Social Capital and School Sector Impacts

on the Non-Cognitive Skills of Early Adolescents:

Evidence from a Nationally Representative Longitudinal Survey

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Abstract

Estimates obtained from the first nationally representative longitudinal study of students in the United States in grades K-8, robust to both probit and propensity score matching models, provide empirical support for James Coleman's social capital theory of Catholic school impacts on student behavior. Catholic schooling has a positive impact on the academic engagement, homework completion, tardiness, absenteeism, class attentiveness, and disruptive behavior of 8th graders. It has a negative impact on student assessments of their self-esteem. Little discernable impact on other psychological traits is observed. Data come from the U.S. Department of Education's Early Childhood Longitudinal Study (K-8) initiated in 1998. All impacts are observed after controlling for numerous background characteristics and for 1st grade math and reading scores.

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Paul E. Peterson and Martina G. Viarengo

In his seminal book, *The Adolescent Society,* James S. Coleman (1962) identifies a disjunction between the high school's manifest educational function, which is under the direction of adults, and its latent social function, quite inimical to educational purposes, which is under peer group control.[1] For adolescents, the focus at school is on the sports stars, cheer leaders and other members of the leading crowd, known more for smart dressing than for smarts per se. Those who study hard and get good grades are edged to the social sidelines. For those who succeed scholastically, it must appear to have been "gained without special efforts, without doing anything beyond the required work." Otherwise, one is socially isolated by "the crowd."

It is the way in which the schools are organized that is the problem, said Coleman (1959, p. 343). Like jails, the military, and factories, they are run by "an administrative corps" that makes demands upon a larger group (students, prisoners, soldiers, workers). In response, the larger group develops a set of norms that govern the choices individuals make: "The same process which occurs among prisoners in a jail and among workers in a factory is found among students in a school. The institution is different, but the demands are there, and the students develop a collective response to these demands. This response

[1] We wish to thank Antonio Wendland, Ron Berry, and Ashley Inman for their assistance in obtaining and managing the data used in this investigation and for their help in preparing this paper.

takes a similar form to that of workers in industry—holding down effort to a level which can be maintained by all. The students' name for the rate-buster is the 'curve-raiser,'…and their methods of enforcing the work-restricting norms are similar to those of workers—ridicule, kidding, exclusion from the group (Coleman, 2006, p. 42)."

A student's psychological sense of self is shaped less by the teachers and administrators at the school than by the peer group culture. Sports stars and members of the leading crowd are much less likely than other students to say that "If I could trade, I would be someone different from myself (Coleman, 1962, ch 8, p. 221.)." Self-esteem and a sense of social isolation are driven less by academic failure than by inability to negotiate successfully the peer group culture.

More recent studies have echoed Coleman's insights into the way in which schools function in adolescent society. To maintain order a political bargain is struck, report Powell and his colleagues (1985, ch 2) in their book, *The Shopping Mall High School*. Students and teachers alike agree to comport themselves properly as long as expectations are minimal. "Students chose courses that are easy, met at convenient times, and enrolled their friends. They did homework, as long as it was not too much… A boy said he deliberately constructed his schedule to avoid homework, so he would have time to "work, play and be with my friends." They never complain when little is expected of them. "Why should we? We just want to get out." They thought their teachers probably felt the same way. They are as much "goof-offs" as the students, as much anxious for the end of school so they too could begin their second jobs. Avoidance treaties were mutually advantageous—like had found like. "No more important finding has emerged from the

inquiries of our study," wrote Theodore Sizer (1984, p. 54) "than that the American high school student, *as student,* is all too often docile, compliant, and without initiative."

In his later work, Coleman developed a "social capital" theory that enabled him to distinguish between adult capacities to control the functions of Catholic and public high schools. Even though the latent social function continued to be controlled by the peer group, Coleman and Hoffer (1987) theorized that the "social capital" available at Catholic schools gave them greater capacity to offset that culture, which resulted in higher test score performance of students in Catholic than in public schools. In their view, conversations among regularly interacting Catholic parents, teachers, and parishioners create an adult framework that reinforces a set of social norms that support the schools' educational mission, an intangible resource they dubbed social capital. Coleman and Hoffer (1987, p. 241) speak of "intergenerational closure," a space where parents know their children's friends' parents and a "communal organization" that develops a greater sense of community conducive to higher levels of engagement on the part of both students and teachers. Offsetting the ordinary demands of peer group culture is "the importance of the embeddedness of young persons in the enclaves of adults most proximate to them, first and most prominently the family and second, a surrounding community of adults" (Coleman and Hoffer, 1987, p. 229). In short, social capital theory was applied to education in order to explain student readiness to comply with educationally productive social norms, such as homework completion, lower absenteeism rates and greater levels of academic engagement (Coleman, Hoffer and Kilgore, 1981, ch. 5).

Intergenerational closure—conversations among parents of students and the teachers of students—could prevent political bargains of the kind Powell and his colleagues observed. Communication among the adults who sustained the Catholic school altered incentives for both teachers and students. Teachers were expected to hold students accountable, and students were be expected to be engaged in their studies. Absenteeism was corralled and homework assignments had to be completed.

The enforcement of public social norms is more easily controlled by the adult community than is the psychological state of the individual adolescent, however. Whether adolescents have a strong sense of self-esteem or a feeling that their destiny is under their own control is very much shaped by peer group influences, Coleman had found in his early study of adolescent society. Even if generational enclosure was achieved in Catholic settings, that did not necessarily mean that it could prevent the peer group culture from shaping the students' subjective psychological states. Coleman and his colleagues (1981, pp. 160-66, 278) found no difference in the impact of Catholic and public schools on student "self"-esteem" or "fate control." When it came to an adolescent's internal feelings, the peer group culture appeared as all-pervasive in Catholic as in public schools. .

Social capital theory has since been applied in numerous ways, most notably by Robert Putnam (1993, 1995, 2000) as an explanation for declines in civic trust in the United States. An anthropological study of the inner workings of Catholic schools by Bryk, Lee, and Holland (1993) found a culture and set of practices within Catholic schools that was quite consistent with Coleman's expectations. Mokan and Tekin (2006) found that Catholic-high school students show lower propensity to bad and risky behavior

as well as drug consumption, and Figlio and Ludwig (2001) found that students who attended Catholic high schools exhibit lower rates of arrest and hard drugs use. Also, Belfield (2004), by examining data from the National Household Education Survey of 1999, showed that community service participation rate of students in Catholic high schools was higher, as was their civic skills and their political tolerance.

All such applications of social capital theory in the study of sector impacts have focused on high school students, however. Virtually no attention has been given to students in their middle school years, even though the adolescent peer group culture is known to be well established by the time young people reach the age of 14, the typical age of an 8th grade student. With the release of the results from the 8th grade wave of the Early Childhood Longitudinal Study, Kindergarten Class of 1998-99 (ECLS-K), it is now possible to see whether social capital theory also applies to early adolescence, that is, whether information from a nationally representative sample of 8th graders provides evidence that 8th grade students in Catholic schools are more ready than those in public schools to comply with educationally productive social norms. Sponsored by the National Center for Education Statistics (NCES) of the U. S. Department of Education, the ECLS-K, beginning in 1998, tracked a panel of students from kindergarten through 8th grade in both public and private schools. In addition to information on student test score performance, the survey meticulously collected not only a host of family background characteristics from parents but also information about an array of non-cognitive atributes from teachers, students and parents at each wave of the survey, allowing for the first time the opportunity for analysts to look at the impact of the

Catholic and public school sectors on a variety of outcomes social capital theory was designed to explain.

Prior Research

We shall not review here the rich and diverse literature that has estimated sector impacts on educational achievement and attainment. It is sufficient to say that the quality of that research has greatly improved since the initial Coleman study, but no consensus has yet to be achieved as to whether students learn more in private schools in general, or Catholic schools in particular, than in public schools. The evidence for a positive Catholic school impact seems to us to be stronger for longer term outcomes, such as high school graduation, college attendance, and earnings some years later than on test scores per se, suggesting perhaps that the social capital available to Catholic schools gives them a greater capacity to impart non-congitive skills that have beneficial long-term consequencs. Positive Catholic high school impacts have been found on educational attainment (Morgan, 2001; Altonji, Elder and Taber, 2005), the probability of completing high school (Evans and Schwab, 1995; Neal, 1997) and the probability of going to college (Evans and Schwab, 1995). In many of the studies positive effects have been reported especially for ethnic minorities and students from more disadvantaged socio-economic background (Newstead and Olsen, 1985; Figlio and Stone 1997, 1999). But the topic remains so controversial that two reviews of the literature published back to back in the same journal reached substantially different conclusions concerning the benefits of school vouchers that widen the door to private schooling. Neal (2002) discusses the possible gains in the productivity of the U.S. K-12 education system arising from the

introduction of a large-scale voucher program, whereas Ladd (2002) casts doubts on the likelihood of these programs to generate substantial gains in student achievement.

One fact is certainly clear, however: More information is available on sector impacts on high school performance than on elementary and middle school performance. The only elementary school studies of sector impacts that make use of data from a nationally representative longitudinal survey rely upon information available from the 5th grade wave of the same survey for which we now have data through 8th grade. In one of these studies, Reardon et al. (2008) found no sector impact in reading and a negative private sector impact in mathematics. Peterson and Llaudet (2007), performing a similar analysis, identified positive private sector impacts in the reading performances of those that had had low test score performance in first grade. However, they found no significant impact in math for this group. Among those with high test performance in first grade, they found beneficial public school impacts in math, but no differences between the two sectors in reading. Afro Americans and Hispanics benefitted in reading from attending a private school, while whites and Asians benefitted in math from attending a public school. No sector impacts have yet been reported by either team—or any other investigator—for the 8th grade wave of the ECLS-K. On the other hand, Carbonaro (2006a, 2006b) did not find any consistent advantage of private schools in providing learning opportunities at kindergarten level.

Despite these studies of sector impacts on the cognitive performances of students, as measured by test scores, no one has used information from ECLS-K or any other nationally representative longitudinal survey to estimate sector impacts on non-congitive skills. That is unfortunate, because a growing number of classical and behavioral

economists, to say nothing of sociologists, policy analysts, and educators, have come to believe that the acquisition of non-congitive skills is at least as important for life outcomes as are student test score performances (for labor-market outcomes, see, for example, Bowles, 2001; Heckman, 2001; Carneiro and Heckman, 2003; Farkas, 2003; for other outcomes, see Heckman, Stixrud, and Urzua, 2006).

ECLS-K Survey

As part of ECLS-K, NCES conducted seven waves of data collection: Fall, 1998 (beginning of kindergarten), Spring, 1998 (end of kindergarten), Fall, 1999 (beginning of 1st grade), Spring, 2000 (end of 1st grade), Spring, 2002 (3rd grade), Spring, 2004 (5th grade), and Spring, 2007 (8th grade). Attrition from one wave to the next was substantial, as students could not easily be tracked as they moved from one school to another and some parents withdrew their consent, which had to be obtained at each wave of the study. Initially, data was collected from 22,666 students in 1,277 schools. That number fell to 17, 324 students in 2,013 schools in first grade, an especially high rate of attrition that was probably due to the especially heterogeneous arrangements for kindergarten instruction. By third grade, the number had fallen to 15,305 students; in 5th grade, the number was 11, 820 and in 8th grade the number was 9,725. See Table 1 for more detail.

The substantial attrition rate is not unusual in surveys that track individuals over long periods of time, and attrition rates do not introduce bias here if they are consistent across school sectors on both observed and unobserved characteristics. Table 2 provides descriptive statistics, separately, for students in the public and Catholic sectors observed in both 1st and 8th grade as well as for those observed in first grade but not, again, in 8th

grade. In column (e) of Table 2, we report the statistical significance of differences in the attrition rates from the public and Catholic samples by background characteristic. For most characteristics, sector differentials in attrition rates are not statistically significant. For example, attrition rates in the two sectors are similar for those with below average math scores, for those from lower socio-economic backgrounds, for African Americans, Whites, Hispanics, and for those not living with their parents. However, attrition in the public sector was greater for those with lower reading scores, for those who were Asian, for those whose mothers did not finish high school, and for those from large towns and cities. As discussed below, the use of propensity-score matching reduces the likelihood of selection bias from differential attrition rates, but if attrition on unobserved characteristics is not well-correlated with observed ones, estimations may be biased.

Certain kinds of students are excluded from our analysis. All those who attended non-Catholic private schools are excluded on the grounds that the number of such schools participating in ECLS-K was small, the number of participating students in later waves became very small, and the category is so heterogeneous that it is difficult to interpret results. We also exluded the students who changed sectors on the grounds that sector impact could not be estimated for this group without making strong assumptions. We also excluded the students whose geographic location changed dramatically—from one of the four regions of the country to another or from one type of community to another (urban, suburban, rural)—because we could not assign location without making strong assumptions. To check whether exclusion of students who moved affected results, we separately estimated impacts that included those who had changed location and/or sector, assigning them to the sector and location reported in first grade. Sector impacts do not

differ significantly from those reported in the main analysis, though impacts attenuate slightly as one would expect given the student migration from one sector and/or location to another.[2]

After exclusions, the number of 8th graders remaining in the analytic sample consist of a maximum of 7,808 students in 2,266 public schools and 976 students in 237 Catholic schools. Numbers vary slightly from one estimation to the next, depending on response rates to specific items. Table 2 provides the summary statistics for the full sample and the analytic sample used for the ordered probit model. As can be seen, the characteristics of those included in the analytic sample resemble closely those of the entire sample. Table 2 also identifies the characteristics of students included in the propensity score matching models. As is to be expected, differences in the background characteristics of the students in the Catholic and public sectors are much smaller in the matched comparison than those in the analytic sample, and for that reason we place greatest weight on the results from the matched comparison analysis.

For baseline information and for initial sector assignment, we rely upon the data collected at the end of 1st grade, because test score information of the kind collected in a national survey is generally thought to be more reliable by that age. Also, in many parts of the country, sector arrangements for those in kindergarten are strikingly different than those that emerge beginning in the first grade of school, as many private schools offer pre-school education through kindergarten but not beyond.

Dependent Variables: Non-cognitive Outcomes

[2] These results and other detailed results discussed below that are not shown in the accompanying tables are available from the authors upon request.

Inasmuch as the study of non-cognitive outcomes is still in its infancy within Catholic school effects research, no standard classification system or set of rubrics has evolved. In the early waves of the ECLS-K, the focus of the teacher questionnaires is on student psychological characteristics rather than on their compliance with social norms. It is not until the 8th grade wave that the survey solicits from teachers information needed for a solid test of social capital theory, and only in the 8th grade wave are students asked an extended battery of questions about their own pyschological well-being. The items used to construct the self-esteem and locus of control indexes are the same as those used in the National Educational Longitudinal Study of the Class of 1988 (NELS:88), a previous U. S. Department of Education longitudinal survey that followed a cohort beginning in 8th grade. Our analysis thus focuses on results from the 8th grade wave, the wave that has the best set of indicators of both social compliance and of student self perception of their own self worth. However, we include in Appendix A estimations of sector impacts on outcomes for 5th grade students.

Consistent with social capital theory, we draw a distinction between two sets of non-cognitive outcomes: 1) conformity with social norms; and 2) self-perceived psychological traits. The first set—social conformity--refers to actions easily observed by others. It is those types of outcomes that are most susceptible to control by a community of adults such as the parents and parishoners Coleman deemed critical to Catholic school success. Variables in this category include tardiness, absenteeism, homework completion, disruptive behavior, classroom attentiveness, and academic engagement. All indicators come from the teacher questionnaire save the last one, which is an index of the students' own assessment of the strength of their educational

commitments and performance at school. The second set—self-perceived psychological traits—are matters internal to the student—student self-esteem, their sense of control over their own destiny, and their propensity to internalize the problems they face.

All variables are either single indicators or are measured by scales constructed by those responsible for the ECLS-K survey and are used by us without modification. Except to conduct a sensitivity test, we ignore data from the parent questionnaire on the grounds that parents do not have the same comparative framework teachers have when assessing compliance with social norms, nor are they a direct source of information about a child's psychological well-being.

We do not claim that our bipartite scheme is the only way to classify non-cognitive outcomes. For example, a numberof behavioral economists have suggested a "Big Five" taxonomy—agreeableness, conscientiousness, extroversion, neuroticism and openness to experience.[3]

Our dependent variables thus consist of the following five teacher-generated indicators of student conformity to social norms, one student-generated indicator of their own academic engagement, and three student-generated indicators of a student's own sense of psychological well being. Reliability reported for these non-cognitive variables

[3] Evidence for the usefulness of this taxonomy has been accumulating ever since Fiske's (1949) early research, most notably by the work of such scholars as Norman (1967), Smith (1967), Goldberg (1981), and McCrae and Costa (1987). Recently, a number of behavioral economists (e.g., Fehr and Gachter, 2000; Holt and Laury, 2002; Falk, 2008; Dohmen et al., 2009) have put the taxonomy to creative use. As it relates to our scheme, the first two categories within the "Big Five" taxonomy—agreeableness and conscientiousness—resemble "social capital" as Coleman defined it in that they appear to identify a readiness to conform to social norms, while the other three categories—extroversion, neruoticism, and openness to experiences—seem to fall within our second category--individual psychological traits not easily shaped directly by others outside the family. Unfortunately, we cannot provide a direct test of the usefulness of the "Big Five" taxonomy because the categories are not easily matched to the scales ECLS-K has made available.

is high (see ECLS-K, User's Manuals, 1st, 3rd, 5th and 8th grades).[4] The content of each variable is as follows:

1. Conformity to social norms (the first five taken from teacher questionnaire, the sixth from the student questionnaire)

Tardiness: Teacher is asked to rate how often student is tardy. The following five point scale is used: "never", "rarely", "some of the time", "most of the time", "all of the time" (Scale reversed so positive coefficients indicate low levels of tardiness.)

Absenteeism: Teacher is asked to rate how often student is absent. The following five point scale is used: "never", "rarely", "some of the time", "most of the time", "all of the time" (Scale is reversed so positive coefficients indicate low absenteeism.)

Homework completion: Teacher is asked to rate how often student completes homework when assigned. The following five point scale is used: "all of the time", "most of the time", "some of the time", "rarely", "never"

Disruptive behavior: Teacher is asked to rate how often student is disruptive in class. The following five point scale is used: "never", "rarely", "some of the time", "most of the time", "all of the time." (Scale is reversed so positive coefficients indicate non-disruptive behavior.)

[4] The ECLS-K 8th Grade User's Manual (sections 3-25 to 3-36) provides measures of reliability for most of the composite variables in the dataset. The reliability is estimated as the variance on repeated estimates of ability compared with total sample variance. For the other variables the measurement is related to the consistency of each of the items and to the score scale as a whole.

Attention in class: Teacher is asked to the frequency with which the student pays attention. The following five point scale is used: "all of the time", "most of the time", "some of the time", "rarely", "never"

Academic Engagement: Student is asked about grades in English and their perceived competence, interest in and enjoyment of reading.

2. **Self-perceived Psychological Traits** (scales constructed from items in student questionnaire)

Self-esteem: A scale construction from student responses to seven questions inquiring about their perceptions of their own self worth. The items included in the scale, drawn from the NELS:88 student questionnaire, are as follows: a) I feel good about myself; b) I feel I am a person of worth, the equal of other people; c) I am able to do things as well as most other people; d) On the whole, I am satisfied with myself; e) I certainly feel useless at times; f) at times I feel I am no good at all; and g) I feel I do not have much to be proud of.

Locus of control: A six-item index scale constructed from responses questions that inquired about the amount of control students had over their own lives. Items were drawn from the NELS:88 student questionnaire. The items are as follows: a) I don't have enough control over the direction my life is taking; b) In my life, good luck is more important than hard work for success; c) Every time I try to get ahead, something or somebody stops me; c) My plans hardly ever work out, so planning only makes me unhappy; d) When I make plans, I am almost certain I can make them work; e) Chance and luck are very important for what happens in my life.

Internalizing problems: An eight-item scale constructed from responses to the following items: The items are as follows: a) I feel angry when I have trouble learning; b) I worry about taking tests; c) I often feel lonely; d) I feel sad a lot of the time; e) I worry about doing well in school; f) I worry about finishing my work; g) I worry about having someone to hang out with at school; h) I feel ashamed when I make mistakes at school.

All but two of the above-mentioned indicators are positively correlated with one another as well as with reading and math test score performance. But the indicators of social compliance have only weak relationships with the indicators of psychological well-being (see Table 3). The six indicators of compliance with social norms have an average inter-correlation of 0.32, and the inter-correlation among the three scales measuring student self perception of their psychological well being is no less than 0.44. But there is only a 0.12 average inter-correlation between social-norm and psychological-trait indicators, suggesting that the two dimensions are almost completely orthogonal to one another[5].

For indicators derived from the teacher questionnaire, most assessments are made by teachers of English because every student in the survey was assessed by that teacher and English teachers were asked the full battery of questions. But we also include observations of science and math teachers on those aspects of student behavior about which they were questioned. The sample of students was split randomly between the

[5] Range of correlations for the conformity to social norms measures range from 0.12 to 0.60, and the range of correlations for the psychological traits vary between 0.06 to 0.59. The range of the correlations of items in the social norm index with those in the psychological trait index varies between -0.06 and 0.35.

math and science teachers, leaving a smaller number of math and science teacher observations.

Independent and Control Variables

The primary independent variable of interest is school sector—whether or not a student was educated within the Catholic or public sector. Also included in the analysis are controls for gender, ethnic group, an indicator of disability, socio-economic status (i.e., an index which jointly measures parental education, income, and occupational prestige), status with respect to the poverty threshold, mother's age at the birth of the first child, number of siblings, region of the country, type of community, and 1st grade test scores in mathematics and reading. Socio-economic status and 1st grade mathematics and reading test scores have been standardized with a mean set to equal to zero and a standard deviation set to equal 1.0. Table 2 provides descriptive statistics for all variables.[6]

Analytic Strategy

An ordered probit model is used to estimate sector impacts on all students included in the analytic sample. The model is preferred over an ordinary least squared regression because many variables are not continuous.[7] However, an ordered probit model that includes all students must make strong assumptions about the comparability of the students in the two sectors since the social composition of the two sectors differs sharply (see Table 2). For this reason estimations are also made from matched comparison models.[8] A propensity score matching model (Dehejia and Wahba, 2002)

[6] Table 2 provides the descriptive statistics for mother's education, but that variable is not used separately in any of the models as it is a component of the socio-economic status index.

[7] See Appendix B for a discussion of the ordered probit model used in the analysis.

[8] See Appendix B for the procedures used in the matched comparison analysis.

matches control students to treated students with similar observable pre-treatment characteristics. The model assumes that treated and non-treated groups, if similar on observable characteristics, differ only with respect to the treatment. If so, it is possible to establish the causal effect of school sector on student outcomes.

The propensity score matching estimator is implemented in two steps. First, the estimation of the propensity score is carried out by using a binary choice model which estimates the propensity score as a function of the control variables measured prior to treatment. To improve the quality of the matches used to estimate the average effects of treatment on the treated we restrict the analysis to those observations where the propensity score belongs to the intersection of the supports of the propensity score of treatment and control units (i.e., the "common support", following Becker and Ichino, 2002). We use the nearest neighbor matching for this estimation because it appears to be the method which minimizes group differences among many items.[9] To verify that the results of the match satisfies the "balancing property hypothesis" (Becker and Ichino, 2002), one may compare the characteristics of the treatment and control groups after matching. As can be seen in Table 2, differences in covariates have been significantly reduced. Second, we ran an ordered probit regression to estimate the average effects of treatment on the treated. Following Abadie et al.'s (2004) methodology we correct the standard errors to make matching estimators consistent. We also take into account the fact that we are using an ordered probit model on a previously matched sample.

Propensity score matching limits the number of observations to the subset that can be matched. But since every Catholic student in the analytic sample is matched to its

[9] The other methods used are: Caliper matching, Radius (with a range of calipers), and Mahalanobis metric matching.

closest neighbor in the public sample, the matched comparison is representative of the relative impact of the private sector, if it may be assumed that there are no biases introduced by attrition or by differences in unobserved characteristics not captured by observables.

Exclusion of observations where values are missing for specific characteristics introduces bias whenever non-responses are not randomly distributed. To retain those observations, missing values are estimated by means of a multiple imputation technique that follows King et al. (2001): the multivariate imputation by chained equations (van Buuren et al., 1999, "MICE" method in STATA). It relies on the imputation of missing variables by using switching regressions, an iterative multivariable regression technique. Five imputed datasets have been created and the regression estimates have been averaged over the five sets of results. We use this technique to estimate values for the missing independent variables.

Because observations of students are clustered within schools, hierarchical linear modeling is used for the ordered probit estimations (Raudenbush and Bryk, 1986).

Results

Results lend credence to Coleman's social capital theory. As can be seen by examining the results from the matched comparison models in Table 5, most estimations show positive Catholic sector impacts on several indicators of student readiness to comply with educationally productive social norms. [10] According to the assessments made by English teachers, attendance at a Catholic school reduces tardiness and

[10] Table C1 presents complete results for estimations of homework completion and classroom disruption in English classes.

absenteeism while enhancing homework completion and academic engagement in 8th grade. However, no significant impact on attentiveness in class and non-disruptive behavior is observed. A similar pattern is reported by science teachers. In math, a positive Catholic sector impact is detected for all six indicators of social compliance. Results from the ordered probit models resemble closely those obtained from the matched comparison models. In sum, a robust set of positive Catholic sector impacts on student compliance with social norms is observed, just as Coleman hypothesized.

While Catholic sector impacts on student compliance with social norms are generally positive, sector impacts on student self-reports of their psychological well being are not. Sector impacts on student self control and tendency to internalize problems are statistically insignificant. A negative Catholic sector impact on students' self-esteem is suggested by the ordered probit model. The sign in the propensity matching model is also negative, but the coefficient fails to reach the standard level of statistical significance. All in all, the most cautious interpretation is that no consistent impacts on student self-perceived psychological well-being can be detected. Nor should one expect any other result from Coleman's social capital theory, as it identifies the peer culture as the primary source of student self-esteem.

To see whether impacts on non-cognitive outcomes varied by minority status, socio-economic status, and initial test score performance (measured in first grade), we estimated ordered models with interaction terms for outcomes in English classes, the context in which the number of observations was large enough to estimate interaction terms with a fair degree of precision.

In the probit analysis for all students, four of the six estimations of Catholic impacts on social-norm outcomes revealed smaller Catholic impacts on minority students. However, only two of the matched comparisons estimations showed those smaller impacts, while another indicated that the impact for minorities was larger. No significant impacts of the interaction term on student psychological traits were observed. In sum, there is some, though hardly conclusive, evidence that Coleman's social norm theory is more tenuous for minority group students.

Results for students from lower socio-economic status (SES) and those of lower test scores showed no consistent pattern of results; 20 the 24 estimations were statistically insignificant. Nor were impacts on psychological traits any less erratic; nine of 12 estimations were statistically insignificant, two had larger impacts for those of lower SES, and one had the opposite impact.

We also examined results only for those math and science teachers who were not also the student's English teacher. In a few cases--less than 5 percent of the total--the English teacher served as the student's math or science teacher, or both, so in these instances observations in math and science are not separate and independent of those made in English classes. In Table 6, we isolate the Catholic sector impacts in math and science classes for only those classes where a teacher other than the English teacher taught the student. We provide probit estimations for impacts on all students in the analytic sample for all outcomes measured in math and science classes: tardiness, absenteeism, homework completion, disruptive behavior and attention in class.[11] The estimations do not change significantly from the main results reported in Table 5. In

[11] Because ECLS-K split the sample in half between the math and science teachers, there are not enough observations to estimate impacts using the matched comparison model.

math, sector impacts on both outcomes remain positive. In science, Catholic sector impacts on homework remain positive, and impacts on attention in class continue to be insignificant. In other words, the identification of consistent impacts across subject areas is not dependent on the assessments of the small number of English teachers who also taught the same students in math and/or science.

Interpretation of Estimates

For outcomes that were significantly impacted by the Catholic sector in the matched sample estimations we used Clarify software developed by King et al. (2000) to simulate those impacts for the representative student. For all estimations in which the Catholic sector variable was found to be statistically significant in the matched comparison model, that impact was simulated by estimating the change in the predicted probability of school sector on outcomes for the average student holding constant all the control variables in the analytic sample model, as reported in Table 5.[12] The method is discussed in Appendix B and an illustration may be found in Table B. 1. In the right column (matched students) we present this point estimate of the Catholic school impact whereas in the left column (simulated probability) we present the simulated probabilities that an observation will take on any of the values of the dependent variable specified.[13]

[12] In an ordered probit model a significantly positive coefficient indicates that increasing the relevant independent variable increases the probability that the non-cognitive dependent variable takes on the highest value, and reduces the probability that the dependent variable takes on the lowest value. The impact on the probabilities that the dependent variable takes on the intermediate values is *a priori* unclear. See Greene (2000, pp. 875-879) for further details.We also calculated the marginal effects at the means of the independent variables without simulations. Estimated impacts were similar regardless of method used.

[13] For example, we can observe that there is a 2.6 percent probability that tardiness will take the value of 3 (=some of the time), 22.4 percent probability that it will take the value 4 (=rarely) and 74.5 probability that it will take the value of 5 (=never).

Based on these calculations, one can see that impacts were not only statistically significant but substantively meaningful. Attending a Catholic school increases the predicted probability for the representative student of always completing homework by 12 percentage points, an increase of 23 percent over the benchmark simulated probability. Similarly, attending Catholic school increases the predicted probability of never being tardy by 10.5 percentage points, an increase of 14 percent. The impact on the probability of never being absent increases by 9.3 percentage points, which represents an improvement of nearly 51 percent. The impact on the probability of being the most academically engaged increases by 0.04 percentage points, a gain of 19 percent. Greater sector effects are observed for the non-cognitive skills more easily monitored by teachers (for example, absence and homework completion).

The impact of school sector on non-cognitive skills demonstrated in math and science classes is similar. In mathematics the increase in the probability of never being tardy is 7.9 percentage points, an increase of 11 percent. The increase in the probability of never being absent is 8.2 percentage points, an increase of 42 percent. The probability of always completing homework goes up by 20.8 percentage points, an increase of 35 percent. The increase in the probability of paying attention all of the time climbs by 13.3 percentage points, a jump of 36 percent. In science, estimates show an 11.4 percentage point increase in the probability of never being tardy, an increase of 15 percent. The probability of always completing homework increases by 13.9 percentage points if one is in the Catholic sector, an increase of 25 percent.

Discussion

In this paper we provide the first rigorous test of social capital theory as developed by James Coleman that draws upon data from a nationally representative longitudinal survey of students in 8th grade, a time in the life cycle when compliance with educationally productive social norms is most problematic. Results are quite robust to a range of indicators of social compliance—reductions in student tardiness, absenteeism and disruptive behavior as well as positive impacts on academic engagement, homework completion, and class attentiveness in English, math and science class. However, in some cases—class attention and student disruption in English and science classes--null findings are obtained. The results from the analytic sample models are very consistent with those generated by the preferred matched comparison models.

At the same time, no consistent impacts on a student's self-perceptions of their psychological well-being are identified, a finding not necessarily inconsistent with Coleman's social capital theory. That theory focused explicitly on compliance with adult expectations and did not address the consequences for a student's sense of self worth.

These results are obtained after controlling for a broad range of characteristics including family background characteristics and student test scores in 1st grade, and the results are based upon estimations that retain as many observations as possible by imputing values for missing data. For the analytic sample model for all students, hierarchical linear modeling is used to take into account multiple observations at a single school site. Results do not change when all those who change sectors are assigned to the sector in which they first began. Results are generally, if not entirely, robust to independent observations by English, math and science teachers.

Though our test of social capital theory has been rigorous, it is nonetheless subject to several limitations. The observations available from the ECLS-K decline steadily with each wave so that the 8th grade wave consists of just 9,725 of the 17, 324 observations available in first grade. Attrition rates from the public and private sector differ with respect to a number of observable characteristics, and it is possible that the non-observable characteristics of those that disappear from the sample could also have vary by sector. Of special concern is the possibility that a higher proportion of non-compliant students in the private than in the public sector may have been among those who are missing from the 8th grade wave. For that reason, we place the greatest weight on the findings from the matched comparison sample, where every remaining student in Catholic school is matched to a public student that comes nearest to resembling the Catholic school student on observable characteristics. We nonetheless recommend that randomized experiments seeking to estimate sector impacts obtain information on students' compliance with social norms as well as their test scores and self- perceptions of personal well-being.

No less interesting is the minimal Catholic sector impact on a students' sense of self worth and other indicators of psychological well-being, as reported by students themselves. Coleman would probably not have been surprised to hear of this finding, as his theory of adolescent society identified the primary sources of self-esteem as coming from the student's place in the peer group status hierarchy. Left for further research is the determination of the independent significance of learned social compliance behavior and a student's sense of self-worth for such long-term outcomes as educational attainment and labor market participation. However that question is resolved, it seems clear that the

study of human capital acquisition could benefit substantially from the exploration of school impacts on non-cognitive as well as cognitive outcomes, as measured by test-score performance.

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Table 1. Number of students and schools participating in the Early Childhood Longitudinal Study-Kindergarten Class of 1998-99 (ECLS-K) waves in lst grade, 3rd grade, 5th grade, and 8th grade, by school sector

	School Sector					
	Public	**Catholic**	**Private, other religion**	**Private secular**	**School sector unknown**	**Total**
Kindergarten						
Students	17,777	2,510	1,445	934		22,666
Schools	914	120	149	94		1,277
1st Grade						
Students	13,543	1,979	945	415	875	17,324
Schools	1,645	173	128	67		2,013
3rd Grade						
Students	11,961	1,678	764	221	681	15,305
Schools	2,245	228	142	58		2,673
5th Grade						
Students	9,328	1,319	575	175	423	11,820
Schools	1,175	126	77	21		1,399
8th Grade						
Students	7,808	976	453	172	316	9,725
Schools	2,266	237	153	95		2,751

Table 2. Descriptive statistics for background and dependent variables for the entire 8th grade sample, the analytic sample and the sample used for the matched comparison models

	Entire Sample			Analytic Sample[1]			Matched Comparison Sample[2]		
	All	**Public**	**Catholic**	**All**	**Public**	**Catholic**	**All**	**Public**	**Catholic**
School Sector									
Catholic	0.11	0.00	1.00	0.14	0.00	1.00	0.50	0.00	1.00
Background									
Math 1st grade	-0.02	-0.05	0.26	-0.02	-0.08	0.30	0.30	0.30	0.30
	(0.99)[3]	(0.99)	(0.92)	(1.00)	(1.01)	(0.91)	(0.97)	(1.02)	(0.91)
Reading 1st grade	-0.02	-0.06	0.29	-0.04	-0.09	0.30	0.31	0.33	0.30
	(0.99)	(0.99)	(0.88)	(0.98)	(0.99)	(0.88)	(0.92)	(0.96)	(0.88)
Male	0.50	0.50	0.51	0.50	0.50	0.51	0.50	0.49	0.51
Female	0.50	0.50	0.49	0.50	0.50	0.49	0.50	0.51	0.49
White	0.60	0.59	0.72	0.61	0.58	0.75	0.75	0.75	0.75
African American	0.11	0.12	0.04	0.11	0.12	0.03	0.03	0.05	0.03
Hispanic	0.18	0.18	0.14	0.18	0.18	0.13	0.13	0.13	0.12
Asian	0.06	0.06	0.06	0.06	0.05	0.06	0.06	0.07	0.06
Other	0.05	0.06	0.04	0.05	0.06	0.04	0.04	0.03	0.03
Disability	0.14	0.14	0.10	0.13	0.14	0.09	0.10	0.05	0.05
Non-English-speaking home	0.15	0.16	0.08	0.15	0.17	0.07	0.06	0.07	0.07
SES	-0.09	-0.17	0.52	-0.12	-0.22	0.54	0.53	0.52	0.54
	(1.01)	(1.00)	(0.87)	(1.02)	(1.00)	(0.86)	(0.91)	(0.95)	(0.86)
Mother did not finish High School	0.084	0.09	0.01	0.09	0.10	0.01	0.02	0.02	0.01
Mother finished High School	0.21	0.22	0.12	0.21	0.22	0.12	0.13	0.14	0.12
Mother finished College	0.17	0.15	0.31	0.17	0.15	0.33	0.29	0.25	0.33
Mother with more than College	0.21	0.20	0.24	0.08	0.06	0.14	0.12	0.11	0.14
Mother's age at first child birth	23.40	22.51	23.60	24.40	23.35	25.52	24.60	23.55	25.52
Poverty	0.19	0.21	0.04	0.20	0.23	0.03	0.03	0.03	0.03
Number of siblings	1.48	1.48	1.45	1.49	1.49	1.44	1.41	1.38	1.44
Living with parents	0.70	0.68	0.82	0.70	0.68	0.83	0.82	0.80	0.83

School Characteristics									
Midwest	0.28	0.27	0.33	0.28	0.27	0.33	0.34	0.34	0.33
Northeast	0.19	0.18	0.23	0.21	0.21	0.25	0.24	0.23	0.25
South	0.33	0.34	0.23	0.29	0.30	0.21	0.21	0.21	0.22
West	0.21	0.21	0.21	0.22	0.22	0.22	0.22	0.21	0.22
Large Town	0.38	0.38	0.37	0.36	0.36	0.37	0.38	0.39	0.37
City	0.29	0.26	0.52	0.31	0.28	0.54	0.53	0.51	0.54
Small Town or Rural Area	0.33	0.36	0.12	0.32	0.36	0.09	0.09	0.10	0.09
Conformity to Social Norms									
Tardiness	4.52	4.49	4.72	4.53	4.48	4.72	4.64	4.56	4.72
	(0.70)	(0.71)	(0.53)	(0.69)	(0.71)	(0.54)	(0.61)	(0.66)	(0.54)
Absenteeism	3.90	3.88	4.10	3.91	3.87	4.10	4.01	3.91	4.10
	(0.62)	(0.62)	(0.58)	(0.62)	(0.62)	(0.58)	(0.57)	(0.55)	(0.58)
Homework	4.90	4.84	5.39	4.91	4.82	5.42	5.24	5.07	5.42
Completion	(1.16)	(1.18)	(0.74)	(1.17)	(1.21)	(0.73)	(0.95)	(1.11)	(0.73)
Disruptive	4.26	4.25	4.33	4.26	4.25	4.31	4.35	4.39	4.31
Behavior	(0.88)	(0.89)	(0.79)	(0.88)	(0.89)	(0.80)	(0.81)	(0.81)	(0.81)
Perceived	2.54	2.52	2.70	2.54	2.51	2.71	2.69	2.68	2.71
interest/competence	(0.74)	(0.75)	(0.69)	(0.74)	(0.75)	(0.70)	(0.72)	(0.75)	(0.70)
Attention in class	3.99	3.97	4.15	3.99	3.96	4.16	4.17	4.17	4.16
	(0.80)	(0.81)	(0.72)	(0.81)	(0.82)	(0.72)	(0.73)	(0.75)	(0.72)
Psychological Traits									
Self-esteem scale	-0.004	-0.02	0.10	-0.01	-0.03	0.11	0.09	0.07	0.11
	(0.69)	(0.70)	(0.63)	(0.69)	(0.70)	(0.63)	(0.65)	(0.68)	(0.63)
Locus of control	-0.01	-0.03	0.14	-0.02	-0.05	0.15	0.12	0.09	0.15
	(0.63)	(0.63)	(0.56)	(0.62)	(0.63)	(0.56)	(0.57)	(0.58)	(0.56)
Internalizing	2.89	2.88	2.93	2.90	2.89	2.95	2.94	2.93	2.95
problem behavior	(0.62)	(0.62)	(0.58)	(0.62)	(0.62)	(0.57)	(0.56)	(0.57)	(0.57)
Number of Observations	8,784	7,808	976	5,796	4,986	810	1,620	810	810

Notes to Table 2.

[1] Analytic sample includes 8th grade students who did not change region, location or school sector during the four waves.

[2] Attention in class, homework completion, disruptive behavior, tardiness, absenteeism and class behavior for students in their English class. The three variables "disruptive behavior", "tardiness", "absenteeism" and "internalizing problem behavior" have been reverse scaled.

[3] Standard deviations in parentheses. Math, reading and SES standardized so that mean=0, std. dev. =1 for the entire sample. Weighted using ECLS-K sampling weights

[4] * denotes a statistically significant difference between Catholic and public schools

Table 3. Correlations among test score and non-cognitive variables of 8th grade students participating in ECLS-K

	Math 8th	Read 8th	Academic Engagement	Attention in class	Homework completion	Disruptive behavior[1]	Tardiness	Absenteeism	Self-esteem scale	Locus of control	Internalizing problem behavior
Math 8th	1.00										
Read 8th	0.71	1.00									
Conformity to Social Norms											
Academic Engagement	0.19	0.35	1.00								
Attention in class	0.31	0.37	0.33	1.00							
Homework completion	0.34	0.38	0.33	0.60	1.00						
Disruptive behavior	0.20	0.25	0.21	0.52	0.39	1.00					
Tardiness	0.20	0.23	0.17	0.38	0.36	0.40	1.00				
Absenteeism	0.17	0.16	0.13	0.27	0.29	0.12	0.34	1.00			
Self-perceived Psychological Traits											
Self-esteem scale	0.23	0.24	0.24	0.20	0.20	0.07	0.08	0.12	1.00		
Locus of control	0.31	0.35	0.26	0.25	0.27	0.14	0.15	0.13	0.59	1.00	
Internalizing problem behavior	0.15	0.13	-0.06	0.03	0.04	-0.02	0.01	0.06	0.40	0.33	1.00

[1] The variables disruptive behavior, tardiness, absenteeism, and internalizing problem behavior have been reverse scaled.

Table 4: Characteristics of students observed in 1st grade who were observed in 8th grade and who were not observed in 8th grade

	Students in Public School in 1st grade		Students in Catholic School in 1st grade		
	Observed in 8th grade (a)	**Not observed in 8th grade (b)**	**Observed in 8th grade (c)**	**Not observed in 8th grade (d)**	*Difference (a-b) and (c-d) is Statistically Significant (e)*
Background					
Math 1st grade	55.0 (15.88)[1]	51.8 (15.82)	60.6 (14.27)	57.4 (15.08)	No
Reading 1st grade	68.0 (20.13)	64.6 (20.31)	75.4 (18.79)	71.6 (20.84)	Yes
Male	0.50	0.53	0.50	0.50	No
Female	0.50	0.47	0.50	0.50	No
White	0.58	0.47	0.74	0.69	No
African American	0.12	0.21	0.03	0.09	No
Hispanic	0.18	0.19	0.13	0.13	No
Asian	0.06	0.08	0.06	0.05	Yes
Other	0.05	0.06	0.04	0.04	Yes
Disability	0.15	0.15	0.09	0.13	No
Non-English-speadking home	0.81	0.73	0.91	0.85	No
SES	-0.08 (0.97)	-0.25 (0.96)	0.64 (0.83)	0.41 (0.87)	No
Mother did not finish high school	0.13	0.16	0.01	0.02	Yes
Mother finished high school	0.28	0.27	0.17	0.21	No
Mother finished college	0.14	0.10	0.32	0.22	No
Mother with more than college	0.12	0.19	0.15	0.19	No
Poverty	0.20	0.27	0.02	0.05	No
Number of siblings	1.54	1.56	1.48	1.45	No
Living with Parents	0.75	0.58	0.88	0.77	No
School Characteristics					
Midwest	0.27	0.21	0.35	0.34	No
Northeast	0.19	0.17	0.24	0.27	No
South	0.33	0.37	0.23	0.24	No
West	0.21	0.25	0.19	0.16	No
Large Town	0.15	0.17	0.27	0.23	Yes
City	0.14	0.21	0.26	0.23	Yes
Small Town or Rural Area	0.28	0.29	0.27	0.27	No
Observations	7,049	6,494	867	1,112	

[1] Standard Deviations in parentheses. Math, reading and SES have been standardized: mean=0, std. dev. =1. Weighted using ECLS-K sampling weights; Only those respondent students who were in the sample in 1st grade are included.

Table 5. Estimated Catholic sector impacts on conformity to social norms in English, math and science classes and self-perceived psychological well-being of 8th grade students from ordered probit models for all students and matched comparison models

Conformity to Social Norms in English class

	Tardiness		*Abseenteism*		*Homework completion*		*Disruptive behavior*		*Academic Engagement*[1]		*Attention in class*	
	All Students	Matched Comparison Models	All Students	Matched Comparison Models	All Students	Matched Comparison Models	All Students	Matched Comparison Models	All Students	Matched Comparison Models	All Students	Matched Comparison Models
Catholic												
Without controls[2]	0.447***[3]		0.461***		0.619***		0.082*		0.102***		0.290***	
	(0.051)		(0.046)		(0.041)		(0.042)		(0.023)		(0.040)	
With controls	0.294***	0.279***	0.371***	0.363***	0.278***	0.296***	-0.084*	-0.089	0.051**	0.077**	0.041	0.029
	(0.057)	(0.070)	(0.052)	(0.078)	(0.048)	(0.064)	(0.049)	(0.072)	(0.026)	(0.039)	(0.046)	(0.063)
Observations	5,796	1,543	5,796	1,543	5,796	1,543	5,796	1,543	5,796	1,543	5,796	1,543

Conformity to Social Norms in math class

	Tardiness		*Abseenteism*		*Homework completion*		*Disruptive behavior*		*Attention in class*	
	All Students	Matched Comparison Models	All Students	Matched Comparison Models	All Students	All Students	All Students	Matched Comparison Models	All Students	Matched Comparison Models
Catholic										
Without controls	0.421***		0.429***		0.724***		0.375***		0.519***	
	(0.070)		(0.065)		(0.062)		(0.063)		(0.058)	
With controls	0.275***	0.234**	0.282***	0.313***	0.467***	0.529***	0.204***	0.228**	0.342***	0.369***
	(0.078)	(0.113)	(0.074)	(0.091)	(0.072)	(0.089)	(0.072)	(0.094)	(0.068)	(0.089)
Observations	2729	725	2729	725	2729	725	2729	725	2729	725

Conformity to Social Norms in science class

	Tardiness		*Abseenteism*		*Homework completion*		*Disruptive behavior*		*Attention in class*	
	All Students	Matched Comparison Models	All Students	Matched Comparison Models	All Students	All Students	All Students	Matched Comparison Models	All Students	Matched Comparison Models
Catholic										
Without controls	0.402***		0.442***		0.627***		0.139**		0.289***	
	(0.070)		(0.065)		(0.058)		(0.061)		(0.058)	
With controls	0.307***	0.332***	0.349***	0.364	0.285***	0.350***	0.009	0.012	0.096	0.013
	(0.079)	(0.099)	(0.074)	(0.088)	(0.071)	(0.104)	(0.071)	(0.099)	(0.069)	(0.091)
Observations	2727	725	2727	725	2727	725	2727	725	2727	725

Self-perceived Psychological Traits

	Self-esteem scale		*Locus of control*		*Internalizing problem behavior*	
	All Students	Matched Comparison Models	All Students	Matched Comparison Models	All Students	Matched Comparison Models
Catholic						
Without controls	0.011		0.137***		0.085***	
	(0.010)		(0.026)		(0.024)	
With controls	-0.021**	-0.053	0.038	0.032	0.017	0.016
	(0.010)	(0.035)	(0.027)	(0.032)	(0.027)	(0.034)
Observations	5,796	1,543	5,796	1,543	5,796	1,543

[1]In reading.

[2] Controls include: prior math and reading test scores (1st grade), prior non-cognitive variable (1st grade), gender, ethnicity (black, Asian, Hispanic and other race), presence of a disability, language spoken at home, whether or not the student comes from home whose income was below the poverty line, number of siblings, whether or not the student lives with both parents, mother's age at birth of first child, region (Northeast, Midwest, West South), community type (city, large town, or small town/rural) and a socioeconomic status (SES) index, a composite that jointly measures parental education, income, and occupational prestige. Models estimating homework completion as dependent variable also include as controls the frequency with which homework is assigned and the time teachers expect students to devote to the homework.

[3] Significance level: *** p<0.01, ** p<0.05, * p<0.1

Table 6. Estimated Catholic sector impacts on conformity to social norms in math and science classes from ordered probit models for all students and for those in classes where teachers is not the same as the student's English teacher

	Math classes		Science classes	
	All classes	**Classes with different teacher**	**All classes**	**Classes with different teacher**
		Tardiness		
Catholic	0.275***[1]	0.256***	0.307***	0.319***
	(0.078)	(0.080)	(0.079)	(0.083)
Observations	2729	2620	2727	2620
		Absenteeism		
Catholic	0.282***	0.270***	0.349***	0.344***
	(0.074)	(0.075)	(0.074)	(0.079)
Observations	2729	2620	2727	2620
		Homework completion		
Catholic	0.467***	0.448***	0.285***	0.259***
	(0.072)	(0.073)	(0.071)	(0.075)
Observations	2729	2620	2727	2620
		Disruptive behavior		
Catholic	0.204***	0.190***	0.009	0.009
	(0.072)	(0.074)	(0.071)	(0.073)
Observations	2729	2620	2727	2620
		Attention in class		
Catholic	0.342***	0.320***	0.096	0.259***
	(0.068)	(0.069)	(0.069)	(0.075)
Observations	2729	2620	2727	2620

[1] See notes to table 5. Estimations from matched comparison models not provided because they contain too few observations too few to estimate impacts precisely. Only half the sample was asked about math and science classes.

APPENDIX A

Sector Impacts on Non-cognitive Outcomes in Fifth Grade

Sector impacts on non-cognitive outcomes are also available from the 5th grade wave of the ECLS-K. However, the survey does not contain as good a set of indicators of conformity to social norms and student self-perceptions of self-worth. Whereas the indicators available from the 8th grade survey provide information on tardiness, absenteeism, academic engagement, homework completion, class attention, and class disruption, all of which are excellent indicators of compliance with social norms, the indicators that best measures conformity to social norms in the 5th grade survey--the "class behavior" index—is based on items that refer to the behavior of the entire class, not just the individual in question (see Table A.1). Similarly, the 8th grade survey asks students themselves about their sense of self-worth. But the indices available from for the 5th grade wave are taken from the English teacher questionnaire, providing only indirect indicators of student self-perceptions.

We nonetheless present in Table A. 2 estimates of sector impacts on 5th grade student non-cognitive outcomes, which are based upon information drawn from the 5th grade wave of the ECLS-K. The models used to generate the estimates are the same set of control variables as those in the models used to generate estimations for 8th grade outcomes, as reported in Table 5. In general, we found positive Catholic sector impacts on "class behavior" in reading, mathematics and science and less robust positive impacts on "not internalizing problem behavior" (rescaled so that a positive sign indicates the student does not internalize such behavior). Negative Catholic sector impacts on student "self-control" are also observed. No impacts are found on "interpersonal skills," "externalizing problem behavior," "approaches to learning," and "works to the best of ability."

The results are broadly consistent with those obtained the analysis of 8th grade outcomes, as reported in Table 5. Catholic sector impacts has a positive impact on class behavior, while Catholic sector impacts are either null or negative for indicators of a student's psychological well-being.

Table A. 1. Description of outcome variables estimated for 5th grade students.

Variable	Description
Classroom Behavior	Teachers rate the children class behavior as follows: 1) group misbehaves very frequently, 2) group misbehaves frequently, 3) group misbehaves occasionally, 4) group behaves well, 5) group behaves exceptionally well. (Separate ratings are obtained for science and math classes).
Interpersonal Skills	Teacher rates the child's ability to operate in the school environment through social communication and interactions. The scale is constructed from five items: the child's skill in forming and maintaining friendships; getting along with people who are different; comforting or helping other children; expressing feelings, ideas, and opinions in positive ways; and showing sensitivity to the feelings of others.
Self-control	Teacher rates the child's ability to control his or her behavior. The scale is based upon four items: respecting the property rights of others, controlling temper, accepting peer ideas for group activities, and responding appropriately to pressure from peers.
Acting out	Teacher is asked about acting out behaviors. The scale includes six items that rate the frequency with which a child argues, fights, gets angry, acts impulsively, and disturbs ongoing activities, talks during quiet study time.
Attentiveness and Persistence	Teacher is asked about the ease with which the child can benefit from the learning environment. The scale includes six items: attentiveness, task persistence, eagerness to learn, learning independence, flexibility, and organization.
Anxiety and Loneliness	Teacher is asked to provide information about introverted behavior on the part of the child. This scale comprises four items: presence of anxiety, loneliness, low self-esteem, and sadness.
Works to the Best of Ability	Teacher is asked how often the child works to the best of his ability. (The same question is asked separately for English, math and science).

Table A. 2. Catholic sector impacts on teacher perceptions of 5th grade student classroom behavior, peer group relationships, and personality traits, as estimated from ordered probit for all students and matched comparison models.

Classroom Behavior

	Class behavior (reading)		*Class behavior (mathematics)*		*Class behavior (science)*	
	All students	Matched comparison	All students	Matched comparison	All students	Matched comparison
Catholic	0.235**[1]	0.252***	0.254**	0.235**	0.230**	0.199*
	(0.102)	(0.097)	(0.101)	(0.120)	(0.099)	(0.118)
Observations	9,306	2,472	4,997	1,161	5,051	1,223
Pseudo R^2	0.06	0.04	0.03	0.03	0.02	0.04

Peer Group Relations

	Interpersonal skills		*Self control*		*Externalizing problem behavior*	
	All students	Matched comparison	All students	Matched comparison	All students	Matched comparison
Catholic	0.031	0.003	-0.097**	-0.130**	0.048	0.026
	(0.040)	(0.056)	(0.039)	(0.059)	(0.040)	(0.058)
Observations	9,306	2,472	9,306	2,472	9,306	2,472
Pseudo R^2	0.07	0.05	0.07	0.05	0.08	0.06

Personality Traits

	Approaches to learning		*Work to the best of ability (reading)*		*Internalizing problem behavior*	
	All students	Matched comparison	All students	Matched comparison	All students	Matched comparison
Catholic	0.052	0.026	-0.003	-0.040	0.074**	0.042
	(0.039)	(0.057)	(0.055)	(0.063)	(0.038)	(0.051)
Observations	9,306	2,472	9,306	2,472	9,306	2,472
Pseudo R^2	0.13	0.11	0.11	0.09	0.06	0.06

[1] Significance level: *** p<0.01, ** p<0.05, * p<0.1

All regressions include the following controls: prior math and reading test scores (1st grade), prior non-cognitive variable (1st grade, when available), gender, ethnicity (black, Asian, Hispanic and other race), presence of a disability, language spoken at home, whether or not the student came from a home whose income was below the poverty line, number of siblings, whether or not the student lives with both parents, region (Northeast, Midwest, West, South), community type (city, large town, or small town/rural) and a socioeconomic status (SES) index, a composite that jointly measures parental education, income, and occupational prestige, mother's age at first child birth.

APPENDIX B

Probit model

For the empirical analysis we use an ordered probit model given that our dependent variables consist of a limited number of ordered outcomes.[1] Ordered probit does not require the assumption of linearity required by an ordinary least squares regression, and it does not assume differenced between values of outcomes to be to the same. The model specification is also preferred to a multinomial model for discrete choice of ordered data as it does not suffer from the lack of independence of irrelevant alternatives (Greene, 2003).

The structural model is the following:

$$Y_i^* = Xi\,\beta + \varepsilon_i \quad (1)$$

Where:

Y_i^* is the dependent ("latent") variable
X_i is the vector of explanatory variables,
β is the vector of coefficients to be estimated and
ε_i is a vector of normally distributed error terms
i=1, 2, …, N

We do not observe the predicted rating of the latent variable but we do observe the following thresholds:[2]

$y_i = 0$ (or rating = "never") if $Y_i^* \leq 0$ (2)
$y_i = 1$ (or rating = "sometimes") if $0 < Y_i^* \leq \mu_1$ (3)
$y_i = 2$ (or rating = "often") if $\mu_1 < Y_i^* \leq \mu_2$ (4)
$y_i = 3$ (or rating = "very often") if $\mu_2 < Y_i^* \leq \mu_3$ (5)

Where μ_1, μ_2, μ_3 are the thresholds estimated in the ordered probit model. The underlying rationale of the ordered probit model is that the different thresholds that are dependent on the latent variable in the following way:

$$y_i = \begin{cases} s_1 \text{ if } y_i \in A_1 \\ s_2 \text{ if } y_i \in A_2 \\ \dots \\ s_n \text{ if } y_i \in A_n. \end{cases} \quad (6)$$

[1] The ordered probit model was developed by Aitchison and Silvey (1957) and Snell (1964).

[2] This specification holds true for the variables: approaches to learning, interpersonal skills, self-control, internalizing and externalizing problem behavior. The notation needs to be adapted to the other variables as work to the best of ability has a different point scale whereas class behavior has both a different point scale and an additional category.

Where the sets A_n form a partition of the state space S* of y^*, $S^*=U^n_{j=1} A_j$ and $A_i \cap A_j = \emptyset$

for $i \neq j$ and s_j are the discrete values that include S of Y^*. That is, the aim is to determine the regressors related to the mapping between S^* and S.

In the context of our analysis we are going to estimate hierarchical models in order to take into account the multi-level structure of the data[3]. We will estimate an education production function of the following form:

$$NCS_{ist} = \alpha_1 + \beta_0 C + X_{ib}\beta_1 + X_{sb}\beta_2 + \lambda_{s3} + \lambda_{s5}*5thGrade + e_{ist} \quad (7)$$

Where:

NCS_{ist} is the "latent" dependent variable, here the non-cognitive skill of student *i* in school *s* at time *t*
C is an indicator variable for Catholic school attendance
X_{ib} is a vector of student-level variables controlling for student and background characteristics, X_{sb} is a vector that controls for school characteristics
α_1 is a constant; β_0 β_1 β_2 are coefficients to be estimated
λ_{s3} and λ_{s5}*5thGrade are random effects that take into account school changes between 1^{st}-5^{th} grades
e_{ist} is a random term for each observation

From the estimation of the models we will calculate the probabilities of receiving the ratings:

$$\text{Prob}[y_i = 0 \text{ (or rating = "never")}] = F(X\beta) \quad (8)$$
$$\text{Prob}[y_i = 1 \text{ (or rating = "sometimes")}] = F[\mu_1 - X\beta] - F(X\beta) \quad (9)$$
$$\text{Prob}[y_i = 2 \text{ (or rating = "often")}] = F[\mu_2 - X\beta] - F(\mu_1 - X\beta) \quad (10)$$
$$\text{Prob}[y_i = 3 \text{ (or rating = "very often")}] = 1 - F(\mu_2 - X\beta) \quad (11)$$

Figure B. 1 illustrates the ordered probit model. In order to interpret the effect of the explanatory variables on the non-cognitive skills examined we estimate the marginal effects of the independent variables:

$$\delta \text{Prob}[y = 0 \text{ (or rating = "never")}] / \delta X = -F(X\beta) * (\beta) \quad (10)$$
$$\delta \text{Prob}[y = 1 \text{ (or rating = "sometimes")}] / \delta X = F[\mu_1 - X\beta] - F(X\beta) * (\beta) \quad (11)$$
$$\delta \text{Prob}[y = 2 \text{ (or rating = "often")}] / \delta X = F[\mu_2 - X\beta] - F(\mu_1 - X\beta) * (\beta) \quad (12)$$
$$\delta \text{Prob}[y = 3 \text{ (or rating = "very often")}] / \delta X = 1 - F(\mu_2 - X\beta) * (\beta) \quad (13)$$

As shown by Greene (2008) this implies that the coefficient of a single variable depends on the other covariates and the underlying probability distribution as well as on the category of ranking. The impact of school sector on the non-cognitive skills is calculated by estimating the change between the two values of the dummy variable D, where D can be either 0 or 1:

$$\Delta(D) = [F[\mu_1 - X\beta + \gamma] - F(X\beta + \gamma)] - [F[\mu_1 - X\beta] - F(X\beta)] \quad (14)$$

Catholic sector impacts are simulated for each outcome identified as statistically significant in Table B. 1.

[3] We control for the different clustering of the class behavior variables.

Table B. 1. Simulated estimates of Catholic sector impacts on the representative student

English

Conformity to Social Norms

	Tardiness		*Absenteeism*		*Homework completion*	
Simulated Estimates[1]	Simulated Probability	Matched Students	Simulated Probability	Matched Students	Simulated Probability	Matched Students
P[y=1]	<0.001	<-0.001	<0.001	-0.001	0.001	-0.002
P[y=2]	0.004	-0.005	0.006	-0.007	<0.001	-0.002
P[y=3]	0.026	-0.022	0.099	-0.078	0.012	-0.013
P[y=4]	0.224	-0.077	0.713	-0.008	0.069	-0.043
P[y=5]	0.745	0.105	0.183	0.093	0.398	-0.060
P[y=6]					0.519	0.120
Significance	***[2]	***	***	***	***	***

	Academic engagement	
	Simulated Probability	Matched Students
P[y=1]	0.162	-0.019
P[y=2]	0.500	-0.009
P[y=3]	0.317	0.025
P[y=4]	0.021	0.004
P[y=5]		
P[y=6]		
Significance	**	**

Mathematics

Conformity to Social Norms

	Tardiness		*Absenteeism*		*Homework completion*	
Simulated Estimates	Simulated Probability	Matched Students	Simulated Probability	Matched Students	Simulated Probability	Matched Students
P[y=1]	0.002	<-0.001	0.001	-<0.001	<0.001	-<0.001
P[y=2]	0.002	-0.003	0.006	-0.003	<0.001	-0.002
P[y=3]	0.019	-0.014	0.107	-0.076	0.007	-0.015
P[y=4]	0.227	-0.061	0.692	-0.002	0.061	-0.072
P[y=5]	0.745	0.079	0.195	0.082	0.338	-0.118
P[y=6]					0.592	0.208
Significance		**		***		***

	Attention in class	
	Simulated Probability	Matched Students
P[y=1]	0.001	-0.001
P[y=2]	0.005	-0.007
P[y=3]	0.072	-0.056
P[y=4]	0.550	-0.070
P[y=5]	0.373	0.133
P[y=6]		
Significance		**

Science

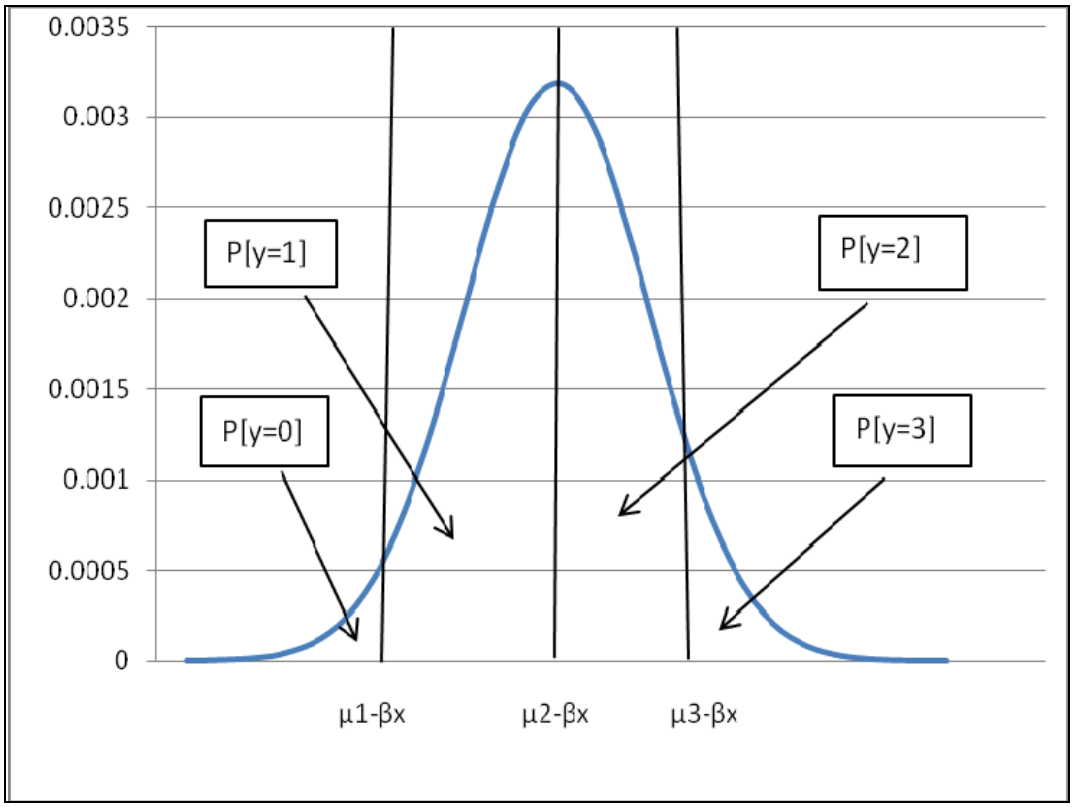
Conformity to Social Norms

	Tardiness		*Homework completion*	
Simulated Estimates	Simulated Probability	Matched Students	Simulated Probability	Matched Students
P[y=1]	0.001	<-0.001	0.003	-0.006
P[y=2]	0.002	-0.004	0.001	-0.003
P[y=3]	0.028	-0.022	0.014	-0.015
P[y=4]	0.225	-0.088	0.073	-0.045
P[y=5]	0.745	0.114	0.358	-0.071
P[y=6]			0.550	0.139
Significance		***		***

[1] In order to estimate the predicted probabilities for the representative student we used Clarify software to implement a simulation based approach developed by King et al. (2000). The method relies on estimating the probit model and generating random draws from the multivariate normal distribution with mean equal to the vector of parameter estimates and variance equal to the variance-covariance matrix of estimates. 1,000 sets of simulated parameters were drawn. Then, the value of the independent variables was set at the mean and the predicted probabilities were estimated.

[2] Significance level: *** p<0.01, ** p<0.05, * p<0.1

Figure B. 1. The Estimated Ordered Probit Model



Propensity Score Matching

To generate the propensity score we use all the variables of the model (prior math and reading test scores (1st grade), gender, ethnicity (black, Asian, Hispanic and other race), presence of a disability, language spoken at home, whether or not the student came from a home whose income was below the poverty line, number of siblings, whether or not the student lives with both parents, region (Northeast, Midwest, West South), community type (city, large town, or small town/rural) and a socioeconomic status (SES) index, a composite that jointly measures parental education, income, and occupational prestige, mother's age at first child birth).

We present the results for the nearest neighbor matching estimator. The implementation of this technique consists in matching pair of students whose characteristics are most similar.

To provide an interpretation of the coefficients in the matched sample estimations we used Clarify software developed by King et al. (2000) to simulate the school sector effects for the representative student.

APPENDIX C

Estimations for Non-cognitive Outcomes in Eighth Grade

In Table C. 1. full equations are provided for two 8th grade outcome variables in English classes—homework completion and disruptive student behavior. Note that results are consistent with general expectations for such control variables as 1st grade test score performance, gender, ethnicity, presence of a disability, socio-economic status, and whether the child is living in a home with both parents. Estimations for other outcomes are similar.

Table C. 1. Impacts on homework completion and disruptive behavior of 8th graders in English class, as estimated from ordered probit for all students and matched comparison models, complete results.

	Homework completion				**Disruptive behavior**			
	All Students		Matched Students		All Students		Matched Students	
Catholic	0.278***[1]	(0.048)[2]	0.296***	(0.064)	-0.084*	(0.047)	-0.089	(0.072)
Math 1st grade	0.137***	(0.021)	0.112**	(0.053)	<-0.001	(0.022)	-0.058	(0.053)
Reading 1st grade	0.097***	(0.022)	0.123**	(0.051)	0.054**	(0.023)	0.074	(0.049)
Female	0.514***	(0.032)	0.567***	(0.075)	0.503***	(0.034)	0.509***	(0.065)
African American	-0.189***	(0.057)	-0.400*	(0.210)	-0.399***	(0.060)	-0.540***	(0.202)
Hispanic	-0.119**	(0.053)	-0.233*	(0.127)	-0.064	(0.055)	-0.037	(0.105)
Asian	0.345***	(0.086)	0.142	(0.207)	0.261	(0.091)	0.145	(0.209)
Other	-0.249***	(0.070)	-0.256	(0.167)	-0.179	(0.069)	-0.130	(0.168)
Disability	-0.361***	(0.045)	-0.537	(0.111)	-0.084	(0.051)	-0.206	(0.131)
Non-English-speaking home	0.077	(0.055)	0.029	(0.153)	-0.027	(0.059)	-0.235	(0.163)
SES	0.182***	(0.023)	0.153***	(0.046)	0.047**	(0.021)	0.035	(0.052)
Mother age 1st birth	0.003	(0.003)	0.002	(0.008)	0.003	(0.003)	0.012	(0.009)
Number of siblings	-0.023	(0.015)	<-0.001	(0.038)	-0.010	(0.015)	-0.020	(0.034)
Living with parents	0.257***	(0.037)	0.376***	(0.090)	0.129***	(0.038)	0.215**	(0.088)
Northeast	-0.144***	(0.045)	-0.092	(0.091)	0.171***	(0.049)	0.230*	(0.096)
South	-0.184***	(0.043)	-0.268***	(0.097)	-0.017	(0.043)	0.040	(0.100)
West	-0.233***	(0.048)	-0.207**	(0.102)	-0.078	(0.051)	-0.125	(0.096)
City	-0.011	(0.040)	0.032	(0.071)	-0.072*	(0.043)	-0.058	(0.085)
Small Town or Rural Area	0.080**	(0.041)	0.160	(0.128)	-0.088**	(0.041)	-0.074	(0.142)
Expected time for homework[3]	0.189***	(0.026)	0.134**	(0.059)				
Homework assignment frequency	0.141***	(0.023)	0.116*	(0.060)				
Observations	5,796		1,543		5,796		1,543	
Pseudo R^2	0.110		0.105		0.085		0.086	

[1] Significance level: *** p<0.01, ** p<0.05, * p<0.1

[2] Standard Errors in parentheses, (math, reading and SES have been standardized: mean=0, std. dev. =1); Weighted using ECLS-K sampling weights

[3] In the regressions where homework completion is the dependent variable we also control for two variables extracted from the teacher questionnaire. Results are robust to the exclusion of these additional control variables.