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Reconstructing school segregation: on the efficacy and equity of single-sex schooling

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Reconstructing School Segregation: On the Efficacy and Equity of Single-Sex Schooling

Sherrilyn M. Billger

March 2006

Forschungsinstitut
zur Zukunft der Arbeit
Institute for the Study
of Labor

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Discussion Paper No. 2037
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ABSTRACT

Reconstructing School Segregation: On the Efficacy and Equity of Single-Sex Schooling*

A change to Title IX has spurred new single-sex public schooling in the US. Until recently, nearly all gender-segregated schools were private, and I therefore address potential selection bias in the effects on educational and labor market outcomes using within private sector comparisons, an index comparing expectations to outcomes, quantile regressions, and other techniques. Descriptive statistics suggest significant benefits, but more consideration of selection bias reveals less consistency. Girls' school alumnae are more likely than their coed peers to receive scholarships, but they are not more likely to pursue college degrees, and both genders are less likely to meet their own educational expectations. Moreover, single-sex schooling is not universally superior in supporting gender equity, as coeducational public schools yield the least segregated college major choices. On the other hand, I find 15-20% higher starting salaries among single-sex school graduates, but only persistently for men of median ability. Much of the benefit from single-sex schooling accrues to students already likely to succeed, but favorable selection is an insufficient explanation for all gains. Most notably, there are clear returns for both African-Americans and low income students.

JEL Classification: I21, J24, J3, I28

Keywords: single-sex education, labor outcomes, secondary schooling, gender

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1. Introduction

In response to a relatively minor clause in the "No Child Left Behind" Act, the Department of Education has promoted amendments to Title IX that allow for single-sex public schools and classes (Federal Register, 2004). In fact, in response to this announcement, there are 44 single-sex public schools and 167 schools have instituted separate-gender classes (as of Spring 2006).[1] Such a quick response is surprising, given that official changes have not yet been announced by Department of Education. The stated goal of this change to Title IX is that greater choice will improve educational outcomes for both boys and girls. Unfortunately, there is no direct evidence that such a change would indeed improve outcomes for all involved students, mostly because nearly all existing single-sex programs are within private schools, where resources and student backgrounds are quite different from those at many public schools.

Relevant literature within Economics is quite limited, where most work focuses on peer or role model effects rather than single-sex schooling directly. For instance, Hoxby (2000) finds that classes with more female students performed better in certain subjects. Though indirectly related to the topic at hand, were these results taken to the extreme, the impact on boys and girls would not be equal. Indeed, one of the important issues within this debate is whether such school segregation is beneficial for both genders, in terms of both academics and acculturation.

According to Solnick (1995), students at women's colleges were more likely to shift into traditionally male fields, leading to better labor market success. Billger (2002) studies a college that switched from all-female to coeducation and finds that women were more likely to pursue majors in science and math before the institution admitted men. The source of these differences

[1] National Association for Single Sex Public Education, http://www.singlesexschools.org/, accessed March 2006.

likely arises from a combination of personal and institutional characteristics. For instance, single-sex schools and colleges may highlight the positive effects of same-gender role models in front of the classroom. Using data from the NLS72, Rothstein (1995) examines the effect of female faculty on female college students. She documents a higher probability of advanced degree attainment with more women on a department's faculty. On the other hand, Canes and Rosen (1995) find that increasing the number of female faculty does not lead to more female majors. Investigating 8th grade student and teacher across genders, Ehrenberg et al. (1995) reveal no significant role model effect on student learning; gain scores are no higher when a student learns from a teacher of the same gender. Taken together these results provide, at best, lukewarm support for separate-gender classes and schools.

In this paper I investigate whether single-sex schooling leads to improved labor market outcomes for alumni. With survey data from the National Center for Education Statistics, I address degree attainment and salaries, controlling for personal, family, school, and community characteristics. I use a variety of techniques to address selection bias. Indeed, single-sex schools with particular admission requirements are, a priori, likely to generate improved student outcomes. I therefore begin with selection-corrected benchmarks from common two-step techniques. I also compare attainment to earlier expectations. Does this schooling impart gains or do students simply meet their prior goals? Comparisons of college majors reveal whether school affiliation reinforces traditional gender roles. In addition, I explore correlations between innate ability, school characteristics, and outcomes using quantile regressions. Finally, comparisons both within and across gender highlight potential costs and benefits to public single-sex schooling.

2. Single-Sex Schools

The main data set used in this analysis is the National Educational Longitudinal Study (NELS), a panel survey from the National Center for Education Statistics. A representative sample of eighth graders was interviewed in 1988, then subsequently in 1990, 1992, 1994, and 2000. These data include detailed information about students, families, schools, communities, and teachers. Data from the Private School Survey were then merged by zip code to identify whether a respondent lived near a single-sex school. Data from the Integrated Postsecondary Education Data System provide college and university characteristics. In addition, data from the Occupational Employment Statistics program at the Bureau of Labor Statistics have been included to identify median wages by occupation.

In Table 1 I report summary statistics separately by gender for private single sex education (SSE), private coeducation, and public coeducation. These categories are determined from the 10th grade school survey which asked each school directly whether it was coeducational, all-girls, or all-boys. Eighth grade test scores reveal that both girls and boys who attend single-sex schools have consistently higher average academic scores than their counterparts at public coeducational institutions. Also, students at these schools are unsurprisingly more likely to live near a single-sex school. On the other hand, gender differences emerge in family income, revealing that among private schools, more girls of lower socioeconomic status pursue SSE. A majority of students expect to attend college, and significantly more of the single-sex (male) alumni have this plan, even among private schools. Interestingly, none of the girls' school graduates in this survey chose a women's college. Graduates from private schools have higher degree attainment by 2000, which is eight years after 12th grade. Though SSE alumni pursue more education, this difference is not statistically

significant across private schools. Relative to coed private schools, the gains from single-sex schooling may be greater for women than men, with 11% higher starting salaries but virtually identical salaries for men.

I assume that parents (or guardians) are primarily responsible for a student's decision to pursue SSE. Potentially relevant factors include location, family income, student ability and preferences, and public school quality. To investigate the likelihood that a student will attend a single sex school, I estimate a probit for this decision separately by gender:

(1) $$Prob\ (singsexsch_i = 1|X_i) = \Phi\ (X_i \beta)$$

where X is a matrix of personal characteristics including: race, family socioeconomic status (SES), 8th grade test scores, college expectations, religious participation, urban and regional residence, proximity to single-sex schools, proportion minorities and free lunch in 8th grade school, whether afraid to ask questions, gifted program enrolment, flunked a grade, and parental involvement.

At the time of the NELS surveys, nearly all SSE was privately controlled, suggesting that socioeconomic status is particularly relevant to this decision. In addition, these schools are more common in urban areas in the northeast and south, and a student living nearby is more likely to attend. Much SSE is Catholic or otherwise religiously-affiliated, so religious participation may be positively correlated with matriculation. The percentage of students who are minorities, and those eligible for free lunches, reflect the public school climate in 8th grade, and may affect a parent's decision to enroll their child elsewhere. Participation in gifted programs and whether a student has been held back a grade reflect ability and student behavior. Parental involvement is revealed by whether the student has spoken with their parent/guardian about school in recent months. Finally, many sociological studies assert that students pursue SSE because they feel

intimidated in coeducational environments. I investigate this hypothesis with an indicator for whether the student expressed fear about answering questions in math and/or science classes in 8th grade.

Table 2 reports probit results by gender for the full sample and the private school subsamples. Marginal effect estimates and coefficient standard errors are reported. Marginal effects for continuous covariate *j* are calculated as follows:

(2) $$\frac{\partial p_i}{\partial x_{ij}} = \phi\,(X_i \beta)\beta_j$$

where $\phi\,(\cdot)$ is the standard normal density function. For each indicator explanatory variable *k*, the marginal effect is:

(3) $$\frac{\partial p_i}{\partial x_{ik}} = \Phi\,(\beta_1 + \beta_2 x_{2i} + \cdots + \beta_{k-1,i} x_{k-1,i} + \beta_k) - \Phi\,(\beta_1 + \beta_2 x_{2i} + \cdots + \beta_{k-1,i} x_{k-1,i})$$

In some cases, it appears that higher ability induces attendance, though not universally. Among only private school students, girls at SSE are more likely to be from lower income classes, while the opposite is true for boys. College expectations are insignificant to the decision for girls, but very important for boys. Proximity to SSE is unsurprisingly significant, but dwarfed by the marginal effect of urban residence. A potentially surprising result emerges, in that religious participation is negatively correlated with SSE matriculation. It is also interesting that, among private school students, girls who were afraid to participate in class in eighth grade are 32% more likely to attend a girls' school in tenth grade.

3. Educational and Labor Market Outcomes

Degree Attainment

It has become rather common for many high school graduates to pursue college education, suggesting little variation in this outcome. It is nevertheless valuable to explore whether certain school characteristics and school types induce greater receipt of 4-year degrees. I begin with probit estimates for the likelihood of receiving bachelor's degrees within 8 years of graduating high school:

(4) $$Prob\ (earn4yrdegree_i = 1|X_i,S_i,have\ HS\ diploma_i) = \Phi\ (X_i\delta + S_i\gamma)$$

where X is a matrix including race, socioeconomic status (SES), HS rank, 8th grade test scores, parents' education, region, gifted program enrolment, SAT score, and SAT missing indicator. S is a matrix with an indicator for private school and another for private SSE, and the probit is estimated accounting for clustering and stratification across observations in the same strata and school. As in Table 2, marginal effects and parameter standard errors are reported. Results in Columns 1 and 4 of Table 3 display the expected signs, as income and SAT scores are positively correlated with degree attainment. Higher high school rank corresponds to worse performance and is significantly negatively correlated with earning a bachelor's degree. Conditional on personal characteristics, private school graduates are over 13% more likely to earn a BA/BS, but there is no supplemental benefit from SSE. This result supports that hypothesis that apparent gains from SSE are upward biased by selection.

To investigate this selection bias in a different way, I generate an index to compare attainment by eight years after graduation to prior expectations. Specifically, in eighth grade respondents were asked, "How far in school do you think you will get?" I begin by ordering degree levels, including high school drop-outs through advanced degrees, and each level is assigned a one point step. The index is then the difference between receipt and expectation:

(5) $$AttExp_i = Degree\ Attained\ by\ 2000_i - Degree\ Expected\ in\ 1988\ in\ 8^{th}\ Grade_i$$

AttExp equals zero when the respondent attained exactly the degree expected. For instance, a student who expects to obtain some technical training after high school but actually drops out before 12th grade would have a value of –2. Another student who expects to finish college and in fact pursues graduate work would have a value of 1.

The index is not significantly different among women when comparing SSE to coeducation. For men, however, the distribution is significantly different, even among private schools, according to Pearson χ^2 tests. I present the distribution of the index in Figure 1. Among SSE alumnae, expectations are less frequently met, while public coed schools have the highest mode for meeting goals. If SSE truly imparted benefits on students, we might expect the opposite result. It is nonetheless possible that expectations are unmet if the effects of fertility, institutions, etc. are disproportionately negative for SSE alumnae with otherwise lofty goals. It is also possible that eight years is not a sufficiently long window for all interested women to obtain advanced degrees. Single sex education is similarly less beneficial among alumni, where Catholic and public school graduates are more likely to meet or exceed their expectations.

Perhaps gains would not accrue uniformly, and Figure 1 displays additional distributions among African-Americans and low SES respondents. However, within both genders, and within each category, the distributions for SSE alumni appear to have greater mass in the left tail and less in the right. It is also important to note that cell sizes are quite small in some cases, so inference is not entirely appropriate. It remains the case, however, that none of the evidence reported in Figure 1 runs counter to the selection bias hypothesis.

I next analyze the index parametrically, by estimating an ordered logit model which assumes the latent variable:

(6) $$AttExp_i^* = x_i\eta + u_i \qquad AttExp_i = -4, -3, \ldots, 3$$

This latent variable represents increasing attendance relative to expectations, and the error term u_i is assumed to be logistic distributed. The estimated parameter signs reveal whether the latent variable increases as the respective regressor increases. I estimate (6) with covariates identical to those in (4). Coefficients and robust standard errors appear in columns 2 and 4 of Table 3. Private school attendance benefits female students, but SSE has no significant effect on either gender.

NELS also reports whether respondents received a college grant or scholarship, and using these data I estimate the likelihood of obtaining this aid:

(7) $$Prob\ (scholarship_i = 1 | X_i, S_i, have\ HS\ diploma_i) = \Phi\ (X_i\delta + S_i\gamma)$$

In this case all independent variables are as defined in (5), though parameters are expected to vary from that. Results appearing in columns 3 and 6 of Table 3 reveal important differences by gender. Controlling for family SES, girls' school graduates are 11% more likely to receive aid, while alumni are 11% less likely. It therefore appears that SSE alumnae face lower average human capital investment costs, ceteris paribus, but are not more likely to complete bachelor's degrees or to meet their own educational expectations.

Proponents of separate gender education claim that gender stereotypes are not reinforced, and students become more confident and more willing to pursue the fields that most interest them. I investigate this claim using data on college major choice at the first post-secondary institution attended. Presumably, before much time has passed, a student's secondary school experience influences their choices in college. Table 4 lists the distribution of students across major field by gender and school type. Majors are sorted according to the distribution of females from public secondary schools, and popular majors such as education, health, and business appear near the bottom. Women from coed schools are substantially more likely to pursue

degrees in education, with more single-sex graduates in science, literature, and communications. Male single-sex alumni are more likely to pursue business, philosophy/religion, and secretarial skills. I also calculate the Duncan index (Duncan and Duncan, 1955) so that the overall level of segregation may be ascertained.

(8) $$D_j = \frac{\sum \left| \frac{A_i}{X} - \frac{B_i}{Y} \right|}{2} \qquad j = 1,2,3$$

Where *A* and *B* are women and men, respectively, and *X* and *Y* represent the total number of women and men in each sample. The school types *j* include SSE, private coed, and public coed. An index value equal to zero denotes no segregation and 100 denotes full segregation.

The greatest degree of segregation occurs among alumni of coed private schools, and there appears to be *less* segregation among public school graduates. These results relate well to Wootton's (1997) findings on occupational differences by gender. For instance, women's participation in managerial positions has greatly increased in recent years, while men are somewhat more likely to be in administrative support jobs. While there is less segregation in SSE compared to private coed schools, this evidence suggests that overall, gender stereotypes may be less prevalent in mixed gender public schools.

Salaries

Income reported in 1999 constitutes a starting-level salary for most respondents. I predict starting salaries as a function of personal and school characteristics:

(9) $$lsalary_i = f(X_i, S_i)$$

where X_i includes race, degree attainment, hours worked, marital status, children, urban residence, SAT score, and SAT missing indicator. S_i is a matrix with private and private single-

sex school indicators. I initially use a standard linear functional form and estimate conditional means with OLS regressions:

(10) $E(lsalary_i|X_i) = X_i\beta$

Results are reported in Table 5. Graduates of these schools earn higher average salaries than their peers, men 17% and women 16%. A robustness check run with only graduates of private secondary schools reveals a greater return for men at 20% and a slightly lower return for women at 12%.

In order to address selection bias in a different way, I use quantile regressions as developed in Koenker and Bassett (1978). Regression coefficients are estimated at a number of quantiles in the conditional distribution of salary, thereby extending beyond mean effects available through OLS.

(11) $Quant_\theta(lsalary_i|X_i) = X_i\beta_\theta$

where $\theta \in (0,1)$. Furthermore, the conditional distribution of salary is highly related to ability or on the job performance that is unobservable to researchers. Thus, quantile regression results provide evidence about which students are mostly likely to experience wage gains, given their location in the conditional salary distribution. If the "best and brightest" are more likely to attend single-sex schools *and* to perform very well on the job, we would expect positive and significant returns at upper quantiles. This would provide some evidence of positive selection bias in returns. Furthermore, coefficient estimates that increase monotonically support the hypothesis of selection bias, while decreasing monotonicity refutes it. Coefficients that are least negative or most positive at lower quantiles reveal the greatest gains for the "least able."

As seen in Table 5, benefits for women are not uniform, and test significant only near the median. This suggests that 1) significant benefits may not accrue to the "best" and "worst"

workers and 2) the returns to single-sex schooling are not uniform across innate ability. On the other hand, gains for men appear stronger, with substantially higher wages for even the lowest ability workers. Significant benefits of 23% higher salaries remain at the median among private school alumni, though not necessarily for workers in either tail of the conditional distribution.

Starting salaries may not reflect a worker's long-term earning prospects. I therefore incorporate data on median salary by occupation (from the BLS Occupational Employment Statistics), and merge these by the occupation each respondent reported in 2000. OLS and quantile regression results are listed in Table 6. According to this specification, single-sex schooling yields monotone increasing coefficients for women, supporting the selection bias hypothesis. On the other hand, only the left half of the men's conditional distribution is affected, and SSE yields no benefit in most cases. Unfortunately, these results are likely impacted by the decreased variation in the dependent variable, given that only 39 different occupations are reported in the NELS.

I also analyze starting salaries using switching regressions to address selection bias. Suppose there are two regimes, one for SSE, and the other for coeducation:

(12) $$lsalary_{ij} = X_i\beta_j \qquad j: SSE \text{ or } C$$

A latent indicator function determines SSE attendance and whether $lsalary_{SSE}$ or $lsalary_C$ is observed. To estimate this model, I incorporated all significant regressors from specification (1) in the first stage. Inverse mills ratios were then included in the second stage wage regressions.[2]

[2] To address possible concerns about weak instruments, I only use significant regressors in the first stage. In addition, regressions on predicted wage residuals including the instruments yield very low R-squared values, and it appears that instruments are insignificant in reduced form wage regressions.

Resulting salary predictions are reported in Table 7 by gender and school type for a variety of characteristics. Controlling for selection into these schools, African-Americans experience large salary gains relative to their coed peers. In addition, it appears that SSE alumnae may be able to "catch up" to their male peers from coeducational schools, with large investments in education.

Is it Just the Catholic Effect?

Many studies have examined the effect of Catholic schooling on students, reaching an apparent consensus that these students are significantly more likely to finish high school.[3] According to Grogger and Neal (2000) urban minorities fare particularly well in terms of educational outcomes. On the other hand, Sander and Krautmann (1995) find that graduates are not more likely to pursue college education, though Altonji et al. (2005b) suggest college attendance may be enhanced. It is certainly true that many single-sex schools are Catholic, and additional robustness tests are warranted.

Within this NELS sample, 80% of the boys' school students are at Catholic schools, but that is true for only 51% of the females (not an overwhelming majority). I have estimated the probability of obtaining bachelor's degrees with additional regressors for religious and secular schools, as well as interaction terms. I find no significant effects. Another robustness test involved augmented starting salary regressions. Estimated OLS and quantile regression

[3] In addition to those mentioned, Evans and Schwab (1995) and Neal (1997) confirm the positive correlation between Catholic school attendance and H.S. diploma attainment. Sander (1995) reports that eight years of Catholic primary schooling yield higher test scores, while Jepsen (2002) finds that Catholic primary schooling has no effect on later scores. Altonji et al. (2005a) discuss important caveats for the predicted effects of Catholic school attendance.

coefficients appear in Figure 2. The effect of girls' school attendance increases through conditional quantiles. We also see a positive benefit to religious single-sex schooling for girls at the left tail of the conditional salary distribution, and much lower gains for the right tail. For those with lower unobserved performance, a Catholic girls' school may generate significant gains. The effect of boys' schooling appears greater up to the median. For men, Catholic schooling is particularly beneficial for those earning (conditionally) lower salaries, but SSE Catholic schooling yields lower income. As a final robustness check, I have also run this analysis on Catholic school attendance, rather than SSE. Descriptively, Catholic school students have lower test scores and similar incomes, much like the private coed sample. Compared to non-Catholic private schools, I also find no direct effect on degree attainment, scholarships, or starting salaries.

4. Efficacy and Equity in Public Single-Sex Education

To truly evaluate public single-sex education, it is necessary to consider not only the resulting outcomes for alumni, but also the equity in both implementation and long-term effects. Results presented in this analysis suggest limited benefits for graduates. A variety of estimates imply higher salaries, particularly for those of median ability. And compared to other private schools, single-sex institutions lead to less gender segregation in college major, but coed schools fare even better in this respect. A possible explanation is the reinforcement of gender stereotypes at single sex schools (as some detractors claim). It is also somewhat troubling that SSE alumni are unlikely to meet their educational expectations. There appears to be no significant difference in receipt of BA/BS degrees, though SSE alumnae are more likely to obtain scholarships. Taken together, these results do not provide a ringing endorsement of single-sex education.

Some positive prospects do nonetheless arise. First, predicted salaries for alumnae of girls' schools are often similar to alumni from coeducational schools, suggesting enhanced gender equity through higher salaries for some women. In addition, African-American students experience unique gains, and single-sex education may therefore provide an important opportunity to continued improvements in educational quality and outcomes for African-Americans.

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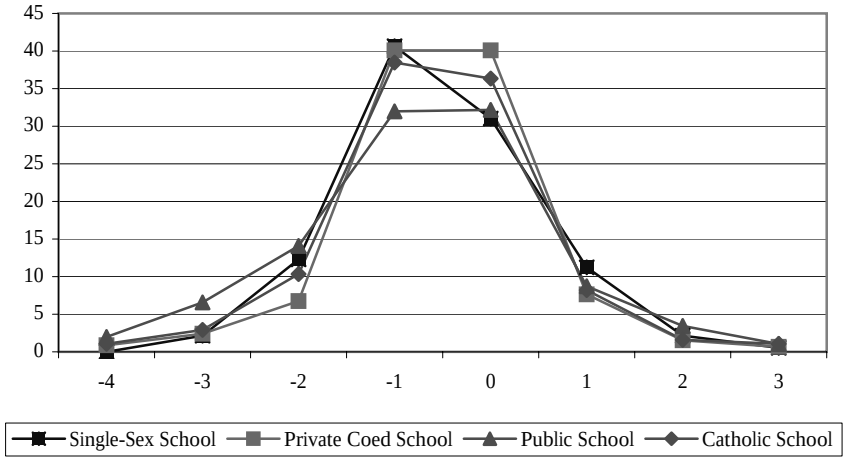
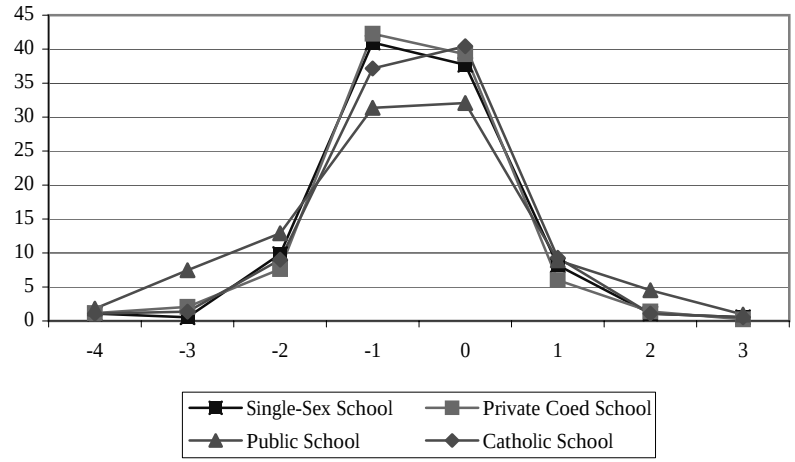
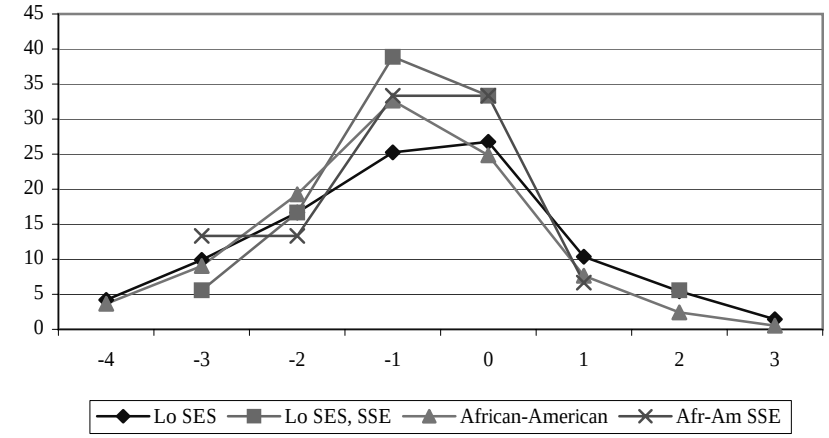
Figure 1. Educational Attainment Relative to Expectations
Zero: Attainment = Expectation

Females



Males





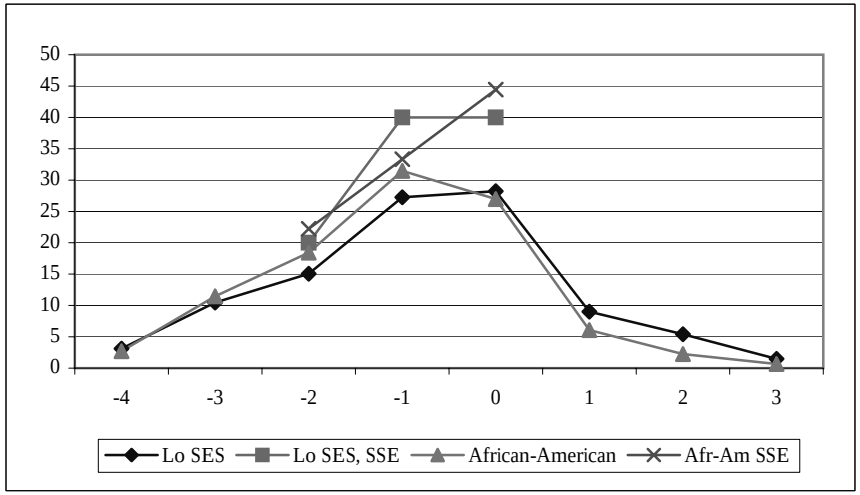
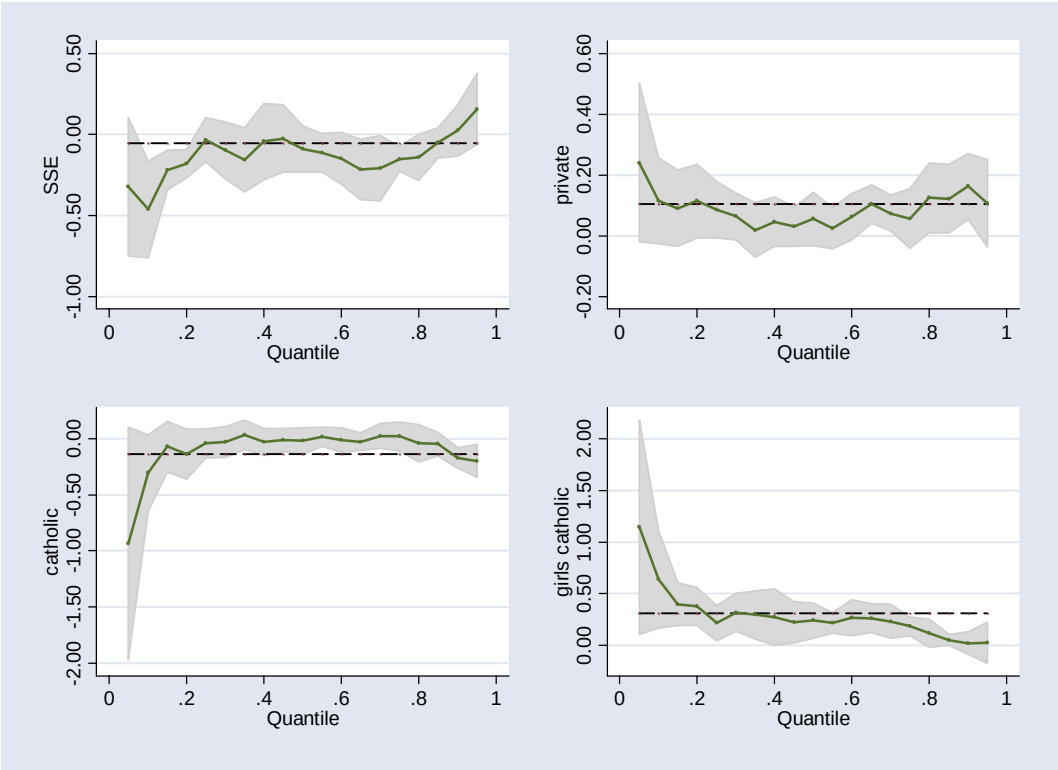


Figure 2. The Effect of Private, Catholic, and Single-Sex Education on Starting Salaries

Women



Men

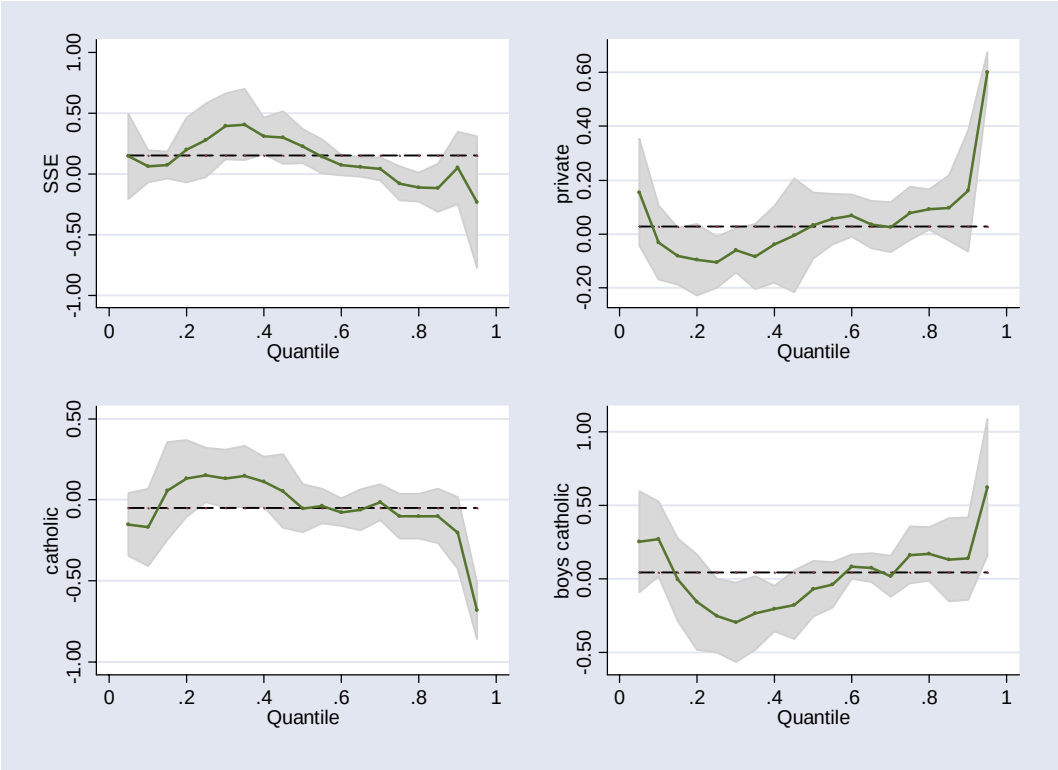


Table 1. Summary Statistics

	Females			Males		
	Private Single-Sex	Private Coeducation	Public Coeducation	Private Single-Sex	Private Coeducation	Public Coeducation
Reading Score	56.66	55.47	51.43	56.73	54.36	49.67
	(8.74)	(9.59)	(10.05)	(9.14)	(9.97)	(9.84)
Math Score	54.43	54.66	50.25	57.32	55.10	50.91
	(9.75)	(8.89)	(9.92)	(8.80)	(9.69)	(10.17)
Science Score	53.12	51.63	49.64	55.84	55.21	51.71
	(9.37)	(9.13)	(9.41)	(9.30)	(10.63)	(10.58)
Percent	9.47	2.99	26.95	2.65	2.89	24.39
in Lowest SES	(29.36)	(17.05)	(44.38)	(16.13)	(16.78)	(42.94)
Percent	63.68	60.47	19.25	61.17	63.91	20.58
in Highest SES	(48.21)	(48.94)	(17.05)	(48.86)	(48.07)	(40.43)
Single-Sex School	0.223	0.085	0.038	0.187	0.038	0.029
in Zip Code	(0.418)	(0.278)	(0.190)	(0.391)	(0.191)	(0.169)
Expect to go to	0.920	0.940	0.790	0.977	0.870	0.752
College	(0.27)	(0.24)	(0.41)	(0.15)	(0.34)	(0.43)
Attended	0.000	0.015	0.006	0.001	0.004	0.003
Single-Sex College	(0.00)	(0.12)	(0.08)	(0.03)	(0.06)	(0.06)
Received College	0.381	0.370	0.334	0.293	0.292	0.256
Scholarship	(0.49)	(0.48)	(0.47)	(0.46)	(0.46)	(0.44)
Earned BA/BS	0.641	0.589	0.309	0.610	0.520	0.247
	(0.48)	(0.49)	(0.46)	(0.49)	(0.50)	(0.43)
Earned Post-Grad	0.087	0.096	0.037	0.073	0.058	0.022
Degree	(0.28)	(0.29)	(0.19)	(0.26)	(0.23)	(0.15)
Income in 1999	28,158.06	25,546.00	21,639.32	43,298.36	33,523.68	29,553.41
	(13310.33)	(13404.76)	(14291.06)	(22129.10)	(29443.12)	(20211.01)
Median Income,	31,016.63	32,663.38	29,889.76	35,916.01	36,310.43	32,924.80
Chosen Occupation	(11602.47)	(10485.60)	(12379.25)	(17557.84)	(16665.22)	(14798.27)
Observations	186	468	4875	188	449	4183

Data: National Educational Longitudinal Study, Private School Survey, Occupational Employment Statistics.
Standard deviations in parentheses.

Table 2. Probability of Attending a Single-Sex School

	Females		Males	
	All Students	Private Schools	All Students	Private Schools
African-American	-0.007	0.259**	-0.002	0.227
	[0.005]	[0.118]	[0.005]	[0.173]
Lowest Socioeconomic	0.003	0.427***	-0.011***	-0.138
Quartile	[0.007]	[0.122]	[0.004]	[0.157]
Second Socioeconomic	0.004	0.08	-0.009***	-0.229***
Quartile	[0.007]	[0.104]	[0.003]	[0.084]
Highest Socioeconomic	0.019**	0.072	-0.00005	-0.202***
Quartile	[0.009]	[0.077]	[0.003]	[0.074]
Reading Score	0.0005*	0.006	0.0003**	0.002
	[0.0002]	[0.005]	[0.0002]	[0.005]
Math Score	-0.0002	-0.005	0.0002	0.010**
	[0.0003]	[0.005]	[0.0002]	[0.005]
Science Score	0.00001	0.007	-0.0003	-0.001
	[0.0003]	[0.005]	[0.0002]	[0.004]
Expect to go to College	0.003	-0.114	0.010***	0.392***
	[0.006]	[0.121]	[0.003]	[0.060]
Religious Participation	-0.009**	-0.197***	0.001	-0.195**
	[0.004]	[0.064]	[0.003]	[0.076]
Urban Residence	0.072***	0.072	0.088***	0.424***
	[0.012]	[0.064]	[0.016]	[0.053]
Girls' School in	0.075***	0.303***		
Zip Code	[0.024]	[0.087]		
Boys' School in			0.038**	0.387***
Zip Code			[0.017]	[0.079]
Pseudo R-squared	0.209		0.353	
Observations	4503	629	3957	598

MLE Probit marginal effects are reported, with robust standard errors in brackets.
NCES sampling weights are also incorporated.
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 3. Bachelor's Degree Attainment and Scholarship Receipt

	Females				Males			
	Probit Marg. Effects (1)	Prob(BA) Single-Sex (2)	Prob(BA) Coeducation (3)	Probit Rec. Scholarship (4)	Probit Marg. Effects (5)	Prob(BA) Single-Sex (6)	Prob(BA) Coeducation (7)	Probit Rec. Scholarship (8)
Single-Sex School	0.207**			0.117	0.216			-0.108*
	[0.096]			[0.079]	[0.234]			[0.052]
Private School	0.167***	0.645	0.591	-0.005	0.548***	0.692	0.548	0.0401
	[0.053]			[0.044]	[0.169]			[0.046]
Lowest Socioeconomic	-0.275***	0.413	0.138	0.023	-0.514***	0.614	0.105	0.0088
Quartile	[0.026]			[0.032]	[0.099]			[0.035]
Highest Socioeconomic	0.109***	0.780	0.689	-0.184***	0.648***	0.769	0.627	-0.0193
Quartile	[0.031]			[0.027]	[0.082]			[0.029]
Rank in	-0.937***			-0.620***	-1.841***			-0.4736
High School Class	[0.055]			[0.050]	[0.143]			[0.048]
African-American	0.071	0.932	0.304	0.320***	-0.235	0.561	0.150	0.0397
	[0.046]			[0.036]	[0.175]			[0.060]
White		0.623	0.415			0.698	0.341	
Observations	3307	101	3206	3307	2989	126	2852	2989

Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%
Additional regressors include additional race/ethnicity, test scores, and a constant term.
Conditional estimated probabilities from models adjusting for sample selection into the treatment group of single-sex or coeducation.

Table 4. College Major Choice

College Major	Females Private Single-Sex	Females Private Coeducation	Females Public Coeducation	Males Private Single-Sex	Males Private Coeducation	Males Public Coeducation
Philosophy & Religion	0.38	2.43	0.38	5.39	0.58	0.66
Language	0.70	0.31	0.54	0.11	0.66	0.23
Culture Studies	1.06	1.37	0.64	0.80	1.24	0.61
Doctors/Dentists	0.18	0.32	0.72	0.37	0.08	0.67
Mathematics	2.11	3.45	0.72	0.23	0.57	0.62
Agriculture & Forestry	0.00	0.00	0.76	1.72	1.20	2.05
Home & Leisure	0.00	0.72	0.95	0.00	0.00	1.11
Mechanical	0.00	0.21	1.05	0.90	1.63	8.60
Literature	5.51	1.42	1.38	2.71	4.34	0.94
Performing Arts	1.13	1.40	1.59	2.49	1.21	2.10
Cosmetology	0.23	0.00	1.84	0.00	0.00	0.20
Law	0.23	1.51	1.84	0.50	0.64	0.86
Engineering	0.30	2.68	1.94	9.33	5.89	9.92
Computer	0.62	1.82	2.11	1.73	3.81	3.83
Art & Architecture	3.40	3.67	2.46	2.56	1.53	3.33
Communications	5.46	2.30	3.14	6.02	4.43	3.19
Administrative Assistant	4.82	0.28	3.17	3.93	1.53	0.75
Science	11.61	3.88	4.63	4.75	6.22	5.52
Social Sciences	12.96	11.77	9.37	8.52	7.71	7.04
Business & Economics	7.59	12.03	13.46	19.69	16.14	15.09
Miscellaneous	19.25	6.89	14.08	20.18	26.74	20.45
Education	6.86	19.79	15.49	4.60	3.83	5.67
Health	15.60	21.74	17.23	3.49	9.91	6.55
Duncan Index	33.17	40.82	29.05			

Data: National Educational Longitudinal Study, Private School Survey, Integrated Postsecondary Education Data System.
Duncan Index reflects gender segregation within school type.

Table 5. Effect of Single-Sex Schooling on Starting Salaries

	Females		Males	
	All Schools	Private Schools	All Schools	Private Schools
OLS estimate	0.211***	0.161*	0.161***	0.166*
	[0.072]	[0.083]	[0.062]	[0.097]
Q=0.10	-0.020	-0.216	0.148*	0.113
	[0.183]	[0.108]	[0.085]	[0.121]
Q=0.25	-0.013	0.046	0.037	0.165
	[0.076]	[0.094]	[0.108]	[0.110]
Q=0.50	0.107**	0.090	0.184***	0.175***
	[0.022]	[0.060]	[0.039]	[0.057]
Q=0.75	0.082	0.146**	0.096*	0.0636
	[0.066]	[0.065]	[0.054]	[0.060]
Q=0.90	0.128	0.155	0.198*	0.130
	[0.103]	[0.097]	[0.109]	[0.105]
Observations	2869	505	2939	516
R-squared	0.31	0.29	0.16	0.35

Robust standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%
Additional Regressors include race/ethinicity, degree attainment, marital status, hours worked, urban/rural, children, and a constant term.
Quantile regression estimates result from 500 bootstrapping repetitions.

Table 6. Effect of Single-Sex Schooling on Median Salaries by Occupation

	Females		Males	
	All Schools	Private Schools	All Schools	Private Schools
OLS estimate	-0.06	-0.069	0.019	0.012
	[0.052]	[0.049]	[0.066]	[0.065]
Q=0.10	-0.017	-0.031	0.066	0.052
	[0.026]	[0.039]	[0.043]	[0.052]
Q=0.25	-0.046	-0.072**	0.108*	-0.027
	[0.029]	[0.033]	[0.055]	[0.055]
Q=0.50	-0.008	0.000	0.038	0.034
	[0.024]	[0.032]	[0.041]	[0.046]
Q=0.75	0.030	0.009	-0.012	-0.072
	[0.053]	[0.053]	[0.031]	[0.052]
Q=0.90	-0.021	0.020	-0.035	-0.029
	[0.046]	[0.051]	[0.029]	[0.045]
Observations	3041	523	3044	531
R-squared	0.17	0.14	0.08	0.13

Robust standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%
Additional Regressors include race/ethinicity, degree attainment, marital status, hours worked, urban/rural, children, and a constant term.
Quantile regression estimates result from 500 bootstrapping repetitions.

Table 7. Predicted Wages Resulting from Selection-Corrected Regressions on Salary

	Females				Males			
	Starting Salaries		Occupational Salaries		Starting Salaries		Occupational Salaries	
	Single-Sex	Coeducation	Single-Sex	Coeducation	Single-Sex	Coeducation	Single-Sex	Coeducation
African-American	30,424.67	19,700.72	36,089.46	28,938.67	37,958.08	26,929.58	26,349.12	32,386.87
Single	31,865.45	26,746.47	32,119.79	31,403.30	31,644.26	30,959.60	37,243.44	34,390.24
Married	25,241.34	25,270.60	33,146.15	30,845.68	34,853.80	36,736.82	31,724.31	34,535.98
H.S. Diploma	25,509.95	21,795.10	28,323.60	27,574.74	32,807.72	31,712.73	31,121.69	32,374.94
BA/BS Degree	30,673.94	32,458.12	33,788.17	35,150.56	38,589.97	37,857.33	43,434.79	38,753.70
Grad. Degree	36,842.26	30,200.12	34,103.28	42,781.50	23,920.30	31,516.97	35,866.24	46,126.55