Irrelevance of High School Performance for Reversal of the College Gender Gap

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Abstract

Comparison of the National Longitudinal Survey of the high school class of 1972 (NLS) and the National Education Longitudinal Survey of the high school class of 1992 (NELS) captures the reversal of the gender gap in enrollment in higher education in the United States. Analysis of the interacting effects of parental educational background, high school grades and high school curricula shows that while increased education of parents explains some of the overall increase in college attendance of their children, it does not explain the reversal from a male surplus to a female surplus of college students. Observed changes in high school performance across cohorts, whether measured by grades or college preparatory curricula, do not explain either the increased college attendance or the gender gap reversal. This reversal occurred within categories of parental education and high school performance, and should not be attributed to trends in either of these features of students' lives.

Reversal of the College Gender Gap

A dramatic reversal of the gender gap in higher education began in the last quarter of the 20th century and is still in progress today. From almost no higher education at the start of the 20th century (Cameron & Heckman 1998, Carlson 2008), formal schooling subsequently expanded (Folger & Nam 1967, Trow 1973, Goldin 1998) as a key institutional channel determining other aspects of social position (Sewell, Hauser & Wolf 1980, Shanahan, Miech & Elder 1998). For cohorts born in the second quarter of the century, higher educational attainment among men surged ahead at a record pace while women lagged in schooling (Mare 1979, Buchmann, DiPrete & McDaniel 2008). For the Lucky Few generation born between 1929 and 1945, the gender gap in higher education favoring men grew wider than at any previous time in U.S. history (Goldin, Katz & Kuziemko 2006; Carlson 2008). Although baby boomer women born between 1946 and 1964 experienced strong gains in schooling, college attendance and completion also increased for boomer men, so men retained their lead in higher education. In the final quarter of the century, however, Generation X born between 1965 and 1982 actually reversed the pattern observed for earlier generations. For the first time in U.S. history among whites, more women than men enrolled in college and completed associate and baccalaureate degrees (Buchman & DiPrete 2006, DiPrete & Buchman 2006). (The gender gap in higher education among black Americans has always favored women as far back as records are available.) The female advantage in college enrollment and completion continues to intensify in subsequent cohorts (but see American Council on Education 2010).

Parental Education and High School Performance as Predictors

In their 2006 article on the reversal of the college gender gap, Buchman and DiPrete examined evidence from General Social Surveys showing that family backgrounds have changed as influences on college attendance and completion for whites in the United States between 1972 and 2002. They distinguish between generations born before and after 1965 (thus Generation X in their younger cohort versus mostly baby boomers in the older group). They conclude that young baby boomers did not necessarily emulate same-sex parents as role

models in educational attainment. However, such gender-specific educational inheritance emerges more strongly for Generation X respondents: "…mother's level of education has become more important for daughters and the father's level of education has become more important for sons." (Buchman & DiPrete 2006: 523). These findings differ from those of Kalmijn (1994), but Kalmijn did not have Generation X respondents in his study and did not consider shifts/intereactions in such patterns across cohorts.

Buchman and DiPrete (2006) also added analysis of the National Education Longitudinal Survey of the high school class of 1992 (NELS), which picked up this cohort of students in 1988 when they were beginning high school and then followed them for nearly a decade after graduation. This longitudinal data set includes only members of the Generation X cohort, so for this younger part of the population they had studied in the General Social Survey results, Buchman and DiPrete were able to delve deeper into the mechanisms by which the boys in Generation X lagged behind the girls in college attendance. From the NELS respondents, they learned that one of the ways that parents of Generation X may have transmitted their own educational advantages and their educational aspirations to their children was by encouraging them to perform at a higher level in high school. High school performance (measured in terms of both grades and participation in college preparatory curricula) was correlated to some extent with parental education of the NELS respondents, but Buchman and DiPrete reported that such high school performance measures independently increased their power to predict college outcomes.

However, because the NELS respondents were all in Generation X, Buchman and DiPrete were unable to say whether the role of high school performance as a transmitter of parental advantage and aspirations worked differently for these Generation X students than had been the case for the previous generation of boomer children. Correlations between high school performance and college attendance in cross-section in this one cohort do not necessarily mean that changes in such performance over time were connected to changes in college attendance across cohorts. The General Social Survey data for older generations had no information about high school curricula or grades.

We extend the previous findings of Buchman and DiPrete by replacing the General Social Surveys with the National Longitudinal Survey of the high school class of 1972 (NLS), which followed up an earlier cohort for nearly a decade after graduation. All the NLS respondents were at the heart of the baby boom generation. This longitudinal survey, like the NELS data following the graduating class of 1992, included information on both family background and high school performance. Thus we are able to replicate the research of Buchman and DiPrete on Generation X students, to extend the analysis to a boomer cohort from NLS data, and then to compare the two cohort patterns of parental backgrounds and high school performance as interacting effects. Not only can we see how changes in parental education affected college enrollment by their children, but we can also examine how high school performance changed between these two cohorts, both in terms of changing patterns of high school results, and changes in how these results were related to parental backgrounds and college enrollment.

Data from Educational Longitudinal Surveys

The National Longitudinal Survey (NLS) followed the high school class of 1972 for seven years after high school graduation, to capture most of the process that produced more male than female college graduates for this group at the heart of the baby boomer generation. The National Education Longitudinal Survey (NELS88) began observing the high school class of 1992 when they entered high school as freshmen and then continued follow-up intervals for eight years after high school graduation, to capture the process that reversed the previous gender gap and produced more female than male graduates for this Generation X cohort.

The NLS72 survey interviewed 16,693 high school seniors in Spring 1972 using a two-stage national probability sample of 1000+ public and private high schools in all 50 states and the District of Columbia. We follow previous studies that take into account statistical issues of clustering raised by this school-based sampling design with tools such as Stata's SVY procedure and the AM statistical software developed for use with the ELS surveys. The first follow-up conducted from October 1973 to April 1974 re-interviewed 93.7 percent of original respondents and added 4,450 1972 seniors with retrospective questions about 1972 circumstances. The second follow-up conducted from October 1974 to April 1975 included 94.6 percent of the 20,872 respondents to the first follow-up. The third follow-up from October 1976 through May 1977 collected information about circumstances of respondents as of October of both 1975 and 1976, and included 93.9 percent of second follow-up respondents. A fourth follow-up took place from October 1979 through May 1980, and included 18,630 respondents. A fifth follow-up was conducted in 1986, over-sampling key minority subgroups from the roster of respondents who completed any of the previous surveys, but we will not use this final round in proposed research. Minor changes from 1980 to 1986 in four-year degrees granted are immaterial for assessing the general outlines of gendered educational outcomes up to the baccalaureate level, while complexity of sample weighting and the much smaller size of the fifth follow-up raise serious barriers for our analysis.

The NELS88 survey began with a stratified two-stage probability sample of 21,474 eighth-grade students in approximately 1500 schools in 1988, freshened at the first follow-up in 1990 to make it nationally representative of public and private high school sophomores, and again at the second follow-up in 1992 to make it nationally representative of public and private high school seniors. In each of these follow-up surveys, some members of the original sample who were not successfully interviewed in the baseline survey were recovered and answered retrospective questions to capture some of the responses missed by non-response to the baseline survey. Since most existing research on the reversal of the gender gap in higher education concludes that crucial changes in grade progression over these years involved transition from high school into college and progression through college (rather than changes such as rates of high school completion) we will focus on the "refreshed" 1992 sample of high school seniors within NELS88 as captured in the third follow-up in 1994 and the fourth follow-up in 2000. Cost constraints affected these later follow-ups in the NELS88 series. Consequent sub-sampling reduced the third follow-up from 21,635 high school seniors in 1992 to 15,964 respondents in 1994, without affecting representativeness as a national sample of 1992 high school seniors. The final 2000 round included 12,144 respondents.

As shown in Table 1 below, the boomer generation studied in the NLS survey of the high school class of 1972 faithfully presents the national pattern for that generation. More men than women among white NLS respondents enrolled in college over the course of the decade following high school graduation. It is important to keep in mind that this male surplus in college enrollment is only a part of the overall picture, because it refers only to enrollment by people who actually finished high school. We do not include or consider here the educational attrition that takes place before high school graduation, limiting attention here to the population at risk of enrollment (that is, high school graduates).

Table 1 Here

Two decades later, the NELS data (previously studied by Buchman and DiPrete and others) showed the reversal that prompted them to write on the subject. Table 1 shows that while both male and female high school graduates in the NELS Generation X cohort showed higher propensities to enroll in college among whites, the gains over the NLS boomers were much greater (about twice as great) for women than for men. In the NLS cohort, boomer women lagged behind boomer men in college enrollment after graduating from high school. But in the NELS cohort, Generation X women moved ahead of Generation X men in going to college after

finishing high school. This is the reversal of the gender gap in college enrollment, so widely discussed in both popular and scholarly accounts.

Modeling Mechanisms Underlying the Reversal

This analysis takes a three-pronged approach to factors that might explain the reversal shown in Table 1, following the logic of Buchman and DiPrete but filling out the picture in ways that go beyond their 2006 analysis. First of all, we look again at the fact that just as NELS respondents were about 20 years younger than NLS respondents, the parents of the NELS students also represent a more recent generation of better-educated parents. In fact, many of the parents of NELS respondents are about the same age as the NLS student respondents.

Table 2 shows that for the NLS high school class of 1972, educational levels of parents were very similar for male and female respondents. Neither parent had attended college for about half of white respondents. One parent had been to college for slightly more than one-fourth of them, and both parents had attended college for the remaining one-fourth or less. By comparison, just under three-fourths of black NLS respondents reported neither parent as having ever attended college, with one-fifth reporting one parent who attended college and one-tenth reporting both parents with college experience.

Table 2 Here

For the 1992 high school class of NELS respondents, parents' college experience was again about the same for both sexes. Gains over the two decades were greater for black than for white students. Only about a third of white students reported neither parent attending college, and almost half (the modal category) reported both parents having attended college. Less than half of black NELS respondents reported that neither parent attended college, and the share reporting both parents with college experience more than tripled compared to the NLS for both male and female students.

We expect that even if the propensity for students to go on to college had not changed within levels of parental education, this structural shift in the population of parents should have translated into strong gains in college attendance for their children. Since the parental shift was almost identical for male and female students among both black and white respondents, however, this simple structural effect probably would not explain the actual gender reversal itself. As noted above, Buchman and DiPrete reported this same result and pointed out that part of the cause of the gender gap reversal may have been a stronger tendency for the female NELS respondents to emulate their more educated mothers, a gender role imitation effect they did not find in the General Social Survey data for boomers and other previous generations of students.

Beyond this important parental background feature, more college enrollment among the Generation X respondents in NELS data might also reflect changes in the experiences they had during their high school years. NELS cohort might have taken greater advantage of college preparatory courses and curricula. They might have taken high school more seriously in general and earned higher grades than the NLS respondents from the baby boom generation. If these features of the high school experience changed across cohorts, we would expect such changes to lead to more college enrollment, even if the propensity to go to college remained constant within categories of high school experience.

Table 3, however, does not offer much encouragement to such a hypothesis. Only black female respondents showed any important distributional improvement in college prep course enrollment and in earning at least half of their grades above a B level. For whites of both sexes, the share of NELS students with both high grades and college prep course work was almost identical to the share observed among NLS students from 20 years earlier. The share with neither high grades nor college preparatory courses actually increased slightly across these two cohorts.

Table 3 Here

After accounting for these two sources of change in the proportion of high school graduates going on to college, the remainder of the observed trends remains as a residual tendency—an increased or decreased propensity to enroll in higher education *within* each category of parental educational background and high school performance. This residual tendency remains unexplained by such background factors, so that we will need to look elsewhere for new understanding.

Indirect Standardization Models of Change in College Enrollment

While multivariate regression models (both OLS and, in the case of binary outcomes like college enrollment, logit and other approaches) are much in vogue for analysis of such issues, we have opted here for a simpler classic indirect standardization approach. This approach, while it does not directly produce estimates for significance tests, also avoids a host of perhaps unwarranted assumptions about normality of underlying distributions, correlation of error terms, and other arcane matters that can seriously compromise the logical robustness of model results. While multivariate regression models can be good for identifying the relation of certain social-structural factors/categories to studied outcomes, such models also are not good for simultaneous attention to changes in the underlying distribution of populations across such structural categories. In addition, the standardization approach is closer to the actual observed data. There are no "error terms" in these results. The results fit the original data exactly and completely.

Indirect standardization can be described in general as a matter of combining differences and averages. For example, we calculated the array of proportions of respondents within each category of parental education (neither parent, only one parent or both parents attended any college) and high school performance (college preparatory curricula or not, half of high school grades A's and B's or not) who went on to enroll in college, separately by race and sex of student, first using NLS data and again using NELS data. We subtracted these proportions in the NLS arrays from equivalent elements in the NELS arrays. We calculated averages of equivalent elements in these pairs of arrays. These three sets of arrays are referred to below as the "attendance" measures, referring to the propensity of people in each of the considered categories to enroll in college.

We also calculated an array of proportions of respondents who reported themselves in each of these categories of parental education and high school performance, adding up to 100 percent of the respondents in each category of race and sex in each survey. We again subtracted elements of the NLS arrays from the equivalent elements of the NELS arrays. We calculated averages of equivalent elements in these pairs of arrays. These three sets of arrays are referred to below as the "distribution" measures, referring to the distribution of respondents across the categories of parental education and high school performance for each race/sex group in each survey.

The total difference in attendance for each race/sex group (shown in Table 1 above) can then be disaggregated into components by multiplying one set of averages times the other set of differences and summing the results.

For example, the difference in college enrollment for black female NELS versus NLS respondents who got good grades but did not take college preparatory courses in high school and both of whose parents attended college can be multiplied by the average of the proportions of black female respondents who fell into this category in the two surveys. When this multiplication is performed and the results added across all categories of parental education and high school performance, we see how much college attendance increased for black female respondents as a result of changing propensities within these structural categories. The distribution of respondents across the categories is held constant at its average level for the two surveys.

On the other hand, the average of college enrollment proportions for black female NELS and NLS respondents in the same specific category described above can be multiplied by the difference in the proportions of black female respondents who fell into this category in the NELS compared to the NLS survey. When this product is summed across all categories of parental education and high school performance, we see how much college attendance increased for black female respondents as a result of the distributional changes in parental background and high school performance, with propensities to attend in each category held constant at the average level in the two surveys.

These two components of changes--the propensity to attend within categories, and changes in the distribution of respondents across categories--sum to the total effect reported in Table 1 above. We can see how much of the change we have explained in terms of parental education and high school performance changes (the latter of the two effects above) and how much remains unexplained and mysterious (the former of the two effects above). We also can further disaggregate each of these effects. Table 4 reports the distributional change effects attributable to gains in parental education separately from those attributable to changes in high school grades and experiences with college prep courses. It also disaggregates the mysterious and unexplained changes in propensities to attend for different categories of high school experience, so that changing propensity effects within each of these four categories add up to the overall propensity change effect. Table 4 shows several clear and straightforward results.

Table 4 Here

First, the distributional effects of rising parental education clearly had something to do with the gains in college attendance observed in the NELS cohort compared to the earlier NLS generation. For all race/sex groups, more parents with college backgrounds translated into more students going on to college themselves in Generation X than among the earlier boomers. However, the purely distributional effect of increasing parental education was greater for male than for female respondents, among both blacks and whites. If we only consider the notion that more educated parents will have more educated children, we can explain part of the increase in college attendance across cohorts, but none of the reversal in the gender gap. Disaggregating this result further by the sex of the parent when only one parent went to college will not change the overall result, though it might produce some interesting fluctuations in effects across categories of parental education.

Second, the details of high school experiences did not change across these two cohorts in ways that offer any explanations for either increased overall enrollment or reversal of the college gender gap. In fact, NELS respondents in the more recent cohort were actually less likely to enroll in college preparatory curricula and showed no general improvements in grade distributions compared to the earlier NLS boomer cohort. The distribution of students across different categories of high school performance actually changed in ways that would by itself have slightly reduced the share of students going on to college. These results prompted the title of this study, emphasizing the irrelevance of observed changes in high school performance for explaining trends in college enrollment.

Third, the changing propensities to go to college *within* these detailed categories of parental background, grades and high school curricula are left to explain the lion's share of the overall increase in college enrollment for the NELS cohort compared to the earlier NLS group. Even more importantly, the much greater unexplained increase in these within-category propensities for women (both black and white) is what produces the reversal of the college gender gap for whites and the widening of the gap in favor of women among black respondents. Without these changing propensities, given only the observed structural changes, the gender gap for whites would not have reversed. The deficit of male college attendance for blacks would have narrowed rather than widening. Clearly, neither of the factors considered here should be accepted as explanations for the reversal of the college gender gap.

The only hints about this mysterious unexplained increase in propensities to go to college within considered categories of students come from disaggregating these propensity effects according to the categories of high school performance where they originated. Table 4 shows very clearly that the overwhelming bulk of these rising propensity effects appear among the high school students who did not take college preparatory courses, and also among those who did not get the highest grades. In effect, we see that in Generation X the "lower-performing" high school students were catching up with the "higher-performing" students, narrowing the gap in propensities to go on to college and weakening the significance of high school performance as a predictor of higher education. It is this tantalizing insight that may point to new ways to think about and explain the reversal of the college gender gap.

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Table 1 –

College Enrollment Crossover,
1972 to 1992 U.S. High School Graduate Cohorts

Race/Sex	1972	1992	Change
White Males	73.8%	82.6%	**8.8%**
Black Males	70.4%	67.7%	**-2.7%**
White Females	69.8%	85.0%	**15.2%**
Black Females	71.5%	84.9%	**13.4%**

Source: Calculated from NLS-72 and NELS-88 Education Longitudinal Surveys

Table 2 –

College Attendance by Parents of NLS and NELS Respondents

Race/Sex	Survey	Neither Parent	One Parent	Both Parents
White Males	NLS	52.1%	25.1%	22.7%
	NELS	31.9%	24.0%	44.0%
Black Males	NLS	73.0%	18.8%	8.2%
	NELS	39.3%	34.3%	26.4%
White Females	NLS	52.1%	27.3%	20.7%
	NELS	34.6%	24.8%	40.7%
Black Females	NLS	71.3%	19.0%	9.7%
	NELS	46.2%	23.0%	30.8%

Source: Calculated from NLS-72 and NELS-88 Educational Longitudinal Surveys

Table 3 -

High School Performance of NLS and NELS Respondents

Race/Sex	Survey	Neither Parent	One Parent		Both Parents
		Low grades No CP	High grades No CP	Low Grades Coll Prep	High Grades Coll Prep
White Males	NLS	45.7%	5.3%	30.4%	18.5%
	NELS	47.9%	14.1%	19.7%	18.2%
Black Males	NLS	67.1%	5.5%	21.3%	6.1%
	NELS	68.5%	5.3%	22.3%	3.9%
White Females	NLS	38.7%	13.7%	20.9%	26.8%
	NELS	44.1%	14.9%	15.4%	25.7%
Black Females	NLS	59.7%	11.8%	17.9%	10.6%
	NELS	52.7%	14.4%	16.0%	16.9%

Source: Calculated from NLS-72 and NELS-88 Educational Longitudinal Surveys

Table 4 –

Race/ Sex	Parental Education Gains	HS Performance Changes	Enrollment Propensity Change	of which: Low grades No CP	of which: High grades No CP	of which: Low Grades Coll Prep	of which: High Grades Coll Prep	Net Total Change
White Males	**6.1%**	**-2.5%**	**5.2%**	*4.4%*	*1.7%*	*-0.5%*	*-0.4%*	**8.8%**
Black Males	**7.1%**	**-2.0%**	**-7.9%**	*-7.1%*	*0.4%*	*-1.5%*	*0.2%*	**-2.7%**
White Females	**5.5%**	**-2.4%**	**12.7%**	*8.2%*	*3.3%*	*0.3%*	*0.9%*	**15.2%**
Black Females	**3.5%**	**-0.3%**	**9.4%**	*5.0%*	*2.7%*	*0.8%*	*0.9%*	**13.4%**

Source: Indirect standardization of data from NLS-72 and NELS-88 Educational Longitudinal Surveys