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Catholic Schools and Bad Behavior: A Propensity Score Matching Analysis

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Abstract

Although there is a sizeable literature on the effect of private school attendance on academic student outcomes, the number of studies that investigate the impact of school sector on non-academic outcomes is limited. Using a rich data set, we analyze the impact of Catholic school attendance on the likelihood that teenagers use or sell drugs, commit property crime, have sex, join gangs, attempt suicide, or run away from home. We employ propensity score matching methods to control for the endogeneity of school choice. Catholic school attendance reduces the propensity to use cocaine and to have sex for female students. However, it increases the propensity to use and sell drugs for male students.

KEYWORDS: Catholic schools, crime, risky behavior

I.　　　Introduction

The academic performance of K-12 public schools has become a central issue in American politics both at the local and federal level.[1]　One important policy proposal towards improving academic outcomes is to enhance competition between public and private schools through vouchers and other vehicles.[2]　The policy rationale for this "school choice" argument is that vouchers would increase the demand for private schooling, which in turn would put pressure on public schools to improve their quality.　Implicit in this proposal is the notion that private schools are more effective in improving student *academic* outcomes in comparison to public schools.[3]　A large literature has emerged to investigate the validity of this hypothesis (e.g. Altonji, Taber and Elder 2001, Figlio and Stone 2000, Neal 1997, Goldhaber 1996, Evans and Schwab 1995, Sander 1996, and Sander and Krautman 1995).　This literature analyzes whether students in Catholic (and other private) schools perform better on standardized exams, are more likely to graduate from high school, and/or immediately enroll in college in comparison to students in public schools.

　　　　Although there exists evidence regarding the positive impact of Catholic schooling on academic outcomes (e.g. Evans and Schwab 1995, Eide, Goldhaber and Showalter 2004), some papers report mixed results or no impact of Catholic schools (e.g. Neal 1997, Sander 1996).[4]　If private schools generate better academic outcomes than their public counterparts, it is conceivable that they also produce more favorable non-academic outcomes for their students.　That is, if the academic environment of the school has an impact on the non-academic behavior

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[1] The average American student does not perform well on standardized tests in comparison to students from other countries.　For example, the U.S. ranks 18th in the world on 8th grade science tests, and it ranks 19th in 8th grade math (U.S. Department of Education 2000). The issue is important because there is evidence linking students' academic performance to their future success in the labor market (Murnane et al. 1995).　Furthermore, at the aggregate level, there is evidence indicating that education quality of the labor force has a positive impact on economic growth (Hanushek and Kimko 2000).

[2] In response to a question on vouchers in the third Presidential debate in 2000, President George W. Bush stated that "…[federal money] will go to the parent so the student can go to a tutoring program, or another public school, or a private school." A number of voucher programs have been implemented since mid-1990s (Peterson et al. 2001).

[3] Because vouchers are used mostly for religious private schools, a heated public debate has emerged regarding the constitutionality of the voucher programs.　More precisely, the issue of whether public money can be used to enroll at sectarian schools and whether this is a violation of the First Amendment's prohibition against the "establishment" of religion has been debated at various state courts as well as the Supreme Court of the United States (Lane 2002, Canedy 2002).

[4] For a summary of issues surrounding school choice, see Hoxby (2003).

of the student, then it is possible that private schools have a differential impact on student behavior, such as criminal activity. The issue is important because if school type has an influence on non-academic student behavior, it would constitute another dimension of the current school choice debate for two reasons. First, risky behavior of youths such as juvenile crime and teenage sexual activity entails social costs, including the financial burden put on the welfare and criminal justice systems. Second, they have ramifications for the future well-being of the individual involved. For example, Mocan, Billups and Overland (2005) show that current criminal activity makes future criminal activity more likely by increasing criminal human capital and depreciating legal human capital. Bound and Freeman (1992) and Freeman and Rodgers (2000) document a negative relationship between youth criminal record and labor market outcomes. In addition, there is evidence indicating that teenage risky behaviors are complements, which implies that there may be positive spillover effects from curtailing risky activities (Dee 1999).

Research on the impact of school type on non-academic outcomes, such as risky behavior, is not as extensive even though schools are generally evaluated not only on their effectiveness in academic learning but also on their ability to promote healthy social and psychological development of the youth (Watt 2003). Belfield (2003) finds a strong positive association between Catholic school attendance and community service participation, civic skills, political knowledge and tolerance using data from the National Household Education Survey of 1999. Bettinger and Slonim (2005) investigate the effect of vouchers on students' altruistic behavior, exploiting data from an Ohio school voucher lottery. They find that students attending private schools (all Catholic in their sample), after being randomly assigned to these schools through a lottery, tend to give more to charity in experiments. They also find that this private school treatment effect has no impact on the amount children give to other students.

Angrist et al. (2002) use data from a Columbia voucher lottery to examine the effects on a number of academic and non-academic outcomes three years after the random assignment. They find that students who attend private schools as a result of winning the lottery have higher educational attainment and higher scores on achievement tests. The authors also find some evidence suggesting that voucher winners worked less than the losers and were less likely to marry or cohabit as teenagers. In a follow-up study, Angrist, Bettinger, and Kremer (2005) look at the long-term educational consequences of these vouchers. They find that lottery winners have substantially higher high school graduation rates and test scores than losers seven years after the randomized experiment.

Watt (2003) finds no evidence to indicate that small and/or private schools are better suited for adolescents' emotional well-being using data from the Add Health, refuting the notion that these schools offer a unique sense of

community that is conducive to the emotional adjustment of adolescents. In fact, the findings suggest that attending small and private schools cause higher levels of depression and a greater likelihood of suicide attempts among males and cause higher likelihood of use or threat or use of weapons among both males and females. However, it is not clear whether a causal link between small and private schools and adolescent outcomes is identified because of standard endogeneity problems.

Using data from Great Britain, Thornton (1998) suggests that one in ten students in private schools use drugs, and many independent schools are unaware of the extent of drug and alcohol abuse among their students. Figlio and Ludwig (1999) examine the effects of private religious schooling on adolescent non-market behaviors using data from the National Education Longitudinal Survey of 1988. They use instrumental variables to account for unobserved heterogeneity, and find that private religious schools reduce adolescent sexual activity, arrests, and the use of cocaine. They find no consistent evidence that these schools have any effect on drinking, marijuana use, gang involvement, or smoking. Valois et al. (1997) examine a number of health risk behaviors among public and private high school students in South Carolina. They find that attending a private high school does not necessarily have an impact on adolescent risky behavior. In particular, private high school students, compared to public school students, were more likely to report higher rates of alcohol use, drinking and driving, binge drinking, smoking, marijuana use, and use of alcohol and other drugs before sexual intercourse. Along the same lines, Sander (1998, 1999) suggests that Catholic schools are not more effective than public schools in reducing marijuana, alcohol abuse, or smoking.

In this paper we employ the National Longitudinal Study of Adolescent Health data set (Add Health) to investigate whether school type has an impact on youth risky behavior, and we analyze the impact of attending a Catholic school on 13 different risky behaviors, ranging from using cocaine use to gang fights. We focus on the Catholic school-public school distinction because the number of students in non-Catholic private schools is not large enough in the data set to conduct a meaningful analysis for this group. However, this is not a major shortcoming because Catholic schools students constitute about 49 percent of all private school enrollment (U.S. Department of Education, 2000). Furthermore, most of the research on the impact of school choice has focused on Catholic school-public school differences.

We control for the endogeneity of school choice by employing propensity score matching estimators. We find that Catholic schooling has the opposite effect on the behavior of male and female students. Catholic schooling has a positive influence on the propensity to use and to sell drugs for male students, but it reduces the extent of cocaine use and sexual activity of female students.

The paper is organized as follows. In Section II we discuss the conceptual issues of risky teenage behavior and selection of school type, and describe the propensity score matching methods. In Section III, we introduce the data set used in the analyses. Section IV discusses the propensity score matching procedure and reports the results. Section V concludes the paper.

II.   Conceptual Issues and Empirical Specifications

There exists research to suggest that teens may be poor decision makers. For example, Halpern-Felsher and Cauffman (2000) find that adults consistently outperform teens on measures of decision-making competence regarding the long term benefits and costs of interventions such as cosmetic surgery. On the other hand, some analysts report that youths and adults react similarly regarding the perceived consequences of risky behavior (e.g. Beyth-Marom et al., 1993). Recent research in economics has demonstrated that youths respond to prices and incentives as predicted by economic theory (e.g. Harbaugh, Mocan and Visser 2006, Mocan and Rees 2005, William et al. 2002, Gruber and Zinman 2001, Grossman and Saffer 1987). Even though youths may have different risk-aversion and time discount rates than adults, they are not irrational or emotional decision makers (Gruber 2001). As a result, there is room for public policy to influence their behavior by implementing policies that alter prices and incentives.

Behavioral change may also be accomplished by education if education can alter tastes towards risky behavior, or if education can provide information regarding future costs of risky behavior.[5] Figlio and Ludwig (1999) list a number of reasons why Catholic schools may be relatively more effective than public schools in this regard. First, religious instruction in Catholic schools may change the preferences of teens for certain activities. Second, Catholic schools may tend to offer more strict discipline than public schools. Third, Catholic schools, given that they can more easily regulate who attends, may offer a better peer group than public schools on average.[6] Of course, a counter-argument can be made to argue that the strict discipline and related environment of Catholic schools may generate unintended consequences such as rebellion and bad behavior associated with it.

The investigation of the effect of Catholic school attendance on student outcomes (academic as well as non-academic) is complicated by empirical difficulties. It is important to control for family and child heterogeneity that may

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[5] Tastes can also be influenced by other factors such as peers, culture, and role models. For a discussion of the application of behavioral economics to theoretical models of the risky behavior of teens, see O'Donoghue and Rabin (2001).
[6] Figlio and Ludwig (1999) list other reasons including an "incapacitation" effect, as students in Catholic schools are assigned more homework and participate in more extracurricular activities. Thus, students in Catholic schools may have less time available to devote to risky activities.

influence both school choice and risky behavior. For example, if parents who put a high value on education tend to send their children to Catholic schools, and if this unobservable parental attribute has an impact on the outcome of the child, then the correlation between Catholic schooling and student outcomes may be attributable to this unobservable family characteristic. Alternatively, negative selection into Catholic schooling may exist. That is, children with higher unobserved probability of undertaking risky activities could be more likely to attend Catholic schools. This is because teens with pre-existing behavioral problems (unobserved to the researchers) may be sent to Catholic schools because their parents may believe that these children are more likely to benefit from the added religious instruction and any extra discipline offered in Catholic schools. Under this scenario, unobserved attributes which make Catholic school choice more likely are positively correlated with the teen's risky behavior, and single equation estimates of the effect of Catholic schooling on risky behavior would be biased toward finding a positive relationship between Catholic schooling and risky behavior.

Our empirical strategy is designed to address these issues. Consider Equation (1),

$$(1) \qquad Y_i \; = \; \beta_0 + \beta_1 D_i + X_i'\beta_2 + \varepsilon_i,$$

where Y_i is a dichotomous indicator of risky behavior for the student i, X is a vector of socio-demographic and other characteristics of the family and the student, and D is an indicator variable for Catholic school attendance.

As discussed above, the propensity to enroll in a Catholic private school (D=1) is likely to be correlated with factors that influence the propensity for risky behavior of the student (ε). One solution for this endogeneity issue is to find an instrument that explains the tendency for Catholic school attendance, but does not have a direct impact on the teen's propensity to engage in risky behavior. In analyses of the impact of Catholic schooling on academic outcomes, researchers used as instruments the religious beliefs of the student or family (Coleman, Hoffer, Kilgore, 1982; Noell, 1982; Evans and Schwab, 1995; Neal, 1997), measures of the availability of Catholic schooling — the proportion of Catholics in the area, proximity of Catholic schooling, urbanity (Evans and Schwab, 1995; Goldhaber, 1996; Neal, 1997), and interactions between religious beliefs and urbanity (Sander and Krautman, 1995; Sander 1996). In our case, these might not be desirable instruments because religious affiliation, religiosity of the area, and urbanity may also impact the propensity to engage in risky behavior.

To address the potential bias due to unobserved heterogeneity, we use propensity matching estimators, first introduced by Rosenbaum and Rubin (1983). Traditional matching and propensity score matching methods have been

increasingly employed in economics (Benjamin 2003; Zhao 2005; Dehejia and Wahba 2002; Heckman, Ichimura, and Todd 1997, 1998; Hahn 1998; Lechner 2002; Smith and Todd 2005; Jalan and Ravallion 2003; Mueser, Troske, and Gorislavsky 2005).[7]   In traditional matching estimators, each treatment unit (Catholic school students in our context) is matched to a fixed number of units with the opposite treatment (non-Catholic school students) under the assumptions of unconfoundedness (conditional independence) and common support, which can be formally expressed as

$$(Y_i=0, Y_i=1) \perp D_i \mid X_i,$$

where only $Y_i=1$ or $Y_i=0$ is observed (the student engages in risky activity, or does not engage in risky activity); and

$$0< \Pr(D_i = 1 \mid X_i) < 1.$$

Unconfoundedness assumption implies that the treatment (Catholic school attendance) is random conditional on some set of observed characteristics (X). This allows for "selection on observables." The common support assumption guarantees that each treated unit (a student in a Catholic school) can be matched with a corresponding control unit (a student attending a public school). The average treatment effect is then calculated as the mean within-match difference in the outcome variable between the treated and untreated units. Unlike regression techniques, matching estimators do not impose any functional form restrictions, nor do they assume a homogenous treatment effect across populations (Zhao 2005).

The application of matching methods becomes impractical and difficult to implement when the set of covariates gets large. For example, in case of *n* dichotomous covariates, there are 2^n possible cells over which the difference in the outcomes for the treatment and controls units needs to be calculated. Obviously, the problem gets worse if some of the covariates are continuous.

One way of dealing with the dimensionality problem is to use a propensity score estimator. Rosenbaum and Rubin (1983) showed that confoundedness and common support assumptions imply

$$(Y_i=0, Y_i=1) \perp D_i \mid p(X_i), \quad \text{and}$$

$$0< \Pr(D_i = 1 \mid p(X_i)) < 1,$$

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[7] See also the symposium on matching estimators in the February 2004 issue of the *Review of Economics and Statistics*.

where $p(X_i)$ is the propensity score, defined as the probability of receiving treatment (attending a Catholic school) conditional on X. Therefore, if (Y_i=0, Y_i=1) and D_i are independent conditional on X_i, then they are also independent on the propensity score $p(X_i)$. This reduces the dimensionality of the matching problem to a single dimension, $p(X_i)$. The intuition is that, whereas one conditions on X in traditional matching estimators, in propensity score matching estimators one conditions on the propensity score, because observations with the same propensity score have the same distribution of the full vector of covariates, X (Dehejia and Wahba 1999).

In practice, the propensity score matching estimator is implemented in two steps. The first step involves estimation of the propensity score using a binary choice model, such as a logistic regression. Rosenbaum and Rubin (1983) defines a propensity score as a function of the vector X, such that $X_i \perp D_i \mid p(X_i)$, i.e., conditional on the propensity score, the covariates are independent of assignment of treatment.

The choice of the vector X and the functional form are determined by whether the estimated propensity score satisfies the Balancing Property Hypothesis, i.e., $X_i \perp D_i \mid p(X_i)$. To test the Balancing Property Hypothesis, we divide the sample in k equally spaced groups defined over the estimated propensity score and check whether the average propensity score of the treatment and control units differ within each group (Dehejia and Wahba 1999, 2002, Becker and Ichino 2002). If there are significant differences in the average propensity score between treatment and control units in at least one group, we split the group in half and repeat the test. We continue this process until the average propensity score of treatment and control units do not differ in any group. We then test the means of each variable in X between treatment and control units. If this test fails, we try again with the inclusion of higher order terms and interactions of covariates to the model until this condition is satisfied. Following Becker and Ichino (2002), we restrict this algorithm to only those observations where the propensity score belongs to the intersection of the supports of the propensity score of treatment and control units. Becker and Ichino (2002) suggest that imposing the common support condition this way may improve the quality of the matches used to estimate the average effects of treatment on the treated (ATT).

The second step involves estimating a univariate nonparametric regression to evaluate the average effect of treatment on the treated (ATT), which can be specified as follows

(2) $E(\Delta_i \mid D_i = 1) = E\{(Y_i=0, Y_i=1) \mid D_i = 1\}$

$= E\{E\{(Y_i=0, Y_i=1) \mid D_i = 1, p(X_i)\}\}$

$= E\{E\{Y_i =1 \mid D_i = 1, p(X_i)\} - E\{Y_i =0 \mid D_i = 0, p(X_i)\} \mid D_i = 1\}.$

Following Dehejia and Wahba (2002) and Leuven and Sianesi (2003), we employ a range of methods to evaluate the ATT. First, we consider nearest neighbor matching without replacement. Rosenbaum (1995) argues that the results can be sensitive to the order in which treatment units and control units are matched. Therefore we consider both "low-to-high" and "high-to-low" matching. In these methods, the treatment units are ranked from lowest to the highest or from highest to lowest propensity score. The highest ranked treatment unit is matched first to a control unit and then that particular comparison unit is removed from further matching (Dehejia and Wahba 2002).

Second, we employ nearest neighbor matching with replacement. Matching with replacement can minimize the propensity score distance between the matched control units and therefore can reduce bias because each treatment unit can be matched to the nearest control unit even if a control unit is used multiple times (Dehejia and Wahba 2002). Third, we use a radius matching estimator with a range of calipers. In radius matching, all control units with the propensity score within a certain radius from the propensity score of the treatment unit are matched.

For each of these methods, we estimate a weighted regression using the control and treatment units where the control units are weighted by the number of times that they are matched to a treatment unit. Estimating a regression can improve the precision of the estimates (Dehejia and Wahba 2002).

It should be noted that the propensity score matching procedure is not a magic bullet. The procedure assumes that given the equality of their observable attributes, individuals differ in their choice of schooling for reasons that are not correlated with the outcome. Thus, the procedure is reliable to the extent that students' unobservable attributes, which make them more or less likely to attend a Catholic school, do not directly influence their behavior. (An example for such an unobservable is the convenience, such as the distance between home and a Catholic school). Standard problems of bias remain if unobservables that influence Catholic school attendance also affect the outcome.

III. Data

The data used in the paper are drawn from Wave I of the National Longitudinal Study of Adolescent Health (Add Health).[8] The Add Health is a nationally representative survey of adolescents in grades 7 through 12. It is considered the largest and most comprehensive survey of adolescents ever undertaken in the United States. It was designed to provide detailed information on teen behavior, including their criminal and sexual activities and substance use/abuse. The full sample from Wave I consists of 20,745 adolescents interviewed between April and December 1995. We select a subsample consisting of teens attending a Catholic or public school in an urban area.[9]

The survey contains a section with detailed questions about one's delinquent behavior. Specifically, the respondents were asked whether they had committed any of the following acts in the past 12 months: damaging property, robbery, burglary, participating in a gang fight, running away from home, selling drugs, or stealing something worth more than fifty dollars. Teens also answered questions about whether they had ever used different types of illicit drugs such as marijuana, cocaine, hard drugs (heroin, LSD, ecstasy, mushrooms, etc.), or ever injected illegal drugs with a needle. Finally, they were asked about their sexual behavior and whether they had attempted suicide in the 12 months prior to the interview date.

For sections that involve sensitive information, such as delinquent behavior, the respondent listened to pre-recorded questions through earphones and entered their answers directly on a laptop computer to minimize potential interviewer and parental influences. Turner, et al. (1998) provide evidence that

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[8] The Add Health project is a program project designed by J. Richard Udry (PI) and Peter Bearman, and funded by grant P01-HD31921 from the National Institute of Child Health and Human Development to the Carolina Population Center, University of North Carolina at Chapel Hill, with cooperative funding participation by the National Cancer Institute; the National Institute of Alcohol Abuse and Alcoholism; the National Institute on Deafness and Other Communication Disorders; the National Institute on Drug Abuse; the National Institute of General Medical Sciences; the National Institute of Mental Health; the National Institute of Nursing Research; the Office of AIDS Research, NIH; the Office of Behavior and Social Science Research, NIH; the Office of the Director, NIH; the Office of Research on Women's Health, NIH; the Office of Population Affairs, DHHS; the National Center for Health Statistics, Centers for Disease Control and Prevention, DHHS; the Office of Minority Health, Centers for Disease Control and Prevention, DHHS; the Office of Minority Health, Office of Public Health and Science, DHHS; the Office of the Assistant Secretary for Planning and Evaluation, DHHS; and the National Science Foundation. Persons interested in obtaining data files from The National Longitudinal Study of Adolescent Health should contact Add Health Project, Carolina Population Center, 123 West Franklin Street, Chapel Hill, NC 27516-2524 (email: addhealth@unc.edu).
[9] We exclude teens in rural areas for two reasons: (1) to be consistent with Figlio and Ludwig (1999), and (2) no Catholic school students were observed to be residing outside of an MSA.

this computer-based method leads to a significantly higher incidence of reported risky activities relative to other survey methods.

When selecting a list of controls variables, it is important to condition only on variables that are strictly exogenous. Any variable that is correlated with both Catholic school attendance and risky behavior may induce bias in the estimates. Keeping this in mind, we include the following variables: binary indicators for age, gender, race and ethnicity of the respondent, whether the parents receive public assistance, mother's education, whether parents are Catholic, marital status of the parents, and whether the school is in an urban location. After selecting teens based on these criteria and excluding cases with missing data, we have a sample of 11,437 adolescents.

The definitions of the variables are provided in Table 1. The upper panel of Table 2 presents the means for the outcome variables for the full sample as well as for students in Catholic and public schools. A star next to the mean value of the variable under the public school column indicates that the means are different between Catholic and public schools for that variable. We note that students in Catholic schools are more likely to have engaged in most of the risky behaviors under study. Specifically, Catholic school students are more likely to have used or sold drugs, or committed property damage or burglary. On the other hand, Catholic school students are less likely to have had sex.

The sample characteristics of the explanatory variables are presented in the lower panel of Table 2. There are significant differences between the Catholic school students and the public school students. Catholic school students are more likely to be male, white and non-Hispanic. They are also more likely to have Catholic parents and mothers with higher education. Their parents are also more likely to be married, and less likely to be on welfare in comparison to the parents of public school students.

IV. Results

Propensity Score Estimation

Using the algorithm outlined in Section II, we estimate the propensity score for our sample, incorporating the covariates linearly and with some higher-order terms in order to satisfy the balancing property. It has been argued that gender differences in risky behavior can be attributed to differences in risk aversion (Powell and Ansic 1997), discount rates (Lau and Williams 1998), and the motivation for security (Schneider and Lopes 1986). Therefore, we estimate models both for the full sample and for males and females separately. Table App-1 in the Appendix reports the results from the logistic regressions that estimate the propensity scores. The great majority of the covariates are statistically significant determinants of

Table 1. Variable Definitions

Outcome Variables	
Cocaine	=1 if ever used cocaine in life, =0 otherwise
Marijuana	=1 if ever used marijuana in life, =0 otherwise
Hard Drugs	=1 if ever used ecstasy, mushrooms, speed, ice, heroin, LSD, or PCP in life, =0 otherwise
Injected Drugs	=1 if ever injected any illegal drug with a needle, =0 otherwise
Damaged Property	=1 if deliberately damaged someone else's property in the past 12 months, =0 otherwise
Burglary	=1 if went into a house or building to steal something in the past 12 months, =0 otherwise
Gang Fight	=1 if took part in a fight where a group of friends was against another group in the past 12 months, =0 otherwise
Attempted Suicide	=1 if attempted suicide in the past 12 months, =0 otherwise
Had Sex	=1 if ever had sexual intercourse, =0 otherwise
Ran Away from Home	=1 if ran away from home in the past 12 months, =0 otherwise
Sold Drugs	=1 if sold marijuana or other drugs in the past 12 months, =0 otherwise
Theft	=1 if stole something worth more than 50 dollars in the past 12 months, =0 otherwise
Robbery	=1 if used or threatened to use a weapon to get something from someone, =0 otherwise

Explanatory Variables	
Male	=1 if male, =0 otherwise
Age12-[a]	=1 if less than or equal to 12 years of age, =0 otherwise
Age13	=1 if 13 years of age, =0 otherwise
Age14	=1 if 14 years of age, =0 otherwise
Age15	=1 if 15 years of age, =0 otherwise
Age16	=1 if 16 years of age, =0 otherwise
Age17	=1 if 17 years of age, =0 otherwise
Age18	=1 if 18 years of age, =0 otherwise
Age19+	=1 if older than 18 years or age, =0 otherwise
Hispanic	=1 if Hispanic, =0 otherwise
White	=1 if non-Hispanic white, =0 otherwise
Black	=1 if black, =0 otherwise
Asian	=1 if Asian, =0 otherwise
Other Race[a]	=1 if other race, =0 otherwise
Mother Ed<HS[a]	=1 if mother has less than high school degree, =0 otherwise
Mother Ed=HS	=1 if mother has high school degree, =0 otherwise
Mother Ed>HS	=1 if mother has GED, =0 otherwise
Mother Ed Missing	=1 if mother's education is missing, =0 otherwise
Parent on Welfare	=1 if any parent is on welfare, =0 otherwise
Parent Catholic	=1 if respondent's parent is Catholic, =0 otherwise
Parent Married	=1 if lives with a married parent, =0 otherwise
Urban School	=1 if the school is in an urban area, =0 otherwise
Suburban School[a]	=1 if the school is in a suburban area, =0 otherwise
Catholic School	=1 if attending a Catholic school, =0 if attending a non-Catholic public school

[a] Omitted category in the analyses.

Table 2. Descriptive Statistics

Outcome Variable	Full Sample		Catholic Schools		Public Schools	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Cocaine	0.034	0.181	0.054	0.227	0.033**	0.178
Marijuana	0.282	0.450	0.344	0.476	0.279***	0.449
Hard Drugs	0.075	0.263	0.107	0.309	0.073***	0.261
Injected Drugs	0.005	0.069	0.017	0.131	0.004***	0.065
Damaged Property	0.182	0.386	0.227	0.419	0.180**	0.384
Burglary	0.051	0.221	0.072	0.256	0.051**	0.219
Gang Fight	0.209	0.407	0.183	0.387	0.210	0.407
Attempted Suicide	0.040	0.195	0.026	0.160	0.040	0.197
Had Sex	0.377	0.485	0.303	0.460	0.380***	0.485
Ran Away from Home	0.086	0.280	0.072	0.259	0.086	0.281
Sold Drugs	0.075	0.263	0.142	0.349	0.072***	0.259
Theft	0.055	0.228	0.068	0.251	0.054	0.227
Robbery	0.041	0.198	0.050	0.218	0.040	0.197
Explanatory Variable						
Male	0.495	(0.500)	0.608	(0.489)	0.490***	(0.500)
Age12-	0.033	(0.179)	0.013	(0.114)	0.034**	(0.181)
Age13	0.128	(0.335)	0.111	(0.315)	0.129	(0.335)
Age14	0.153	(0.360)	0.142	(0.349)	0.154	(0.361)
Age15	0.178	(0.382)	0.196	(0.397)	0.177	(0.382)
Age16	0.196	(0.397)	0.207	(0.406)	0.196	(0.397)
Age17	0.182	(0.386)	0.198	(0.399)	0.182	(0.386)
Age18	0.115	(0.319)	0.129	(0.335)	0.115	(0.319)
Age19+	0.013	(0.115)	0.004	(0.066)	0.014*	(0.117)
Hispanic	0.195	(0.396)	0.124	(0.330)	0.198***	(0.398)
White	0.600	(0.490)	0.704	(0.457)	0.596***	(0.491)
Black	0.242	(0.428)	0.135	(0.342)	0.246***	(0.431)
Asian	0.075	(0.263)	0.089	(0.286)	0.074	(0.262)
Other race	0.073	(0.261)	0.068	(0.251)	0.074	(0.261)
Mother Ed<HS	0.153	(0.360)	0.035	(0.184)	0.158***	(0.365)
Mother Ed=HS	0.314	(0.464)	0.279	(0.449)	0.315*	(0.465)
Mother Ed>HS	0.442	(0.497)	0.623	(0.485)	0.434***	(0.496)
Mother Ed missing	0.091	(0.288)	0.063	(0.244)	0.093**	(0.290)
Parent on Welfare	0.111	(0.314)	0.046	(0.209)	0.113***	(0.317)
Parent Catholic	0.329	(0.470)	0.765	(0.425)	0.311***	(0.463)
Parent Married	0.692	(0.462)	0.765	(0.425)	0.689***	(0.463)
Urban school	0.334	(0.472)	0.425	(0.495)	0.331***	(0.470)
Catholic School	0.040	(0.196)				
Number of Observations	11,437		459		10,978	

Note: Standard deviations are in parentheses. ***, **, and * denote statistically different from Catholic school mean at p<0.01, 0.05, and 0.10, respectively.

Catholic school attendance, especially for males.

As explained above, the procedure starts by splitting the sample in equally spaced intervals of the propensity score and testing whether the average propensity score of the Catholic school attendants and the public school attendants are equal within each interval. If the test fails in one of the intervals, the interval is split in half and the test is repeated. This algorithm generated eight intervals for the whole sample. We also made sure that the balancing property is satisfied for each of the covariates within each interval. In order to improve the quality of matches, we imposed the common support condition in the propensity score estimation. This ensures that each treatment unit has a corresponding matching unit in the comparison group. Because we also estimate models separately for males and females, the above conditions are satisfied for males and females separately. The final number of blocks that satisfies the balancing property is 6 for females and 8 for males. Table 3 displays the distribution of the number of Catholic and public school attendants across blocks within the common support region.

Table 4 reports the results of the balancing property test for the full sample as well as for the male and females samples. T-statistics pertaining to the differences between the covariates of the treatment and control groups are listed in each cell. As shown in Table 4, Catholic school and public school students are identical in their observed characteristics within each block in overwhelming majority of the cases. For example, in the full sample, the differences in the means of the covariates between Catholic and public students are statistically significant at the 5 percent level for only 10 cases out of 154 combinations. The quality of the balances is also very good for the male and female samples. In only seven out of 123 cases for males, and five out of 97 cases for females, are the covariates statistically significant between the Catholic school students and public school students.

The mean propensity score is 0.141 with a standard deviation of 0.110 for Catholic school students. Public school students have a mean propensity score of 0.035 with a standard deviation of 0.055. Among females, the mean and standard deviations of the propensity score are 0.095 and 0.073 for Catholic school students, and 0.029 and 0.041 for public school students. For males, the mean and standard deviation are 0.167 and 0.123 for Catholic school students, and 0.044 and 0.067 for public school students. The fact that the mean estimated propensity scores differ considerably between the treatment and control groups suggests that the two groups are substantially different in a multivariate sense, and it reinforces the desirability of sub-classification (Benjamin 2003).

Table 3. The Distribution of Catholic and
Public School Attendants within Each Block

Blocks	Catholic School	Public School	Total
Full Sample			
1	33	4,363	4,396
2	51	2,690	2,741
3	57	1,686	1,743
4	70	977	1,047
5	80	662	742
6	112	312	424
7	54	77	131
8	2	3	5
Total	459	10,770	11,229

Blocks	Catholic School	Public School	Total
Male Students			
1	11	1,737	1,748
2	31	1,350	1,381
3	33	950	983
4	30	497	527
5	59	365	424
6	78	234	312
7	26	39	65
8	11	12	23
Total	279	5,184	5,463

Blocks	Catholic School	Public School	Total
Female Students			
1	41	3,346	3,387
2	25	782	807
3	42	633	675
4	23	198	221
5	32	59	91
6	17	72	89
Total	5,090	180	5,270

Note: The distributions do not include 208 observations for the full sample, 194 observations for the male sample, and 510 observations for the female sample since these observations are outside the common support region.

Table 4. T-Statistics for the Equality of the Means of Covariates within Estimated Propensity Score Blocks

Full Sample

Variable	Block 1	Block 2	Block 3	Block 4	Block 5	Block 6	Block 7	Block 8
Male	-0.61	-0.66	1.45	0.52	-1.31	0.98	--	--
Hispanic	-2.05*	1.24	-0.54	0.25	0.54	--	--	--
White	1.49	1.02	1.77	0.44	-1.50	-0.10	-0.10	--
Black	0.86	-0.68	-0.80	0.82	0.59	0.40	-0.58	--
Asian	-1.62	-1.77	-1.12	-0.52	0.71	1.71	0.84	-0.77
Age13	0.55	-0.04	0.32	-0.98	-1.79	1.02	0.28	--
Age14	0.62	0.18	-1.09	-1.13	-1.94*	1.32	1.20	0.77
Age15	-2.28*	-0.12	0.16	1.77	-0.27	0.59	0.41	-0.29
Age16	0.03	0.32	0.55	-1.07	1.20	-0.10	-0.69	0.77
Age17	-0.38	-0.07	0.54	0.01	1.96*	-0.97	0.08	--
Age18	0.78	-0.02	0.12	0.90	0.80	-1.19	-0.70	-1.34
Age19	-0.30	0.65	-0.74	0.71	0.35	--	--	--
Parent on welfare	0.64	0.15	-0.36	0.24	-1.23	0.54	0.84	--
Mother Ed=HS	0.06	-2.66*	0.49	2.28*	-1.14	-1.85	1.25	-0.77
Mother Ed>HS	-2.06*	-0.14	0.50	-1.08	1.20	1.41	-1.76	0.77
Mother Ed missing	0.50	0.79	-1.24	-0.56	0.78	0.78	0.98	--
Parent Catholic	0.16	1.25	-1.90	-1.67	--	--	--	--
Urban School	-1.65	0.88	0.64	1.54	-0.60	-0.04	--	--
Asian*Male	-1.02	-1.75	-1.51	0.18	1.10	--	0.84	-0.77
Hispanic*Urban school	-2.67*	0.97	-0.54	1.93*	--	--	--	--
College*Urban school	-2.34*	1.44	0.30	-0.09	0.30	1.28	-1.76	0.77
Asian*Male*Urban School*Mother Ed=HS	--	--	--	-0.23	--	--	0.84	-0.77
Parent Married	0.22	0.80	0.03	-0.49	1.30	-1.12	-0.57	-0.77

 * Asterisk denotes significance at 5% level or lower.

Table 4 (continued).
T-Statistics for the Equality of the Means of Covariates within Estimated Propensity Score Blocks

Males

Variable	Block 1	Block 2	Block 3	Block 4	Block 5	Block 6	Block 7	Block 8
Hispanic	-0.78	-1.61	0.004	-0.29	1.01	--	--	--
White	0.26	1.49	0.67	1.86	-1.00	-1.20	-1.39	0.06
Black	1.57	-0.96	0.27	1.00	-1.60	1.18	0.34	--
Asian	-1.67	-2.50*	-1.35	-0.69	2.02*	-0.22	2.14*	--
Age13	0.001	0.63	0.22	-0.35	-1.21	1.79	--	--
Age14	0.83	-0.91	0.94	-0.38	-1.93*	1.30	1.47	--
Age15	-0.46	-1.04	0.90	-1.07	1.13	-0.62	-0.22	1.42
Age16	-0.64	0.67	-0.95	0.91	-0.21	0.57	-0.51	--
Age17	0.40	-0.42	-0.69	0.49	2.33*	-0.88	-1.77	-0.38
Age18	0.16	1.06	-0.02	0.43	-0.74	-0.82	0.52	-0.68
Age19	--	--	--	--	--	--	--	--
Parent on welfare	0.86	-1.27	0.82	0.42	-1.04	1.00	--	--
Mother Ed=HS	-0.92	0.18	1.07	1.77	-0.24	-1.89	--	--
Mother Ed>HS	-0.01	-1.51	0.60	-0.45	-0.31	1.45	--	--
Mother Ed missing	0.10	0.81	-1.63	-0.98	0.85	0.31	--	--
Parent Catholic	0.39	-0.85	-0.91	-0.82	-0.57	--	--	--
Urban School	-0.99	-0.26	0.92	1.03	-1.80	0.08	1.23	0.06
Parent Married	-0.44	0.61	1.37	0.04	-0.20	-1.56	1.39	-0.30
Asian*Urban School	0.26	-0.95	-2.43*	-0.16	0.70	-0.22	2.14*	--

Table 4 (concluded).
T-Statistics for the Equality of the Means of Covariates within Estimated Propensity Score Blocks

Females

Variable	Block 1	Block 2	Block 3	Block 4	Block 5	Block 6
Hispanic	-2.24*	-1.17	2.37*	-1.13	--	--
White	1.72	-0.72	0.87	0.80	-0.72	-1.08
Black	0.14	0.20	-0.87	-0.72	-0.44	0.46
Asian	-2.21*	0.42	-1.38	-0.09	0.73	1.23
Age13	1.10	-1.23	-1.78	-0.38	1.06	0.57
Age14	-0.54	0.86	-1.30	-0.87	1.51	0.09
Age15	-2.40*	0.76	0.46	0.70	1.51	1.64
Age16	0.73	-0.71	0.80	0.50	-1.80	0.33
Age17	0.36	-0.06	0.86	0.59	-0.64	0.85
Age18	0.55	0.89	0.17	-0.21	-1.19	-2.86*
Age19	0.66	-1.40	0.52	0.84	-0.44	--
Parent on welfare	0.43	0.51	-0.94	0.56	-0.44	--
Mother Ed=HS	1.48	-0.98	1.16	0.28	-0.69	-1.61
Mother Ed>HS	-1.87	0.35	-0.29	-0.37	0.69	1.61
Mother Ed missing	0.33	-0.29	0.18	0.48	--	--
Parent Catholic	-1.54	-0.96	--	--	--	--
Urban School	-0.25	1.81	0.61	-0.03	-0.73	--
Parent Married	-0.73	-0.34	0.97	0.01	-1.21	-0.29

* Asterisk denotes significance at 5% level or lower.

Estimates of the Catholic School Effect on Risky Behavior

To put the results into perspective we first estimated linear probability models, where each outcome is a dichotomous indicator of a particular risky behavior. Column 1 of Table 5 reports the estimated coefficients and standard errors of the impact of Catholic school attendance on each risky behavior in linear probability models for the full sample as well as the sample of males and females. Each model contains all variables listed in Table 2. For males, the coefficient of Catholic School is negative in three cases, and positive in 10. The coefficients are positive and statistically significant in five bad behavior equations. The coefficients are negative in 8 out of 13 cases for females, but they are never statistically significant. These results are obtained from regressions which do not control for the endogeneity of school choice; therefore they are not reliable because of the potential bias due to selection into Catholic schooling as described in Section II.

        Next, we turn to the propensity score matching estimates that control for selection into the Catholic schooling. Table 5 presents the estimated treatment effects that emerge from various methods described in Section II. The estimates for the full sample are presented in the top panel, and the estimates for the male and female samples are presented in the second and third panels, respectively. In each panel, columns 2 and 3 depict the estimates obtained from matching without replacement. Column 4 displays the estimates from matching with replacement; and columns 5, 6 and 7 present the estimates from radius matching with different calipers. Following Dehejia and Wahba (2002), we include all the controls linearly in the weighted regressions. These variables include the binary indicators of male, Hispanic, white, black, Asian, seven age dummies, parental welfare receipt, mother's education dummies, parent's marital status, whether the school is an urban location, and whether the parent is Catholic.[10]

        The results are consistent between procedures (columns 2-7). In the full sample, the coefficient of Catholic school is positive and statistically significant for marijuana, injecting drugs, burglary and selling drugs, and negative and significant for having sex, and to some extent for gang fighting. However, the

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[10] The goal of matching is to choose subsamples of students whose characteristics closely resemble the characteristics of the Catholic school students. In Appendix Table App-2, we present tests for the equality between the means of the covariates for the treatment group (Catholic school students) and the control groups from each matching procedure. As shown in the table, the characteristics of the control samples obtained from each method are very similar. In fact, they are essentially identical for control group characteristics from the matching without replacement method (columns 1 and 2). Contrary to the large mean differences between Catholic school students and public school students in the unmatched (raw) data as shown in Table 2, the two groups closely resemble each other in Appendix Table App-2.

Table 5.
Regression-Adjusted Propensity Score Matching Estimates of the Catholic
Schooling on Risky Behavior

Full Sample

Control Sample:	All Public School Students†	Without Replacement		With Replacement	Radius Matching		
		Low to High	High to Low	Nearest Neighbor	Caliper, δ=0.00001	Caliper, δ=0.00005	Caliper, δ=0.0001
	1	2	3	4	5	6	7
Cocaine	0.020*	0.013	0.011	0.012	0.017	0.014	0.017
	(0.011)	(0.014)	(0.014)	(0.016)	(0.014)	(0.013)	(0.014)
Marijuana	0.057**	0.073***	0.073***	0.067	0.055**	0.051**	0.053**
	(0.022)	(0.030)	(0.030)	(0.046)	(0.027)	(0.026)	(0.027)
Hard Drugs	0.025*	0.011	0.010	0.038*	0.009	0.007	0.011
	(0.015)	(0.020)	(0.020)	(0.022)	(0.019)	(0.019)	(0.019)
Injected Drugs	0.013**	0.013*	0.013**	0.015**	0.016**	0.015**	0.016**
	(0.006)	(0.007)	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)
Damaged Property	0.016	-0.019	-0.021	0.005	-0.018	-0.025	-0.023
	(0.020)	(0.027)	(0.027)	(0.045)	(0.024)	(0.024)	(0.023)
Burglary	0.017	0.026*	0.023	0.031*	0.025*	0.023*	0.020
	(0.013)	(0.015)	(0.015)	(0.018)	(0.014)	(0.014)	(0.013)
Robbery	0.015	0.013	0.012	-0.009	0.012	0.007	0.006
	(0.011)	(0.014)	(0.014)	(0.032)	(0.011)	(0.011)	(0.011)
Gang Fight	-0.017	-0.046*	-0.054**	-0.053	-0.009	-0.014	-0.017
	(0.019)	(0.026)	(0.026)	(0.043)	(0.022)	(0.022)	(0.021)
Attempted Suicide	-0.008	-0.011	-0.013	-0.010	-0.011	-0.015	-0.015
	(0.008)	(0.011)	(0.011)	(0.015)	(0.010)	(0.010)	(0.010)
Had Sex	-0.046**	-0.056*	-0.057**	-0.104**	-0.035	-0.039	-0.044*
	(0.021)	(0.030)	(0.029)	(0.052)	(0.026)	(0.025)	(0.024)
Theft	0.007	0.006	0.009	0.022	0.018	0.013	0.010
	(0.012)	(0.015)	(0.016)	(0.016)	(0.014)	(0.014)	(0.013)
Run away from Home	-0.003	0.0003	-0.002	-0.025	0.003	-0.002	-0.003
	(0.013)	(0.017)	(0.018)	(0.035)	(0.016)	(0.016)	(0.016)
Sold Drugs	0.066***	0.060***	0.055***	0.030	0.058***	0.059***	0.060***
	(0.016)	(0.021)	(0.020)	(0.034)	(0.020)	(0.020)	(0.019)
Number of Obs.	10,948	918	918	716	4,215	5,380	6,666

Notes: All matching estimates are regression adjusted using all covariates linearly. The standard errors of the regression adjusted matching estimates are computed using a bootstrap with 499 replications.
† In this specification, the control group includes all non-Catholic school students. Thus, these are standard OLS coefficients.

Table 5 (continued).
Regression-Adjusted Propensity Score Matching Estimates of the Catholic Schooling on Risky Behavior

Males

Control Sample:	All Public School Students†	Without Replacement		With Replacement	Radius Matching		
		Low to High	High to Low	Nearest Neighbor	Caliper, δ=0.00001	Caliper, δ=0.00005	Caliper, δ=0.0001
	1	2	3	4	5	6	7
Cocaine	0.040**	0.049***	0.052***	0.061***	0.044***	0.043**	0.043**
	(0.017)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.019)
Marijuana	0.086***	0.109***	0.110***	0.099	0.082***	0.089***	0.098***
	(0.030)	(0.037)	(0.038)	(0.066)	(0.033)	(0.032)	(0.034)
Hard Drugs	0.047**	0.038	0.043*	0.092***	0.045*	0.044*	0.039*
	(0.021)	(0.028)	(0.026)	(0.027)	(0.026)	(0.026)	(0.024)
Injected Drugs	0.018**	0.015	0.015	0.018*	0.018*	0.018*	0.019*
	(0.009)	(0.010)	(0.010)	(0.011)	(0.010)	(0.009)	(0.010)
Damaged Property	0.017	0.011	0.011	0.030	-0.032	-0.022	-0.026
	(0.029)	(0.037)	(0.039)	(0.067)	(0.035)	(0.035)	(0.033)
Burglary	0.027	0.031	0.035*	0.050**	0.025	0.035*	0.028
	(0.019)	(0.022)	(0.021)	(0.023)	(0.019)	(0.021)	(0.020)
Robbery	0.019	0.010	0.010	-0.019	0.017	0.014	0.012
	(0.015)	(0.019)	(0.019)	(0.046)	(0.016)	(0.016)	(0.016)
Gang Fight	-0.021	-0.039	-0.043	-0.084	-0.016	-0.014	-0.019
	(0.026)	(0.033)	(0.035)	(0.061)	(0.031)	(0.029)	(0.029)
Attempted Suicide	0.002	0.0004	0.001	-0.002	-0.008	-0.003	-0.004
	(0.010)	(0.012)	(0.013)	(0.019)	(0.013)	(0.014)	(0.013)
Had Sex	-0.025	-0.041	-0.029	-0.110	-0.030	-0.021	-0.023
	(0.028)	(0.037)	(0.035)	(0.074)	(0.034)	(0.031)	(0.032)
Theft	0.008	0.014	0.017	0.039*	0.021	0.024	0.016
	(0.018)	(0.023)	(0.023)	(0.022)	(0.021)	(0.019)	(0.021)
Run away from Home	-0.009	-0.011	-0.016	-0.048	-0.011	-0.003	-0.003
	(0.015)	(0.021)	(0.021)	(0.049)	(0.019)	(0.017)	(0.016)
Sold Drugs	0.095***	0.097***	0.103***	0.075	0.085***	0.085***	0.082***
	(0.025)	(0.030)	(0.029)	(0.055)	(0.029)	(0.028)	(0.027)
Number of Obs.	5,378	558	558	418	2,078	2,394	2,913

Notes: All matching estimates are regression adjusted using all covariates linearly. The standard errors of the regression adjusted matching estimates are computed using a bootstrap with 499 replications.
† In this specification, the control group includes all non-Catholic school students. Thus these are standard OLS coefficients.

Table 5 (concluded).
Regression-Adjusted Propensity Score Matching Estimates of the Catholic
Schooling on Risky Behavior

Females

Control Sample:	All Public School Students †	Without Replacement		With Replacement	Radius Matching		
		Low to High	High to Low	Nearest Neighbor	Caliper, δ=0.00001	Caliper, δ=0.00005	Caliper, δ=0.0001
	1	2	3	4	5	6	7
Cocaine	-0.005	-0.050**	-0.050**	-0.066**	-0.022	-0.021	-0.022
	(0.011)	(0.022)	(0.023)	(0.030)	(0.019)	(0.020)	(0.019)
Marijuana	0.018	-0.014	-0.022	0.005	0.011	-0.001	0.012
	(0.033)	(0.047)	(0.045)	(0.054)	(0.040)	(0.040)	(0.040)
Hard Drugs	-0.003	-0.049	-0.049*	-0.055	-0.038	-0.040	-0.037
	(0.019)	(0.030)	(0.030)	(0.037)	(0.031)	(0.032)	(0.029)
Injected Drugs	0.007	0.002	0.002	0.002	0.012	0.011	0.009
	(0.008)	(0.011)	(0.011)	(0.012)	(0.008)	(0.009)	(0.009)
Damaged Property	-0.012	-0.020	-0.023	0.012	-0.010	-0.011	-0.008
	(0.024)	(0.033)	(0.034)	(0.034)	(0.025)	(0.026)	(0.025)
Burglary	-0.000	-0.001	-0.001	-0.015	0.011	0.005	0.004
	(0.014)	(0.019)	(0.019)	(0.027)	(0.015)	(0.015)	(0.016)
Robbery	0.008	0.002	0.007	0.002	0.003	0.001	0.003
	(0.014)	(0.019)	(0.018)	(0.021)	(0.013)	(0.013)	(0.012)
Gang Fight	-0.014	-0.056	-0.062*	-0.012	-0.006	-0.005	-0.019
	(0.026)	(0.037)	(0.038)	(0.037)	(0.030)	(0.028)	(0.029)
Attempted Suicide	-0.022	-0.038*	-0.040	-0.030	-0.021	-0.034**	-0.025
	(0.014)	(0.024)	(0.025)	(0.026)	(0.016)	(0.016)	(0.016)
Had Sex	-0.054	-0.117***	-0.118***	-0.132**	-0.051	-0.057	-0.058
	(0.033)	(0.047)	(0.048)	(0.060)	(0.040)	(0.039)	(0.041)
Theft	-0.002	0.001	0.001	-0.005	0.005	0.003	0.003
	(0.014)	(0.019)	(0.020)	(0.022)	(0.013)	(0.014)	(0.012)
Run away from Home	0.007	0.012	0.006	0.007	0.011	0.004	0.010
	(0.023)	(0.032)	(0.030)	(0.037)	(0.028)	(0.030)	(0.030)
Sold Drugs	0.023	-0.021	-0.021	-0.034	0.013	0.004	0.005
	(0.018)	(0.028)	(0.028)	(0.034)	(0.025)	(0.027)	(0.025)
Number of Obs.	5,600	360	360	299	1,730	2,186	2,559

Notes: All matching estimates are regression adjusted using all covariates linearly. The standard errors of the regression adjusted matching estimates are computed using a bootstrap with 499 replications.
† In this specification, the control group includes all non-Catholic school students. Thus these are standard OLS coefficients.

middle and bottom panels of the table reveal that there is a substantial difference between males and females regarding the impact of Catholic schooling. Catholic schooling has a negative impact on bad behavior for females, but for males it has a positive impact. For example, for females, Catholic schools tend to reduce the propensity to have sex by 11-13 percentage points and the propensity to use cocaine by 5-6 percentage points. For males, catholic schooling has a positive impact on drug related behavior. Specifically, Catholic schooling increases the propensity to use cocaine by 4-5 percentage points, to use marijuana by 8-11 percentage points, to inject drugs by about 2 percentage points, to use hard drugs by 4-5 percentage points, and to sell drugs by 8-10 percentage points. In some models, there is a positive impact on the propensity to burglarize (4-5 percentage points) as well. The gender difference in the impact of Catholic schooling on student bad behavior is interesting. To the extent that our estimates are not contaminated by endogeneity of school choice, they suggest that males and females respond differently to the same treatment (being in a Catholic school): while Catholic schooling reduces the propensity of bad behavior of female students, it increases it for male students.

The finding that Catholic schooling decreases the propensity of cocaine use and sexual activity for female students, but increases the propensity to use and sell drugs for male students suggests that boys and girls react differently to the Catholic school environment, which is commonly associated with discipline and structure. This could be because males may have a more difficult time adopting to their environment. It is interesting to note that other research has also identified differential response of males and females to certain "treatments." For example, Sacerdote (2005) shows that among Korean children who are adopted by American families, males complete fewer years of schooling, have lower probability of completing four years of college, and they have lower incomes than females. Male adoptees also have higher propensities of drinking and being overweight.

Kling and Liebman (2004), and Kling et al. (2005) analyze data from the Moving To Opportunity program, where families, mostly female-headed minority households with children living in high-poverty public housing projects, were offered housing vouchers by lottery. Consistent with our results, these papers find that female and male youth respond differently to this "treatment." The intervention had beneficial effects for females, but adverse effects for males. Specifically, the program reduced the extent of mental health problems and risky behavior for female youth, but it increased injuries and substance use for male youth. The authors conclude that male and female youth appear to respond to their environment in different ways, and provide a number of explanations that may help explain this outcome, ranging from the possibility that males have less effective coping strategies in stressful situations, to differential peer effects.

To demonstrate that our data set is consistent with other databases in one respect, we investigated the impact of Catholic schooling on the Add Health Picture Vocabulary Test (AHPVT). At the beginning of the interview, teens were given the AHPVT, which is a computerized, abridged version of the Peabody Picture Vocabulary Test. The AHPVT involves the interviewer reading a word then the respondent selecting the illustration which best fits the word. We estimated propensity score matching models, separately for females and males, and found a statistically significant impact on Catholic schools on the test scores. For males, the estimate of the impact of Catholic school attendance on AHPVT suggests that all else equal, students in Catholic schools score about 0.16 of a standard deviation higher on this standardized exam than students in public schools. For females, the effect is larger. Catholic schooling increases the scores of females students by 0.40 of their standard deviation.

This result is consistent with the ones reported earlier regarding bad behavior. That is, the impact of Catholic schooling is more significant for female students than male students. Catholic schooling reduces the propensity for bad behavior for female students, while it increases it for male students; and the positive impact of Catholic schooling on test scores is greater in magnitude for female students than for male students.

V. Conclusion

Engaging in risky behaviors can have negative consequences for the current and future well-being of the individual and his or her family, and these behaviors can also have negative social consequences through their burdens on the welfare and criminal justice systems. Although teenage risky behavior can be changed by sanctions and incentives, another potential tool in this regard is the influence of schooling. In particular, the analysis of the impact of Catholic school education on teenage risky behavior is important because of the current school choice debate in the United Sates.

Using a rich, nationally representative data set, we analyze the impact of Catholic school attendance on risky behaviors such as using or selling drugs, committing theft, robbery and burglary, having sex, engaging in gang-related fights, attempting suicide, and running away from home. We control for the endogeneity of school choice by employing a variety of propensity score methods. We find that for female teenagers Catholic schooling leads to a reduction in the propensity to have sex. For males, on the other hand, attending a Catholic school (as opposed to public school) increases the propensity to use and sell drugs.

Appendix

Table App-1.
Estimates of the (Logistic) Propensity Score Model

Variable	Full Sample		Males		Females	
	Coefficient	Std. Error	Coefficient	Std. Error	Coefficient	Std. Error
Male	0.534***	0.108	---	---	---	---
Age13	0.730*	0.448	0.509	0.639	1.019	0.625
Age14	0.941**	0.443	0.880	0.632	1.096*	0.619
Age15	1.123***	0.438	1.301**	0.620	0.865	0.620
Age16	1.032**	0.437	1.156*	0.618	0.900	0.620
Age17	1.087**	0.438	1.365**	0.618	0.686	0.627
Age18	1.128**	0.446	1.298**	0.631	1.035	0.631
Hispanic	-0.631***	0.229	-1.886***	0.256	-1.021***	0.261
White	-0.330	0.224	-0.701**	0.289	-0.121	0.356
Black	-0.436*	0.266	-1.026***	0.352	0.127	0.412
Asian	-0.353	0.332	-1.814***	0.408	0.192	0.431
Mother Ed=HS	1.389***	0.277	1.342***	0.414	1.395***	0.370
Mother Ed>HS	2.367***	0.291	2.108***	0.404	1.420***	0.365
Mother Ed missing	1.170***	0.326	1.494***	0.454	0.491	0.517
Parent on Welfare	-0.587***	0.239	-0.515	0.330	-0.596*	0.345
Parent Catholic	2.403***	0.124	2.433***	0.161	2.305***	0.195
Parent Married	-0.009	0.125	-0.071	0.163	0.153	0.195
Urban school	1.727***	0.177	0.684***	0.147	0.959***	0.196
Asian*Male	-0.868**	0.361				
Hispanic*Urban school	-1.574***	0.301				
College*Urban school	-1.184***	0.216				
Asian*Male*Urban School*Mother Ed=HS	-1.302*	0.770				
Asian*Urban School			1.016*	0.562		
Constant	-7.332***	0.567	-6.162***	0.780	-7.026***	0.797
Log Likelihood	1,549.4		-878.8		-676.6	
Number of Observations	11,437		5,657		5,780	

*, **, and *** indicate that the estimates are statistically significant at the 10%, 5%, and 1% levels, respectively.

Table App-2.
T-statistics for the Equality of Covariates between the Treatment Group and Various Control Groups

	Full Sample					
	Without Replacement		With Replacement	Radius Matching		
Variable	Low to High	High to Low	Nearest Neighbor	Caliper, δ=0.00001	Caliper, δ=0.00005	Caliper, δ=0.0001
Male	-0.27	-0.20	1.64	2.90*	3.50*	3.81*
Hispanic	0.20	0.20	-2.67*	3.62*	1.26	-0.19
White	-0.44	-0.80	3.07*	2.31	3.28*	3.95*
Black	0.10	0.29	-1.84	-5.16*	-5.26*	-5.45*
Asian	0.35	0.47	-1.02	1.56	0.60	0.93
Age13	0.00	0.00	-0.69	0.92	1.09	0.56
Age14	0.48	0.58	0.06	-0.59	0.09	0.51
Age15	0.17	0.17	0.95	-0.72	-0.87	0.22
Age16	-0.08	-0.08	0.65	-0.84	-0.85	-1.06
Age17	-0.57	-0.65	0.12	-0.15	0.62	0.62
Age18	0.00	0.00	-1.01	2.01	0.77	0.27
Age19	0.58	0.58	0.09	-0.49	-1.13	-1.55
Parent on welfare	0.49	0.66	-1.17	0.95	-1.69	-2.32
Mother Ed=HS	-0.15	-0.22	-1.46	0.62	-0.09	-1.14
Mother Ed>HS	0.07	0.00	2.66*	-1.34	1.83	4.08*
Mother Ed missing	-0.27	0.00	-1.83	3.01*	0.76	-0.20
Parent Catholic	0.31	0.31	3.64*	16.09*	17.52*	19.02*
Urban School	-0.07	0.00	-0.89	6.90*	5.01*	5.12*
Parent Married	-0.08	-0.47	2.55*	-0.97	0.77	1.65

*Asterisk denotes significance at the 1% level.

Table App-2 (continued).
T-statistics for the Equality of Covariates between the Treatment Group and Various Control Groups

	Without Replacement		With Replacement	Radius Matching		
				Males		
Variable	Low to High	High to Low	Nearest Neighbor	Caliper, δ=0.00001	Caliper, δ=0.00005	Caliper, δ=0.0001
Hispanic	0.28	0.28	-2.19	2.83*	1.57	-0.13
White	-0.69	-0.29	3.05*	1.37	2.00	2.93*
Black	0.41	0.27	-1.95	-3.40*	-3.83*	-4.46*
Asian	0.34	0.34	-0.78	1.09	0.71	0.67
Age13	0.15	-0.15	-0.72	1.08	0.38	-0.37
Age14	0.55	0.55	-0.34	-0.78	-0.72	-0.43
Age15	0.42	0.32	1.03	-1.14	-0.92	-0.13
Age16	-0.40	-0.30	0.74	-0.99	-0.64	0.03
Age17	-0.30	-0.30	0.23	1.26	2.02	1.14
Age18	-0.25	0.00	-1.11	1.18	-0.10	-0.57
Age19	--	--	--	--	--	--
Parent on welfare	0.00	0.00	-1.71	1.77	0.42	-0.36
Mother Ed=HS	0.30	0.10	-0.90	-1.60	-2.62*	-2.94*
Mother Ed>HS	-0.18	-0.09	2.47*	0.21	2.20	3.52*
Mother Ed missing	-0.31	-0.16	-2.09	2.29	1.22	0.05
Parent Catholic	0.20	0.20	3.38*	12.84*	13.72*	15.18*
Urban School	0.70	0.70	-0.59	5.15*	4.81*	4.19*
Parent Married	-0.20	-0.30	3.12*	-2.22	-1.44	-0.25

*Asterisk denotes significance at the 1% level.

Table App-2 (concluded).
T-statistics for the Equality of Covariates between the Treatment Group and Various Control Groups

	Females					
	Without Replacement		With Replacement	Radius Matching		
Variable	**Low to High**	**High to Low**	**Nearest Neighbor**	**Caliper, δ=0.00001**	**Caliper, δ=0.00005**	**Caliper, δ=0.0001**
Hispanic	-0.43	-0.43	-1.90	3.84*	2.81*	1.73
White	-0.44	-0.22	1.27	-0.26	0.47	0.89
Black	-0.14	-0.14	-1.17	-1.78	-2.25	-2.58*
Asian	0.68	0.33	0.20	2.34	2.33	2.21
Age13	-0.57	-0.57	0.17	-0.61	-0.99	-0.40
Age14	0.14	0.41	0.27	0.33	-0.15	0.30
Age15	0.42	0.42	0.60	-0.33	-1.03	-0.62
Age16	0.42	0.42	0.22	0.12	0.70	-0.11
Age17	0.00	-0.29	0.24	-1.73	-0.85	-0.69
Age18	-0.15	-0.15	-0.83	2.18	2.72*	1.69
Age19	-0.82	-0.82	-1.36	1.96	0.84	0.54
Parent on welfare	0.48	0.48	-0.41	1.86	1.47	0.44
Mother Ed=HS	0.56	0.56	0.25	2.02	0.31	0.02
Mother Ed>HS	-0.75	-0.75	0.25	-2.70*	-0.33	0.49
Mother Ed missing	-0.51	-0.51	-1.38	1.62	0.51	0.04
Parent Catholic	0.12	0.12	1.31	8.43*	10.40*	11.29*
Urban School	0.00	0.00	0.54	6.35*	5.53*	5.80*
Parent Married	-0.12	-0.12	1.02	-0.75	-0.37	0.71

*Asterisk denotes significance at the 1% level.

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