The Determinants of Private High School Attendance[†]

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John Z. Smith Jr.

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Address Correspondence to:
Vassar College
Department of Economics
124 Raymond Ave., Box 708
Poughkeepsie, NY 12604-0708
914.437.7669 (voice)
914.437.7576 (fax)
jzsmith@vassar.edu

This paper develops a model of private school choice that incorporates measures of the availability and costs of private schooling, as well as the quality of existing public schools, in the local market for secondary education. Using data from the National Longitudinal Survey of Youth and the 1980 Private High Schools File, I estimate this model on samples of all individuals enrolled in high school in 1979 and all Catholics enrolled in high school in 1979. I find that the availability of a private high school of one's religious affiliation in one's county of residence significantly increases the likelihood of private school attendance. Further, per capita educational expenditures in one's county of residence are inversely related to the likelihood of attending a private high school. Finally, private school enrollments decisions are relatively insensitive to tuition and fees levels. These results provide a link between aggregate models of private school enrollment within educational markets and microdata models of private school choice.

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The Determinants of Private High School Attendance: Microdata Evidence on Private School Choice

Section I: Introduction

One of the most publicized policy debates in America centers on reform of the American educational system, particularly policies designed toward increasing parental choice in schooling. Support for choice policies-- ranging from open-enrollment policies among public school districts to tuition voucher programs-- is widespread. In a 1991 Gallup survey, 62% of Americans surveyed favored some form of school choice policy. The cause of choice has also been taken up vicariously in the print media: the *Wall Street Journal*'s opinion-editorial page featured over 76 articles on school choice and tuition programs in 1992, 28 of which mentioned Polly Williams and the city of Milwaukee's tuition voucher program.[1] Moreover, many local school districts, jurisdictions, and states have adopted choice plans. Clearly, there is a strong interest in choice programs, which are purported to increase competition among schools and generate superior educational outcomes for students.

In spite of the growing popularity of choice policies, little is known concerning the determinants of participation in these programs. Most of the existing evidence is derived from tabulations and summary statistics from survey responses.[2] From a policy maker's perspective, information on the determinants of participation in school choice programs is crucial in projecting take-up rates and estimating costs associated with choice plans.

The American educational system has, however, been subject to an alternative type of school-choice option for over 160 years: the availability of private schooling. Modeling the choice of private versus public schooling is a straightforward application of consumer choice theory. Specifically, private school attendance is modeled as a function of: own price (both the tuition costs and the access costs (availability) of private schooling); the quality of available public schooling; tastes; and income, broadly defined as resources available to the family. Nevertheless, no existing research on private school choice tests such a model of private school attendance on individual-level data.

The existing empirical research on school choice can be placed into two categories: microdata models of private school choice; and aggregate models of private school enrollment in a geographic location (e.g. SMSA or state.) There have been few microdata studies of private school choice, and most of the existing studies have estimated choice models using data from the 1980 High School and Beyond Data Set.[3] These studies have included measures of family resources and observable dimensions of the tastes for private schooling, but omitted measures of the availability and costs of private schooling, as well as proxies for the quality of public schools. Aggregate models of private school enrollment, such as Martin-Vazquez and Seaman [1985] and West and

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[1]Under Milwaukee's tuition voucher plan, roughly 1000 students with incomes less than 175% the federal poverty level are eligible to receive tuition vouchers up to $2500 toward non-sectarian private schooling.

[2]In large part, the lack of knowledge regarding the determinants of participation in choice programs stems from the paucity of available data, low take-up rates, and the recent introduction of many plans, particularly at the state level.

[3]cf. Coleman, Hoffer, and Kilgore [1982], Murnane [1984], Murnane, Newstead, and Olsen [1985], and Coleman and Hoffer [1987].

Palsson [1988] have included measures of the costs and availability of private schooling and public school quality proxies within the relevant educational market, but excluded individual level observations on tastes and income.

If the correct model of private school choice is a function of individual resources, tastes, ***and*** the competitiveness of the local education market, then both versions of the school choice models in the existing literature are misspecified. I develop a model of private high school choice in which private school attendance is a function of: family resources (income), tastes for private schooling, and conditions in the local market for secondary education. I then test this model on microdata (the NLSY) that includes measures of private school access and public school quality at the county level.

Estimating the model over all individuals enrolled in high school in 1979, I find that family income, tastes for private schooling, private school access, and public school quality are all important determinants of the private school attendance decision. Being raised Catholic increases one's likelihood of attending private school by 7.2 percentage points. Moreover, the presence of a private high school of one's religious affiliation increases the likelihood of attending private school by 14 percentage points. Hence, tastes for private schooling, particularly religious schooling, are important, as is the availability of denominational schooling.

Individuals who live in counties with per capita educational expenditures above the state average are less likely to attend private school. A ten point increase in the ratio of county per capita educational expenditures relative to the state average reduces the probability of private school enrollment by 1.78 percentage points. This finding is in agreement with the earlier work on aggregate models of private school enrollment, which all find that increases in per pupil expenditures and general educational expenditures reduce private school enrollment proportions.[4]

The responsiveness of private school attendance to income and tuition levels is relatively small: a $10,000 increase in family income would increase the propensity to attend private school by two percentage points. Controlling for family income and tastes, the level of private school tuitions do not exert a significant impact on the likelihood of attending private school.

These results are particularly interesting, in that they reveal the importance of the availability of religious schooling and the quality of public schooling in influencing the private school attendance decision. Further, the findings concerning the responsiveness of enrollment decisions to price and income changes are important from a policy perspective. Voucher programs, which serve to lower the price of private schooling, may result in relatively small changes in the composition of private and public school enrollment.

This paper is organized as follows. Background and stylized facts regarding private high schools are presented in Section II. The literature concerning school choice is reviewed in Section III. Section IV develops a model of private school choice, and Section V describes the data used in this study. Empirical results on private school choice are presented in Section VI. Section VII concludes and denotes the significance of the results for educational choice policy.

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[4]Reference Gustman and Pidot [1973] for evidence of per pupil expenditures on public school enrollments for urban areas and Smith [1993] for the effect of state-wide current per pupil expenditures on private school enrollment in a micro model.

Section II: Background on Private Schooling: The Stylized Facts

Our knowledge of public high schools in the United States is extensive. Detailed data on public high schools is collected and disseminated by the National Center for Education Statistics. Moreover, the public high school system in the United States was subjected to intense scrutiny in the early eighties.[5] Our understanding of the workings of private high schools, is, in comparison, much more skeletal. In part, this arises from the heterogeneity among the group of private schools: recently founded Christian academies that sprang up in the South after the passage of the Civil Rights Act are markedly different from well-established Catholic high schools in the Northeast. Even among the Catholic high schools, there is considerable variation by ownership and control: Jesuit schools such as Fordham Prep in the Bronx are distinct from small parish (parochial) high schools. Further, many private high schools seek to minimize contact with state education agencies, and often fail to report enrollment figures. Hence, data collection is considerably more spotty among private high schools, particularly smaller independent and Christian schools in the South and West.

While it is useful to recognize the limits of our knowledge concerning the aggregate grouping of private schools, studies of private high schools in the past 15 years have added substantially to the understanding of the operation, administration, and missions of private high schools, which allows one to examine the extent to which nonsectarian private schools and religious schools of different affiliations are similar. In particular, there exists fairly detailed information concerning Catholic high schools, and nonsectarian schools who are members of the National Association of Independent Schools (NAIS).[6]

Detailed information regarding enrollments and the number of schools by religious affiliation is contained in Data Appendix C. Data Appendix B presents statistics on enrollment and tuitions by Census region, urbanicity, race and income level. Hence, I provide a brief outline of the characteristics of private schools below.

Enrollment

During the 1979-1980 school year, 1.112 million students (7.4% of the total high school enrollment) were enrolled in private high schools. Enrollment in private high schools reached a peak rate of approximately 11.8% in 1965, dropped sharply to eight percent by 1969, and remained relatively constant throughout the seventies.[7] More recently, private school enrollment rates have trended upward, rising to 8.7% in 1985.[8] Clearly, private schools are an important institutional provider of secondary education in America.

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[5]Some of the more publicized studies are: National Commission on Excellence in Education [1983], Boyer [1983], Ravitch [1983], Sizer [1984], Powell, and Farrar, and Cohen [1985].

[6]Reviews of Catholic education in the U.S. are provided by Neuwein [1966], Greeley and Rossi [1966], Beutow [1970], Greeley, McCready, and McCourt [1976], Greeley [1982], and Yeager, Benson, Guerra, and Manno [1985]. Reviews of private schools are provided by Kraushaur [1972], Abramowitz and Stackhouse [1980], and Benson and McMillen [1991].

[7]October 1979 Current Population Survey (CPS) Private School Enrollment Supplement.

[8]October, 1979 CPS Private School Enrollment Supplement.

The Importance of Religious Schools

Religious high schools of all denominational affiliations enrolled 81% of all private high school students during the 1979-1980 academic year.[9] The largest religious high school system is the Catholic high school system, which comprised 31% of all private high schools, 65% (733,000 students) of all private high school students, and 82% of all religious private high school students.[10] Among the other religious high schools, Baptist, Seventh-Day Adventist, Christian, Lutheran, and Episcopalian schools constitute the majority of enrollment. Nonsectarian private high schools enrolled 18% (210,000 students) of all private high school enrollment in 1979-1980.[11] Given these enrollment figures, I employ the following tripartite classification for private schools for the rest of this paper: Catholic high schools, other religious high schools, and nonsectarian private high schools. Admittedly, such a classification scheme is not a perfect partitioning of private high schools by type and similarity of student enrollment.[12] Nonetheless, this scheme is used by many researchers of private schools, as it adds tractability to any analysis of private schools, particularly since a finer division of private schools would result in extremely small cell sizes.

Academic Standards and Curricula

Most people tend to associate competitive admissions and demanding college preparatory curricula with the elite private schools. Catholic schools, however, are also fairly demanding in their academic standards and curriculum. Carper and Hunt [1984] argue that "the contemporary Catholic educational system is primarily secular and specifically oriented to facilitating the social mobility of selected Catholic youth."[13] Over seventy

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[9]October, 1979 CPS Private School Enrollment Supplement, p. 3.

[10]October, 1979 CPS Private School Enrollment Supplement, p. 3, and author's calculations. See Data Appendices B and C for further details.

[11]October, 1979 CPS Private School Enrollment Supplement and author's calculations. These point-in-time statistics, however, fail to capture changes in the composition of private school enrollment that began in the late sixties and continued throughout the 1980s. Enrollment in Catholic high schools peaked in the mid-sixties, and declined until 1982. Enrollment in non-sectarian private schools, particularly the independent schools that are members of the NAIS, also declined during this period, although the aggregate decline was very slight. (It is important to note that many of the newly-formed academies in the South are organized as nonsectarian schools.) Other religious schools, however, experienced marked growth during this time. Enrollment in Christian and fundamentalist schools grew by roughly 500% from 1973 to 1983. Sources: Private Schools in the United States [1991], p. 31; Carper and Hunt [1984].

[12]Within the group of Catholic high schools, there are four classifications of high schools, based on administrative organization and control of the school: parish (parochial) schools, operated by a single parish; inter-parish schools, operated jointly by two or more parishes; diocesan schools, operated by the diocese; and private Catholic schools, operated by a religious order or private group. Forty percent of Catholic high schools are private; 40% are diocesan; 13% are parochial; and seven percent are interparochial. Since private and diocesan schools have larger average enrollments, they collectively enroll more than 80% of all Catholic high school students.

[13]Carper and Hunt [1984], p. 24.

percent of Catholic high schools required an entrance exam, compared with 66% percent of private schools.[14] Further, approximately 77% of Catholic school students were enrolled in college preparatory (sometimes called academic) curricula, as compared to 71% of all other private school students and 35% of all public school students.[15] Finally, requirements for years completed of core subjects, such as Math, English, Science, and Social Studies, are roughly the same across all private schools, although Catholic schools require slightly fewer years of Math and Science courses, on average, than other private schools.[16]

Organization

The mean enrollment across all types of private high schools in 1979-1980 was roughly 215 students, compared to mean public high school enrollment of 866 students. Catholic schools had much higher average enrollments of approximately 500 students, while enrollments in non-sectarian private high schools were much lower, on average (approximately 100 students). Christian high schools also tend to have smaller average enrollments, (approximately 95 students).[17]

Most private high schools (82.9%) were exclusively day schools, and schools that enrolled only boarding students comprised a small fraction of all private schools (3.9%). The remainder of private schools enrolled a combination of day and boarding students.[18] Since boarding students are immersed in a total institution, the treatment effect of a private school education for boarders is likely to differ substantially from the experience of day students in the private schools. Fortunately, the number of boarders is quite small, and should not affect the results substantially.[19]

Across all types of private high schools, 81% are coeducational, 9.2% are male-only, and 9.7% are female-only.[20] Catholic schools have the largest number of single-sex schools, with 16.6% of all Catholic schools male-only, and 25.6% of all Catholic schools female-only.[21]

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[14]Benson and McMillen [1991], p. 79. Moreover, nearly 73% of all Catholic high schools require a formal interview with the high school principal, attended by the student and her or his parents, as a precondition to admission. Yeager *et al.*, p. 212.

[15]Benson and McMillen [1991], p. 90.

[16]Benson and McMillen [1991], p. 91.

[17]Carper and Hunt [1984].

[18]Coleman, Hoffer, and Kilgore [1982], p. 26 and author's calculations. The number of schools offering five-day boarding programs is relatively small.

[19]In the sample from the NLSY used in this paper, I used the reported household interview version to determine that, at most, four of the private school students in my sample were enrolled in private boarding schools ***as boarders***.

[20]Coleman, Hoffer, and Kilgore [1982], p. 56.

[21]Coleman, Hoffer, and Kilgore [1982], p. 56.

Per-pupil expenditures differ substantially, both across the private and public sectors and within the private school sector. Differences in teacher and instructional salaries across sectors are the primary cause of this disparity, as salaries paid to instructional staff represent 60% of current per-pupil expenditures.[22] The private religious schools, particularly the Catholic schools, enjoy cost-savings from the contributed services of lay faculty and members of religious orders, who are paid minimal salaries. Non-Catholic religious high schools do not enjoy the cost-reductions associated with substantial operating subsidies from parishes and dioceses, and have substantially lower percentages of religious faculty. Average per-pupil expenditures in public and private schools are listed below.

Per-Pupil Expenditures in Public and Private High Schools: 1979-1980

School Type	Mean Per-pupil Expenditure (standard deviation)
Public	$2016 ($759)
Catholic	$1353 ($446)
Other Private	$2777 ($1643)
Leading Private	$4648 ($1810)

Source: Coleman, Hoffer, and Kilgore [1982], pp. 26.

Leading private schools, which include elite private schools such as Exeter, Andover, and Choate, have lower pupil-teacher ratios and substantially higher expenditures on facilities and equipment than do other private schools, all of which lead to the substantially higher per-pupil expenditure figures above.

Instructional Staff

Compared to teachers in the public schools, private high school teachers are more likely to be white women. Moreover, private school teachers are younger-- and hence have less experience-- than their public school counterparts.[23] Private schools are also much less likely to offer tenure; 30.7% of teachers in Catholic high schools have tenure, and only 20.7% of teachers in other private high schools have tenure. In public high schools, 77.4% of teachers are tenured, commonly after two to five years' service.[24] The difference in tenure across school sectors is not an artifact of the relative youth of private school teachers, as many private schools do not offer tenure.[25]

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[22]Bredeweg [1982], pp. 33-35.

[23]Benson and McMillen [1991], pp. 49-52.

[24]*Digest of Educational Statistics 1983-1984*, pp. 51.

[25]Only 28% of Catholic high schools offer tenure to teachers. Yeager *et al.*, pp. 45.

Although state regulations regarding the certification of private school teachers vary considerably, virtually all private high school teachers have bachelor's degrees. Further, the percentage of high school teachers with graduate degrees is approximately 48% in both private and public high schools. There is, however, considerable variation within private schools: forty-eight percent of Catholic high school teachers have master's degrees or higher, compared to nearly 60% of non-sectarian private high school teachers and 30% of teachers in other religious high schools.[26]

Compensation is significantly different across the private and public high schools. Salary levels and salary growth are significantly higher within the public high schools: average base academic year salaries in public school are $24,335 compared to $14,400 for private school teachers.[27] In part, this reflects a differential return to experience, as age-earnings profiles in the private school sectors, particularly Catholic schools, are virtually flat, whereas public school experience-earnings profiles exhibit the normal log-concave profile. Private school teachers are also much less likely to be covered by collective bargaining agreements, so some of the growth in earnings for public school teachers may reflect a union wage premium.

Tuition and Fees

The tuition policies of private high schools are complex, and vary widely from school to school. Across the different types of private schools, tuition and fees are lowest in Catholic high schools and highest in non-sectarian private high schools, particularly member schools of the NAIS. Table 2 reports the means of county-level median tuitions by affiliation of private high school, and Data Appendix B provides the details of how this private school tuition information was collected and constructed, as well as summary statistics from the October, 1979 CPS Private School Enrollment Supplement.

Catholic high schools offered tuition scholarships to approximately 12.6% of all students in 1979-1980. Among those students receiving scholarship aid, the average size of the tuition scholarship was approximately $481 dollars, a replacement rate of nearly 50%.[28] Moreover, nonsectarian high schools, particularly member schools of the NAIS, extend tuition scholarships to slightly more than 13% of students. Information from the NAIS suggests that the average replacement rate of tuition scholarships at member schools is slightly more than 50%, although these schools give more full tuition scholarships than the Catholic schools. Mean tuitions reported paid at non-sectarian high schools in 1979-1980 averaged $2013. Further details are reported in Data Appendix B.

A comparison of the full day tuition and fees figures gathered from the sources reported in Data Appendix B with the tuition and fees reported paid in responses to the October, 1979 Current Population Survey School Enrollment Supplement reveals that average tuitions reported paid are less than full day tuition and fees reported in private school handbooks. To some extent, this may reflect response variation to the CPS question, but actual tuitions paid depend on a number of other factors, such as: membership of the student and her/his parents in the parish; the number of children from a particular family enrolled in the school; and whether the

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[26]Yeager *et al.*, pp. 53-54.

[27]Benson and McMillen [1991], pp. 71.

[28]Yeager *et al.*, p. 172.

parent is a faculty member or employee of the church or school.[29] Even inclusive of tuition reductions and scholarships, however, tuition at private high schools is not a trivial expense for most families. Mean tuition and fees reported paid at private high schools of all types in 1979 was $1177.[30]

The picture that emerges of the private high school sector is one of considerable heterogeneity across types of private high schools. Nonetheless, the Catholic high schools, with roughly two-thirds of all students, are a relatively homogeneous group. In terms of curricular content and academic standards, the private schools are fairly similar, particularly the Catholic and non-sectarian schools. In summary, the differences across types of private high schools are relatively small in comparison to the differences in characteristics of all private schools *vis-a-vis* public schools.

Section III: The School Choice Literature

There has been surprisingly little research on the choice of private or public schooling, presumably due to the paucity of data regarding private school attendance. Existing research on school choice can be classified into three broad groups: survey data on choice of private or public school sector, in which parents are asked questions regarding family background (income, race) and their reasons for enrolling their children in public or private schools; aggregate models of the proportion of private enrollment to total enrollment within SMSAs or states; and models of school choice estimated with microdata, in which detailed family background measures are available. Below, I review briefly the results of these studies concerning the primary determinants of private school choice.

Surveys on Public/Private School Choice

The broadest survey of private school choice was conducted in 1982 by the School Finance Project of the National Institute for Education. Twelve hundred households with school-age children participated in a telephone survey which asked the parents what factors affected their choice of school sector. Private school parents most often cited academic quality as the primary reason for choosing private schools (42%), with religious instruction the next most popular reason (30%), followed by discipline (12%). Among public school parents, student assignment to a particular school was the dominant reason for "choice" of public school (24%), followed by ease of transportation/convenience (22%), and academic quality (11%).[31] Other surveys of school choice, such as Darling-Hammond *et al.*'s 1985 study of school choice and use of the Minnesota tuition tax

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[29]Sixty percent of Catholic high schools grant tuition reductions if more than one child from the family is enrolled in the school. Yeager *et al.* [1982], p. 212.

[30]October, 1979 CPS Private School Enrollment Supplement.

[31]Williams *et al.* [1983], p.21. Further, Nathan [1989] notes that 86% of all public school districts determine school assignments by geographic residence. Williams *et al.* also report that among those public school parents who considered other schools, the primary determinant of their choice of current school was academic quality (standards and courses) (32.6%), followed by personal finances (19%), and transportation/convenience (15%).

deduction in the Minneapolis-St. Paul area, revealed the same reasons for choice of private and public schools.[32]

Perhaps the most surprising result from these descriptive surveys is the emphasis placed on academic standards and courses as a determinant of private school attendance, even among parents sending their children to religious schools. Among parents of Catholic school children, academic standards were cited as the primary determinant of private school enrollment by 45% of parents, and values and religion were the next most-often cited factor (29%). Only for parents of children in other religious schools were values and religion the dominant motivation for private school enrollment (43%), followed by academic standards (22%).[33] This evidence suggests that quality of the academic curriculum is the principal factor influencing the choice of private schooling.

Aggregate Models of Private School Enrollment Rates

Several studies have related the proportion of school-age students enrolled in private schools in an SMSA or state to the level of public school expenditures in these areas, as well as observable demographic characteristics of the area. Gustman and Pidot [1973] jointly model educational expenditures per-pupil and public school enrollment rates for 79 urban areas, using 1962 data. They find that increases in per-pupil expenditures attract additional students into the public schools, and that public school enrollments fall as the percentage of the population that is Catholic rises.[34]

Two aggregate level studies of private school enrollment rates have included measures of private school tuitions. West and Palsson [1988] estimate a logit model of private school enrollment rates at the state level, in which they include the state average tuition charged to first-graders in schools that are members of the NAIS. Their tuition measure enters the logit equation negatively and is marginally significant. They estimate a price elasticity of demand for private school enrollment of -1.5.[35] Martin-Vazquez and Seaman [1985] estimate an OLS model of private school enrollment rates for 75 SMSAs. Estimating separate enrollment equations for proportion of total enrollment in religious and non-religious secondary schools in SMSAs, they find that private school tuitions are not significant in explaining the proportion of students enrolled in private schools.[36] These studies provide some evidence that tuition levels are not significant in determining private school enrollment rates, but since these are not studies of individual-level behavior, these results may not be robust.

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[32]See also Gemett and Olson [1984]. For a detailed study of school choice in British Columbia, wherein private schools receive partial government support, see Kamin and Erikson [1981].

[33]Williams *et al.* [1983], p. 22.

[34]Gustman and Pidot [1973], pp. 18-19.

[35]West and Palsson's tuition proxy is extremely non-representative, as NAIS schools, particularly those at the elementary level, charge much higher tuitions than any other type of private school.

[36]Martin-Vazquez and Seaman [1985], pp. 315-316.

Studies of School Choice using Micro-data

The final class of models used to investigate the private school enrollment decision bring to bear micro-data sets with extensive information on family background. Most of these studies estimate logit or probit models of school choice as a first-stage to control for selection bias in subsequent investigations of private and public school effects on achievement test scores, using the High School and Beyond data. Since these studies focus on achievement test score differentials, and not on school choice *per se*, they rarely report the actual probit estimates. Coleman, Hoffer, and Kilgore [1982], however, do report Catholic school choice logit equation results that were estimated separately for whites, blacks and Hispanics. They model the Catholic high school enrollment decision as a function of family income, mother's education, number of siblings, indicator for Northeast census region, two-parent family, respondent's and mother's educational expectations, and the availability of educational materials at home. With the exception of number of siblings and living in a two-parent family, all of the above variables enter significantly and positively in the Catholic school choice equation.[37]

I estimate a much richer variant of the private school choice model than previous studies, using information from the National Longitudinal Survey of Youth and constructed data sets on: private school availability, by type; private school tuition costs; and measures of public school quality within a county-wide market for secondary education. I develop a model of school sector choice in which the private high school attendance decision is a function of: family resources; family tastes for private schooling; the access and or availability of private school alternatives; and the quality of public schooling. Below, I describe the variables I use to proxy for each of the above determinants of school sector choice.

Family Resources

During the 1979-1980 academic year, mean tuition and fees reported paid at private high schools of all types was $1177.[38] Given that mean net family income in 1979 was approximately $21,000, private school attendance represented a substantial expenditure for most families. The table below illustrates these tuition costs.

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[37]Coleman, Hoffer, and Kilgore find some differences in the significance of coefficients across the white, black, and Hispanic equations, primarily in the sign and importance of the siblings variable. For whites, the number of siblings entered the logit equation with a positive sign, but was insignificant. For blacks and Hispanics, however, the number of siblings significantly decreases one's likelihood of attending Catholic school. Coleman, Hoffer, and Kilgore [1982], pp. 60.

[38]October, 1979 CPS Private School Enrollment Supplement.

Private School Tuition and Fees

Tuition and fees at selected private high schools:
1979 and 1979-1980 to 1982-1983

School	1979 Tuition	Four years tuition: 1979-1983
Buckingham Brown & Nichols [Cambridge, MA] Private day school	$4000	$18,295
Phillips Andover [Andover, MA] Private school		
Day tuition and fees	$4475	$19,265
Boarding tuition and fees	$5575	$25,495
Boston College High School [Dorchester, MA] Catholic-private boys' day school	$1135	$5190
Notre Dame Academy [Hingham, MA] Catholic-private girls' day school	$1000	$4575

Evidence from the October, 1979 CPS Private School Enrollment Supplement further illustrates that private school attendance is highly correlated with family income: only 3.28% of students from families with less than $5000 annual income were enrolled in private high schools, whereas 27.45% of students from families with more than $50,000 annual income were enrolled in private high school. In fact, every study of private school attendance finds a strong positive correlation between private school attendance and family income.

Private school attendance may depend not only on total family resources, but also on resources available per child. Birth order may also be important in determining the availability of resources, due both to the life-cycle accumulation of wealth within the household and the number of older and younger siblings present in the household. I include measures of both sibsize and birth order in estimating the private school choice equation.

Undoubtedly, parental tastes influence the private school enrollment decision, particularly for enrollment into religious schools. Tastes for religious instruction are likely to vary both across individuals within a religious denomination and across religious denominations. The percentage of a denomination's adherents enrolled in denominational schools varies substantially across religions, ranging from 1.267% for Baptists to 11.568% for Seventh-Day Adventists. (See Data Appendix C.) More generally, religious school enrollments as a percentage of adherents are lowest for denominations such as Baptists, Presbyterians, and Jews, and highest for Catholics and fundamentalist Christian denominations. Since denominational affiliation is likely to influence one's propensity to attend private schooling, I include eleven indicator variables for the denomination in which one was raised.[39]

There is also considerable evidence that private high schools were (and are) used as a vehicle to circumvent desegregation laws implemented after the passage of the Civil Rights Act. Devins [1989] found that nearly three-fourths of the "white-flight" from the Boston Public School System after the 1974 and 1975 busing

[39]The excluded group is composed of those individuals who report being raised under no religious affiliation.

and desegregation orders was absorbed by the city's Catholic schools. In the South, *de facto* segregation facilitated by private schooling was even more pronounced. Kraushaur [1972] notes that the number of students attending private schools in the South increased by 1000% from 1964 to 1970.[40] To proxy for tastes for racial segregation, I include both the proportion of county population that is black and an indicator variable for whites residing in the South census region in the model of school choice.

Access: Availability and Costs of Private Schooling Alternatives

I define the relevant geographical "educational market" faced by parents to be one's county of residence. A narrower version of the scope of the relevant market, such as five-digit zip codes, certainly excludes readily accessible private schools, while a broader definition of market scope, such as SMSAs, likely places a grouping of schools within a market that are too geographically dispersed to compete closely for students. The county definition of market scope provides a middle ground, and also allows for the use of several readily-available measures of the quality and funding of public schools.

Parents dissatisfied with the quality of the public schools in their locality have three options: change their residence; enroll their child in a private boarding school; or enroll their child in a local private day school.[41] In the earlier review of the school choice literature, public school parents indicated that they enrolled their children in public schools for reasons of convenience or ease of transportation. Where private schools are more readily available, parents will face lower access costs to private schooling, and will be more likely to enroll their children in private schools. Hence, I include a measure of the density of private schools within one's county, measured as private high schools per 10,000 population, to measure the concentration of private schooling alternatives in the local education market.

Since the valuation of available private schooling should be an increasing function of the match quality of one's preferences for a particular type of private schooling (e.g. independent private, Catholic, etc.), I include separate controls for the presence of: a private high school of any type; a non-sectarian private high school; and a private high school of one's religious affiliation in one's county of residence at age 14.

Since any well-specified model of demand should include measures of prices, I include the median tuitions for Catholic, non-sectarian private, and other religious schools in one's county of residence.[42]

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[40]Kraushaur [1972], p. 16.

[41]An additional alternative may be to apply to a magnet school within the local public school system. During the 1979-1980 academic school year, 14% of the 15,685 school districts within the United States allowed for attendance to be determined outside the rubric of geographic boundaries and location of residence (e.g. magnet schools, specialty schools, and open enrollment within unified school districts.)

[42]Studies of school choice that include only religious denomination indicators (typically, only an indicator for Catholics) are likely to attribute an amalgam of three different effects to the denominational indicator: the availability of denominational schools; the costs of attendance at these schools; and denomination-specific tastes for private schooling.

Quality of Public Schooling

To proxy for local measures of school quality, I include median family income in the county and median house values in the county, both of which represent, to some degree, the average level of resources available to the local public school districts.[43] Further, I include two more direct measures of the resources devoted to public education at the county level: the ratio of per capita direct general expenditures on education at the county level to state-average per capita direct general educational expenditures; and the ratio of per capita property taxes at the county level to the state average. In counties where educational spending is high relative to the state average, one would expect the quality of public high schools to be higher. *Ceteris paribus*, higher quality public schools should lower the propensity to enroll in private schools.

Section V: Methodology

Above, I posited that an individual's valuation of private schooling-- and hence one's propensity to enroll in private schooling-- was a function of family resources, tastes for schooling, access to and costs of private schooling, and quality of public schooling:

$$Attendance = f(family\,resources, tastes, private\,school\,access, public\,s \quad (1)$$

Below, I develop an index function model of school choice. Private school attendance is determined by the utility a child and her or his parents derive from attending a private high school. While these utility levels are not observed, the level of utility can be modeled as a function of observable characteristics, such as the determinants of private school attendance listed in Equation (1) above, which are contained in the vector Z_i, and an error term u_i:

$$I^* = Z_i'\gamma - u_i, \quad where \quad u_i \sim N(0,1) \quad (2)$$

Hence, an individual attends private school if:

$$I_i^* \geq 0 \rightarrow Z_i'\gamma \geq u_i. \quad (3)$$

Since we observe whether an individual attends private high school, we can construct an indicator I_i, which is a function of the latent index I_i^*, as follows:

$$I_i = 1 \quad if \quad I_i^* \geq 0 \quad (Z_i'\gamma \geq u_i), \quad (4)$$

$$I_i = 0 \quad if \quad I_i^* < 0 \quad (Z_i'\gamma < u_i). \quad (5)$$

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[43]Further, the median income in the county proxies for the average socioeconomic status of other students. Unfortunately, only three states, Florida, Georgia, and West Virginia, use counties as the basis for organizing public school districts, so these controls are not perfect.

Given that we observe the private school enrollment decision and that we have imposed the condition that the u_is have unit variance, we can recover parameter estimates of the γs from probit

maximum likelihood estimation of:[44]

$$L = \prod_{i=1}^{N} \left[\Phi(Z_i'\gamma)\right]^{I_i} \cdot \left[[1 - \Phi(Z_i'\gamma)]\right]^{1-I_i} . \qquad (6)$$

Section VI: Description of Data

National Longitudinal Survey of Youth

The primary data source used in this paper is the National Longitudinal Survey of Youth (NLSY), 1979-1990. The NLSY is a panel survey comprising 12,686 individuals at its inception in 1979, all of whom were between the ages of 14 and 21 on 1 January 1979.

The NLSY provides a detailed set of family background measures, including parental socioeconomic status, siblings and birth order measures, and religious denomination in which one was raised. Moreover, the NLSY provides information on a subset of these family background measures and county of residence when the respondent was 14.[45] These variables are particularly useful, since they characterize family demographics at the time (the eighth grade for most respondents) when high school attendance decisions are decided, or at least under consideration. Finally, the NLSY asks a series of questions regarding the dates of previous changes of residence.[46] Knowledge of previous moves allows me to exclude those individuals who did not attend the same school for the duration of their high school enrollment.[47]

County-Level Demographic Information

Since the NLSY contains the county in which each respondent lived at age 14, I merge county level information collected from the 1980 Census on demographics in the county, such as median family income, median house value, percent of population black, and per capita direct general expenditures on education, into

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[44]Appendix A, which appears at the end of the paper, derives the asymptotic covariance matrix for the estimated parameter vector γ, as well as the derivative of the average marginal effects estimator and its asymptotic covariance matrix.

[45]The NLSY asked survey respondents for the following retrospective information in 1979: did father/mother work for pay when respondent was age 14; occupational status of mother's/father's job at age 14; did respondent live in a two-parent family at age 14; did respondent have access to newspapers, magazines, and a library card at home at age 14; and geographic location of residence at age 14.

[46]Questions concerning all previous residence changes were asked in 1979, 1980, and 1982.

[47]Given that I know only whether the last high school attended by a respondent was a private or public school, this exclusion allows me to consider only those individuals who received their high school education in the same school (and same school sector).

the data set.[48] These variables allow me to proxy for the quality of public schooling in the county by measuring financial resources available to the schools.[49]

Private School Data

In the 1979 NLSY survey, respondents were asked:

> *"Is the high school you are currently attending or the high school in which you were last enrolled a public or private (parochial) school?"*

The response to this question represents the extent of information I have regarding private school attendance in my sample. As a result, I restrict my analysis to only those youths who were enrolled in the same high school for the duration of their high school attendance.

To determine the location and type of private high schools in the county of residence, I used the Dept. of Education's *1980-1981 Private High Schools Data File*, which provided a universe list containing the name and location of 4982 private high schools in the United States that were open during the 1979-1981 period. The *1980-1981 Private High Schools Data File* also contained information on: the religious affiliation of the school, if any (nonsectarian or one of 16 religious affiliations); total school enrollment; graduates; and teachers. Tuition information for these private schools was collected from the *Porter-Sargent Handbook of Private Schools, Official Catholic Directories,* and numerous other sources, all of which are listed in Data Appendix B.

The Selected Sample

From the initial NLSY sample of 12,686 youths, I selected those individuals aged 14-19 in 1979 who were not in the active-duty military and were enrolled in high school at the time of the 1979 interview. Further, I excluded those individuals who reported moving outside the county and/or changing high schools during the time period 1 June of the year in which they turned 14 until the date at which they reported having left or completed high school.[50] Additional exclusions were generated as a result of missing observations on county of residence at age 14, and nonresponses and refusals to additional questions on family background and education. Table 1 contains a complete list of the criteria used to select the final sample.

The final sample consists of 3666 youths, all of whom were enrolled in high school during the fall of 1979. Of this group, 174 were enrolled in private high schools for the duration of their high school attendance. Further, the sample contains 1162 individuals who reported being raised in the Catholic faith, 108 of whom were enrolled in private schools.

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[48]This information was collected from the *1983 and 1988 City and County Data Books.*

[49]I also used the *1980 Survey of Churches and Church Membership in the United States*, which provided estimates of the percentage of county population adhering to various religious denominations. I am grateful to Maura Doyle for pointing out this data source.

[50]Individuals who were administered Version B of the Household Interview (15 individuals in my sample, 4 private, 11 public) were not excluded, as they may have been living in boarding school dorms, or juvenile centers.

Section VII: Empirical Results

Characteristics of Private and Public School Students

Table 2 contains sample means of the variables used in the probit school choice model, reported separately for all respondents, private school attendees, and public school attendees. Table 2 reveals that private school students are from relatively advantaged socioeconomic backgrounds: on average, their family income is $6944 higher and father's education is 1.81 years greater than the means for public school students. Eighty-six percent of private school students are white, compared to seventy-nine percent of all public school students, hence whites are overrepresented in the public schools. Private school students are more likely to live in two-parent households at age 14, and are also nearly eight percentage points more likely to be last-born children. Finally, private school students are 15 percentage points more likely to live in households that provide children access to reading materials.

Regarding tastes for private schooling, Table 2 notes that Catholics comprise 31% of the sample population, yet Catholics constitute over 64% of private high school enrollment. Protestant denominations and Jews are underrepresented in the private high schools, whereas fundamentalist denominations are overrepresented. Finally, the mean proportion of county population black is 3.5 percentage points higher in the counties in which private school students reside.

Not surprisingly, private school students are more likely to live in counties with both a non-sectarian private school and a private high school of their own religious affiliation. These counties also have higher private school densities, which serves to lower the access costs to private schooling. The differences in median county tuitions are not substantial across private and public school students, although tuitions tend to be slightly higher in the counties in which private school students reside.

On average, private school students live in slightly wealthier counties, as measured by median family income and median house value. Per capita property taxes are higher, and per capita direct general expenditures on education slightly lower, in the counties in which private school students reside.

Table 3 contains summary statistics for those individuals who were raised Catholic. The percentage of Catholics in private schools is roughly double the population percentage, as noted above. The private-public differences in means for Catholics are closely aligned with those for the entire sample, although certain distinctions in magnitude are notable.

Blacks are slightly overrepresented among Catholic private school students, although this difference is not significant. Further, Catholics who attend private high schools live in counties which are, on average, 13.8% black, whereas the counties of residence of Catholic public school students are, on average, 8.1% black. To some extent, this difference may reflect tastes for racial segregation among Catholics, although the Catholic school system has schools in numerous small communities in New England, New York, Pennsylvania, and the Midwest in which there are few blacks.

Catholic women are overrepresented in the private schools: they constitute 57.4% of Catholics enrolled in private schools, *vis-a-vis* 47.2% of Catholics enrolled in the public schools. The greater proportion of Catholic women in private schools is largely attributable to the availability of single-sex Catholic high schools: over one-

fourth of all Catholic high schools are women-only institutions.[51] Further, women-only Catholic schools tend to charge lower tuitions, due to a higher incidence of contributed services from sisters religious.

Private School Choice Probit Models

Table 4 presents probit coefficient estimates for both the Coleman Hoffer and Kilgore specification of private school choice and the full model discussed in the text.[52] The CHK specification is a restricted form of the full model, as it omits measures of the access to and costs of private schooling, as well as the quality of public schools, in one's county of residence.

Estimated over all observations, both models produce coefficient estimates of the same sign and magnitude for almost all of the variables. The most notable exception is the siblings coefficient, which changes from negative and insignificant in the CHK model to positive and significant in the full model. The reversal of sign is caused by the inclusion of the birth-order indicators: when the full model specification is run without the birth-order indicators, the coefficient on siblings is positive (+0.018), but insignificant. Controlling for birth-order and family income, individuals from large families are more likely to be enrolled in private schools.[53]

When controls for private school availability and public school quality are included (the full model), the magnitude of the Black and Hispanic coefficients increases, while the coefficient on Catholic declines. The decrease in the Catholic faith indicator in the full model provides evidence that the Catholic indicator picks up the effects of private school availability and attendance costs in the restricted [CHK] specification.

The results for the models estimated over Catholics only are roughly equivalent, although the coefficient on net family income becomes insignificant in the full model specification.

Since the CHK model is nested in the full model, the CHK model is simply a restricted version of the full model specification which imposes that the coefficients on the private school access and public school quality measures are zero. Table 5 reports test statistics on the validity of these restrictions. For both the entire sample and the subsample of Catholics, the CHK model is rejected in favor of the full model specification of private school choice. The rejection of the CHK model suggests that measures of private school access and public school quality are important factors affecting individuals' choice of school sector.

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[51]Yeager *et al.*, p. 16.

[52]The school choice equation referred to as Coleman Hoffer and Kilgore [CHK] specification is that used by Coleman Hoffer Kilgore [1982]. Most research on private school choice and achievement differentials across school sectors has employed the CHK specification of school choice.

[53]Coleman, Hoffer, and Kilgore, using the HSB data, found that siblings entered the private school choice logit equation with a positive sign for whites. Coleman, Hoffer, and Kilgore [1982], p. 61. Further, given that the frequency of attendance at religious services is positively correlated with number of siblings (ρ=+0.164), it may be that larger families also have stronger tastes for private religious schooling.

Table 6 contains probit coefficients and marginal effects estimates for the full model specification of private school choice estimated over all observations.[54] The probit coefficients are all of the correct sign, save the median Catholic tuition and fees coefficient, which is positive and significant.[55,56] Below, I consider the marginal effects estimates for each of the determinants of private school choice.

Family Resources

The likelihood of attending private high school is increasing in family income, although the income effect is small: an additional $10,000 in family income would increase the propensity to enroll in private school by two percentage points. An additional year of either father's or mother's schooling results in a 1.3 percentage point increase in the likelihood of attending private school. Finally, an additional sibling increases the likelihood of attending private school by 1.4 percentage points, controlling for birth-order.

Before considering the birth order variables, it is useful to illustrate the definitions used in this paper. An only child is given a value of one for the only child indicator, and is not classified as a first-, middle-, or last-born child. A family with two children has a first- and a last-born child, and a family with three children has a first-, middle-, and last-born child. Finally, a family with five children has a first-born child, three middle-born children, and a last-born child.

Middle-born children are significantly less likely to go to private school, whereas last-born children are significantly more likely to attend private school.[57] A middle-born child is 5.6 percentage points less likely to attend a private high school. One possible explanation for this observed pattern of birth order effects on private school attendance is that middle-born children grow up at a time when resources per child are lowest, and expenditures for private schooling are constrained. Last-born children, however, grow up in the family when

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[54]The marginal effects estimates are derivative of the average calculations for the following representative individual: a white Catholic male living in an SMSA in a New England county that contains both a non-sectarian private and a Catholic high school. This man is a middle-born child with three siblings who lived in a two-parent household in which his mother worked outside the home. The man had access to reading materials at home. His parents were both high school graduates, and their net family income was $21,000. All remaining indicator variables were set to zero, and all remaining continuous variables were set equal to the mean over all observations.

[55]The tuition and fees figures used to calculate county median tuitions are full day tuition and fees estimates reported by the schools. Catholic schools, however, offer a number of scholarships and discounts from these prices, based on membership in the parish, additional siblings enrolled in the school, and financial need. Further, private Catholic high schools, which enroll the most students of any type of Catholic high school and charge the highest average tuitions, offer the most generous scholarship programs. Other researchers estimating aggregate models of private school enrollment in SMSAs have also found a positive and significant sign on the Catholic school tuition measure. (cf. Martin-Vazquez and Seaman [1985]).

[56]An explanation of the positive coefficient on the siblings variable was included in the discussion of Table 4, above.

[57]I also entered birth order variables as a series of indicators for each birth order "position" (first, second, third), and the results were unchanged.

older siblings may have already left the household, freeing up expenditures for remaining children.[58] Moreover, last-born children grow up in the family when parents' life-cycle earnings are higher, which also serves to increase the income available for educational expenditures.

An alternative explanation views public schooling as an experience good. Information on school quality is costly to obtain and of uncertain quality (e.g. word-of-mouth from neighbors). Hence, parents learn about the quality of schooling only by consumption of the good (public schooling). If school quality is revealed to be low or if older siblings experience bad outcomes in the public schools, the parents may place the younger sibling(s) in private schools.

Tastes for Private Schooling

The religion in which one was raised is an important factor in influencing private school choice, reflecting the differential tastes for private (religious) schooling across sectors. Catholics and fundamentalist denominations (e.g. Pentecostals, Assemblies of God, and Seventh-Day Adventists) are significantly more likely to attend private high schools, whereas Baptists, Lutherans, and Jews are significantly less likely to attend private school. Being raised Catholic increases one's likelihood of attending private high school by 7.2 percentage points.[59]

The tastes for racial segregation proxies exert a large influence on the private-school enrollment decision. Southern whites are significantly more likely to enroll in private school, as are individuals from counties with larger proportions of the population black. A ten percentage point increase in the black proportion of county population (e.g. from five percent to fifteen percent) would increase one's likelihood of attending private school by 4.45 percentage points.

Private School Access: Availability and Costs

The presence of a private high school of any type has a positive effect on attending private school, but this effect is not significant. Similarly, the coefficient on the non-sectarian private high school indicator is positive but insignificant. Individuals living in countries that contain a private school of their religious affiliation, however, are significantly more likely to attend private school: the presence of such a school results in a 14 percentage point increase in the likelihood of private school attendance. Finally, the greater the concentration of private high schools in the county, the higher the propensity to attend private school. A ten point increase in the

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[58]To test this theory, I interacted the last-born term with father's occupation (one-digit) and father's age in the probit equation. Although the interaction terms were positive for both last-born*father's age and last-born*"high-wage growth" occupations (professional, managerial, technical), none of these terms was significant.

[59]I also estimated the probit school choice model with the percentage of county population who were adherents to one's religious denomination as a covariate. When the private high school of one's religious affiliation was included in the school choice equation, the coefficient on own denomination population proportion was +0.720 (T-statistic=1.646). When the private high school of one's religious affiliation was excluded, the coefficient on own denomination was +0.922 (T-statistic=2.043). Since the recording of denominational affiliations in the NLSY, Private High School Data File, and the Survey of Churches and Church Membership makes it difficult to exactly match data, I report model estimation results using the private high school indicator.

private high school density measure increases the propensity to attend private school by 1.13 percentage points. Ease of access to private schooling and the availability of religious schooling are indeed crucial determinants of the private school attendance decision.

Evidence on the price-sensitivity of private school enrollment is less conclusive. In part, the existing data on private high school tuitions is less than ideal, due to both nonreporting and the divergence between quoted tuitions and tuitions actually paid. The median non-sectarian and other religious high school tuitions are of the correct sign, although only the coefficient on other religious median tuitions is significant. A one-thousand dollar increase in median tuition at other religious schools would lead to a four percentage point reduction in the likelihood of enrolling in private school. For the 1978-1979 school year, such an increase would represent a 50% increase in the mean tuitions charged at other religious schools.

Proxies for the Quality of Public Schools

Among this group of variables, only the ratio of direct general expenditures on education within the county to the state average was significant in predicting private school attendance. Counties that spend more on education *vis-a-vis* the state average are less likely to be the residences of private school students. Raising the ratio of county per capita direct general educational expenditures to the state average by ten points (e.g. from 0.98 to 1.08) results in a decrease in the likelihood of private school attendance by 1.78 percentage points.

Results from the Catholic Subsample

For the sample of Catholics, the probit coefficients and marginal effects estimates are similar to the estimates from the entire sample.[60] None of the marginal effects estimates are significantly different across the entire sample and Catholics. As a result, I review only the private school access and public school quality measures.[61]

Private School Access: Availability and Costs

Only the presence of a Catholic private high school in one's county of residence had a significant impact on the likelihood of attending a private high school: the presence of a Catholic high school increased the likelihood of attending private school by 29.4 percentage points. Hence, Catholics are much more likely to attend private school when a Catholic high school is readily available.

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[60]The marginal effects estimates are derivative of the average calculations for the following representative individual: a white Catholic male living in an SMSA in a county in New England that contains both a non-sectarian private and a Catholic high school. This man is a middle-born child with three siblings, and lived in a two-parent family where his mother worked outside the home. This man had access to reading materials at home. His parents were both high school graduates, with a net family income of $23,975. All remaining indicator variables were set to zero, and all continuous variables were set equal to the mean for all observations.

[61]For Catholics, increasing the black proportion of county population by ten points results in a 5.22 percentage point increase in the propensity to attend private schooling.

The Catholic school tuition variable remained positive, but was statistically insignificant. Once again, the private school attendance decision appeared relatively insensitive to tuitions.

Public School Quality Measures

Among the proxies for the financial resources available to public schools, the per capita direct general expenditures measure had a negative and significant effect on the likelihood of attending private school: a ten point increase in the ratio of the county's per capita expenditures relative to the state average would lower the likelihood of private school attendance by 3.22 percentage points.[62] Once again, individuals in counties that spend more on education were less likely to enroll in private schools.

Tables 6 and 7 reveal the robustness of the private school choice results obtained from the full model specification; virtually none of the parameter estimates were significantly different.[63] Moreover, both samples revealed the importance of considering the ease of access to private schooling and the funding of existing public schools, variables that are omitted from most microdata investigations of private school choice. Most importantly, this paper provides evidence on the importance of conditions in the local market for secondary education-- namely the availability of alternatives to public schooling and the quality of existing public schools-- in influencing the private school attendance decision.

Section VII: Conclusions

The evidence presented in this paper suggests that measures of the competitiveness of the local educational market are important determinants of the private school attendance decision. The presence of a private high school of one's religious affiliation significantly increases one's likelihood of attending private school. The private school enrollment decision is also sensitive to the quality of public schools in the local educational market: individuals are less likely to attend private high schools in counties with higher educational expenditures. Hence, previous microdata studies of school choice that excluded these measures are likely to be misspecified.

Further, estimation of the fully specified model of private school choice allows one to disentangle the effects on private school of attendance of denominational tastes for private schooling separately from the availability of denominational schooling and tuition costs at these schools. The significance of the Catholic faith indicator was diminished when measures of the availability and cost of Catholic schooling were included in the school choice equation.

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[62]The marginal effects estimates for median house value and ratio of county per capita property taxes to the state average were marginally significant.

[63]The results reported above did not change significantly when the model was estimated over whites only.

Most importantly, these results provide evidence on the sensitivity of private school attendance decisions to changes in tuition and income. Given the small responses in enrollment propensities to sizable changes in tuitions, it is unlikely that educational choice policies such as tuition tax credits and tuition tax deductions would have large impacts on private school attendance decisions. Indeed, existing evidence on tuition tax deduction policies in Minnesota and tuition tax credit policies in Hawaii provide anecdotal evidence in support of this prediction.[64]

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[64]Darling-Hammond *et al.* [1985] The Minnesota tuition tax deduction plan has been in place since 1954, and the amount of the deduction has been changed several times since its inception. The most recent changes raised the amount of the deduction on educational expenses to $1000 per child from $750. Estimates from the Minnesota State Treasury Department estimate that 1.7% of eligible households claimed the deduction, and there was virtually no change in claims after the deduction was increased.

APPENDIX A
Private High Schools in the United States: Background Information and Stylized Facts

A.1 Introduction

Our knowledge of public high schools in the United States is extensive. Detailed data on public high schools is collected and disseminated by the National Center for Education Statistics. Moreover, the public high school system in the United States was subjected to intense scrutiny in the early eighties.[1]

Our understanding of the workings of private high schools, is, in comparison, much more skeletal. In part, this arises from the heterogeneity among the group of private schools: recently founded Christian academies that sprang up in the South after the passage of the Civil Rights Act are markedly different from well-established Catholic high schools in the Northeast. Even among the Catholic high schools, there is considerable variation by ownership and control: Jesuit schools such as Fordham Prep in the Bronx are distinct from small parish (parochial) high schools.

A further impediment to understanding the operation of private high schools arises from the availability of data. Although regulations vary by state, private high schools are generally not required by law to submit data to state education agencies. In fact, many private high schools seek to minimize contact with state education agencies, and often fail to report enrollment figures. Hence, data collection is considerably more spotty among private high schools, particularly smaller independent and Christian private high schools in the South and West.

While it is useful to recognize the limits of our knowledge concerning the aggregate grouping of private schools, studies of private high schools in the past 15 years have added substantially to our understanding of the operation, administration, and missions of private high schools, which allows one to examine the extent to which nonsectarian private schools and religious schools of different affiliations are similar. In particular, there exists fairly detailed information concerning both Catholic high schools and nonsectarian schools who are members of the National Association of Independent Schools (NAIS).[2]

Detailed information regarding enrollments and the number of schools by religious affiliation is contained in Data Appendix C. Data Appendix B presents statistics on enrollment and tuitions by Census region, urbanicity, race and income level. Hence, I provide a brief outline of the characteristics of private schools below.

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[1]Some of the more publicized studies are: National Commission on Excellence in Education [1983], Boyer [1983], Ravitch [1983], Sizer [1984], and Powell, Farrar, and Cohen [1985].

[2]Reviews of Catholic education in the U.S. are provided by Neuwein [1966], Greeley and Rossi [1966], Beutow [1970], Greeley, McCready, and McCourt [1976], Greeley [1982], and Yeager, Benson, Guerra, and Manno [1985]. Reviews of private schools are provided by Kraushaar [1972], Abramowitz and Stackhouse [1980], and Benson and McMillen [1991].

A.2 Enrollment

During the 1979-1980 school year, 1.112 million students (7.4% of total high school enrollment) were enrolled in private high schools. Enrollment in private high schools reached a peak rate of approximately 11.8% in 1965, dropped sharply to eight percent by 1969, and remained relatively constant throughout the seventies.[3] More recently, private school enrollment rates have trended upward, rising to 8.7% in 1985.[4] Clearly, private schools are an important institutional provider of secondary education in America.

A.3 The Importance of Religious Schools

Religious high schools of all denominational affiliations enrolled 81% of all private high school students during the 1979-1980 academic year.[5] The largest religious high school system is the Catholic high school system, which comprised 31% of all private high schools, 65% (733,000 students) of all private high school students, and 82% of all religious private high school students.[6] Among the other religious high schools, Baptist, Seventh-Day Adventist, Christian, Lutheran, and Episcopalian schools constitute the majority of enrollment. Nonsectarian private high schools enrolled 18% (210,000 students) of all private high school enrollment in 1979-1980.[7] Given these enrollment figures, I employ the following tripartite classification for private schools for the rest of this paper: Catholic high schools, other religious high schools, and nonsectarian private high schools. Admittedly, such a classification scheme is not a perfect partitioning of private high schools by type and similarity of student enrollment.[8]

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[3]October 1979 Current Population Survey (CPS) Private School Enrollment Supplement.

[4]October, 1979 CPS Private School Enrollment Supplement.

[5]October, 1979 CPS Private School Enrollment Supplement, p. 3.

[6]October, 1979 CPS Private School Enrollment Supplement, p. 3, and author's calculations. See Data Appendices B and C for further details.

[7]October, 1979 CPS Private School Enrollment Supplement and author's calculations. These point-in-time statistics, however, fail to capture changes in the composition of private school enrollment that began in the late sixties and continued throughout the 1980s. Enrollment in Catholic high schools peaked in the mid-sixties, and declined until 1982. Enrollment in non-sectarian private schools, particularly the independent schools that are members of the NAIS, also declined during this period, although the aggregate decline was very slight. (It is important to note that many of the newly-formed academies in the South are organized as nonsectarian schools.) Other religious schools, however, experienced marked growth during this time. Enrollment in Christian and fundamentalist schools grew by roughly 500% from 1973 to 1983. Sources: Benson and McMillen [1991], p. 31; Carper and Hunt [1984].

[8]Within the group of Catholic high schools, there are four classifications of high schools, based on administrative organization and control of the school: parish (parochial) schools, operated by a single parish; inter-parish schools, operated jointly by two or more parishes; diocesan schools, operated by the diocese; and private Catholic schools, operated by a religious order or private group. Forty percent of

Nonetheless, this scheme is used by many researchers of private schools, as it adds tractability to any analysis of private schools, particularly since a finer division of private schools would result in extremely small cell sizes.

A.4 Academic Standards and Curricula

Most people tend to associate competitive admissions and demanding college preparatory curricula with the elite private schools. Catholic schools, however, are also fairly demanding in their academic standards and curriculum. Carper and Hunt [1984] argue that "the contemporary Catholic educational system is primarily secular and specifically oriented to facilitating the social mobility of selected Catholic youth."[9] Over seventy percent of Catholic high schools required an entrance exam as a precondition for admission, compared with 66% percent of private schools.[10] Further, approximately 77% of Catholic school students were enrolled in college preparatory (sometimes called academic) curricula, as compared to 71% of all other private school students and 35% of all public school students.[11] Finally, requirements for years completed of core subjects — such as Math, English, Science, and Social Studies — are roughly the same across all private schools, although Catholic schools require slightly fewer years of Math and Science courses, on average, than other private schools.[12]

A.5 Organization

The mean enrollment across all types of private high schools in 1979-1980 was roughly 215 students, compared to mean public high school enrollment of 866 students. Catholic schools had much higher average enrollments of approximately 500 students, while average enrollments in non-sectarian private high schools were much lower (approximately 100 students). Christian high schools also tend to have smaller average enrollments, (approximately 95 students).[13]

Catholic high schools are private; 40% are diocesan; 13% are parochial; and seven percent are inter-parochial. Since private and diocesan schools have larger average enrollments, they collectively enroll more than 80% of all Catholic high
school students.

[9]Carper and Hunt [1984], p. 24.

[10]Benson and McMillen [1991], p. 79. Moreover, nearly 73% of all Catholic high schools require a formal interview with the high school principal, attended by the student and her or his parents, as a precondition to admission. Yeager *et al.* [1985], p. 212.

[11]Benson and McMillen [1991], p. 90.

[12]Benson and McMillen [1991], p. 91.

[13]Carper and Hunt [1984].

Most private high schools (82.9%) were exclusively day schools, and schools that enrolled only boarding students comprised a small fraction of all private schools (3.9%). The remainder of private schools enrolled a combination of day and boarding students.[14] Since boarding school students are immersed in a total institution, the treatment effect of a private school education for boarders is likely to differ substantially from the experience of day students in the private schools. Fortunately, the number of potential boarders in the sample is quite small, and should not affect the results substantially.[15]

Across all types of private high schools, 81% are coeducational, 9.2% are male-only, and 9.7% are female-only.[16] Catholic schools have the largest number of single-sex schools, with 16.6% of all Catholic schools male-only, and 25.6% of all Catholic schools female-only.[17]

Per-pupil expenditures differ substantially, both across the private and public sectors and within the private school sector. Differences in teacher and instructional salaries across sectors are the primary cause of this disparity, as salaries paid to instructional staff represent 60% of current per-pupil expenditures.[18] The private religious schools, particularly the Catholic schools, enjoy cost-savings from the contributed services of religious faculty and members of religious orders, who are paid minimal salaries. Non-Catholic religious high schools have lower percentages of religious faculty, which raises expenditures on instructional staff, and generally receive smaller operating subsidies from local congregations and larger administrative units of the denomination. Average per-pupil expenditures in public and private schools are listed below.

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[14]Coleman, Hoffer, and Kilgore [1982], p. 26 and author's calculations. The number of schools offering five-day boarding programs is relatively small.

[15]In the sample from the NLSY used in this paper, I used the reported household interview version to determine that, at most, six of the private school students in my sample were enrolled in private boarding schools ***as boarders***.

[16]Coleman, Hoffer, and Kilgore [1982], p. 56.

[17]Coleman, Hoffer, and Kilgore [1982], p. 56.

[18]Bredeweg [1982], pp. 33-35.

Per-Pupil Expenditures in Public and Private High Schools: 1979-1980

School Type	Mean Per-pupil Expenditure (standard deviation)
Public	$2016 ($759)
Catholic	$1353 ($446)
Other Private	$2777 ($1643)
Leading Private	$4648 ($1810)

Source: Coleman, Hoffer, and Kilgore [1982], pp. 26.

Leading private schools, which include elite private schools such as Exeter, Andover, and Choate, have lower pupil-teacher ratios and substantially higher expenditures on facilities and equipment than do other private schools, all of which lead to the substantially higher per-pupil expenditure figures above.

A.6 Instructional Staff

Compared to teachers in the public schools, private high school teachers are more likely to be white women. Moreover, private school teachers are younger — and hence have less experience — than their public school counterparts.[19] Private schools are also much less likely to offer tenure: 30.7% of teachers in Catholic high schools have tenure, and only 20.7% of teachers in other private high schools have tenure. In public high schools, 77.4% of teachers are tenured, commonly after two to five years' service.[20] The difference in tenure across school sectors is not an artifact of the relative youth of private school teachers, as many private schools do not offer tenure.[21]

Although state regulations regarding the certification of private school teachers vary considerably, virtually all private high school teachers have bachelor's degrees. Further, the percentage of high school teachers with graduate degrees (48%) is approximately equal in both private and public high schools. There is, however, considerable variation within private schools: forty-eight percent of Catholic high school teachers have master's degrees or higher, compared to nearly 60% of non-sectarian private high school teachers and 30% of teachers in other religious high schools.[22]

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[19]Benson and McMillen [1991], pp. 49-52.

[20]*Digest of Educational Statistics 1983-1984*, pp. 51.

[21]Only 28% of Catholic high schools offer tenure to teachers. Yeager *et al.* [1985], pp. 45.

[22]Yeager *et al.* [1985], pp. 53-54.

Compensation differs markedly across the private and public high school sectors. Salary levels and salary growth are significantly higher within the public high schools: average base academic year salaries in public schools are $24,335, compared to $14,400 for private school teachers.[23] In part, this reflects a differential return to experience, as age-earnings profiles in the private school sector, particularly within Catholic schools, are virtually flat, whereas public school experience-earnings profiles exhibit the normal log-concave profile. Private school teachers are also much less likely to be covered by collective bargaining agreements, so a portion of the growth in earnings for public school teachers may reflect a union wage premium.

A.7 Tuition and Fees

The tuition policies of private high schools are complex, and vary widely from school to school. Across the different types of private schools, tuition and fees are lowest in Catholic high schools and highest in non-sectarian private high schools, especially member schools of the NAIS. Table 2 reports the means of county-level median tuitions by affiliation of private high school, and Data Appendix B provides details concerning the collection and construction of the private school tuition information, as well as summary statistics on private high school tuition and fees reported paid from the October, 1979 CPS Private School Enrollment Supplement.

Catholic high schools offered tuition scholarships to approximately 12.6% of all students in 1979-1980. Among those students receiving scholarship aid, the average size of the tuition scholarship was approximately $481 dollars, a replacement rate of nearly 50%.[24] Moreover, nonsectarian high schools, particularly member schools of the NAIS, extend tuition scholarships to slightly more than 13% of students. Information from the NAIS suggests that the average replacement rate of tuition scholarships at member schools is slightly more than 50%, although these schools give more full-tuition scholarships than the Catholic schools. Mean tuitions reported paid at non-sectarian high schools in 1979-1980 averaged $2013. Further details are reported in Data Appendix B.

A comparison of the full day tuition and fees figures gathered from the sources reported in Data Appendix B with the tuition and fees reported paid in responses to the October, 1979 Current Population Survey School Enrollment Supplement reveals that average tuitions reported paid are less than full day tuition and fees reported in private school handbooks. To some extent, this may reflect response variation to the CPS question, but actual tuitions paid depend on a number of other factors, such as: membership of the student and her/his parents in the parish; the number of children from a particular family enrolled in the school; and whether the parent is a faculty member or employee of the church or school.[25] Even inclusive of tuition reductions and scholarships, however, tuition at private high schools is not a trivial expense for most families. Mean tuition and fees reported paid at private high schools

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[23]Benson and McMillen [1991], pp. 71.

[24]Yeager *et al.* [1985], p. 172.

[25]Sixty percent of Catholic high schools grant tuition reductions if more than one child from the family is enrolled in the school. Yeager *et al.* [1985], p. 212.

of all types in 1979 was $1177.[26]

A.8 Conclusion

The picture that emerges of the private high school sector is one of considerable heterogeneity across types of private high schools. Nonetheless, the Catholic high schools, with roughly two-thirds of all students, are a relatively homogeneous group. In terms of curricular content and academic standards, the private schools are fairly similar, particularly the Catholic and non-sectarian schools. In summary, the differences across types of private high schools are relatively small in comparison to the differences in characteristics of all private schools *vis-a-vis* public schools.

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[26]October, 1979 CPS Private School Enrollment Supplement.

APPENDIX B
Derivation of Marginal Effects Estimates and Asymptotic Covariance Estimates

In Tables 6 and 7, derivative of the average marginal effects estimates are reported. These marginal effects measure the change in the value of the index function, given a change in one of the regressors. The derivative of the average marginal effects estimator measures the change in the index function due to a change in one of the regressors, evaluating the derivative at the vector of means of the regressors.

Derivative of the Average Marginal Effects Estimator for the *kth* regressor:

$$\frac{\partial \Phi(Z_i'\gamma)}{\partial Z_{ik}} | Z_i \ \bar{Z} \qquad \phi(Z_i'\gamma)\gamma_k | Z_i \ \bar{Z} \ .$$

For the derivative of the average marginal effects estimator, one can derive standard errors following a linear approximation approach, discussed in Greene [1992], which is listed below.

Asymptotic Variance of the Derivative of the Average Marginal Effects:

$$\textit{symptotic variance}[\frac{\partial \Phi(Z_i'\gamma)}{\partial Z_i}] \quad [\phi(Z_i'\gamma)I \quad \phi(Z_i'\gamma)[\gamma' Z_i][\gamma Z_i']]Var[\gamma][\phi(Z_i'\gamma)I \quad \phi(Z_i'\gamma)[\gamma' Z_i][\gamma Z_i']]$$

The asymptotic variance matrix of the estimated parameter vector γ is given by:

$$Var[\gamma] \quad \left[\sum_{i=1}^{N}\left[\frac{[\phi(Z_i'\gamma)]^2}{\Phi(Z_i'\gamma)[1 \quad \Phi(Z_i'\gamma)]}\right]Z_i Z_i'\right]^{-1} .$$

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TABLE 1

Sample Exclusion Criteria

(Conditions resulting in exclusion from the sample)

Condition Generating Exclusion:	Number of Observations
Full NLSY sample	12,686
Non-response to *private school* and *currently enrolled in high school* questions:	(46)
Not enrolled in grades 9-12 at time of 1979 interview:	(7371)
Inconsistencies in responses to schooling questions, 1979 and later:	(170)
Refusals and invalid skips on religion question(s):	(45)
Missing information concerning: county,state, urban, and SMSA of residence at age 14 (which could not be recovered from matching to 1979 or later responses), or living outside the US at age 14:	(522)
Respondent moved across counties during the period: June of the calendar year of the respondent's 14th birthday to date reported last enrolled in grades 9-12, or did not remain enrolled in same school	(236)
Missing ASVAB test score information:	(129)
Missing/incomplete information on family background measures and/or non-interviews:	(501)
Number of respondents in selected sample:	3666
Public school attendees:	3492
Private school attendees:	174

TABLE 2

Summary Statistics, All Observations: Family Background and Demographics

Sample Means are weighted to reflect population estimates
(standard deviations of non-categorical variables in parentheses)

Variable Description	All observations (N=3666)	Private School Attendees (N=174)	Public School Attendees (N=3492)
Attended Private High School	0.059	1	0
Father's years of schooling*[1]	11.859 (3.242)	13.565 (3.216)	11.751 (3.214)
Mother's years of schooling*	11.697 (2.510)	12.769 (2.569)	11.629 (2.491)
Mother worked outside household when respondent was age 14	0.561	0.506	0.565
Access to newspaper(s), mag(s), and lib. card at age 14	0.524	0.662	0.515
Lived with both parents at age 14	0.759	0.812	0.756
Black	0.145	0.087	0.148
Hispanic	0.057	0.051	0.057
White	0.798	0.862	0.795
Female	0.495	0.550	0.491
Live in SMSA	0.703	0.821	0.696
Live in South*White	0.218	0.272	0.215
Number of siblings	3.201 (2.201)	3.111 (2.132)	3.207 (2.110)
Only child	0.030	0.035	0.030
First-born child (One or more sibs.)	0.168	0.174	0.168
"Middle-born" child (Two or more sibs.)	0.579	0.495	0.583
Last-born child (One or more sibs.)	0.223	0.296	0.219
Net family income in 1979 ($1000s)*	21.333 (12.361)	27.864 (12.575)	20.920 (12.233)

[1]Asterisk (*) denotes a variable for which some respondents had missing values. Values were imputed for these observations, and missing value dummies were created. Data Appendix A describes the procedure used to impute missing values.

Summary Statistics, All Observations: Family Background and Demographics

Sample Means are weighted to reflect population estimates
(standard deviations of non-categorical variables in parentheses)

Variable Description	All observations (N=3666)	Private School Attendees (N=174)	Public School Attendees (N=3492)
Raised in the Catholic faith[2]	0.307	0.641	0.286
Raised in the Baptist faith	0.222	0.108	0.229
Raised in the Episcopalian faith	0.017	0.013	0.018
Raised in the Lutheran faith	0.080	0.009	0.084
Raised in the Methodist faith	0.084	0.038	0.087
Raised in the Presbyterian faith	0.033	0.022	0.034
Raised in the Jewish faith	0.012	0.004	0.012
Raised in the Pentecostal faith	0.012	0.014	0.012
Raised in the Church of Christ faith	0.020	0.023	0.020
Raised in the Seventh Day Adventist faith	0.002	0.012	0.001
Raised in Assembly of God faith	0.005	0.015	0.004
Private high school in county of residence[3]	0.872	0.992	0.864
Number of private high schools per 10,000 pop. in cty. of residence	0.237 (0.211)	0.281 (0.181)	0.234 (0.213)
Non-sectarian private high school in county of residence	0.598	0.804	0.585
Private HS in cty. of res. with same religious affiliation as respondent	0.399	0.728	0.379

[2]Recorded response to the questions: *1) In what religion were you raised?* (If response is Protestant or Christian, probe:) *2) What denomination was that?* Further details on religious faith and denomination variables are provided in Data Appendix C.

[3]Within the sample, 299 counties (representing 3100 respondents) had private schools located in the county. Of these 299 counties with private schools, 220 counties, comprising 2388 respondents, contained Catholic high schools, and 2275 respondents lived in the 206 counties with non-sectarian private high schools. For more information, see Data Appendix B: Private High School Location and Tuition Information.

Summary Statistics, All Observations: Family Background and Demographics

Sample Means are weighted to reflect population estimates
(standard deviations of non-categorical variables in parentheses)

Variable Description	All observations (N=3666)	Private School Attendees (N=174)	Public School Attendees (N=3492)
Median Catholic HS tuition and fees in cty. of residence ($100s)*[4]	10.614 (3.950)	11.212 (4.391)	10.576 (3.918)
Median non-sectarian private HS tuition and fees in cty. of res. ($100s)*	24.979 (8.265)	25.998 (7.544)	24.914 (8.306)
Median other-religious HS tuition and fees in cty. of res. ($100s)*	20.880 (8.368)	21.028 (8.070)	20.871 (8.388)
Median family income in county, 1980 ($1000s)	19.934 (3.717)	20.515 (3.237)	19.898 (3.743)
Median house value in county, 1980 ($1000s)	47.603 (17.699)	50.783 (17.770)	47.402 (17.768)
Proportion of population in county Black, 1980	0.110 (0.117)	0.143 (0.121)	0.108 (0.116)
Ratio of per cap. direct gen. expend. on ed. in cty. to state avg., 1977	1.007 (0.171)	1.005 (0.144)	1.007 (0.172)
Ratio of per capita property taxes in cty. to state average, 1977	0.991 (0.293)	1.046 (0.246)	0.988 (0.295)

[4]There were a total of 2236 private schools in the 299 counties with private schools, and 893 of these reported tuition. For those counties which had no private schools, the state average median county tuition figure for each of the three "private school types" was assigned to the county. In counties which had private schools that did not report tuition information, tuition was imputed from a regression of characteristics of private schools on average median tuition by state and by religious affiliation of school. Further details are contained in Data Appendix B.

TABLE 3

Summary Statistics, Catholics: Family Background and Demographics

Sample Means are weighted to reflect population estimates
(standard deviations of non-categorical variables in parentheses)

Variable Description	All observations (N=1162)	Private School Attendees (N=108)	Public School Attendees (N=1054)
Attended Private High School	0.124	1	0
Father's years of schooling*[1]	12.109 (3.323)	13.387 (3.138)	11.928 (3.311)
Mother's years of schooling*	11.638 (2.734)	12.605 (2.472)	11.508 (2.744)
Mother worked outside household when respondent was age 14	0.511	0.462	0.518
Access to newspaper(s), magazine(s), and lib. card at age 14	0.572	0.682	0.556
Lived with both parents at age 14	0.812	0.850	0.808
Black	0.035	0.050	0.034
Hispanic	0.149	0.067	0.161
White	0.816	0.883	0.805
Female	0.485	0.574	0.472
Live in SMSA	0.818	0.912	0.803
Live in South*White	0.090	0.179	0.077
Number of siblings	3.430 (2.168)	3.415 (2.259)	3.433 (2.157)
Only child	0.020	0.019	0.020
First-born child (One or more sibs.)	0.172	0.141	0.177
"Middle-born" child (Two or more sibs.)	0.598	0.574	0.610
Last-born child (One or more sibs.)	0.210	0.327	0.193
Net family income in 1979 ($1000s)*	23.975 (12.606)	28.367 (12.254)	23.353 (12.538)

[1]Asterisk (*) denotes a variable for which some respondents had missing values. Values were imputed for these observations, and missing value dummies were created. Data Appendix A describes the procedure used to impute missing values.

Summary Statistics, Catholics: Family Background and Demographics

Sample Means are weighted to reflect population estimates
(standard deviations of non-categorical variables in parentheses)

Variable Description	All observations (N=1162)	Private School Attendees (N=108)	Public School Attendees (N=1054)
Private high school in county of residence[2]	0.899	1.000	0.884
Number of private high schools per 10,000 pop. in cty. of residence	0.221 (0.189)	0.253 (0.136)	0.216 (0.195)
Non-sectarian private high school in county of residence	0.680	0.847	0.657
Private HS in cty. of residence with same relig. affiliation as respondent	0.811	0.983	0.787
Median Catholic high school tuition and fees in cty. of res. ($100s)*[3]	10.656 (4.003)	10.975 (4.041)	10.611 (3.998)
Median non-sect. private HS tuition and fees in cty. of res. ($100s)*	27.025 (7.685)	26.315 (7.391)	27.125 (7.725)
Median other-religious HS tuition and fees in cty. of res. ($100s)*	21.542 (8.732)	19.993 (7.787)	21.761 (8.840)
Median family income in county, 1980 ($1000s)	20.942 (3.679)	21.254 (2.930)	20.898 (3.772)
Median house value in county, 1980 ($1000s)	52.301 (18.295)	53.813 (17.383)	52.087 (18.421)
Proportion of population in county Black, 1980	0.088 (0.097)	0.138 (0.113)	0.081 (0.092)
Ratio of per cap. direct gen. expend. on ed. in cty. to state avg., 1977	1.014 (0.167)	1.007 (0.135)	1.015 (0.172)

[2]Within the sample, 144 counties (representing 1023 respondents) had private schools located in the county. Of these 144 counties with private schools, 115 counties, comprising 915 respondents, contained Catholic high schools, and 806 respondents lived in the 100 counties with non-sectarian private high schools. For more information, see Data Appendix B: Private High School Location and Tuition Information.

[3]There were a total of 1092 private schools in the 144 counties with private schools, and 471 of these reported tuition. For those counties which had no private schools, the state average median county tuition figure for each of the three "private school types" was assigned to the county. In counties which had private schools that did not report tuition information, tuition was imputed from a regression of characteristics of private schools on average median tuition by state and by religious affiliation of school. Further details are contained in Data Appendix B.

Summary Statistics, Catholics: Family Background and Demographics

Sample Means are weighted to reflect population estimates
(standard deviations of non-categorical variables in parentheses)

Variable Description	All observations (N=1162)	Private School Attendees (N=108)	Public School Attendees (N=1054)
Ratio of per capita property taxes in county to state average, 1977	1.010 (0.254)	1.096 (0.206)	0.997 (0.258)

TABLE 4[1]

Probit Model Estimates: Private School Choice

Dependent Variable: Attended Private High School

coefficient estimate

(Heteroskedasticity robust standard errors in parentheses)

Variable Description	All observations		Catholics	
	CHK Specification	Full Model Specification	CHK Specification	Full Model Specification
Net family income in 1979, ($1000s)	0.012*[2] (0.003)	0.008* (0.003)	0.010* (0.005)	0.006 (0.005)
Mother's years of schooling	0.068* (0.023)	0.053* (0.021)	0.066* (0.030)	0.040 (0.031)
Live in Northeast Census Region	0.246* (0.098)	---	0.197 (0.132)	---
Live in New England Census Region	---	0.363 (0.306)	---	-0.246 (0.493)
Live in Mid. Atlantic Census Reg.	---	-0.098 (0.260)	---	-0.530 (0.428)
Live with both parents at age 14	-0.110 (0.111)	-0.042 (0.106)	-0.011 (0.164)	-0.106 (0.161)
Access to newspaper(s), mag(s), and library card at age 14	0.089 (0.095)	0.101 (0.088)	0.121 (0.136)	0.170 (0.137)
Mother worked outside household when respondent was 14	-0.088 (0.090)	-0.090 (0.082)	-0.120 (0.131)	-0.051 (0.115)
Siblings	-0.002 (0.022)	0.057* (0.024)	0.023 (0.031)	0.087* (0.034)
Black	0.128 (0.122)	0.247 (0.176)	0.334 (0.214)	0.171 (0.317)

[1]The Coleman, Hoffer, and Kilgore [CHK] model of school choice specified here is the closest approximation to the school choice logit model estimated in CHK [1982]. The CHK choice model, estimated on the 1980 High School and Beyond Data Set, included measures of educational materials available in the home (encyclopedias, books, calculator, etc.); number of rooms in the house; parental expectations or aspirations for respondent's years of schooling; and a measure for the regularity of parent-child discussions about school and experiences. Coleman, Hoffer, and Kilgore also estimated their choice model separately over Blacks, Hispanics, and Catholics. The full model of private school choice is discussed in the text and appears in Tables 6 and 7.

[2]Asterisks denote the significance of the estimated coefficient as follows: a single asterisk (*) denotes significance at the five percent level; two asterisks (**) denote significance at the ten percent level.

Probit Model Estimates: Private School Choice

Dependent Variable: Attended Private High School

coefficient estimate

(Heteroskedasticity robust standard errors in parentheses)

Variable Description	All observations		Catholics	
	CHK Specification	Full Model Specification	CHK Specification	Full Model Specification
Hispanic	-0.049 (0.139)	0.216 (0.198)	-0.151 (0.160)	-0.011 (0.237)
Female	---	0.135** (0.078)	---	0.280* (0.111)
Catholic	0.670* (0.098)	0.290** (0.165)	---	---
Log-likelihood	-726.812	-638.638	-411.907	-348.700
χ^2(k) statistic	$\chi^2_{(13)}$=184.53 (p=0.000)	$\chi^2_{(51)}$=122.97 (p=0.000)	$\chi^2_{(11)}$=69.98 (p=0.000)	$\chi^2_{(39)}$=21.40 (p=0.986)
Number of observations (N)	3666	3666	1162	1162

TABLE 5

Tests of Model Specification: School Choice Probits[1]

Models Tested	$\chi^2(k_u - k_r)$ Test Statistic *(p-value in parentheses)*
Full Model vs. CHK:	
All observations	$\chi^2_{(28)}$=137.73 *(p=0.000)*
Catholics	$\chi^2_{(28)}$=127.76 *(p=0.000)*
Preferred model specification: Full model	

[1]Test statistic is Likelihood-ratio test: $\chi^2(k_u - k_r) = -2[L_r - L_u]$, where the subscripts r and u denote the restricted and unrestricted models, respectively, $[k_u - k_r]$ denotes the number of exclusion restrictions imposed in the restricted model, and L is the log-likelihood estimated from the relevant model specification.

TABLE 6

Private School Choice Probit Equations: All Observations

coefficient estimate
(Heteroskedasticity robust standard errors in parentheses)

Variable Description	Probit Coefficients, LIML Estimation	Marginal Effects, Derivative of the Average
Private high school in county of residence[1]	0.472 (0.301)	0.117 (0.078)
Number of private high schools per 10,000 pop. in county of residence	0.458**[2] (0.257)	0.113** (0.065)
Non-sectarian private high school in county of residence	0.054 (0.121)	0.013 (0.030)
Private religious school of respondent's faith in county of residence	0.567* (0.134)	0.140* (0.042)
Median Catholic high school tuition and fees in county of residence	0.030* (0.013)	0.008* (0.004)
Median Non-sectarian high school tuition and fees in county of residence	-0.005 (0.009)	-0.001 (0.003)
Median tuition and fees in other religious high schools in county of res.	-0.013** (0.007)	-0.003 (0.002)
Median family income (1980) in county of residence ($1000s)	0.006 (0.022)	0.002 (0.006)
Median house value (1980) in county of residence ($1000s)	-0.003 (0.003)	-0.001 (0.001)
Proportion of county population Black, (1980)	1.798* (0.504)	0.445* (0.162)
Ratio of per capita direct general expenditures on education in county to state average, (1977)	-0.718* (0.310)	-0.178* (0.086)

[1]All models include: eight indicators for Census region of residence at age 14, indicators for parents' education level missing, indicator for mother working at age 14 response missing, and an indicator for private school tuition in the county of residence imputed from state average tuition for private schools of same religious affiliation. Data are weighted by sample weights to adjust for the inclusion of members of the supplemental (poverty) subsample in sample.

[2]Asterisks denote the significance of the estimated coefficient as follows: a single asterisk (*) denotes significance at the five percent level; two asterisks (**) denote significance at the ten percent level.

Private School Choice Probit Equations: All Observations

coefficient estimate
(Heteroskedasticity robust standard errors in parentheses)

Variable Description	Probit Coefficients, LIML Estimation	Marginal Effects, Derivative of the Average
Ratio of per capita property taxes in county to state average, (1977)	0.088 (0.207)	0.022 (0.051)
Siblings	0.057* (0.024)	0.014* (0.006)
Only child	0.260 (0.246)	---
First-born child (1 or more siblings)	0.012 (0.148)	---
Middle-born child (2 or more siblings)	-0.262* (0.131)	-0.065** (0.034)
Last-born child (1 or more siblings)	0.298* (0.094)	---
Raised Catholic	0.290** (0.165)	0.072** (0.044)
Raised Baptist	-0.335* (0.182)	---
Raised Episcopalian	-0.320 (0.314)	---
Raised Lutheran	-0.603* (0.299)	---
Raised Methodist	-0.157 (0.203)	---
Raised Presbyterian	-0.272 (0.284)	---
Raised Jewish	-0.953* (0.444)	---
Raised Pentecostal	0.825* (0.327)	---
Raised Assembly of God	0.946* (0.388)	---
Raised Church of Christ (United)	0.143 (0.272)	---

Private School Choice Probit Equations: All Observations

coefficient estimate
(Heteroskedasticity robust standard errors in parentheses)

Variable Description	Probit Coefficients, LIML Estimation	Marginal Effects, Derivative of the Average
Raised Seventh Day Adventist	1.705* (0.506)	---
Black	0.247 (0.176)	---
Hispanic	0.216 (0.198)	---
Female	0.135** (0.078)	---
(Lived in South at age 14)*White	0.841* (0.243)	---
Access to newspaper(s), magazine(s), and library card at age 14	0.101 (0.088)	0.025 (0.022)
Lived with both parents at age 14	-0.042 (0.106)	-0.010 (0.026)
Father's years of schooling	0.051* (0.016)	0.013* (0.004)
Mother's years of schooling	0.053* (0.021)	0.013* (0.006)
Mother worked outside home when respondent was 14	-0.090 (0.082)	-0.022 (0.019)
Net family income in 1979, ($1000s)	0.008* (0.003)	0.002* (0.0009)
Fitted value: $\Phi(Z'\gamma)\|_{Z=\text{mean}(Z)}$	---	0.064
Log-likelihood	-638.638	---
$\chi^2(k)$ statistic	$\chi^2_{(51)}$=122.967 *(p=0.000)*	---
Number of observations	N=3666	N=3666

TABLE 7

Private School Choice Probit Equations: Catholics

coefficient estimate
(Heteroskedasticity robust standard errors in parentheses)

Variable Description	Probit Coefficients, LIML Estimation	Marginal Effects, Derivative of the Average
Number of private high schools per 10,000 pop. in county of residence[1]	0.512 (0.448)	0.107 (0.097)
Non-sectarian private high school in county of residence	0.102 (0.188)	0.021 (0.040)
Private religious school of respondent's faith in county of residence	1.411* (0.357)	0.294* (0.115)
Median Catholic high school tuition and fees in county of residence	0.027 (0.019)	0.005 (0.005)
Median Non-sectarian high school tuition and fees in county of residence	-0.012 (0.013)	-0.003 (0.003)
Median tuition and fees in other religious high schools in county of res.	-0.017** (0.010)	-0.004 (0.0027)
Median family income (1980) in county of residence ($1000s)	0.034 (0.036)	0.007 (0.008)
Median house value (1980) in county of residence ($1000s)	-0.011* (0.005)	-0.002** (0.0013)
Proportion of county population Black, (1980)	2.511* (0.864)	0.522* (0.249)
Ratio of per capita direct general expenditures on education in county to state average, (1977)	-1.548* (0.498)	-0.322* (0.142)
Ratio of per capita property taxes in county to state average, (1977)	0.728* (0.352)	0.151** (0.087)
Siblings	0.087* (0.034)	0.018* (0.008)
Only child	0.341 (0.415)	---

[1]All models include: eight indicators for Census region of residence at age 14, indicators for parents' education level missing, and an indicator for private school tuition in the county of residence imputed from state average tuition for private schools of same religious affiliation. Data are weighted by sample weights to adjust for the inclusion of members of the supplemental (poverty) subsample in sample.

Private School Choice Probit Equations: Catholics

coefficient estimate
(Heteroskedasticity robust standard errors in parentheses)

Variable Description	Probit Coefficients, LIML Estimation	Marginal Effects, Derivative of the Average
First-born child (1 or more siblings)	-0.405** (0.212)	---
Middle-born child (2 or more siblings)	-0.466* (0.187)	-0.097* (0.046)
Last-born child (1 or more siblings)	0.359* (0.129)	---
Black	0.171 (0.317)	---
Hispanic	0.011 (0.237)	---
Female	0.280* (0.111)	---
(Lived in South at age 14)*White	0.938* (0.408)	---
Access to newspaper(s), magazine(s), and library card at age 14	0.170 (0.137)	0.035 (0.029)
Lived with both parents at age 14	0.106 (0.161)	0.022 (0.035)
Father's years of schooling	0.049* (0.023)	0.010** (0.0057)
Mother's years of schooling	0.040 (0.031)	0.008 (0.0067)
Mother worked outside home when respondent was 14	-0.051 (0.115)	-0.011 (0.024)
Net family income in 1979, ($1000s)	0.006 (0.005)	0.001 (0.001)
Fitted value: $\Phi(Z'\gamma)\|_{Z=\text{mean}(Z)}$	---	0.127
Log-likelihood	-348.700	---
$\chi^2(k)$ statistic	$\chi^2_{(39)}$=21.402 *(p=0.986)*	---
Number of observations	N=1162	N=1162