(.917)
R_BLDG	256(254)	70.32(68.49)	30.42(18.52)	29.23(29.23)	444.6(132.83)
R_TEACH	256(254)	48.28(47.87)	17.53(16.95)	20.83(20.83)	189.5(189.5)
TWO_YEAR	256(254)	.516(.516)			
BRANCH	256(254)	.058(.051)			
SEOUL	256(254)	.172(.173)			
METRO	256(254)	.375(.374)			

Numbers in the parentheses are for the sub-sample excluding two outliers:
  Pohang Institute of Technology and Agricultural Cooperative College.

Table 3

Hierarchical Nature of Korean Higher Education Market

	Score	Number of Schools			Average Number of Students			Per Student Operating Expenditure			Per Student Subsidy		
		Pub. U	Pri. U	Pri. C	Pub. U	Pri. U	Pri. C	Pub. U	Pri. U	Pri. C	Pub. U	Pri. U	Pri. C
1st Decile	94.3	3	17	0	25,187	12,977	-	4,719	5,414	-	2,734	1,641	-
2nd Decile	83.5	7	17	1	14,470	8,582	200	3,779	4,219	25,893	2,618	550	23,909
3rd Decile	75.9	5	18	3	11,970	9,773	1,107	3,543	3,883	3,830	1,948	320	734
4th Decile	65.7	2	16	10	7,613	8,852	2,876	3,161	3,026	3,048	1,856	-370	-224
5th Decile	59.3	2	11	9	7,512	10,877	4,819	3,413	2,978	2,657	1,826	-322	-675
6th Decile	52.9	1	11	14	4,022	5,810	4,993	4,224	2,701	2,698	2,740	-439	-848
7th Decile	44.3	0	7	20	-	6,717	4,094	-	2,549	2,295	-	-456	-767
8th Decile	37.6	0	4	21	-	8,580	4,035	-	2,089	2,339	-	-749	-655
9th Decile	29.8	0	2	26	-	3,520	3,982	-	1,468	2,185	-	-694	-632
10th Decile	20.1	0	1	28	-	3,130	4,409	-	1,545	2,089	-	-269	-509
Seoul Metro	70.9	1	51	44	29,341	9,071	4,029	6,105	4,299	2,593	3,843	596	-696
Other Regions	46.7	19	53	88	12,681	9,368	3,998	3,678	3,400	2,271	2,056	124	-585
Whole Nation	54.5	20	104	132	12,514	9,222	4,008	3,942	3,834	2,379	2,250	352	-622

Pub. U: 4-year public university
Pri. U: 4-year private university
Pri. C: 2-year private technical college
Seoul Metro: City of Seoul and the surrounding Kyunggi Province

Figure 1

**Student Admission Score and Per Student Expenditure
in Korean Higher Education Institutions**

Figure 2

**Student Admission Score and Cost to a Student
in Korean Higher Education Institutions**

Legend: ● Public University □ Private University + Private College

X-axis: **Tuition minus Scholarship (in 1000 Korean Won)**
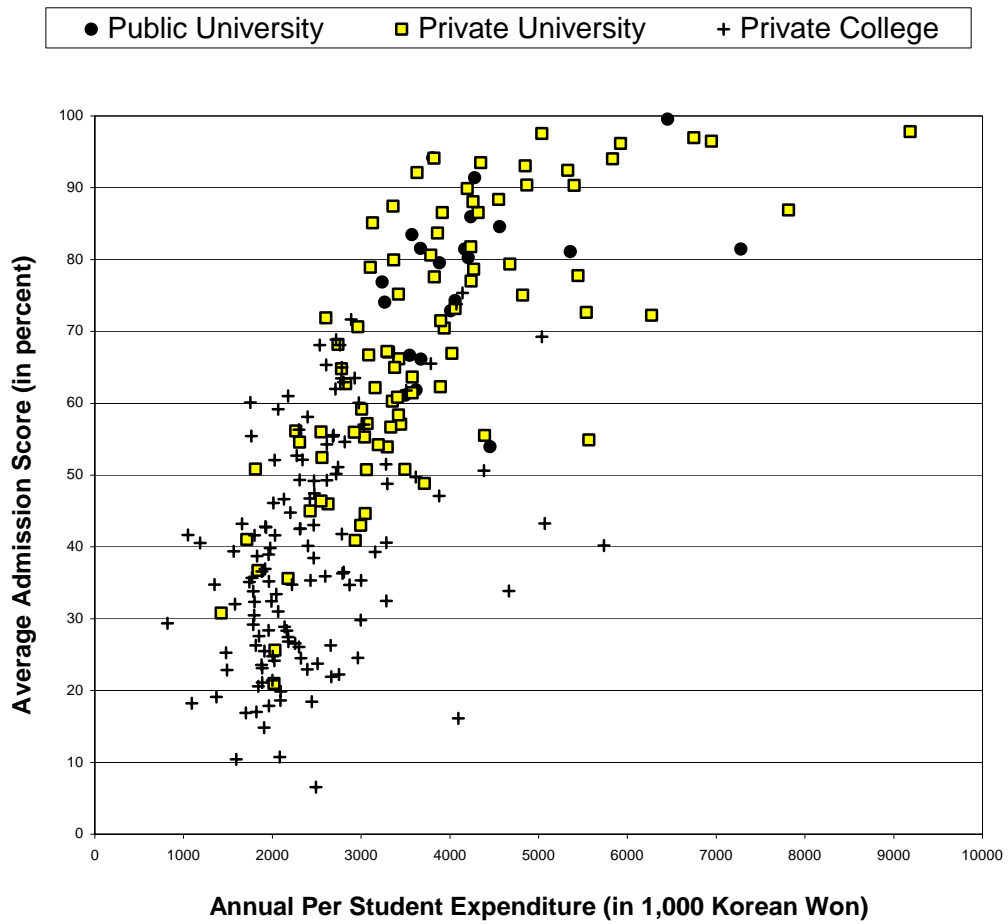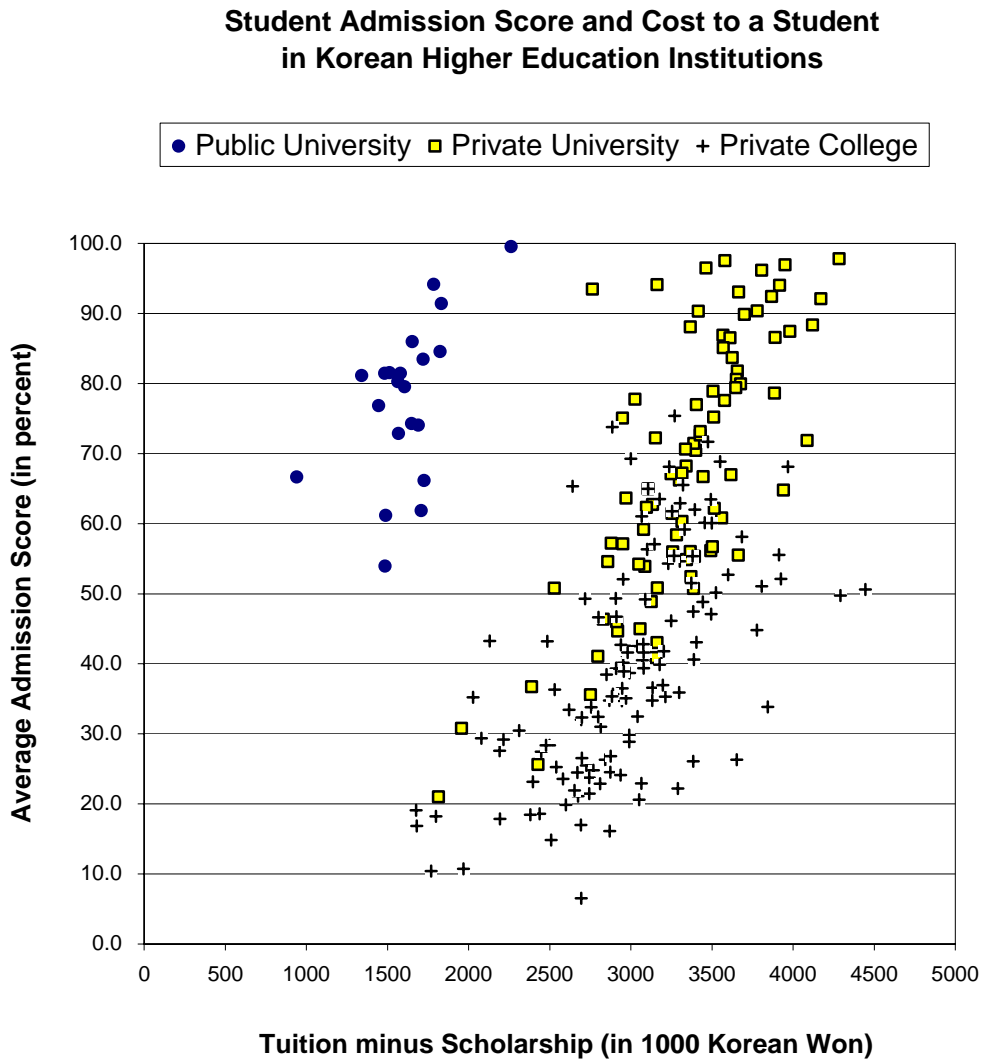
Y-axis: **Average Admission Score (in percent)**

Table 4

Estimation Results with University and College Sample

	3 stage least square		Ordinary least square		Seemingly unrelated	
Operating Expenditure equation						
Constant	245.6	223.1	-478.29*	259.5	248.64	223.3
SCORE	29.98***	2.72	25.46***	2.87	30.15***	2.72
PUBLIC	480.37***	138.78	-163.67*	159.4	426.08***	142.1
TWO_YEAR	316.57**	141.57	460.18***	165.4	310.97**	141.5
R_TEACH	11.13***	2.19	28.14***	3.22	10.77***	2.19
R_BLDG	.604	1.78	-.336	2.65	.665	1.80
LAB	.072***	.020	.137***	.029	.075***	.020
LIB	6.11**	2.64	10.48***	3.94	6.30**	2.67
	N = 190, R^2 = .655		N = 190, R^2 = .729		N = 190, R^2 = .657	
Net Tuition equation						
Constant	1596**	193	2084***	196.3	1665***	184.5
SCORE	20.43***	.045	10.17**	3.67	19.14***	3.32
SUBSIDY	-.562***	.045	-.344***	.038	-.535***	.033
TWO_YEAR	73.37	106	29.55	109	68.22***	105.5
HIST	4.83**	2.33	5.56*	2.30	4.62**	2.58
SEOUL	15.99	107.7	218.8	137.9	74.62	119
METRO	192.06***	100.2	312.2***	123.4	193.7***	106.5
	N = 190, R^2 = .407		N = 190, R^2 = .504		N = 190, R^2 = .431	
Subsidy equation						
Constant	-1117***	302.4	-1222***	259.7	-1217***	257.0
SCORE	16.43***	4.26	17.97***	3.59	16.65***	3.54
PUBLIC	2212***	202.84	2197***	203.7	2618***	190.4
TWO_YEAR	-58.33	176.01	-11.64	163.81	35.44	161.9
	N = 190, R^2 = .549		N = 190, R^2 = .567		N = 190, R^2 = .555	

Note: Endogenous variables in 3SLS estimation are EXP, SCORE, and SUBSIDY.
 *, **, and *** represent p-values of less than.10, .05, and .01 respectively.

Table 5

Estimation Results with University Sample Only

	3 stage least square		Ordinary least square		Seemingly unrelated	
	Operating Expenditure equation					
Constant	-209.20	299.23	-531.48	350.0	-219.00	299.55
SCORE	31.54***	3.87	24.23***	5.54	31.70***	3.87
PUBLIC	186.22	145.95	-282.43*	166.47	150.75	148.68
SCI	1260***	437.1	1928***	588.3	1252***	437.8
R_TEACH	16.19***	2.72	29.46***	3.67	16.23***	2.73
R_BLDG	1.031	3.38	.584	4.56	1.008	3.39
LAB	.0803***	.035	.1314***	.0467	.0814**	.0347
LIB	4.560	3.18	5.894	4.29	4.678	3.19
	N = 100, R^2 = .720		N = 100, R^2 = .778		N = 100, R^2 = .722	
	Net tuition equation					
Constant	1651***	266.4	2412***	286.48	1780***	257.8
SCORE	14.12***	5.07	-1.64	5.84	11.41**	5.02
SUBSIDY	-.529***	.047	-.317***	.047	-.496***	.040
WHOS	110.8***	32.2	154.1***	42.9	119.1***	35.39
HIST	-6.26	4.90	-10.76	6.58	-7.185	5.42
SEOUL	86.48	146.7	230.4	197.0	116.27	162.23
METRO	348.2***	135.7	579.3***	178.6	393.6***	147.6
	N = 100, R^2 = .553		N = 100, R^2 = .633		N = 100, R^2 = .576	
	Subsidy equation					
Constant	-1907***	368.4	-1994***	376.3	-1920***	368.5
SCORE	26.42***	5.21	29.39***	5.34	26.86***	5.21
PUBLIC	2657***	206.6	2082***	236.2	2573***	214.6
	N = 100, R^2 = .563		N = 100, R^2 = .588		N = 100, R^2 = .570	

Note: Endogenous variables in 3SLS estimation are EXP, SCORE, and SUBSIDY.
  *, **, and *** represent p-values of less than .10, .05, and .01 respectively.