

**Gender Matters:**  
**Causal Effects of Single-Sex Schools on College Attendance**

Hyunjoon Park

Assistant Professor  
Department of Sociology  
University of Pennsylvania

Jere Behrman

William R. Kenan, Jr. Professor  
Department of Economics  
University of Pennsylvania

\* This research was supported by the National Academy of Education/Spencer Foundation Fellowship awarded to the first author. Please direct all correspondence to Hyunjoon Park ([hypark@sas.upenn.edu](mailto:hypark@sas.upenn.edu)), Department of Sociology, University of Pennsylvania, 3718 Locust Walk, Philadelphia, PA 19104. Tel: 215-898-0942.

## **ABSTRACT**

Single-sex schooling is a particular way to organize student learning separately by gender, which potentially offers different schooling experiences for girls and boys. A fundamental issue underlying the existing literature, which compares educational outcomes between students attending single-sex and coeducational schools with observational data, is that differences in educational outcomes between the two different types of schools may reflect selection mechanisms. Utilizing a unique feature of Korean education where students are randomly assigned into single-sex and coeducational high schools, we move beyond associations that dominate the existing literature to draw causal inferences on effectiveness of single-sex schools. Using school-level data of college attendance rates by gender for all schools in Seoul, we estimate school-district fixed effect models and find significant positive effects of single-sex schools on four-year college attendance for both boys and girls. We assess the extent to which the share of same-sex teachers explains the single-sex school effects.

## **BACKGROUND**

Single-sex schooling is a particular way to organize student learning separately by gender of students and thus potentially offers different schooling experiences for girls and boys. Several studies in the United States have examined differences between students attending single-sex and coeducational schools (or classrooms) across a variety of educational outcomes including academic performance, student attitudes, and social psychological outcomes (Mael 1998; Mael et al. 2005). Originally, researchers were particularly interested in effectiveness of all-girls schools (classrooms) in enhancing girls' educational outcomes. However, as American women have made significant improvement in their educational attainment, and indeed since the mid 1980s women have surpassed their male counterparts in acquiring college degrees (Buchmann and DiPrete 2006), researchers have become increasingly interested in potential benefits of single-sex schooling for *boys* as well as for girls, especially to address the educational lag of boys over girls (Kleinfeld 2006). Another interesting twist in recent discussions on single-sex schooling is the increased possibility of establishing single-sex settings within the *public* sector. At the end of 2006, the United States Department of Education established new regulations on single-sex education, allowing more opportunities for public education to provide single-sex classrooms or to establish single-sex schools. As a result, the number of public schools that are single-sex schools or offer single-sex classrooms within coeducational schools in the United States has risen from 3 in 1995 to more than 545 in September 2009 (National Association for Single Sex Public Education 2007).

The changing contexts of single-sex schooling in the United States make it desirable to revisit the issue of single-sex schooling effects. Despite the voluminous literature, there is far from a consensus on the effects of single-sex schools. Several studies report positive benefits of

single-sex education, particularly for girls in academic achievement, sex-role attitudes, self-esteem, and career aspiration (Lee and Bryk 1986; Riordan 1990). But other studies find no significant differences between single-sex and coeducational schools, questioning any benefits of single-sex education (Marsh 1989; LePore and Warren 1997).

A fundamental issue underlying the disagreement on the effects of single-sex schools is that it is difficult to know what such differences between students in single-sex and coeducational schools in test scores and other educational outcomes mean, since the differences may reflect selection mechanisms. In an educational system such as US education in which students choose single-sex schools over coeducational schools, the two bodies of students attending single-sex and coeducational schools are likely to differ in many aspects of observed and unobserved characteristics of students and their families. In fact, extensive adjustment for observable differences attenuate observed effects of single-sex schools, often resulting in the disappearance of statistical significance (LePore and Warren 1997). In interpreting the observed differences, there is always the question of unobserved characteristics that may render spurious the relationship between single-sex schools and students' educational outcomes (Mael et al. 2005).

Although a randomized experiment may be required to draw casual inferences on the effects of single-sex schools, it is extremely difficult to find such an experiment in US education. In this study, we assess the effect of single-sex high schools on students' college attendance in the context of Korean education. Interestingly, in Korea students are randomly assigned into single-sex or coeducational high schools within school districts. The randomization is executed on a large scale across the nation using lotteries,<sup>1</sup> creating an exceptional opportunity to see if single-sex schools have direct educational benefits not attributable to the pre-existing

characteristics of students who choose to attend single-sex schools. Using this unique feature of high school entrance in Korea, we can move beyond associations that dominate the existing literature to draw causal inferences about the effectiveness of single-sex schools.

Obviously, college attendance is an important outcome of education that has considerable influences on individuals' life chances, including economic opportunity, family formation, and others. However, the existing literature on single-sex schools has predominately focused on student's test scores, attitudes, or socio-psychological outcomes while students are in high schools (see Mael et al. 2005). There is much less investigation of how single-sex schooling experiences affect transition to post-secondary education. We examine effects of single-sex schools on four-year college attendance and two-year junior college attendance, separately. It is an empirical question to be investigated whether single-sex schools have similar or different impacts on four-year college attendance vs. two-year junior college attendance. Indeed, in a rare study that examined single-sex schooling effects on type of college attended in the United States, Lee and Marks (1990) showed that compared to boys from coeducational high schools, boys from all-boys high schools were less likely to attend junior colleges but more like to attend selective four-year colleges. In other words, the study indicated that the effect of single-sex schools may differ between high-tier and low-tier college attendance.

### **KOREAN CASE: RANDOM ASSIGNMENT**

Before 1974, high schools in Korea could choose their students on the basis of students' scores on entrance examinations administered by individual high schools, resulting in substantial between-school differences in students' academic performance. The rising concern about between-school inequality and academic pressure on students to do well on high-school entrance

examinations led to national educational reforms called the ‘Equalization Policy’ (*P’yŏngjunhwa Chŏngch’aek*) (Lee et al. 1996). This policy has created a de facto experiment, in which students after middle school graduation are *randomly* assigned to high schools within their school districts. Importantly, the random assignment is applied regardless of whether schools are coeducational or single-sex schools. In other words, students cannot choose between single-sex or coeducational schools. They must accept the random assignment unless they move to another school district where they again have to be subject to random assignment.

It is notable that there are usually several high schools within a school district in Korea. For instance, in a typical school district (*Kangnam*) within the capital, Seoul, there are 6 coeducational schools, 6 boys’ and 4 girls’ schools (Seoul Metropolitan Office of Education 2007). The educational policy in Korea does not even allow private schools to choose their students. Private schools as well as public schools are subject to the random assignment of students. The Korean government controls not only public but also private schools to make school curriculum and tuition uniform across all schools in the nation. In sum, all schools within a school district must accept high-school entrants assigned by a lottery, all students also must accept random assignments unless they move to different school districts where they are subjected to other lotteries. This procedure guarantees randomness in student assignment into schools.

## **RESEARCH QUESTION AND DESIGN**

To estimate causal effects of single-sex schools on four-year college attendance and junior college attendance, we use two different analytic strategies. First, we use school-level data that provide the proportion of high school graduates in a specific year who attended four-

year colleges and the proportion of those who attended junior colleges as of one year after high school graduation. For coeducational schools, the data provide the proportions for boys and for girls, separately. Using information on whether schools are single-sex or coeducational, we can compare the proportions of female graduates who entered four-year colleges right after high school graduation between all-girls high schools and coeducational schools. Similarly, we can compare the proportions of male graduates who entered four-year colleges between all-boys high schools and coeducational schools. The data cover all high schools in Seoul (capital of Korea) and hence provide a large number of single-sex and coeducational schools. Moreover, because the data include all schools within a school district, it is possible to conduct school-district fixed-effect models. As mentioned above, students are randomly assigned to schools within the same district. Considering this feature of the random assignment, it is worthwhile to explore whether controlling for school district effects (school-district fixed effect) alters the estimates, which effectively makes this a within-district estimator.

However, note that the school-level data used in this study do not have information on socioeconomic background of students attending the school. Therefore, with the school-level data, it is impossible to compare socioeconomic composition of students between single-sex and coeducational schools. The random assignment of students into single-sex or coeducational schools should result in comparable socioeconomic conditions of students between single-sex and coeducational schools. Given the lack of information on students' socioeconomic background in the school-level data, we rely on student-level data from a national representative survey of high school students that collected a variety of information on family background through parent questionnaires in order to check for balance on the observable characteristics of parents between students in single-sex and coeducational schools. When the balance on the

observables is established, this strengthens the claim that the student distribution in Korean high schools really is a random assignment. Unfortunately, the student-level survey we use is cross-sectional for 11<sup>th</sup> graders in the year 2003, and therefore we are not able to conduct analysis of transition to post-secondary education for those students.

## **DATA**

The Korean government has compiled data that contain a variety of information on high schools, including number of graduates, college attendance rates, public/private, single-sex/coeducational, and amount of fellowships provided, as reported by each school in accordance with legal requirements pertaining to the education law. The compiled data are publicly available at a governmental webpage, [www.schoolinfo.go.kr](http://www.schoolinfo.go.kr). For the current study, we use the most recent data that provide information on college attendance of those who were high school seniors in 2008 (i.e., their college enrollment as of one year after high school graduation). Although data are provided basically for all schools across the nation, in this study we select all schools only in Seoul (the capital). About 22 percent of nation-wide 2008 high school graduates went to schools in Seoul, which is the largest metropolitan area. More importantly, Seoul was the area in which high school equalization policy was implemented for the first time in 1974 and the policy has been maintained strictly afterward. There are total of 11 school districts in Seoul. After deleting vocational high schools and some specialized schools such as foreign language, science, and art schools for which the high school equalization policy is not applied, the final sample consists of a total 196 high schools across 11 school districts.<sup>2</sup> Among 196 high schools, 68 schools are all-boys, 60 schools are all-girls, and 68 schools are coeducational.



The student-level data to be used for checking balance on socioeconomic backgrounds of students to confirm the randomness of student assignment come from a national representative survey of 11<sup>th</sup> graders (i.e., 2<sup>nd</sup> year high school students) in academic high schools, *Conditions of High School Education* (CHSE) conducted in 2003. The survey first selected schools and then randomly chose two classes within selected schools (Kim et al. 2003). All students within the two selected classes were contacted to fill out a student questionnaire that contained questions about students' attitudes, behaviors, study patterns, classroom climates. The response rate for student questionnaires was 87 percent. Parents filled out a parent questionnaire to provide information on their education, household income, and other socioeconomic, cultural characteristics of families. The response rate for parent questionnaires was 81 percent. We exclude those who resided in areas where the high school equalization policy was not applied and those who had missing information on major variables used in the analysis. The final sample for the analysis consists of 4,331 students who resided in the areas subject to the high school equalization policy. In the final sample, 1,540 students attended all-boys schools (N = 24), 1152 students attended all-girls schools (N = 17), and the remaining 1,639 attended coeducational schools (N = 26).

## **RESULTS**

### **Checking the Randomness**

To address the balance, we compare major socioeconomic characteristics of parents across students attending different types of school, using the student-level data of CHSE. Table 1 presents the results of group comparisons in four major socioeconomic variables, household income, father's and mother's university education, and home ownership. Panel A shows

comparisons between boys attending all-boys schools and boys attending coeducational schools. Statistical tests indicate that the group differences for father's, mother's university education, and home ownership are not significant. The group difference for monthly household income is significant only at the 0.1 level. Panel B showing the results for girls indicates no difference between girls attending all-girls schools and girls attending coeducational schools in any of four major socioeconomic variables. In short, the results in Table 1 suggest balance on observable characteristics of parents between students attending single-sex and those attending coeducational schools, reflecting the random assignment.

TABLE 1 ABOUT HERE

### **General Characteristics of Schools**

It is useful to compare the general structure of schools between single-sex and coeducational schools as well as socioeconomic composition of student body. Table 2 displays a few characteristics of schools among all-boys, all-girls, and coeducational schools. The mean number of 2008 graduates is similar between all-boys and all-girls schools, a little bigger than the number for coeducational schools. The graduate/teacher ratio is also smallest for coeducational schools. The comparisons suggest that single-sex schools are not advantaged (and may even be disadvantaged) over coeducational schools at least in these two characteristics, assuming that the larger school size and the bigger student/teacher ratio may not bestow educational advantages to students. An interesting feature of all-boys schools, however, is notable. Teachers in all-boys schools are predominantly male, while half of teachers in coeducational schools and a little less than half in all-girls schools are male. On the other hand,

only a little more than half of teachers in all-girls schools are female, which is not considerably higher than the share in coeducational schools.

TABLE 2 ABOUT HERE

### **Causal Effects of Single-Sex Schooling**

Table 3 and 4 present the results of OLS regression analysis predicting college attendance rates by school type and school district. Three kinds of college attendance rates are examined: rates for any post-secondary institutions (i.e., either four-year colleges or junior colleges), rates for four-year college attendance, and rates for junior-college attendance. Table 3 shows the results for comparing rates for female students in all-girls schools to rates for female students in coeducational schools, while Table 4 displays the results for comparing rates for male students in all-boys schools to rates for male students in coeducational schools. In each model, indicators of school districts are included so that the model is a district fixed-effect model. For each outcome, we estimate two models with and without the proportion of same-sex teachers. The comparison between the two models should reveal the extent to which the effect of single-sex schools, if any, is accounted for by the share of same-sex teachers.

TABLE 3 ABOUT HERE

The first column in Table 3 suggests that single-sex schooling does not have a significant impact on college attendance for girls when college attendance refers to all post-secondary institutions. Moreover, Model 2 for post-secondary education shows that the share of female teachers is not associated with the difference across schools in the rate of girls' college attendance. However, separate results for four-year college attendance and junior college attendance reveal that this null effect of single-sex schooling is the result of opposite effects of

single-sex schooling for four-year college attendance and junior college attendance. Specifically, Model 2-1 shows that the rate for female graduates to attend four-year colleges is 3.5 percent higher for all-girls schools than coeducational schools. The size of 3.5 percent is equivalent to 0.5 standard deviations of the variable, the rate of four-year college attendance for female graduates. In other words, the advantage of all-girls' schools over coeducational schools in sending female students to four-year colleges is fairly substantial. In contrast to the positive effect of single-sex schools on four-year college attendance, Model 3-1 suggests that female students from all-girls schools are less likely to attend junior colleges. Both Models 2-2 and 3-2 indicate that the share of female teachers does not explain the effect of single-sex schools for girls.

#### TABLE 4 ABOUT HERE

Turning to the results for boys in Table 4, the finding for Model 1-1 suggests that boys from all-boys high schools are more likely to attend any post-secondary institutions than their counterparts from coeducational schools. Model 1-2, furthermore, shows that the significant advantage of all-boys schools for college attendance is primarily attributable to the higher percentage of male teachers in all-boys schools than in coeducational schools. The share of male teachers is significantly associated with the increased college attendance rate: a 10% higher share of male teachers leads to 1 percent increase in the college attendance rate.

Model 2-1 displays the extent to which single-sex schooling affects boys' attendance at four-year colleges separate from junior colleges. The result shows that the effect of single-sex schooling is larger than when four-year colleges and junior colleges are combined: the rate for male students to attend four-year colleges is 5.8 percent higher for all-boys schools than for coeducational schools. Given that one standard deviation of the rate is 7.0 percent, the effect

size of 5.8 percent is quite large. In other words, it is evident that male students from all-boys schools are much more likely to attend four-year colleges than male students from coeducational schools. Similar to girls, however, single-sex schooling has a negative effect on junior college attendance: the rate of college attendance is 2 points lower for all-boys schools than for coeducational schools. Finally, Model 2-2 and 3-2 suggest that the significant effects of single-sex schools for boys are attributable to the higher proportion of male teachers in all-boys schools. Once the share of male teacher is taken into account in Model 2-2 and Model 3-2, the effects of single-sex schools disappear. Interestingly, however, the direction of the relationship between the share of male teachers and the attendance rate is opposite between four-year college attendance and junior college attendance. Schools with the larger share of male teachers tend to have a higher rate of four-year college attendance but a lower rate of junior college attendance.

## **DISCUSSION**

In contrast to an expectation that “learning together” should promote equal educational experiences and opportunities for boys and girls, there is compelling evidence that coeducational schools may work as social institutions to reinforce traditional gender role socialization, provide gender-differential classroom learning experiences, and thus constrain female students’ opportunities (Thompson 2003; Oakes 1990). For instance, the “chilly” climate of classrooms for female students is conjectured to lead secondary school female students, who had interests in science and math as much as did male students during primary school, to lose these interests, and consider these subjects to be related to male careers (Hall and Sandler 1982; Bae et al. 2000). Adolescent subculture often places emphasis on physical attractiveness and interpersonal relationships over academic activities (Coleman 1961; Riordan 1985). The archetypical idea is

one in which girls do not want to seem “too smart” because they do not want to lose their appeal to boys!

Noticing subtle gender bias in coeducational settings, researchers have explored the potential benefits of single-sex schools, as an alternative way to organize student learning separately by gender, for enhancing girls’ educational experiences in schools and thus eventually for improving their educational outcomes. Several studies have found some benefits of single-sex schools, especially all-girls’ schools, for girls’ educational outcomes (Mael et al. 2005). However there is still far from a consensus on the effect of single-sex schools. Other studies find no significant differences between single-sex and coeducational schools, questioning any benefits of single-sex education (Marsh 1989; LePore and Warren 1997).

A fundamental issue underlying the disagreement on single-sex school effects is that most studies, which are based on observational data, are not able to properly control for biases due to selection into single-sex schools. When attendance at single-sex schools is determined by students’ (families’) choices, there is always a possibility that students (and their families) attending single-sex and coeducational schools differ in observed and unobserved characteristics that may confound effects of single-sex schools on educational outcomes. In this study, we have attempted to address this critical problem in the literature of single-sex schools by using random assignment to types of schools in Korea. As far as we know, ours is the first study to draw causal inferences on single-sex school effects on the basis of the large-scale random assignment.

Using the school-level data of college attendance rates by gender for all schools in Seoul, we have estimated school-district fixed effect models to assess how boys in all-boys schools and girls in all-girls schools differ from their counterparts in coeducational schools in college attendance one year after high school graduation. We, furthermore, have examined four-year

college attendance and junior-college attendance separately to see the potential variation in the effects of single-sex schools depending on types of post-secondary institutions. Our results show that students, both boys and girls, who attended single-sex high schools, are more likely to attend four-year colleges than their counterparts from coeducational high schools. The positive effect of single-sex schools is fairly substantial in its effect size for both boys and girls. On the other hand, students from single-sex high schools are less likely to attend junior colleges than their peers from coeducational schools. Because of the opposite directions for four-year colleges and junior colleges, the effect of single-sex schools is negligible for girls when four-year colleges and junior colleges are combined.

We have moved beyond assessing causal effects of single-sex schools by attempting to address the extent to which the causal effects of single-sex schools are attributable to the composition of gender of teachers in single-sex schools. An important difference between single-sex schools and coeducational schools is the proportion of teachers of the same sex. All-boys schools tend to have a larger share of male teachers than coeducational schools. The difference in the share of female teachers between all-girls schools and coeducational schools, however, is not much. Our multivariate analysis shows that once the proportion of male teachers is taken into account, the difference in college attendance between all-boys schools and coeducational schools disappears. Interestingly, the share of female teachers does not account for the difference between all-girls schools and coeducational schools.

By drawing causal inferences on the effectiveness of single-sex schools on college attendance, our study contributes significantly to our knowledge regarding whether single-sex high schools might be an important institution to help overcome women's disadvantages in education. An important extension of the current study is to examine different educational

outcomes, beside college attendance, to address whether the effects of single-sex schools are consistent. In particular, it is worthwhile to investigate whether all-girls high schools help girls develop and maintain their interest in Science, Technology, Engineering and Mathematics (STEM) as they progress through school and into jobs, and thus encourage more gender diversity within the population of students interested in STEM careers. In future work we propose to undertake such analyses.



## ENDNOTES

---

<sup>1</sup> There are some school districts in Korea that have not yet implemented the equalization policy. However, in 2003, 72 percent of total high school students resided in areas where the equalization policy was applied.

<sup>2</sup> There are two types of high schools in Korea: vocational and academic high schools. The high school equalization is not applied to vocational high schools for which students apply. Currently, about 25 percent of total high school students go to vocational high schools. There are a small number of specialized schools for language, science, and arts. Although these schools belong to academic high schools, they are not subject to the high school equalization policy.

## REFERENCES

- Buchmann, C., and DiPrete, T. A. 2006. The Growing female advantage in college completion. *American Sociological Review* 71: 515-541.
- Kleinfeld, J. 2006. Five powerful strategies for connecting boys to schools. Paper for White House Conference on Helping America's Youth. Downloaded from <http://www.singlesexschools.org/Kleinfeld.htm>
- Lee, D-H. et al. 1996. Educational policy in Korea. Background Paper for OECD Review of Korean Educational Policy. Korean Educational Development Institute (in Korean).
- Lee, V. E., and Bryk, A. S. 1986. Effects of single-sex secondary schools on student achievement and attitudes. *Journal of Educational Psychology* 78: 381-395.
- Lee, V. E., and Marks, H. M. 1990. Sustained effects of the single-sex secondary school experience on attitudes, behaviors, and values in college. *Journal of Educational Psychology* 82: 578-592.
- LePore, P., and Warren, J. R. 1997. A comparison of single-sex and coeducational Catholic secondary schooling: Evidence from the National Educational Longitudinal Study of 1988. *American Educational Research Journal* 34: 485-511.
- Mael, F. A. 1998. Single-sex and coeducational schooling: Relationships to socioemotional and academic development. *Review of Educational Research* 68: 101-129.
- Mael, F. A. et al. 2005. *Single-sex versus coeducational schooling: A systematic review*. U.S. Department of Education, Office of Planning, Evaluation and Policy Department, Policy and Program Studies Service.
- Marsh, H. W. 1989. Effects of attending single-sex and coeducational high schools on achievement, attitudes, behaviors, and sex differences. *Journal of Educational Psychology* 81: 70-85.
- National Association for Single Sex Public Education. Retrieved on October 2007 from <http://www.singlesexschools.org>
- Riordan, C. 1990. *Girls and boys in school: Together or separate?* New York: Teachers College Press.

Table 1. Group comparisons of major socioeconomic indicators by school type

	All-boys schools	All-girls schools	Coed schools	Statistical test
A.				
Number of boys	1,530 (62 %)		957 (38 %)	
<i>Monthly HH income (logged, Won)</i>	5.67		5.74	t-test: p=0.09
<i>Father university education (%)</i>	40.4		38.4	Chi-square: p=0.35
<i>Mother university education (%)</i>	18.9		19.7	Chi-square: p=0.65
<i>Owning house (%)</i>	77.6		74.5	Chi-square: p=0.10
B.				
Number of girls		1,143 (63 %)	675 (37 %)	
<i>Monthly HH income (logged, Won)</i>		5.71	5.70	t-test: p=0.74
<i>Father university education (%)</i>		41.1	37.2	Chi-square: p=0.14
<i>Mother university education (%)</i>		18.4	21.3	Chi-square: p=0.15
<i>Owning house (%)</i>		77.5	79.3	Chi-square: p=0.39

Source: Student-level data from the Condition of High School Education (CHSE) conducted in 2003

Table 2. Characteristics of Single-Sex and Coeducational High Schools in Seoul

	All-boys schools	All-girls schools	Coed schools
Number of schools	68	60	68
Number of 2008 graduates (mean)	438	436	416
Graduate/Teacher ratio (mean)	5.31	5.41	5.12
Proportion of male teachers (mean)	0.78	0.46	0.50

Table 3. Causal Effects of Single-Sex Schooling on College Attendance for Girls

	Post-secondary <sup>a</sup>		4 Year College <sup>b</sup>		Junior College <sup>c</sup>	
	M1-1	M1-2	M2-1	M2-2	M3-1	M3-2
All-girls school (vs. coed)	0.368	0.502	3.473 **	3.595 **	-3.105 *	-3.094 *
Proportion of female teachers (0.1 unit)		-0.313		-0.286		-0.027
School district (ref: Kangnam)						
Kangdong	9.333 ***	9.124 ***	-2.374	-2.565	11.707 ***	11.689 ***
Seongbuk	10.277 ***	10.232 ***	-9.547 **	-9.587 **	19.824 ***	19.820 ***
Kangseo	9.681 ***	9.645 ***	-3.545	-3.578	13.226 ***	13.222 ***
Dongjak	11.535 ***	11.515 ***	-5.423 **	-5.441 **	16.958 ***	16.956 ***
Seongdong	9.486 ***	9.487 ***	-9.858 ***	-9.857 ***	19.344 ***	19.344 ***
Nambu	13.439 ***	13.700 ***	-6.176 **	-5.937 *	19.615 ***	19.637 ***
Bukbu	11.561 ***	11.562 ***	-3.145	-3.144	14.706 ***	14.707 ***
Dongbu	15.965 ***	16.035 ***	-7.367 **	-7.303 **	23.332 ***	23.338 ***
Seobu	9.853 ***	9.921 ***	-5.576 *	-5.513 *	15.429 ***	15.435 ***
Jungbu	9.196 **	9.081 **	-5.221	-5.325 ^	14.417 ***	14.407 ***
Constant	57.613 ***	59.173 ***	44.905 ***	46.330 ***	12.708 ***	12.843 ***
R <sup>2</sup>	0.373	0.376	0.223	0.225	0.474	0.474

Note : The analysis was conducted for data of 60 all-girls schools and 68 coeducational schools.

<sup>a</sup> The result of school-level OLS regression analysis predicting the proportion of female high school graduates who attended any post-secondary institution (either four-year college or junior college) as of one year after graduation.

<sup>b</sup> The result of school-level OLS regression analysis predicting the proportion of female high school graduates who attended four-year college as of one year after graduation.

<sup>c</sup> The result of school-level OLS regression analysis predicting the proportion of female high school graduates who attended junior college as of one year after graduation.

\*\*\* p < .001 \*\* p < .01 \* p < .05 ^ p < .10

Table 4. Causal Effects of Single-Sex Schooling on College Attendance for Boys

	Post-secondary <sup>a</sup>		4 Year College <sup>b</sup>		Junior College <sup>c</sup>	
	M1-1	M1-2	M2-1	M2-2	M3-1	M3-2
All-boys school (vs. coed)	3.499 **	0.604	5.781 ***	1.181	-2.282 *	-0.578
Proportion of male teachers (0.1 unit)		1.037 **		1.647 ***		-0.610 ^
School district (ref: Kangnam)						
Kangdong	9.199 ***	8.735 ***	1.908	1.171	7.290 ***	7.564 ***
Seongbuk	10.938 ***	10.678 ***	-7.674 **	-8.088 **	18.612 ***	18.766 ***
Kangseo	7.937 **	7.280 *	-0.927	-1.970	8.864 ***	9.250 ***
Dongjak	11.988 ***	11.933 ***	-3.132	-3.220 ^	15.120 ***	15.153 ***
Seongdong	10.230 *	10.297 *	-6.545 **	-6.437 *	16.775 **	16.735 ***
Nambu	13.070 ***	13.728 ***	-3.864	-2.819	16.935 ***	16.547 ***
Bukbu	7.644 ***	7.938 ***	-2.685	-2.219	10.329 ***	10.157 ***
Dongbu	13.397 ***	14.557 ***	-2.587	-0.744	15.984 ***	15.301 ***
Seobu	8.918 **	8.490 **	-2.003	-2.683	10.921 ***	11.173 ***
Jungbu	7.189 **	7.683 **	-3.481 ^	-2.695	10.700 ***	10.378 ***
Constant	50.737 ***	45.495 ***	41.099 ***	32.769 ***	9.639 ***	12.725 ***
R <sup>2</sup>	0.313	0.340	0.284	0.367	0.521	0.529

Note : The analysis was conducted for data of 68 all-boys schools and 68 coeducational schools.

<sup>a</sup>The result of school-level OLS regression analysis predicting the proportion of male high school graduates who attended any post-secondary institution (either four-year college or junior college) as of one year after graduation.

<sup>b</sup>The result of school-level OLS regression analysis predicting the proportion of male high school graduates who attended four-year college as of one year after graduation.

<sup>c</sup>The result of school-level OLS regression analysis predicting the proportion of male high school graduates who attended junior college as of one year after graduation.

\*\*\* p < .001 \*\* p < .01 \* p < .05 ^ p < .10