

Private High School and the College Trajectory

By CONOR COUGHLIN*

The relative effectiveness of secondary school types is an issue at the center of the debate surrounding recent efforts to increase school choice through school voucher programs. In this paper, I use the National Center for Education Statistics' (NCES) 1988 National Educational Longitudinal Study (NELS) to evaluate the effect of private secondary schooling on the average college trajectory of an American student, examining college enrollment and graduation rates across the private and public sectors. I am the first to examine the effect of private schooling on college degree attainment using this most recent NCES survey. Results indicate that private schooling has a significant, positive effect on college enrollment and degree attainment. Further, I find that the effect on college enrollment diminishes with time, suggesting that private schools not only prepare students to persist on college campuses, but also to arrive at college sooner. These relationships are more pronounced after correcting for selection, suggesting that the selection bias is in fact negative. My findings support efforts to increase school choice in the United States.

* Colgate University, Department of Economics (ccoughlin@colgate.edu). The author would like to thank Carolina Castilla and the 2013-2014 honors seminar participants at Colgate University, as well as Mary McGee, a classmate, friend, and coauthor on a previous draft.

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1. Introduction

The question of the relative effectiveness of different secondary school types is one that stands at the center of the debate surrounding recent efforts to increase school choice in the United States, such as school voucher programs. Today, there are 32 school voucher programs across 16 states and Washington, DC serving at least 210,000 students (Economist, 2012). While these programs have manifested primarily at the state and municipal levels, a recent Senate proposal would divert \$24 billion in federal education funds to provide vouchers for up to 11 million low-income children across the United States¹. These programs are controversial. Parents who would otherwise send their students to public schools use the vouchers to enter the private sector (The Economist, 2012). Critics suggest that these school choice programs drain public sector resources, and in the case of religious schools, erode the barrier between church and state. Proponents argue that these vouchers afford low-income families with deserved choices and promote competition. In order to evaluate these efforts to increase school choice, it is essential that we understand the relative effectiveness of the different sectors for student achievement. This is a question that has received considerable attention, but the debate is ongoing and the answer is dynamic. In this paper, I evaluate the effect of private secondary schooling on the average college trajectory of an American student, examining college enrollment and graduation rates across the private and public sectors.

Policy aside, these outcomes carry great significance in their own right, and the debate seems in large part to have missed them. Historically, researchers have considered improvements in test scores as the single most important measure of academic achievement across sectors, when in fact there is little evidence that higher standardized test scores maintain significant economic consequences. The effect of standardized test scores on wages has been found to be modest (Hanushek, Rivkin, and Jamison, 1992; Bishop, 1991). Further, it is argued that standardized tests are culturally, racially, and sexually biased (Santelices and Wilson, 2010; Jencks and Phillips, 1998). Additionally, the approach ignores issues such as “teaching to the test,” whereby teachers emphasize test material ahead of broadly educating for the purpose of inflating scores (Phelps, 2011). This is an issue that has likely been exacerbated by recent efforts to measure teacher performance via pupil test score gains. Educational attainment, on the other hand, particularly attaining a bachelor’s degree (BA), has important and documented economic consequences with respect to employment, job performance, job satisfaction, and income, with degree-holders faring better in each of those instances (Oreopoulos and Salvanes, 2011; Pascarella and Terenzini, 2005; Card, 1999).

Those who have explored the relationship between college enrollment, degree attainment, and secondary school type tend to treat these as independent measures of academic achievement, and secondary ones for that matter. I examine college enrollment and degree attainment together across periods to understand the effect of private schooling on a student’s college career. I am the first to examine the effects of private schooling on post-secondary outcomes using the most current and complete longitudinal survey offered by the National Center for Education Statistics (NCES). With access to the final follow up period, I am able to examine not just college enrollment decisions, but also college degree attainment, an outcome with stronger economic consequences. I consider enrollment across periods in an

¹ The Center for Education Reform offers facts, figures, news, and opinions on school choice reform efforts (<http://www.edreform.com/>)

effort to understand the mechanism behind any potential differences in degree attainment—are these differences the result of superior performance on campus or higher rates of college enrollment to begin with? Together, I hope my findings will offer a more complete story surrounding the impact of private secondary schooling on the post-secondary educational trajectory of American students. Additionally, I offer a few methodological innovations that improve upon previous work.

First, I introduce a new strategy to correct for school choice endogeneity. I consider only those students who attended a private middle school in 8th grade, just prior to beginning high school. If the private school decision is in fact driven by some unmeasured characteristics that are associated with favorable post-secondary outcomes, these unmeasured characteristics ought to also drive the decision to attend a private middle school. Thus, these estimates should suffer less from self-selection bias than those which consider students enrolled in both middle school sectors. Apart from sample restrictions, the issue of selection bias with respect to school choice calls for a strong, exogenous instrumental variable (IV). A number of authors use some student or family characteristic—often religious self-identification in the considerable Catholic school literature, although recent papers have questioned the exogeneity of these sorts of IVs with respect to post-secondary outcomes. Student and family characteristics are often augmented with detailed community based measures such as distance to the nearest private school; however, without the NCES' restricted-access National Educational Longitudinal Survey (NELS) data, I am unable to construct this sort of detailed geographic IV. Instead, I exploit variation in private middle school grade spans to explain the high school decision. I construct a dummy variable that takes the value of 1 if a student attended a private middle school that spans grade 12, zero otherwise. This school characteristic is a strong determinant of high school choice across sectors. Intuitively, a private middle school student is more likely to attend a private high school if that high school is a natural extension of the student's middle school. Conversely, a student whose private middle school does not extend through high school faces a different choice and is much more likely to consider and perhaps enroll in a public sector alternative. This sort of school based exclusion restriction captures a supply side characteristic and is favorable to a student or family background characteristic that might very well be endogenous to student achievement. Booker, Sass, Gill, and Zimmer (2011) employ the same IV in the charter school context. They also restrict their sample in a similar manner to only those students who were enrolled in a charter middle school in 8th grade. Finally, I include extensive controls for observable student and family characteristics that strengthen my exclusion restriction. Among my controls are variables on student and parent expectations with respect to degree attainment in 8th grade. The expectation variables carry significant explanatory power with respect to both the private school decision and various post-secondary outcomes and supplement the traditional standardized test score measure as a proxy for ability.

Findings indicate that that private secondary schooling has a significant, positive impact on each post-secondary educational outcome considered. Further, ordinary least squares (OLS) estimates understate the effect of private schooling on college enrollment and degree attainment. After correcting for the self-selection of inferior students into the private sector, the gains are more pronounced. On average, attending a private high school increases the likelihood of attaining a BA or beyond by 21.51 percentage points. As for enrollment, the effect is also significant and positive but decreases with time. On average, attending a private high school increases the likelihood of enrolling in a post-secondary institution 2 years after

high school graduation (assuming 4 years to a high school diploma) by 18.21 percentage points. The estimate falls to 13.29 percentage points 8 years after high school graduation.

2. Literature

A number of studies since 1980 have evaluated the effect of private secondary schooling on educational attainment and academic achievement, with a focus on Catholic schools, as they historically represented the largest share of the private sector (National Catholic Education Association, 2014). Additionally, religious schooling offers an appealing IV strategy in terms of observable student and family religiosity measures. The question surrounding the effectiveness of private schools (both religious and secular) was first evaluated by Coleman, Hoffer, and Kilgore (1982), who examine the relationship between test scores and school type and find significant differences in student achievement. These results were highly contested. Critics (e.g., Goldberger and Cain, 1982) point to a number of methodological issues such as the nature of the test administered and the sampling procedure, but their main concern surrounds selection bias. They insist that the 17 background variables employed do not sufficiently control for initial differences among students entering the private versus public sector. It is thought that parents and students, simply by choosing private schooling, may be signaling observable and unobservable attributes that are advantageous to post-secondary enrollment and degree attainment. If this is so, then any model that does not correct for the non-random selection of superior students into private schools should yield upwardly biased estimates of the effect of private schooling. Subsequent research has focused on tackling the issue of endogeneity with regard to school choice, employing a variety of IVs and considering a diverse set of educational outcomes and measures of academic achievement. While test scores still represent a common measure of student achievement, some authors have turned their attention towards measures of attainment, such as high school completion or college attendance, often presented in tandem with improvements in test scores.

Sander and Krautmann (1995) consider the effect of Catholic schooling on high school dropout rates and years of schooling measured six years after the final year of high school. They use a set of interactions between urbanicity, region, and Catholic self-identification as IVs and use the 1980 High School and Beyond Survey (HS&B). The authors find that Catholic schools have a large, negative effect on the high school dropout rate, but find that students who attend a Catholic high school are no more likely to acquire more schooling after high school once adjustments are made for selection and other background characteristics. In both cases, the authors find little evidence of a selection bias. Evans and Schwab (1995) also use the HS&B to evaluate the impact of Catholic schooling on high school completion and college enrollment, using a dummy for Catholic self-identification as an IV. They find that students enrolled in Catholic schools have a significantly higher probability of completing high school and starting college. Further, these effects are particularly pronounced for urban students. Like Sander and Krautmann (1995), they find little evidence of selection bias.

Neal (1997) uses the 1979 National Longitudinal Survey of Youth to quantify the impact of Catholic schooling on high school completion rates, college degree attainment, and future wages. As IVs for school type endogeneity, he uses religious self-identification and two county-level measures: Catholic identifying share of the population and Catholic high school density. Neal, like Evans and Schwab (1995), finds a significant, positive effect on high school completion, particularly for urban minorities. He considers only urban students and finds significant, positive treatment effects on college graduation rates for both whites and

minorities. As for future wages, he finds a significant, positive effect only for minorities. Like those authors above, Neal finds little evidence of selection bias. If anything, he suggests that the bias may in fact be negative. He hypothesizes that this might be the result of high-income, suburban parents with strong preferences for good schools who send their children to elite public schools outside of the central city. In every case, Neal restricts his sample to only those students within a Metropolitan Statistical Area (MSA), a restriction that I maintain as students in rural areas rarely have access to private alternatives to the public school system.

Figlio and Stone (1997) are the first to consider the relative effectiveness of private schools using the 1988 NELS, which is the same data that I use. At the time, the most recent follow-up period available was 1994, when students would have completed only two years of college had they followed the “natural” track. The final follow-up period for the survey was 2000. Figlio and Stone (1997) consider outcomes including test scores in mathematics, high school completion rates, college persistence (across those two possible years), and college selectivity or prestige. The authors take a three sector approach, allowing for differences in school choice and treatment effects between public, private religious and private secular schools. They construct detailed variables on community characteristics and interactions between these characteristics for use as IVs, employing geographic information made available only in the restricted-access NELS data. These authors, unlike those before them, do not find that private schools have a differential average effect on test scores or high school completion rates, but find that private schooling increases the probability that a student will attend college for at least two years, and a more selective college at that. They do, however, find that private schools improve test scores slightly among urban African-Americans, which is consistent with earlier findings. It is worth noting that their results were consistent across private school type, suggesting that the treatment effects between secular and religious private schools are similar. For this reason, I feel comfortable pooling the two sectors in my analysis. Grogger and Neal (2000) use the same NELS data to consider the effect of Catholic schools on math achievement, high school completion rates, and college enrollment decisions. The authors employ the same IVs as Neal (1997). Generally, the authors find significant effects for urban students, both white and non-white. As for selection issues, they find some evidence of negative selection for urban students and positive selection for suburban students, a finding that stands against the hypothesis offered by Neal (1997). Like Figlio and Stone (1997), these authors did not have access to the most recent follow-up as it was not yet published and were thus unable to consider the effect of Catholic schooling on college degree attainment.

Altonji, Elder, and Taber (2005) uses NELS data to evaluate the effect of Catholic high schools on high school attendance, test scores, and college attendance. They question the exogeneity of previous IV strategies, namely the use of student and family characteristics, and present a new strategy using the degree of selection on observables as a guide to the degree of selection on the unobservables to offer lower-bound estimates. The authors find that Catholic high schools substantially increase the probability of high school graduation and, more tentatively, of college enrollment. They find little evidence of an effect on test scores. These authors offer a novel technique to minimize selection bias. They focus on a sample of students who attended Catholic middle school. If selecting a Catholic school is signaling some unobservable traits that are advantageous to college enrollment or degree attainment, then it follows that those students who enrolled in private middle school have already offered these signals. Thus, I consider a sample of only those students who were enrolled in a private middle school before entering high school.

Finally, it is worth noting that, since Altonji, Elder, and Taber (2005), the literature has moved towards randomized evaluations, as these eliminate the tricky issue of non-random selection. Researchers have exploited lottery allocations for school vouchers and coveted spots in charter high schools (Hoxby and Rockoff, 2004; Hoxby and Muraka, 2007). Of course, this approach comes with tradeoffs. First, these studies are highly localized in terms of geography, which limits the external validity of their findings. Second, these programs tend to be enacted in cities with poor public school systems like New York and Chicago. As such, the differential across sectors will likely be exaggerated. The average nationwide effect of private schooling on college enrollment and degree attainment is dynamic and still unclear, and in light of recent school choice reform efforts, it is a particularly important relationship to explore.

3. Data and Description

To evaluate the relationship between high school type and the post-secondary outcomes of interest I use the NELS administered by the NCES. NELS is a questionnaire based longitudinal study; the base year is 1988, and follow ups were conducted in 1990, 1992, 1994, and 2000. Thus, a student who completed high school in 4 years would have had a period of 8 years to pursue post-secondary education. The survey contains information on over 12,000 individuals. I restrict my sample based on a number of criteria. First, I consider only those students who were enrolled in 8th grade in the base year (implicitly assuming that the high school decision is made by the household in grade 8). Second, like Neal (1997) I consider only those students who were enrolled at a school located within a MSA in both the base year and during high school. The purpose of this restriction is to examine differences in enrollment and attainment only among those students with uniform access to both school types². Third, I consider only those students who did not transfer during high school to avoid capturing those students who might have transferred between sectors. Finally, I consider only those students who were enrolled in a private middle school in the base year for reasons outlined above. These restrictions cut the sample by 10,708 individuals. There is a further reduction in sample size of 264 individuals due to attrition, resulting in a final sample of 1,172 individuals. For a full breakdown of observations lost due to restrictions and missing values see Appendix table A.2.

From the NELS 1994 and 2000 follow ups I obtain the three post-secondary outcomes: 1994 enrollment, 2000 enrollment, and 2000 degree attainment. In all cases, the variables are binary. The enrollment variables take the value of 1 if the student had ever enrolled in a post-secondary institution in that year, zero otherwise. Enrollment is measured across periods to understand not only if, but when these students are enrolling in the tertiary sector. I measure degree attainment as a binary variable taking the value of 1 if the student attained a BA or beyond, zero otherwise. School type is recorded first in the base year in order to restrict the sample to private middle school students, as well as in the 1990 period to determine high school type. The independent variable of interest is a dummy on private high school enrollment. Most observable student and family controls along with the Through 12 IV are recorded at baseline (1988). These controls include race, gender, a set of religious self-

² It would be preferable to restrict my sample based on place of residence, but geographic information of that nature is not offered in the public-use NELS data. Assuming that schools admit students who live in close geographic proximity to their location, the effect of this restriction should be the same.

identification dummies, and socioeconomic status (SES). SES is a standardized index constructed by the NCES using information on father's education level, mother's education level, father's occupation, mother's occupation, and family income. Additionally, I control for scores on standardized tests in reading and math administered by the NCES in 8th grade as a proxy for ability and student and parent expectations with respect to degree attainment as a proxy for ambition. Ability has been standardized to facilitate interpretation. Expectations are measured as dummy variables that take the value of 1 if the student or parent expected a college degree in the base year, zero otherwise. A few additional control variables were obtained from the 1990 follow up, namely urbanicity and census region of a student's high school. Information on school transfer decisions from both high school follow up periods (1990 and 1992) was used in restricting the sample. For a full list of variables and descriptions see Appendix table A.1. Selected summary statistics are offered below in table 3.1.

TABLE 3.1
PERCENT FREQUENCIES BY DEPENDENT VARIABLES AND SCHOOL TYPE

	Private HS		Enrolled: 1994		Enrolled: 2000		Degree: 00	
	Yes	No	Yes	No	Yes	No	Yes	No
Public HS	--	--	82.22	17.78	90.00	10.00	53.33	46.67
Private HS	--	--	93.24	6.76	97.34	2.66	73.06	26.94
Low ability (below mean)	68.09	31.91	82.45	17.55	91.22	8.78	47.34	52.66
High ability (above mean)	81.16	18.84	94.60	5.40	97.74	2.26	78.52	21.48
Student expects degree:								
Yes	79.96	20.18	93.74	6.26	97.71	2.29	75.05	24.95
No	59.64	40.36	72.29	27.71	83.13	16.87	28.92	71.08
Parents expect degree:								
Yes	77.62	22.38	91.41	8.59	96.27	3.73	69.21	30.79
No	36.84	63.16	47.37	52.63	57.89	42.11	26.32	73.68
Urban	80.87	19.13	92.35	7.65	96.68	3.32	71.17	28.83
Suburban	69.07	30.93	87.37	12.63	93.56	6.44	63.14	36.86
SES Quartile 1	57.41	42.59	81.48	18.52	85.19	14.81	35.19	64.81
SES Quartile 2	57.06	42.94	80.79	19.21	87.57	12.43	37.85	62.15
SES Quartile 3	71.85	28.15	86.97	13.03	94.12	5.88	58.40	41.60
SES Quartile 4	85.21	14.79	95.16	4.84	99.00	1.00	82.22	17.78

Descriptive analyses offered in Table 3.1 suggest that there are substantial differences in educational attainment across the private and public sectors. Students who enrolled in a private high school are more likely than public school students to have enrolled in college across both periods and to have attained a degree by 2000. The difference in enrollment rates is more pronounced in 1994, which suggests that perhaps private school students on average enroll sooner than do public school students, which might explain some of the difference in degree attainment in the final follow up. Other descriptive findings are in line with expectations. Students with above average standardized test scores fare better in all outcomes, as did students with higher measures of SES. Finally, both expectation measures seem to be correlated with post-secondary success.

Descriptive results, however, ignore observable and unobservable differences in student and family characteristics. While observable characteristics such as SES can be explicitly controlled for, unobservable characteristics can cause selection bias. The sources of these potential characteristics might be cultural, familial, or personal. In any case, it is essential to find an exogenous source of variation in the decision between public and private high schools. As described above, I employ middle school grade span as this exogenous source of variation in school choice—namely, a dummy variable that takes 1 if a student’s middle school spans grade 12, zero otherwise. In table 3.2 I offer cross-tabulations for the IV with the three outcomes of interest, along with private high school enrollment.

TABLE 3.2
CROSS TABULATIONS FOR THROUGH 12 IV

		Private HS		Enrolled : 1994		Enrolled: 2000		Degree: 2000	
		Yes	No	Yes	No	Yes	No	Yes	No
Through 12	Yes	93.68	6.32	95.78	4.22	99.30	0.70	81.97	18.03
	No	67.38	32.62	87.79	12.21	93.56	6.44	60.81	39.19

Attending a middle school that spans grade 12 among these private middle school students demonstrates a positive relationship with private high school enrollment. Just over 6% of students whose private middle school spanned grade 12 enrolled in a public high school, as opposed to roughly 32% of those whose middle schools did not. This result is intuitive. Whether it be a function of comfort or convenience, it is reasonable that private middle school students would choose to remain enrolled at their current school if possible, while those students who must change schools would consider public alternatives. In terms of the outcome variables, students whose private middle school spanned grade 12 seem to perform marginally better, but these differences are likely driven by individual and family characteristics which have not been controlled for in these descriptive results. Conditional upon religion, ability, ambition, urbanicity, and SES, it is likely that these differences disappear. Together, these cross-tabulations offer strong descriptive evidence that my IV strategy is a valid one.

4. Empirical Specification

I estimate a linear probability model of the various educational outcomes as follows:

$$(1) \quad Outcome_i^g = \beta_0 + \beta_1 privateHS_i + \beta_2 ability_i + \beta_3 ability_i^2 + \beta_4 SES_i + \delta plans_i + \alpha X_i + \varepsilon_i$$

Where $outcome_i^g$ is the post-secondary education outcome $g = \{1994 \text{ enrollment, } 2000 \text{ enrollment, } 2000 \text{ degree attainment}\}$ for individual i ; X_i is a matrix of student, family, and

school level controls³; plans_i is a matrix of student and parent degree expectation dummies. The ability and expectation variables are of particular interest as these are most crucial to the validity of my exclusion restriction. I have included a squared term on ability to allow for quadratic relationships. I estimate both OLS and two-stage least squares (2SLS) IV regressions, testing for both endogeneity and the strength of my middle school grade span IV. Results are presented in the following section.

5. Results

Figlio and Stone (1997) divide the private sector into private religious and private secular schools and find consistent effects on a number of post-secondary outcomes after correcting for selection. To substantiate my pooling of students who attend both secular and religious private high schools I tested for differences in their respective correlations with degree attainment. The results presented in Appendix table A.3 are consistent and thus support my approach.

In table 5.1 below, selected OLS and 2SLS estimates for each educational outcome are presented. For full results see Appendix table A.5. Endogeneity tests are also reported in the appendix (Table A.4). I find evidence of endogeneity in both enrollment models, but not in the model of college degree attainment. Nonetheless, in all cases I favor the 2SLS results considering the results of the endogeneity tests as well as the well-documented issue of selection bias in the literature.

Single equation estimates suggest that private high schooling has a small, and in most cases, insignificant effect on tertiary educational outcomes. Private high school is significant only in the 1994 enrollment model. On average, those who attend a private high school as opposed to public are 4.7 percentage points more likely to have enrolled in a post-secondary institution by 1994, or 2 years after high school graduation assuming a student follows the natural track. This differential is statistically insignificant when enrollment is measured 8 years after high school graduation (in 2000), suggesting that any difference in degree attainment might be a result of time to campus. Other OLS results are in line with expectations. Ability in all cases demonstrates a significant, positive effect on every educational outcome. The squared term is in each case significant and negative, thus the relationship is quadratic and turns negative at some level of ability (between 0.67 and 1 standard deviations above the mean for enrollment and roughly 2 standard deviations above the mean for degree attainment). Expectations, both on the part of parents and students, are generally positive⁴. These results, however, do not correct for selection, and so I offer 2SLS IV results, with OLS serving as a benchmark for comparison.

First stage estimates suggest that my middle school grade span IV is strong in explaining school choice across sectors. The parent expectation variable is also significant, whereas ability and student expectations are not. This suggests that this proxy for ambition with respect to degree attainment at the family level is a significant driver of the private school

³ Controls not specified include urbanicity, race, gender, religious self-identification, and census region. Additional controls for number of siblings, family composition, and hours spent per week on homework were jointly insignificant and thus omitted.

⁴ To assuage concerns of collinearity, it should be noted that the correlation coefficient between these two expectation variables is roughly 0.3

decision, a control which has been overlooked in the literature. Urbanicity and SES are also significant and positive with respect to high school choice.

TABLE 5.1
OLS AND 2SLS ESTIMATES

	Enroll:1994			Enroll: 2000		Degree: 2000	
	OLS	1 st Stage	2 nd Stage	OLS	2 nd Stage	OLS	2 nd Stage
Private HS	0.0468* (0.0240)	--	0.1821** (0.0685)	0.0262 (0.0186)	0.1329*** (0.0469)	0.0391 (0.0319)	0.2151* (0.1159)
Ability	0.0625*** (0.0144)	0.0134 (0.0164)	0.0603*** (0.0141)	0.0326*** (0.0118)	0.0309*** (0.0117)	0.1245*** (0.0179)	0.1218*** (0.0182)
Ability ²	-0.0318** (0.0100)	0.0008 (0.0124)	-0.0324*** (0.0097)	-0.0245*** (0.0083)	-0.0249*** (0.0081)	-0.0326*** (0.0123)	-0.0333*** (0.0122)
Student plans	0.1245*** (0.0355)	0.0409 (0.0422)	0.1150** (0.0360)	0.0780*** (0.0281)	0.0705** (0.0285)	0.2725*** (0.0408)	0.2602*** (0.0422)
Parent plans	0.2527* (0.1068)	0.2166* (0.1126)	0.2257* (0.1105)	0.2609** (0.1098)	0.2396** (0.1136)	-0.0421 (0.0926)	-0.0772 (0.1047)
Urban	0.0290 (0.0184)	0.1291*** (0.0260)	0.0157 (0.0180)	0.0172 (0.0128)	0.0068 (0.0113)	0.0584** (0.0257)	0.0411 (0.0277)
SES	0.0317* (0.0132)	0.0879*** (0.0211)	0.0151 (0.0154)	0.0320*** (0.0088)	0.0189** (0.0094)	0.1751*** (0.0225)	0.1535*** (0.0269)
Through 12	--	0.2291*** (0.0242)	--	--	--	--	--
Constant	0.4289** (0.1337)	0.1572 (0.1715)	0.4001** (0.1402)	0.5920*** (0.1086)	0.5693*** (0.1142)	0.2834* (0.1649)	0.2459 (0.1785)
IV F-stat	--	89.61***	--	--	--	--	--
R ²	0.15	0.17	0.11	0.15	0.10	0.28	0.26
N	1,172	1,172	1,172	1,172	1,172	1,172	1,172

NOTE—robust standard errors; full controls included (religion, race, census region)

* p<0.10; ** p<0.05; *** p<0.0

After correcting for school choice endogeneity, estimates demonstrate a highly significant, positive effect of private high school on each educational outcome. These estimates are in each case greater in magnitude than OLS, suggesting that the selection bias is in fact negative. In other words, inferior middle school students are self-selecting into the private high school sector. In terms of enrollment, those who attend a private school are 18.21 percentage points more likely to have enrolled by 1994 and 13.29 percentage points more likely to have enrolled by 2000. The relationship between private high school and college enrollment appears to diminish with time, consistent with the descriptive results from Table 3.1. The coefficient on private schooling is largest in magnitude for college degree attainment. On average, those who attend a private high school are 21.51 percentage points more likely to have attained a BA or beyond by 2000. This difference cannot be explained fully by differences in enrollment. Thus, it seems that private school students both enroll sooner and perform better, even after correcting for selection and controlling for observable differences.

Whereas parent expectations seem to drive the private school decision in the first stage, student expectations are more significant in explaining post-secondary outcomes in the

second stage. This could be due to a change in agency; parents control decisions made at the secondary school level, while older, autonomous students control decisions at the post-secondary level. Parent expectations remain significant with regard to college enrollment decisions, but demonstrate no effect on college degree attainment. This finding reinforces the agency argument. Ambitious parents might persuade a child to enroll in college, but the challenge of persisting on a college campus rests solely upon the ambition of the student. Ability is again significant and shows a quadratic relationship with each outcome.

6. Conclusions

I use the NELS survey to examine the effect of private high school on both college enrollment and college degree attainment and find that private secondary schooling has a significant, positive impact on each post-secondary outcome after correcting for selection. Results suggest that private schooling affects the average college trajectory both in terms of preparedness and time to campus. I find that the marked difference in college enrollment rates diminishes across time. Thus, not only do private schools seem able to better prepare a student to succeed on a college campus and attain a degree, they prepare them to do so earlier. The expectation variables also provide some interesting insights. Whereas parents' degree expectations have a significant impact on the secondary school decision as well as the college enrollment decision to a lesser extent, student degree expectations seem to be the primary driver of post-secondary outcomes. High school enrollment decisions are often in the hands of parents, and ambitious parents are likely to elect private schooling for their children. Ambitious parents might also manage to pressure their child to enroll in a post-secondary institution. College degree attainment, on the other hand, responds to individual motivation. Degree attainment requires commitment. Ambitious parents cannot force an unambitious child to succeed on a college campus, but they can send an unambitious child to a rigorous, private high school and insist that the child enroll in a post-secondary institution.

A more puzzling finding is the strong evidence of a large negative selection bias. Neal (1997) found evidence of negative selection into Catholic high schools, but it is nonetheless counter-intuitive. Parents and students, by choosing private high school, are signaling unobservable attributes that are disadvantageous to post-secondary success. This might be a result of the nature of my sample. I consider only those students who were enrolled in a private middle school and exploit variation in the high school decisions of these students. It may be that students who have succeeded at a private middle school are more likely to enter the public sector as the added cost is seen by parents as unneeded, while struggling students or their parents elect to stay in the private sector. It may also be a result of my geographic restriction. I consider only those students who attended middle school in a MSA, which consists of a city center and all economically connected suburban areas. In suburban areas, where the public school alternatives are often sound, high-income parents with strong preferences for education may elect to send their high-quality students to a high-quality suburban public school. Due to the size of my sample, I do not have the power to efficiently estimate the coefficient of interest across these two groups; they were insignificant but markedly different in magnitude. The coefficient on private schooling for urban students was significantly larger than for suburban student, which might support this suburban-urban hypothesis.

In any case, the results suggest that private high schools have large significant benefits in terms of college enrollment and college degree attainment, outcomes with great economic

importance. Thus, my findings offer support for efforts to increase school choice, but with a few important caveats. First, this research considers the average effect of moving one student from the public to the private sector. Large-scale increases in school choice and subsequent shifts in relative sector enrollments would have more complex effects. Such shifts would change the nature of peer effects and available resources across sectors and would likely alter the relationships here explored. A second important point: I ignore cost differences across sectors. To fully understand the implications of private high schools for economic efficiency, these should be considered as well. With regard to school choice efforts, however, parents are most often afforded with a voucher that is equivalent to the cost of educating a student in the public sector, and so costs incurred by the government are unchanged regardless of where the student enrolls. The relationship between private high schools and the college trajectory of American students is profoundly important and evolving. I hope that this research helps to shed some light on the nature of that relationship and to inform these sorts of policy decisions that crucially depend upon some understanding of it.

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APPENDIX

TABLE A.1
VARIABLE NAMES AND DESCRIPTIONS

	Variable	Description	Period ²	
School	Private HS	Attended a private high school	F1	
	Private religious	Attended a private religious high school	F1	
	Private other	Attended a private non-religious high school	F1	
	Urban	Attended high school in an urban area (versus suburban)	F1	
	Through 12	Middle school spans through grade 12	BY	
	North East ^b	Attended high school in the North East (New England & Middle Atlantic states)	F1	
	North Central	Attended high school in the North Center (East N. Central & West N. Central states)	F1	
	South	Attended high school in the South (S. Atlantic, East S. Central, & West S. Central states)	F1	
	West	Attended high school in the West (Mountain and Pacific states)	F1	
	Individual	Degree	Attained a Bachelor's degree or beyond by 2000	F4
Enroll 94		Enrolled in a post-secondary institution by 1994	F3	
Enroll 00		Enrolled in a post-secondary institution by 2000	F3	
Ability		Standardized test composite in reading & math (in standard units)	BY	
Ability2		Standardized test composite in reading & math (in standard units) squared	BY	
Catholic		Student identifies as Catholic	BY	
Protestant		Student identifies as Protestant	BY	
Other Christian		Student identifies as other Christian	BY	
Jewish		Student identifies as Jewish	BY	
Other religion		Student identifies as other religion	BY	
No religion ^b		Student does not identify with any religion	BY	
Student plans		Student plans to attain a Bachelor's degree or beyond	BY	
Female		Female	BY	
Asian		Asian	BY	
Black		Black	BY	
Hispanic		Hispanic	BY	
Native American		Native American	BY	
White		White	BY	
<i>Homework 1</i>		<i>Total number of hours spent per week on homework: 0.00</i>	<i>BY</i>	
<i>Homework 2</i>		<i>Total number of hours spent per week on homework: 0.50-1.99</i>	<i>BY</i>	
<i>Homework 3</i>		<i>Total number of hours spent per week on homework: 2.00-2.99</i>	<i>BY</i>	
<i>Homework 4^b</i>		<i>Total number of hours spent per week on homework: 3.00-5.49</i>	<i>BY</i>	
<i>Homework 5</i>		<i>Total number of hours spent per week on homework: 5.50-10.49</i>	<i>BY</i>	
<i>Homework 6</i>		<i>Total number of hours spent per week on homework: 10.50-12.99</i>	<i>BY</i>	
<i>Homework 7</i>		<i>Total number of hours spent per week on homework: 13.0-20.99</i>	<i>BY</i>	
<i>Homework 8</i>		<i>Total number of hours spent per week on homework: ≥ 21.00</i>	<i>BY</i>	
Family		Parent plans	Parents expect student to attain a Bachelor's degree or beyond	BY
		SES ¹	Socioeconomic status composite	BY
		<i>Two parent</i>	<i>Student lived with both biological parents</i>	<i>BY</i>
		<i>Siblings 0</i>	<i>No siblings</i>	<i>BY</i>
	<i>Siblings 1^b</i>	<i>One sibling</i>	<i>BY</i>	
	<i>Siblings 2</i>	<i>Two siblings</i>	<i>BY</i>	
	<i>Siblings 3</i>	<i>Three siblings</i>	<i>BY</i>	
	<i>Siblings 4</i>	<i>Four siblings</i>	<i>BY</i>	
	<i>Siblings 5</i>	<i>Five siblings</i>	<i>BY</i>	
	<i>Siblings 6</i>	<i>Six or more siblings</i>	<i>BY</i>	

NOTE — Italicized variables used only as additional controls in the OLS regression presented in table A.4

^bbase group

¹constructed by the NCES using father's education level, mother's education level, father's occupation, mothers occupation, and family income

²refers to the NCES follow up period from with the information was extracted (BY—base year; F1—1990; F2—1992; F3—1994; F4—2000)

TABLE A.2
SAMPLE RESTRICTIONS AND MISSING VALUES (EXECUTED IN THIS ORDER)

	Observations Lost
Sample restrictions:	
Eighth grade in base year	585
Did not transfer or change schools during high school	2,859
Metropolitan Statistical Area in middle school	2,839
Metropolitan Statistical Area in high school	57
Private middle school	4,368
Missing Values	264
Observations lost	11,854

TABLE A.3
OLS ESTIMATES FOR DEGREE ATTAINMENT ON PRIVATE SCHOOL TYPE

	Degree: 2000
Private religious	0.0456 (0.0336)
Private other	0.0583 (0.0403)
Ability	0.1257*** (0.0186)
Ability ²	-0.0355** (0.0127)
Student plans	0.2577*** (0.0417)
Parent plans	-0.0487 (0.0942)
Urban	0.0614* (0.0266)
SES	0.1678*** (0.0234)
Constant	0.2297 (0.1669)
F-stat ¹	0.85
R ²	0.29
N	1,132

NOTE — robust standard errors; full controls included (religion, race, census region) along with number of siblings, family composition, and hours spent per week on homework (italicized variables in table A.1); decrease in sample size is due to missing values for these controls

¹F test for equality of the private religious and private other coefficients

TABLE A.4
ENDOGENEITY TESTS

	Enroll: 1994	Enroll: 2000	Degree: 2000
\hat{u}	-0.1437* (0.0710)	-0.1133** (0.0477)	-0.1869 (0.1198)
Private HS	0.1821** (0.0678)	0.1329*** (0.0457)	0.2151* (0.1162)
Ability	0.0603*** (0.0144)	0.0309*** (0.0119)	0.1218*** (0.0180)
Ability2	-0.0324** (0.0100)	-0.0249*** (0.0083)	-0.0333*** (0.0124)
Student plans	0.1150** (0.0361)	0.0705** (0.0281)	0.2602*** (0.0417)
Parent plans	0.2257* (0.1074)	0.2396** (0.1101)	-0.0772 (0.0953)
Urban	0.0157 (0.0177)	0.0068 (0.0111)	0.0411 (0.0275)
SES	0.0151 (0.0150)	0.0189** (0.0090)	0.1535*** (0.0269)
Catholic	0.0322 (0.0807)	-0.0084 (0.0156)	0.0342 (0.1361)
Protestant	0.0115 (0.0802)	-0.0280* (0.0167)	0.0546 (0.1351)
Other Christian	-0.0340 (0.0941)	-0.0563 (0.0353)	-0.0426 (0.1509)
Jewish	0.0455 (0.0814)	-0.0083 (0.0153)	0.0792 (0.1382)
Other religion	-0.0220 (0.1069)	-0.0366 (0.0429)	0.0397 (0.1629)
Female	0.0309 (0.0162)	0.0153 (0.0114)	0.0083 (0.0236)
Asian	-0.0447 (0.0375)	0.0018 (0.0134)	-0.1078* (0.0556)
Hispanic	0.0336 (0.0365)	0.0209 (0.0279)	-0.0466 (0.0606)
Black	0.0464 (0.0327)	0.0345** (0.0174)	0.0127 (0.0568)
Native American	0.0697 (0.0549)	0.0324 (0.0328)	-0.3548 (0.2456)
North Central	-0.0250 (0.0245)	-0.0253 (0.0186)	-0.0472 (0.0324)
South	0.0012 (0.0226)	0.0004 (0.0138)	-0.0598* (0.0348)
West	0.0181 (0.0243)	-0.0006 (0.0142)	-0.0029 (0.0428)
Constant	0.4001** (0.1351)	0.5693*** (0.1097)	0.2459 (0.1671)
Endogeneity F-stat	4.10**	5.65**	2.43
R ²	0.15	0.15	0.28
N	1,172	1,172	1,172

NOTE— robust standard errors

* p<0.10; ** p<0.05; *** p<0.0

TABLE A.5
OLS AND 2SLS ESTIMATES

	Enroll:1994			Enroll: 2000		Degree: 2000	
	OLS	1 st Stage	2 nd Stage	OLS	2 nd Stage	OLS	2 nd Stage
Private HS	0.0468* (0.0240)	--	0.1821** (0.0685)	0.0262 (0.0186)	0.1329*** (0.0469)	0.0391 (0.0319)	0.2151* (0.1159)
Ability	0.0625*** (0.0144)	0.0134 (0.0164)	0.0603*** (0.0141)	0.0326*** (0.0118)	0.0309*** (0.0117)	0.1245*** (0.0179)	0.1218*** (0.0182)
Ability ²	-0.0318** (0.0100)	0.0008 (0.0124)	-0.0324*** (0.0097)	-0.0245*** (0.0083)	-0.0249*** (0.0081)	-0.0326*** (0.0123)	-0.0333*** (0.0122)
Student plans	0.1245*** (0.0355)	0.0409 (0.0422)	0.1150** (0.0360)	0.0780*** (0.0281)	0.0705** (0.0285)	0.2725*** (0.0408)	0.2602*** (0.0422)
Parent plans	0.2527* (0.1068)	0.2166* (0.1126)	0.2257* (0.1105)	0.2609** (0.1098)	0.2396** (0.1136)	-0.0421 (0.0926)	-0.0772 (0.1047)
Urban	0.0290 (0.0184)	0.1291*** (0.0260)	0.0157 (0.0180)	0.0172 (0.0128)	0.0068 (0.0113)	0.0584** (0.0257)	0.0411 (0.0277)
SES	0.0317* (0.0132)	0.0879*** (0.0211)	0.0151 (0.0154)	0.0320*** (0.0088)	0.0189** (0.0094)	0.1751*** (0.0225)	0.1535*** (0.0269)
Catholic	0.0495 (0.0816)	0.1231 (0.1305)	0.0322 (0.0857)	0.0053 (0.0145)	-0.0084 (0.0230)	0.0568 (0.1359)	0.0342 (0.1447)
Protestant	0.0280 (0.0810)	0.0609 (0.1310)	0.0115 (0.0850)	-0.0150 (0.0144)	-0.0280 (0.0237)	0.0760 (0.1349)	0.0546 (0.1433)
Other Christian	-0.0292 (0.0948)	-0.0315 (0.1415)	-0.0340 (0.0993)	-0.0525 (0.0351)	-0.0563 (0.0398)	-0.0364 (0.1513)	-0.0426 (0.1590)
Jewish	0.0618 (0.0825)	0.0493 (0.1404)	0.0455 (0.0862)	0.0046 (0.0142)	-0.0083 (0.0230)	0.1004 (0.1383)	0.0792 (0.1457)
Other religion	-0.0034 (0.1076)	0.0606 (0.1483)	-0.0220 (0.1130)	-0.0219 (0.0413)	-0.0366 (0.0488)	0.0638 (0.1625)	0.0397 (0.1703)
Female	0.0283 (0.0161)	-0.0147 (0.0229)	0.0309 (0.0163)	0.0132 (0.0113)	0.0153 (0.0115)	0.0048 (0.0235)	0.0083 (0.0237)
Asian	-0.0415 (0.0374)	0.0241 (0.0390)	-0.0447 (0.0367)	0.0044 (0.0134)	0.0018 (0.0136)	-0.1036* (0.0561)	-0.1078* (0.0555)
Hispanic	0.0293 (0.0366)	-0.0253 (0.0517)	0.0336 (0.0363)	0.0176 (0.0277)	0.0209 (0.0270)	-0.0521 (0.0610)	-0.0466 (0.0604)
Black	0.0566 (0.0322)	0.1184** (0.0534)	0.0464 (0.0330)	0.0426** (0.0178)	0.0345** (0.0175)	0.0260 (0.0561)	0.0127 (0.0578)
Native American	0.1092* (0.0487)	0.2832*** (0.0444)	0.0697 (0.0521)	0.0635** (0.0291)	0.0324 (0.0313)	-0.3034 (0.2548)	-0.3548 (0.2494)
North Central	-0.0258 (0.0245)	0.0196 (0.0333)	-0.0250 (0.0251)	-0.0259 (0.0186)	-0.0253 (0.0189)	-0.0482 (0.0324)	-0.0472 (0.0328)
South	0.0130 (0.0231)	0.0805** (0.0317)	0.0012 (0.0230)	0.0098 (0.0141)	0.0004 (0.0143)	-0.0444 (0.0341)	-0.0598* (0.0352)
West	0.0387 (0.0243)	0.1518*** (0.0390)	0.0181 (0.0249)	0.0156 (0.0153)	-0.0006 (0.0149)	0.0239 (0.0425)	-0.0029 (0.0427)
Through 12	--	0.2291*** (0.0242)	--	--	--	--	--
Constant	0.4289** (0.1337)	0.1572 (0.1715)	0.4001** (0.1402)	0.5920*** (0.1086)	0.5693*** (0.1142)	0.2834* (0.1649)	0.2459 (0.1785)
IV F-stat	--	89.61***	--	--	--	--	--
R ²	0.15	0.17	0.11	0.15	0.10	0.28	0.26
N	1,172	1,172	1,172	1,172	1,172	1,172	1,172

NOTE— robust standard errors

* p<0.10; ** p<0.05; *** p<0.0