Effects of Public and Private Schools on Academic Achievement

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The Korean high school system is regulated and monitored by the government to ensure that (i) middle school graduates are randomly assigned to private and public high schools and (ii) the tuitions are the same for both institutions. Hence, any difference between the academic performances of the graduates from private and public high schools is a result from the difference in the schools' efforts towards the students' academic achievement. Results show that the students in private schools have better academic performance than those in public schools. Moreover, significant difference exists among boys-only, coed, and girls-only schools. The students' income level influences their academic performance.

Keywords: Coeducational schools, Private schools, Public schools, Single-sex schools

JEL Classification: H4, I0, I2

I. Introduction

This study investigated the effects of (1) single-sex and coeducational schools, (2) public[1] and private schools, and (3) average per capita income of the students' households on the academic performance of high school students in Korea. In addition to the studies that have focused

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[1] Public schools are administrated either by local or national governments, whereas private schools are managed either by non-profit organizations or foundations. Thus, public schools can be considered as the same as the 'state schools' in the United Kingdom.

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on this topic, our research contributes to literature by using a unique dataset from the Korean high school system.

In most countries, students are allowed to choose which high school to apply for. Thus, in these societies, the academic ability and household income level of students in public schools are not necessarily the same as those in private schools. Likewise, the amount of tuition in private schools is usually higher than those in public schools. Therefore, the private school students' better academic performance compared with that of public school students cannot be considered as evidence in support of the hypothesis; that is, private schools provide better education to students than public school because the former usually attracts students that have better academic performance and higher household incomes. Thus, a selection bias exists.

The high school system in Korea, however, is different from that of other countries. In particular, middle school graduates in Korea are randomly assigned to any of the high school located near the residence of the student, regardless of the type of school—that is, whether the high school is public or private, or whether it is boys-only, girls-only, or coeducational. Furthermore, government regulation dictates that the levels of tuition be the same for all high schools in Korea, regardless whether it is private or public. Thus, private high schools in Korea neither have the advantages in terms of the academic abilities of new students nor in financial resources. Thus, the academic performance and profit levels are uniformly distributed among students of public/private schools and among students of single-sex/coeducational schools so long as they belong to the same school district. In a sense, the data from Korean high schools are very close to an experimentally controlled dataset. Therefore, any difference in the academic performance between the institutions at the time of graduation can indicate which type of school has contributed more to the academic achievement of its students.

Existing studies, including the works of Peterson *et al.* (2006), Chubb and Moe (1990), and Coleman *et al.* (1982), have agreed about the effects of public and private high schools to some extent; that is, private high schools tend to produce better performing students in terms of academics as compared with public schools. Using the unique Korean dataset, the present study has likewise found that the academic achievement of students in private schools is better than that in public. Owing to the unique characteristic of the dataset, the results of this study can strongly reinforce the conclusion made by previous studies.

Almost all high schools in Korea are equally divided among boys-only,

girls-only, or coeducational high schools. Given that we have abundant observations from the three types of high schools, we can draw a meaningful comparison. Moreover, that middle school graduates are randomly assigned to a single-sex or a coeducational high school helps evaluate the additional academic value introduced by these schools without any selection bias.

Previous findings are somewhat varied in that some studies have reported that enrolling in exclusive schools results in higher academic achievement for both boys and girls (Lee and Bryk 1986; Woodward *et al.* 1999). By contrast, other studies maintained that coeducational schools produce higher educational outcomes for both groups (Garcia 1998). Riordan (1994) proposed that single-sex schooling provides higher achievement for boys, and coeducational offers better outcome for girls. Conversely, Daly (1996) and Marsh (1989) concluded that no difference exists in the academic performance among students from different types of school. Based on the Korean dataset, the present study found that students from boys-only high schools perform better academically than those from girls-only high schools, but no significant difference was observed between students from single-sex and coeducational high schools. Finally, we found that the average income level of students is positively related to their academic achievement. This particular result is consistent with previous studies, including Shin (2005) and Thomas (2005).

II. Model of the Study and Data Description

To assess the difference in academic performance among the students of different types of high school, we employ a panel-model in which we regressed an index of academic performance on two key dummy variables and on family income:

$$y_{it} = \alpha_i + \beta_1 d_{1t} + \beta_2 d_{2t} + \beta_3 d_{3t} + \beta_4 x_{it} + \varepsilon_{it} \quad (1)$$

where y_{it} is an index of academic achievement and x_{it} is the family income. The other variables are as follows:

d_{1t}: Public school dummy
d_{2t}: Boys-only school dummy
d_{3t}: Girls-only school dummy

The private school is the baseline among private and public schools, while the coeducational school is the baseline among boys-only, girls-only, and coed institutions.

We collected annual data from all high schools in Seoul, the capital of Korea, from 1999 to 2009. The key features of the school include the following: (i) whether the school is boys-only, girls-only, or coeducational, (ii) whether the school is public or private, and (ii) the per capita income of the district in which the school is located.[2] The data are collected from the official annual report published by the Ministry of Education and the Seoul Metropolitan Office of Education.

The academic achievement of a particular high school was measured based on the number of its graduates that enter Seoul National University (SNU) every year. SNU is considered as the best university in Korea, and most high schools advertise their achievement by disclosing the number of their graduates that enter SNU each year. Considering that the numbers of SNU entrants are important public information, the Korean National Assembly requests such data from the Ministry of Education, which they make public every year. Thus, the number of successful entrants to SNU can be a good indicator of the academic performance of a school, as well as of the achievement of the top students of each high school. In this study, the dependent variable (y_{it}) refers to the number of SNU entrants per 1,000 graduates in each high school.

Observations from 202 high schools in Seoul, including virtually all high schools, are used in this study. Special purpose high schools, which include science and foreign language-oriented high schools, were excluded from the sample to avoid any potential bias. The total number of observation was 2,072.[3] Table 1 lists the distribution of schools based on different characteristics. Among the 202 high schools, 67 are boys-only, 61 are girls-only, and 74 are coeducational high schools. Table 1 also shows that 73 are public schools and 129 are private. Moreover, Seoul is divided into 11 school districts, with most districts having considerable proportions of boys-only, girls-only, and coeducational schools. Likewise,

[2] The city consists of 11 administrative districts. The per capita income in the district is used as a proxy for the income level for the school located in that district.

[3] The sample period began in 1999 when there were only 180 high schools. By the end of the sample period in 2009, the number of schools has steadily increased up to 202. Therefore, this study gathered a total of 2,072 observations —1,980 observations from the original 180 schools and 92 observations from the new schools.

TABLE 1
FEATURES OF 11 EDUCATIONAL DISTRICTS IN SEOUL

District ID	Boys-only (%)	Girls-only (%)	Coeducational (%)	Public (%)	Private (%)
1	38	31	31	38	62
2	47	35	18	6	94
3	17	22	61	72	28
4	25	25	50	42	58
5	52	43	5	19	81
6	25	30	45	40	60
7	36	28	36	24	76
8	35	31	35	38	62
9	31	25	44	44	56
10	10	30	60	50	50
11	42	33	25	33	67
Average	33	30	37	36	64

TABLE 2
PER CAPITA INCOME TAX IN EACH DISTRICT (MILLION WON)

Year	District 1	District 2, 3	District 4, 11	District 5	District 6	District 7	District 8	District 9	District 10
1999	0.078	0.079	0.090	0.249	0.156	0.106	0.629	0.099	0.123
2000	0.066	0.102	0.088	0.349	0.136	0.095	0.545	0.081	0.107
2001	0.066	0.127	0.100	0.550	0.166	0.118	0.717	0.100	0.126
2002	0.088	0.157	0.121	0.617	0.212	0.165	0.920	0.121	0.175
2003	0.089	0.157	0.121	0.631	0.215	0.164	0.930	0.121	0.176
2004	0.110	0.192	0.156	0.815	0.314	0.214	1.286	0.163	0.211
2005	0.121	0.208	0.164	0.897	0.359	0.252	1.469	0.198	0.250
2006	0.125	0.222	0.188	1.094	0.370	0.266	1.578	0.189	0.259
2007	0.169	0.315	0.216	1.385	0.553	0.348	2.247	0.257	0.340
2008	0.246	0.385	0.287	1.735	0.716	0.464	2.772	0.354	0.482
2009	0.157	0.300	0.242	2.032	0.516	0.367	2.537	0.221	0.349

most districts have similar portions of public and private schools.

Given that the data on the per capita income in each district are not available, we utilized the per capita income tax in each district as a proxy variable. Table 2 shows the per capita income tax in the 11 school districts. The data are collected from the National Tax Office.[4] When

[4] As shown in Table 2, districts 2 and 3 and districts 4 and 11 are grouped together because the tax districts did not coincide with the school districts 2 and 3 and 4 and 11. Instead, one tax district covered the school district 2 and 3 and another tax district covered 4 and 11 collectively.

TABLE 3
NATIONAL PER CAPITA INCOME (NOMINAL, MILLION WON)

Year	Per Capita GDP
2009	21.28
2008	20.16
2007	18.84
2006	17.96
2005	17.26
2004	16.04
2003	15.14
2002	13.72
2001	12.77
2000	11.63
1999	10.64

measuring the effect of income on education, using a relative income index may be more prudent than using an absolute income index; that is, whether the district is relatively rich or poor compared with the entire nation of Korea. Thus, the proxy for the per capita income is divided by the national per capita GDP. This relative per capita income index is employed as the family income proxy (x_{it}) in our empirical analysis. For reference, the national per capita GDP in Korea throughout the sample period is shown in Table 3.

III. Empirical Results

The empirical model in (1) was estimated to statistically determine whether the students' academic performance varies depending on their high school features. In the model, the first coefficient β_1 measures the contribution to academic achievement of students from public schools relative to those from private schools, and the second and third coefficients β_2, β_3 measure the contribution of boys-only and girls-only, respectively, relative to coeducational schools. The empirical results based on the model in (1) are shown in Table 4, where the first column lists the names of the explanatory variables, and the second column reports the corresponding coefficient estimates and their t-statistics.

For the relative family income index used as a control variable, the estimated coefficient is 1.35, which is highly significant. The positive sign of the coefficient is consistent with our expectation. Based on the estimated coefficients of the included dummy variables, two important

TABLE 4
ESTIMATED EFFECTS OF THE HIGH SCHOOL FEATURES ON STUDENTS' ACADEMIC ACHIEVEMENT

Variable	Coefficient	Coefficient with Year Dummies
Constant	6.566073*** (14.21529)	8.1*** (11.24)
Public School Dummy	-1.022701*** (-2.313329)	-1.005296** (-2.34)
Boys-only School Dummy	2.831137*** (5.708617)	2.441551*** (5.06)
Girls-only School Dummy	-2.586393*** (-5.166080)	-2.981332*** (-6.12)
Income	1.348198*** (22.05242)	1.527787*** (11.24)

Notes: 1) the numbers in the parentheses are t-statistics
2) the symbol *** indicates the statistical significance of the variable at 5%.

observations can be drawn.

First, the dummy variable of public high schools has a negative coefficient. This observation implies that public school graduates are less likely to attend SNU than the graduates of private schools. In our data, each high school is found to send an average of 14 students out of 1,000 graduates to SNU, whereas public high schools send an average of 1 less student. Thus, the SNU admittance ratio of private high school graduates is significantly higher by 7% compared with that of public high school graduates.

On average, private high schools in Korea admit students of the same academic level as public high schools, and the levels of tuition are the same for both institutions. However, Korean private schools are sending significantly more students to SNU than public.

This finding is somewhat surprising in Korean society given that most teachers prefer to work in public high schools rather than in private schools because of job security and stability. Hence, it is improbable that the teachers in Korean public schools are less qualified than the teachers in private schools. Nevertheless, the result shows that the private school system is better than the public one in terms of its capability to send students to SNU. However, this finding must be carefully interpreted. Nam and Sung (2009) claimed that the average test scores of

students are not significantly different between private and public schools in Korea. If we accept this conclusion, a possible interpretation of the result of the present study is that private schools care more about their top students compared with public schools.

Another possible interpretation of the above finding is that teachers from private schools are given better incentives to send more students to top universities, including SNU, than their counterparts in public schools. The majority of principals in private high school are appointed by owners or owner-controlled committees. The performance of such principals is often measured by the number of students who are admitted to elite universities such as SNU. Hence, these private school principals place more emphasis on their school's capability to send many students to elite universities by putting more pressure on teachers and students. This is in contrast with their public counterparts, who are appointed by the Education Bureau or the government, and are periodically transferred from one school to another. In this event, the teachers who can send more students to elite universities can be better rewarded in private schools than those in public schools. For example, Cho (2013) analyzed the performance of contractual teachers employed in Korean schools and their influence on the academic achievement of students. Contractual teachers are hired by the schools for a specific period without tenure. Cho (2013) concluded that contractual teachers in public high schools have a negative influence on the students' achievement, whereas those in private schools positively affect the students' academic achievement. However, unlike their counterparts in public high schools, principals of private schools have the power to award tenures to the contractual teachers. Cho (2013) argued that the discretional power exerted by principals of private schools can explain the difference in the performance of contractual teachers between public and private schools. Thus, we can surmise that such discretional power given to the private school principals can motivate students more to enter elite universities not only through the contractual teachers, but also through the regular teachers in private schools.

The second observation we can make from Table 4 is that boys-only schools perform better than the girls-only schools.[5] The coefficient of

[5] The interpretation of this study that concerns boys-only and girls-only schools must be considered with caution because the result may reflect some gender effect on the entrance to SNU. This is an important limitation, but inherent in any empirical study that uses school-level data. Such problem can be solved by using individual-level data, and we leave this issue for future studies. An example

the boys-only dummy is 2.8, whereas the coefficient of the girls-only is −2.6. This finding denotes that boys-only schools can send 2.8 more students to elite universities, whereas girls-only schools send 2.6 less students. Thus, the difference boys-only schools send 5 more students per 1,000 graduates to the SNU compared with girls-only schools. A possible explanation for the significant advantage of boys-only schools over girls-only is that Korean parents still under-value the need for obtaining advanced education for their daughters compared with their sons. In Korean society, men have generally been the main breadwinner of any family, whereas the wives have been responsible for child-rearing. Although this tendency is gradually disappearing, it still remains to some degree. Considering that Korean parents partially invest on education to guarantee a higher income in the future, they may opt to invest less on their daughters than on their sons. However, approximately 40% of SNU's admissions are currently given to female students.

The results of this study indicate that the performance measured based on the number of SNU entrants is significantly different among the three types of schools, in the order of boys-only, coeducational, and girls-only schools. A related research conducted by Park, Behrman, and Choi (2013) investigated the effect of single-sex schooling in Korea, and they found that single-sex schools send a higher ratio of its graduates to universities compared with coeducational high schools.

In the above model in (1), only fixed-effect terms are included to account for the heterogeneity in different schools. This study tried to include year dummies in the baseline model (1) as a robustness check for the above results given that (i) the dependent variable is the number of SNU entrants and (ii) the entrant criteria, including affirmative action and merit-based screening, may vary each year. The third column of Table 4 reports the estimation results with additional year dummies. As shown in Table 4, not only no sign was changed, but the magnitude of each estimated coefficient is hardly changed as well except for the constant term. Therefore, our main results are robust to any yearly heterogeneity.

of using individual-level data is Lee and Kim (2013), in which they showed that in Korean high schools, there is no significant difference between the written examination scores of boys and girls, but in other evaluations, such as homework and experiments, girls perform significantly better than boys.

IV. Conclusion

This study investigated the effects of (i) single-sex and coeducational schools, (ii) public and private schools, and (iii) the relative per capita income in which the school is located on the academic performances of high school students in Korea. Results show that private schools perform better than public, and the students' academic achievement is positively affected by income level. Moreover, this study found that boys-only schools perform significantly better than girls-only schools. However, no difference was found between single-sex and coeducational high schools.

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