



# Do skills and behaviors in high school matter? The contribution of noncognitive factors in explaining differences in educational attainment and earnings

Christy Lleras \*

Department of Human and Community Development, The University of Illinois at Urbana-Champaign, 2026 Christopher Hall, 904 West Nevada Street, Urbana, IL 61801, USA

## ARTICLE INFO

### Article history:

Available online 29 April 2008

### Keywords:

Cognitive skills  
 Noncognitive behavior  
 Inequality  
 Educational attainment  
 Earnings  
 Race  
 Gender differences

## ABSTRACT

Using data from the National Educational Longitudinal Study (NELS), this study examines the unique and collective impact of cognitive skills and noncognitive behaviors in high school on educational attainment and earnings for a tenth grade cohort, 10 years later in 2000. The results indicate that students with better social skills, work habits, and who participated in extracurricular activities in high school had higher educational attainment and earnings, even after controlling for cognitive skills. Skills and behaviors in high school also explain a substantial portion of the socioeconomic, sex, and racial and ethnic gaps in educational attainment and earnings.

© 2008 Elsevier Inc. All rights reserved.

## 1. Introduction

During the late 1970s, Bowles and Gintis (1976) published *Schooling in Capitalist America*, which boldly claimed that individual's noncognitive behaviors were perhaps more important than cognitive skills in determining stratification outcomes. While early sociological theories of status attainment ("Wisconsin" model) posited that academic performance, and to a lesser extent mental ability, were important mechanisms linking parental socioeconomic background to employment outcomes in adulthood (Sewell and Hauser, 1975; Sewell et al., 1969; Woelfel and Haller, 1971), Bowles and Gintis (1976, pp. 122–123) argued that social class reproduction was mainly due to differential patterns of behavioral socialization within and across schools. In addition, they suggested that the kinds of behaviors employers sought out in the labor market were the same as those fostered and rewarded by teachers and schools in the educational system. In related work, Jencks and his colleagues (1979) also demonstrated the importance of noncognitive behaviors and personality traits. They found that industriousness, leadership, and good study habits in high school were positively associated with higher occupational attainment and earnings, even after controlling for social class.

In the time period since Bowles, Gintis and Jencks, researchers have extensively examined the effects of cognitive ability, often measured by standardized achievement tests, on employment outcomes, but rarely examined the effects of noncognitive behaviors on educational and occupational success (Kerckhoff et al., 2001; Farkas et al., 1997; Raudenbush and Kasim, 1998; Farkas, 2003). As a result, little is known about what kinds of behaviors and skills, other than cognitive, are fostered and rewarded during the schooling experience that influence later success in the labor market. Nor do we know much about

\* Fax: +1 217 333 9061.

E-mail address: [clleras@uiuc.edu](mailto:clleras@uiuc.edu)

the extent to which differences in skills and habits account for racial, ethnic, socioeconomic, and sex differences in educational and employment outcomes. This study follows up on the work of Jencks and his colleagues (1979) and extends prior work on the micro-processes involved in educational and labor market stratification by assessing the impact of a range of noncognitive behaviors, in addition to cognitive skills, on the educational attainment and earnings of a national cohort of tenth grade students, measured 10 years later in 2000. The results from this study indicate that noncognitive behaviors measured in high school have unique and significant effects on both educational attainment and earnings, even after controlling for cognitive skills. The results also show that skills and behaviors play an important role in explaining group differences in stratification outcomes. Finally, the results indicate that only part of the effect of cognitive skills and noncognitive behaviors on earnings is explained by increased educational attainment.

## 2. Literature review

### 2.1. Cognitive ability

Empirical studies have shown that cognitive skills or ability, typically measured by standardized tests, have a significant effect on labor market outcomes, either directly or indirectly via higher educational attainment. In a recent study, Murnane et al. (2000) estimated that high school male graduates with greater cognitive skills earn as much as 30 percent more than workers with lower levels of skills. In addition, at least one-third of the estimated monetary return to cognitive skills in earnings operates through post-secondary education. Students who graduate from high school with higher cognitive performance are more likely to both attend and complete college, which in turn, translates into higher earnings in later adulthood. In addition, studies have examined the effect of cognitive skills on employment and earnings inequality by race/ethnicity and sex, controlling for educational attainment (Farkas et al., 1997; Raudenbush and Kasim, 1998). The results of these studies suggest important differences may exist in the impact of cognitive ability on wage gaps and occupational status across racial/ethnic and sex groups. For example, Farkas and colleagues (1997), using data from the National Longitudinal Survey of Youth (NLSY), found that the cognitive skill levels of African American and Mexican American workers (measured by the Armed Forces Qualification Test) explained a substantial portion of the earnings gaps between these groups and European Americans. Similarly, in a study by Raudenbush and Kasim (1998), differences in earnings between Hispanics and European males disappeared once literacy was controlled.

In a related study, Kerckhoff et al. (2001) found that educational attainment and cognitive skill together completely accounted for the effects of parents' education on occupational status and earnings. While cognitive skill was relatively less effective in explaining the variance in occupational status among African American men, it was more effective in explaining differences in earnings, compared to those among African American women, Hispanic and European men and women. Interestingly, for African Americans and European Americans, educational attainment explains much more of the variance in occupational status than does cognitive skill (the same holds true for earnings, but to a lesser extent).

Taken together, these studies suggest that cognitive skills are an important mechanism linking increased schooling to later earnings, and may also play a significant role in explaining racial and ethnic differences in labor market outcomes. These findings also highlight the possibility that cognitive skill and educational experiences may have differential effects on occupational outcomes across different racial/ethnic and sex groups. However, recent empirical research has also shown that individuals with similar levels of cognitive ability can have very different earnings, even after controlling for educational attainment, occupational characteristics and experience, parental education, race, and sex (Bowles and Gintis, 2002). Further, educational attainment often remains a strong predictor of earnings after cognitive abilities are included in the model. This suggests that schooling may contribute to later socioeconomic attainment not only by affecting an individual's level of cognitive ability, but also by influencing the development of other sorts of "skills" learned and reinforced in school, but not measured by standardized achievement tests.

### 2.2. Noncognitive behaviors

In the mid-1970s, when many researchers were studying the importance of academic performance and mental ability in determining educational and labor market success, Bowles and Gintis (1976) were among the first to argue that, net of achievement, noncognitive behaviors were also important predictors of schooling and employment success. In fact, with respect to the structure of reward systems in schools, empirical research has shown that teachers reward noncognitive behaviors (e.g., industriousness or work habits, cooperativeness or getting along) as much or more than actual achievement when assigning grades (Bowles and Gintis, 1976; Farkas et al., 1990). In a study of middle school students in a low-income, urban school district, Farkas (1996) found that attendance, disruptiveness, and work habits had independent, significant effects on the grades assigned by middle school teachers, after controlling for basic skills and coursework mastery. Rosenbaum (2001), using data from a national sample of white, African American, and Hispanic students (High School and Beyond Survey), also found empirical support for the idea that noncognitive behaviors and cognitive abilities determine course grades.

Why might students with better noncognitive behaviors in school also be sought after and rewarded in the workplace? Clearly, one of the ways that better noncognitive behaviors in school may lead to greater employment opportunities and earnings is by increasing the likelihood that an individual will invest in and complete post-secondary education and training.

Research shows that student's who are more attentive in class, spend more time on and complete homework, and avoid disruptive behaviors have higher cognitive gains (Roscigno and Ainsworth-Darnell, 1999; Farkas et al., 1990; Farkas, 1996; Lleras, 2008) and greater educational attainment (Deluca and Rosenbaum, 2001; Rosenbaum, 2001).

In one of the few empirical studies to examine the relationship between noncognitive behaviors in high school and educational attainment and earnings, Rosenbaum (2001) found significant effects for work habits and other noncognitive indicators in models that included a measure of cognitive ability (Rosenbaum, 2001). The results showed that participation in extracurricular school activities, spending time on homework, interest in school, and fewer disciplinary problems were all positively and significantly related to educational attainment, after controlling for achievement and family socioeconomic background. In predicting earnings 9 years later, being less social in high school (as measured by student's reports of their popularity and whether they view themselves as socially active) was negatively associated with later earnings after controlling for cognitive ability. Interestingly, being interested in school was also negatively related to later earnings. In addition, students with fewer discipline problems also had higher earnings.

This study will extend the work by Rosenbaum (2001) and others (Jencks, 1979) by analyzing the influence of a range of other noncognitive behaviors in high school on educational attainment and later earnings for a national cohort during the current labor market, in 2000. Further, this study will examine the extent to which cognitive skills and noncognitive behaviors in high school individually and collectively explain racial, ethnic, and sex, and socioeconomic differences in later educational attainment and earnings by adding cognitive and noncognitive measures separately and together to the models.<sup>1</sup> Finally, this study differs from prior work by examining whether the 'benefits' in terms of educational attainment and earnings gained from greater cognitive ability and noncognitive behaviors are shared equally across racial/ethnic, sex, and socioeconomic groups.

### 2.3. Employer surveys and noncognitive behaviors

While this study does not measure noncognitive behaviors in the workplace, prior studies utilizing employer surveys offer additional evidence that employers, like teachers and school systems, often reward individuals with better noncognitive behaviors (Holzer, 1996; Murnane and Levy, 1996). For example, in the National Center for Educational Quality of Workforce survey in 1995, employers were asked to rank a number of characteristics or attributes with respect to hiring decisions. Rather than citing years of schooling, grades, or other school-related attributes, employers more frequently ranked attitudes, communication skills, and employer recommendations as the most important factors in determining whom to hire (Stasz, 2001). Other employer studies reveal "soft skills," like the ability to work productively in groups and solve problems, as well as basic computer skills, to be important in securing well-paying jobs, particularly for less educated workers (Murnane and Levy, 1996).

Studies of employers suggest that noncognitive skills, such as work habits, may also be important factors in the hiring process, as well as in evaluations of employee performance on the job. For example, Barrick and Mount (1991) conducted a meta-analysis on the relationship between several "personality dimensions" and job performance ratings and salary levels by employers across five occupational groups (i.e., professionals, police, sales, managers, skilled/semi-skilled). Their results indicate that being hardworking and conscientious are associated with higher job and training proficiency ratings by employers, longer job tenure, and higher salary levels.

Results from the Multi-City Study of Urban Inequality (MCSUI), indicate that cognitive skills and habits are important factors in the job requirements and hiring processes among employers of non-college educated workers specifically (Holzer, 1996). In his analysis of MCSUI data, Holzer (1996) finds that most jobs available to non-college graduates require the daily use of some major cognitive skill, such as arithmetic, reading/writing paragraphs, or use of computers. The most frequently performed tasks in non-college jobs were those that require interactive and communication skills, such as dealing with customers in person. Their results also suggest that both skills and habits play an important role in employers' decisions about which potential applicants to hire. For example, almost all of the employers (90 percent) held an interview with the potential job applicants, suggesting that most employers want the opportunity to judge applicants in a format that would allow them to gain information beyond the objective measures (e.g., attitudes and behavior) provided by tests and educational credentials (Holzer, 1996). Employers were also asked whether it was important for the applicant to show neatness, good English and verbal skills, politeness, and motivation during the interview. Overwhelmingly (70–80 percent of time) employers stressed the importance of politeness and motivation in recently filled non-college jobs, followed by verbal skills (70 percent) and physical appearance or neatness (50 percent) (Holzer, 1996).

Although this study is not measuring employment behavior per se, prior studies utilizing employer surveys or occupational data provide additional evidence that individuals with better noncognitive behaviors may also be sought out by employers in the hiring process. Further this line of empirical research suggests that teachers often foster and reward noncognitive behaviors such as work habits, conscientiousness, and sociability (e.g., getting along well with others, cooperativeness) which have been shown to be important for later educational attainment and earnings.

<sup>1</sup> The estimated models differ from those by Rosenbaum (2001) who only examines the impact of noncognitive behaviors on educational attainment and earnings once achievement has been controlled.

### 3. The present study

Despite the abundance of research seeking to measure the relationship between schooling and earnings, few studies have specifically examined the relative effects of cognitive skills and noncognitive behaviors on educational attainment and later earnings (Rosenbaum, 2001). Thus, little is known about what kinds of skills that are fostered and rewarded in schooling may influence student's later success, particularly in the current labor market characterized by rising service sector employment and increasing demands for education. In addition, even less is known about the extent to which differences in cognitive skills and noncognitive behaviors may account for racial and ethnic, sex, and socioeconomic differences in educational attainment and earnings in the current market (Bowles et al., 2001). This study extends prior work on the micro-processes involved in status attainment by addressing the following questions:

1. Do cognitive skills and noncognitive behaviors measured in high school, including work habits, conscientiousness, and sociability have independent effects on educational attainment and earnings 10 years later in 2000?
2. To what extent do cognitive skills and noncognitive behaviors in school individually and collectively explain racial, ethnic, sex, and socioeconomic differences in educational attainment and earnings?
3. Are the benefits of skills and behaviors similar across different racial, ethnic, sex, and socioeconomic groups?
4. How much of the relationship between cognitive skills and noncognitive behaviors and earnings is accounted for by increased educational attainment?

### 4. Methods

#### 4.1. Data and sample

The data used in this study come from the first and fourth follow-up surveys of the National Education Longitudinal Study (National Center for Education Statistics, 2000). The NELS are a stratified nationally representative sample of approximately 24,500 eighth grade students in 1052 public and private schools who were re-interviewed in the tenth grade (1990), twelfth grade, 2 years after high school 1994. In 2000, when respondents were typically 8 years out of high school, NELS conducted the fourth follow-up survey on a subsample of 12,144 (of the original 8th grade base year sample). The NELS includes extensive information about the achievement, work habits, and school experiences of students during high school. In addition, information about post-high school educational and employment experiences were collected in the fourth follow-up survey in 2000, when many of the students had completed their education and most were working full-time in the labor market.

To estimate the over-time effects of cognitive skills and noncognitive behaviors on educational attainment and earnings, the sample for this study included 10,821 African American, Hispanic, Asian, and non-Hispanic white students from the tenth grade cohort who participated in both the first follow-up (10th grade) and fourth follow-up survey conducted in 2000. In order to estimate the approximate impact of skills and behaviors on educational attainment and the willingness of employers to pay for skills and behaviors, only respondents who were primarily working (as opposed to going to school) and employed full-time (at least 35 h per week) during 1999 were included in the analysis. This sample differs from the one from HS&B data used by Rosenbaum (2001) which includes only students who had graduated from high school. The sample was further restricted to include only respondents with no missing data on educational attainment or earnings.<sup>2</sup> These restrictions yielded a final sample of 7656 African American, Hispanic, Asian, and non-Hispanic White respondents.<sup>3</sup>

#### 4.2. Measures

Drawing on prior research findings which suggest that the relationship between schooling and later earnings is only partly explained through the effects on cognitive ability (Bowles et al., 2001), this study will expand the definition of what kinds of 'skills' or abilities fostered and rewarded in school are also important for educational and occupational success. This expanded definition of skill will include traditional measures of cognitive ability as well as, new measures of noncognitive behaviors (e.g., work habits, sociability) which may affect educational and occupational outcomes. Table 1 presents the descriptions and summary statistics for the variables used in the analyses.

##### 4.2.1. Cognitive skills

Cognitive skills are measured via multiple-choice tests of mathematics, reading comprehension, science, and history/geography/citizenship administered to students at the end of the tenth grade school year. The assessments in the first follow-up survey were designed to measure problem-solving skills and concepts that students should have learned by the time

<sup>2</sup> Approximately 1 percent of the sample were missing data on educational attainment ( $n = 106$ ) and 6 percent were missing on earnings ( $n = 571$ ).

<sup>3</sup> The final sample was compared with the original sample on key demographic characteristics and only a few significant differences were found. The final sample had a slightly higher percentage of males (47 versus 52 percent) and fewer Asians (7 versus 6 percent) compared to the original fourth follow-up sample of the tenth grade cohort. As might be expected, the original sample had lower earnings compared to the final sample used in the study. The final sample did not differ from the original sample on educational attainment or family socioeconomic background.

**Table 1**

Means, standard deviations, and descriptions for variables used in the analyses predicting educational attainment and earnings in 2000: sample of workers National Educational Longitudinal Study, ( $n = 7656$ )

Variables	Description	Metric	Mean	SD
<i>Cognitive ability, 10th grade</i>				
Achievement test composite score	Mean of mathematics, reading, science, and history test scores in 10th grade (IRT-theta)	27.58 = Lowest score 71.09 = Highest score	50.81	8.69
<i>Noncognitive behaviors, 10th grade</i>				
<i>Work habits/conscientiousness</i>				
Homework	Teacher's response to: how often does this student complete homework assignments?	1 = Never 5 = All of the time	3.99	.87
Hardworking	Teacher's response to: does this student usually work hard for good grades?	0 = No; 1 = Sometimes 2 = Yes	1.31	.84
Tardy	Teacher's response to: how often is this student tardy to class?	1 = All of the time 5 = Never	4.42	.65
<i>Motivation</i>				
Passive	Teacher's response to: is this student exceptionally passive or withdrawn?	0 = Yes; 1 = Sometimes 2 = No	1.83	.48
<i>Sociability/cooperativeness</i>				
Relate	Teacher's response to: does this student seem to relate well with other students?	0 = No; 1 = Sometimes 2 = Yes	1.53	.61
Sports participation	Sum of the number of interscholastic and intramural sports activities the student reported participating in during 10th grade school year	0 = None; 9 = All	1.13	1.31
Academic participation	Sum of the number of academic activities or clubs the student reported participating in during 10th grade	0 = None; 6 = All	.80	1.02
Fine arts participation	Sum of the number of fine arts activities the student reported participation in during 10th	0 = None; 2 = All	.33	.59
<i>Politeness</i>				
Less disruptive	Teacher's response to: how often is this student disruptive in class?	1 = All of the time 5 = Never	4.38	.74
<i>Family socioeconomic background</i>				
Family SES	Composite measure of parents' occupational prestige, education, and family income	Range: -2.43 to 1.91	-.04	.76
<i>Individual characteristics</i>				
Male			.52	.50
African American			.09	.29
Hispanic			.12	.33
Asian			.06	.25
Educational attainment	Continuous variable of self-reported educational attainment as of January 2000	1 = Less high school 2 = High school only 3 = Some pse 4 = Certificate/license 5 = Associate 6 = Bachelor 7 = Master 8 = PhD or prof. deg.	4.20	1.70
Earnings (log), 1999	Self-reported income of respondent from employment, 1999		10.15	.59

the assessments were administered. All four standardized achievement test scores were averaged to construct a composite measure of cognitive ability.<sup>4</sup> This way of measuring cognitive skills was used for several reasons. While all the tests emphasize

<sup>4</sup> The  $t$ -scale transformed test scores (IRT-theta) for each subject which are standardized on 10th grade scores ( $M = 50$ ,  $SD = 10$ ) provided in NELS were used to construct the composite cognitive ability measure.

comprehension in the subject area, each subject test taps into other cognitive abilities as well. The reading test emphasizes interpretation of questions and the contextual understanding of words and passages. The mathematics test assesses both basic mathematical skills, as well as more advanced problem solving skills, including word problems and quantitative comparisons. The science subject test emphasizes reasoning ability while the subject test in history/citizenship/geography emphasizes memory and recall of information (National Center for Education Statistics, 1992). In addition, Jencks (1985) and others (Gamoran, 1992) have also found that achievement is much more rigorously controlled when test scores from all academic subjects have been included in the model rather than including a single test score in one subject.

#### 4.2.2. Noncognitive behaviors

Several noncognitive behaviors have been identified in prior research as important for educational and occupational success. These behaviors include being hard working and conscientiousness, having the ability to get along well with others and work effectively in groups, being polite, and following the rules (Farkas, 1996; Holzer, 1996; Lleras, 2008; Rosenbaum, 2001; Stasz, 2001; Murnane and Levy, 1996; Barrick and Mount, 1991; Ainsworth-Darnell and Downey, 1998). This study will utilize information from the first follow-up teacher and student surveys in the NELS to measure these kinds of noncognitive behaviors. Tenth grade teacher reports of student's behaviors and performance in class are used since teachers may provide a more accurate picture of students actual work habits and social skills, and because I am interested in whether employers reward the same kinds of behaviors as teachers (Farkas, 1996).<sup>5</sup> Research has shown that teacher's perceptions of student behavior are primarily based on student's actual performance in class and are often in line with student reports of effort (Madon et al., 1998; Muller et al., 1999). It is also possible that teacher's judgements are affected by things other than performance such as, student's racial and socioeconomic background (see e.g., Alexander et al., 1987; Downey and Pribesh, 2004). However, it is important to note the findings of a prior study using the NELS:88 data demonstrated that while teachers were more likely to report that African American and Hispanic students were performing below their ability and not completing homework assignments compared to white students, these gaps largely disappeared once differences in test scores and family composition were controlled (Shouse et al., 1992). Other studies have also shown that race, sex, and class differences in teachers' perceptions of student performance and effort usually correspond to real differences (Muller et al., 1999; Madon et al., 1998). That being said, the measures of noncognitive behaviors used in this study which rely on teacher reports mostly likely capture both the teachers' perceptions of student behavior as well as actual student behavior.

Prior research suggests that students who complete homework on time have better grades (Farkas, 1996; Ainsworth-Darnell and Downey, 1998), achievement (Lleras, 2008) and increased educational attainment (Rosenbaum, 2001). Further, research shows that individuals who are hardworking and conscientious are sought after and rewarded by employers in the workplace (Stasz, 2001; Holzer, 1996). Three items from the teacher survey were used to tap into these kinds of noncognitive behaviors (*Work Habits/Conscientious*). These items asked teachers to assess: (1) how often the student "completes homework assignments"; (2) whether the student "usually works hard for good grades"; and (3) how often the student is "tardy to class". Studies also suggests that individuals who are perceived as being more *motivated* have better educational and occupational outcomes (Rosenbaum, 2001; Holzer, 1996). Therefore, I include an item which asks teachers whether the student is "exceptionally passive or withdrawn."

A related dimension is the extent to which individuals have the ability to get along well and interact effectively with others (*sociability and cooperativeness*), which has also been shown to be important for educational (Bowles and Gintis, 1976; Farkas et al., 1990) and labor market success (Murnane and Levy, 1996; Stasz, 2001; Holzer, 1996). Several items were used to measure these kinds of noncognitive behaviors. One item from the tenth grade teacher survey which asked teachers whether the student seemed to "relate well with other students" was used. Three items from the student survey were used to measure extracurricular participation in school by counting up the number of sports activities, the number of academic clubs or other academic-related activities (e.g., school service clubs, school yearbook) and the number of fine arts the student participated in during the tenth grade (i.e., band/orchestra, school play/musical) were also used. Unlike Rosenbaum (2001), who included a dichotomous measure of whether or not students participated in any extracurricular activity in high school in his analysis of educational attainment and earnings, this way of measuring school participation directly measures social interaction and student involvement in school and indirectly captures student's exposure to greater and more varied teacher and peer networks within the school.<sup>6</sup>

Attitudes, (*politeness*) were also reported by employers to be of importance in the hiring process (Holzer, 1996; Stasz, 2001). Further, the results from Rosenbaum (2001) indicated that students with fewer disciplinary problems had greater educational attainment and earnings. Therefore, an item which asks teachers how often the student is "disruptive in class" was used.

#### 4.2.3. Family background

To measure the socioeconomic background of the respondent's family in high school, a composite measure provided in the NELS was used. The continuous measure combines standardized values of mother's and father's occupational prestige, educational attainment, and family income as reported by the parent was used.

<sup>5</sup> The teacher measures were based on the average responses by one mathematics or science teacher and one English or history teacher.

<sup>6</sup> Fine arts is included as a separate measure of school participation because fine arts may have differential effects on educational outcomes compared to other kinds of extracurricular participation and depending on student's race and sex (McNeal, 1995; Marsh and Kleitman, 2002).

#### 4.2.4. Additional controls

In the analysis of earnings, two additional control variables were added to the models. A dummy variable indicating whether the respondent worked 60 or more hours per week was included. Since employers in different occupations (i.e., service versus manufacturing) may reward cognitive skills and noncognitive behaviors differently, I include dummy variables indicating the respondent's occupational classification. These were derived by collapsing the 39 occupation codes provided in the NELS 4th follow-up survey into six occupational categories using the detailed Occupational Classification system provided by the U.S. Census.<sup>7</sup>

#### 4.2.5. Educational attainment

The fourth follow-up survey asked individuals about the highest educational level attained as of January 2000 when respondents were 26–27 years old. Educational attainment consisted of eight categories ranging from less than high school (1) to PhD or professional degree (8).

#### 4.2.6. Earnings

The measure of earnings is the log of the average annual earnings reported for respondents during the previous year (1999).

### 5. Analytic strategy

The goal of this study is to assess whether cognitive skills and noncognitive behaviors measured in high school have a unique effect on later educational attainment and earnings. In addition, the extent to which cognitive skills and noncognitive behaviors individually and collectively account for racial, ethnic, sex and class differences in educational and employment outcomes is examined.

The data used to meet these goals come from the first and fourth follow-up surveys of the NELS. In the base year survey of the NELS: 88, a two stage, stratified, random sampling procedure was used. First, schools were sampled, and then students within those schools were sampled. Ordinary least squares analysis of such data may produce biased slopes and standard errors due to correlated error structures. Therefore, I utilize the survey commands (svy) in STATA to account for the complex nature of the NELS survey design.<sup>8</sup>

To estimate the effects of skills and behaviors in high school on educational attainment, ordinal logistic regression models were estimated in STATA using the ologit command (Stata, 2003). The estimated coefficients represent the (log) odds of being in higher educational categories compared to the next highest educational category. In this analysis, educational attainment is regressed on sex, race and ethnicity, and family SES. Next, I add the achievement test score composite, and measures of work habits, motivation, sociability, and politeness individually and collectively in the final model. These models extend the work by Rosenbaum (2001) by estimating the unique and combined effects of cognitive and noncognitive skills and behaviors on educational attainment.

The second analysis of earnings is estimated using ordinary least squares regression commands with the svy command in STATA. The analysis proceeds in a similar way as the analysis of educational attainment. In the final model predicting earnings, educational attainment is added in order to determine to what extent the effects of cognitive skills and noncognitive behaviors on earnings are mediated by education.

In the final sample, missing data presented a problem. The percent of missing cases on the independent variables used in the analyses ranged from 1.5 to 14 percent. Missing value analyses indicated that the data were not missing completely at random, an assumption that must be met in order to obtain unbiased estimates from listwise or pairwise deletion methods.<sup>9</sup> Therefore, missing data was imputed via multiple imputation commands available in STATA 9.0 (Royston, 2004). Multiple imputation methods (MI) replace missing values with predicted values generated from statistical models which include all the variables used in the analysis. Unlike single imputation methods which generate a single value for each missing value, MI generates five imputed datasets using the statistical regression model to provide a set of plausible values for the missing values in the data set. The coefficients estimated from the multiple imputed data sets are averaged to provide the point estimates for the missing values. This method of dealing with missing data better reflects the variability in the data and takes into account the uncertainty about which is the right value to impute.

### 6. Results

#### 6.1. Descriptive results

Table 1 presents the unweighted descriptive statistics for the sample. The test composite score which included mathematics, reading comprehension, science, and history/geography/citizenship ranged from 27.58 to 71.09, with a mean of

<sup>7</sup> The occupations are: (1) professional/managerial (reference category); (2) technical/Sales; (3) service; (4) labor/mechanical; (5) farming; (6) military.

<sup>8</sup> The svy commands use Taylor-series linear methods to produce the correct standard errors (Stata, 2003).

<sup>9</sup> The Missing Value Analysis (MVA) option in SPSS supports Little's MCAR test, a  $\chi^2$  test for missing completely at random. The results of this analysis were significant ( $p < .000$ ) indicating that the data were not MCAR.

**Table 2**  
Zero-order correlations among key predictors

	1	2	3	4	5	6	7	8	9	10
(1) Achievement test composite score <sup>a</sup>										
(2) Homework	.36**									
(3) Hardworking	.32**	.71**								
(4) Tardy <sup>b</sup>	.22**	.42**	.36**							
(5) Passive <sup>c</sup>	.07**	.17**	.16**	.01						
(6) Relate	.12**	.26**	.24**	.11**	.32**					
(7) Number sports activities	.05**	.07**	.06**	-.01	.11**	.08**				
(8) Number academic activities	.26**	.22**	.20**	.09**	.10**	.11**	.17**			
(9) Number fine arts activities	.12**	.09**	.08**	.04**	.05**	.05**	.04**	.18**		
(10) Less disruptive	.26**	.42**	.40**	.38**	-.13**	.08**	-.06**	.12**	.07**	

<sup>a</sup> Mathematics, reading, science, and history/geography/citizenship.

<sup>b</sup> Reverse coded such that positive coefficients indicate respondent is less likely to be tardy to class.

<sup>c</sup> Reverse coded such that positive values indicate being less passive in class.

\*\*  $p < .01$ .

50.81. Looking at tenth grade measures of noncognitive behaviors, the majority of individuals in the sample were judged by their teachers to be hardworking and conscientious students. Most students were not thought to be exceptionally passive or withdrawn by their teachers and to relate well with other students. On average, respondents in the sample participated in at least one sport or academic activity in high school. Respondents were less likely to participate in fine arts. Finally, most respondents were not judged to be disruptive in class by their teachers.

By the fourth follow-up survey in 2000, approximately 15% of the sample had completed high school only. Almost one-third of the sample had enrolled in post-secondary education, but never obtained a degree. And, a little over half (53.2 percent) of the 10th grade cohort had completed some kind of post-secondary education by 2000.

Table 2 presents the correlation matrix among the cognitive and noncognitive variables used to predict educational attainment and earnings. All of the correlations were significant ( $p < .01$ , two-tailed) except for the correlations between tardy and number of sports activities and passive. The bivariate correlations indicate that the measure of cognitive ability (achievement test composite score) is empirically distinct from the measures of noncognitive behaviors, with  $r$  ranging from .05 for number of sports activities to .36 for homework.<sup>10</sup> Among the noncognitive behaviors, most had a very low to low correlation. However, the strong correlation between hardworking and homework ( $r = .71$ ) indicated a potential source of multicollinearity. In the models predicting educational attainment and earnings (Tables 3 and 4), I performed diagnostic tests to check for multicollinearity among the cognitive and noncognitive predictors. The results indicated that there were not problems with multicollinearity when all of these variables were entered together in the regression models.<sup>11</sup> Overall, the results from the zero-order correlations among the predictors in the model and the multicollinearity diagnostics confirm that while the cognitive and noncognitive measures are somewhat interrelated, they are empirically distinct from one another.

## 6.2. Cognitive skills, noncognitive behaviors, and educational

### 6.2.1. Attainment

Table 3 presents the ordered logit coefficients estimating the effect of cognitive skills and noncognitive behaviors on educational attainment by 2000, 10 years after the first follow-up survey was conducted on tenth graders. Column 1 is the baseline model and includes family socioeconomic status, sex, and dummy variables for racial and ethnic background. Without controls for cognitive skills and noncognitive behaviors, respondents from a higher socioeconomic background are significantly more likely to complete higher levels of schooling. The odds of completing more education are 2.52 times greater with one-standard-deviation increase in family SES. Male respondents have significantly lower educational attainment as well. Controlling for family SES and sex, the differences between African Americans and Hispanics and Whites are small and non-significant.<sup>12</sup> In contrast, Asian respondents have significantly higher attainment compared to White respondents, even after controls for family background.

Column 2 adds cognitive skills to the model predicting educational attainment. As expected, students with greater cognitive abilities as measured by standardized achievement tests in math, reading, science, and history are more likely to have higher levels of completed schooling. The odds of completing more education versus less education are 2.21 times greater with a one-standard-deviation increase in the cognitive ability composite score. Adding cognitive skills to the model greatly

<sup>10</sup> These correlations are on the low end of typical correlations found in studies of academic performance and these sorts of measures of engagement. However, this is partially due to the fact that a composite measure of cognitive ability was used rather than a sole measure using only mathematics test score. The correlations are higher when only mathematics test score is used.

<sup>11</sup> The largest Variance-inflation factor (VIF) was 2.4 and the average VIF was 1.41, indicating that multicollinearity was within acceptable tolerances in the regression models (Studenmund, 2001).

<sup>12</sup> Rosenbaum (2001) and others (Mare and Winship, 1988) have also found that once family socioeconomic status is controlled, racial gaps in educational attainment disappear.

**Table 3**

Ordered logit regression coefficients estimating effects of cognitive ability &amp; noncognitive behaviors in 10th grade on educational attainment by 2000

Independent variables	Educational attainment			
	(1)	(2)	(3)	(4)
Family SES	1.212*** (3.367)	.879*** (2.408)	1.058*** (2.880)	.829*** (2.291)
Male	-.621*** (.537)	-.679 (.507)	-.309** (.734)	-.449** (.638)
African American	-.070 (.932)	.355** (1.426)	.096 (1.101)	.380** (1.462)
Hispanic	-.067 (.935)	.180* (1.197)	.046 (1.047)	.212* (1.236)
Asian	.620*** (1.859)	.584*** (1.793)	.366** (1.442)	.402*** (1.495)
<i>Cognitive ability, 10th grade</i>				
Achievement test composite score <sup>a</sup>		9.108*** (9027.222)		7.039*** (1140.246)
<i>Noncognitive behaviors, 10th grade</i>				
Homework			.542*** (1.719)	.453*** (1.573)
Hardworking			.278*** (1.320)	.233*** (1.262)
Tardy <sup>b</sup>			.115 (1.122)	.089 (1.093)
Passive <sup>c</sup>			.103 (1.108)	.110 (1.116)
Relate			.101 (1.106)	.099 (1.104)
Sports participation			.103*** (1.108)	.129*** (1.138)
Academic participation			.219*** (1.244)	.149*** (1.161)
Fine arts participation			.063 (1.065)	.016 (1.016)
Less disruptive			.017 (1.017)	-.036 (.965)
Threshold 1	4.354	.063	-.766**	1.848
Threshold 2	-2.164	2.368	1.587**	4.274
Threshold 3	-.527	4.121	3.393**	6.143
Threshold 4	-.161	4.545	3.803**	6.568
Threshold 5	.239	4.960	4.261**	7.053
Threshold 6	3.292	8.220	7.550**	10.465
Threshold 7	5.372	10.322	9.653**	12.580
R <sup>2</sup>	.224	.318	.346	.387

Note. Numbers in parentheses are odds ratios. The R<sup>2</sup> estimates were obtained by reestimating the models using the svy command for OLS regression.

<sup>a</sup> Achievement test composite coefficient multiplied by 100.

<sup>b</sup> Reverse coded such that positive coefficients indicate respondent is less likely to be tardy to class.

<sup>c</sup> Reverse coded such that positive values indicate being less passive in class.

\*  $p < .05$ .

\*\*  $p < .01$ .

\*\*\*  $p < .001$  (two-tailed tests).

reduces the positive effect of being from a higher SES family by almost one-third, although socioeconomic background remains a significant predictor of educational attainment 10 years later. The measure of cognitive abilities does little to explain the higher educational attainment among female respondents in the sample. Differences in cognitive skills measured in high school, however, do explain some of the educational advantage experienced by Asians (7 percent). In addition, once cognitive ability in tenth grade is controlled, Hispanic and African American respondents become significantly more likely to have higher educational attainment compared to similar White respondents.<sup>13</sup>

Column 3 adds several noncognitive variables to the models predicting educational attainment. All of the noncognitive behaviors measured in high school are significant and in the expected direction, except for fine arts participation and being less disruptive which fail to reach significance. Having better work habits, being conscientiousness, getting along well with others, and participating in academics and sports in 10th grade are all associated with greater educational attainment 10 years later. For example, a one-standard-deviation increase in homework completion is associated with a 1.59 increase in

<sup>13</sup> Rosenbaum (2001) also found similar results using data from the HS& B survey.

**Table 4**

OLS regression estimates from models predicting earnings

Independent variables	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	10.098***	9.784***	9.797***	9.610***	9.775***	9.596***
Family SES	.087***	.063***	.069***	.052***	.035***	.023***
Male	.254***	.248***	.259***	.247***	.269***	.256***
African American	-.124***	-.096***	-.120***	-.100***	-.118***	-.110***
Hispanic	-.053**	-.035	-.047*	-.034	-.044*	-.037
Asian	.078*	.075*	.066*	.069*	.055	.059
<i>Cognitive, 10th grade</i>						
Achievement Test Composite Score <sup>a</sup>		.594***		.512***		.278**
<i>Noncognitive Behaviors, 10th Grade</i>						
Homework			.038***	.031**		.015
Hardworking			-.004	-.007		-.017
Tardy <sup>b</sup>			-.001	-.001		-.005
Passive <sup>c</sup>			.043**	.042**		.039**
Relate			.053***	.052***		.049***
Sports participation			.021***	.023***		.018***
Academic participation			.023***	.018**		.014*
Fine arts participation			-.037***	-.040***		-.040***
Less disruptive			-.011	-.018		-.018
Educational attainment					0.66***	.057***
R <sup>2</sup>	.112	.118	.129	.132	.138	.148

Note. All models include controls for respondents who worked excessive hours (60 or more hours per typical week) and for occupation (six dummy variables—see text for occupation classifications).

<sup>a</sup> Achievement Test Composite coefficient multiplied by 100.

<sup>b</sup> Reverse coded such that positive coefficients indicate respondent is less likely to be tardy to class.

<sup>c</sup> Reverse coded such that positive values indicate being less passive in class.

\*  $p < .05$ .

\*\*  $p < .01$ .

\*\*\*  $p < .001$  (two-tailed tests).

the odds of completing more education. Participating in one sports or academic activities increased the odds of higher educational attainment by 1.15 and 1.25, respectively.

Similar to the results for cognitive skills, including noncognitive behaviors in the model reduces the educational advantage among respondents from higher SES families by about 13 percent. Unlike cognitive skills, adding noncognitive measures to the model greatly reduces the gender gap by almost one-half. That is, having better noncognitive behaviors partly explains the higher educational attainment among females. Controlling for noncognitive behaviors has little effect on the African American and Hispanic coefficients. However, noncognitive behaviors reduce the educational advantage experienced by Asians much more (40 percent) than prior cognitive abilities (6 percent). This suggests that the greater educational attainment experienced by Asians compared to Whites can be partly attributed to their better noncognitive behaviors.

The results in Column 2 and 3 indicate that both cognitive skills and noncognitive behaviors in high school individually help to explain differences in educational attainment 10 years later. In comparing these two models to the baseline model in Column 1 which includes race, ethnicity, sex, and family SES, adding these measures greatly increases the explanatory power of the overall model. Comparing the  $R^2$  indicates that the model which includes the noncognitive behaviors increases the explanatory power over the baseline model by approximately 35 percent, while the cognitive model increases the explanatory power by approximately 30 percent. That is, noncognitive behaviors explain slightly more than the measure of cognitive ability when entered into separate analyses of educational attainment.

In Column 4, cognitive ability and noncognitive behaviors are entered together into the final model of educational attainment. These results show that most of the noncognitive behaviors remain significant predictors of educational attainment once cognitive skills are added to the model. Thus, when both measures are used to explain educational attainment, each makes a significant and unique contribution. The cognitive skill coefficient is reduced by almost one-fourth which also suggests that part of the relationship between cognitive skill and educational attainment is mediated by noncognitive behaviors.

In terms of explaining racial, ethnic, sex, and socioeconomic differences in educational attainment, cognitive skills and noncognitive behaviors together explain about one-third of the higher educational attainment experienced by students from more economically advantaged households. These variables also reduce the sex gap in educational attainment by almost one-third and substantially influence the racial and ethnic gaps in attainment. Controlling for prior cognitive skills, the educational advantage of Hispanic and African American students actually increases once noncognitive behaviors are added to the model. This indicates that the educational attainment experienced by these groups compared to Whites is actually greater than their noncognitive behaviors would suggest. This finding differs from that of Rosenbaum (2001) who found that adding noncognitive behaviors to the model explained a large amount of the “educational advantage” among African American and Hispanics compared to Whites. His results suggested that the higher educational attainment experienced by these racial and ethnic groups was due to the fact that they had better noncognitive behaviors. The educational advantage of Asians com-

pared to Whites has been reduced by about one-third. Overall, adding both cognitive skills and noncognitive behaviors to the model increases the  $R^2$  substantially—almost doubling the proportion of variance explained in educational attainment.

The results indicate that cognitive and noncognitive behaviors measured in high school have significant and unique effects on later educational attainment. However, are the benefits of skills and behaviors similar for different groups? A series of interactions between the cognitive and noncognitive measures and family SES, male, African American, Hispanic, and Asian were added separately to the final model (results not shown). While most of the interactions were non-significant, a few significant interactions indicated differential educational returns by SES, sex, and race/ethnicity for cognitive skill and noncognitive behaviors. The results showed that respondents from higher SES backgrounds benefited more in terms of educational attainment from greater cognitive skills in high school and better work habits as measured by homework completion and works hard. Female respondents who completed their homework on time and had higher achievement test scores also had higher educational attainment compared to male respondents. The interactions between race and ethnicity and school participation also indicated that Hispanic and Asian respondents experienced fewer benefits in terms of educational attainment from participating in fine arts and sports in high school compared to Whites.

Overall, the results from the analysis indicate that noncognitive behaviors measured in high school, in addition to cognitive skills, have significant effects on later educational attainment. Furthermore, noncognitive behaviors seem to play a much more important role in explaining the female and Asian advantage in educational attainment, compared to cognitive ability. Finally, the results indicate that although most of the noncognitive behaviors had positive and significant effects on educational attainment, fine arts seem to be less important compared to sports and academic activities in high school.

### 6.3. Cognitive skills, noncognitive behaviors, and earnings

Table 4 presents the results from an ordinary least squares regression predicting the log earnings of respondents working at least 35 h per week in 1999. This analysis extends prior work by Rosenbaum (2001) by including controls for respondents who worked excessive hours (60 or more hours) in a typical week in 1999, as well as for occupational classification. Since occupations may differ in their demands for skills and behaviors, this analysis represents a much more stringent test of whether behaviors and abilities measured in high school influence earnings 9 years later. Just like in the analysis of educational attainment, Column 1 presents the baseline model which includes family SES, sex, and race and ethnicity. Without controls for prior cognitive skills, noncognitive behaviors, or educational attainment, respondents from higher socioeconomic backgrounds have significantly higher earnings compared to respondents from lower SES families. Males also have higher earnings and African American and Hispanic respondents have lower earnings compared to White respondents. This differs from the results found by Rosenbaum (2001) in which African Americans and Hispanics actually had higher earnings once test score was controlled. Asian respondents, as in the analysis of educational attainment, tend to have higher earnings compared to White respondents after controlling for family SES and sex.

Columns 2 and 3 add the cognitive skills and noncognitive behaviors separately to the equations predicting earnings. The results indicate that greater cognitive abilities are strongly associated with higher earnings. A one-standard-deviation increase in the ability composite score is associated with a 52 percent increase in earnings. Respondents who were judged by their teachers to have completed their homework, been active participants in class, and got along well with others also had significantly greater earnings 10 years later. A one-standard-deviation increase in completing homework is associated with a 47 percent increase in earnings. Participating in sports and academic activities is also associated with higher earnings by approximately 3 percent. Interestingly, fine arts participation is actually associated with lower earnings.

As in the analyses predicting educational attainment, cognitive skills and noncognitive behaviors when entered separately into equations predicting earnings reduce the earnings advantage among higher SES respondents by 28 percent and 21 percent, respectively. Likewise, both measures individually explain some of the reduced earnings among African American and Hispanic respondents, although cognitive skill seems to reduce the racial/ethnic gaps the most. Cognitive ability, by itself, explains approximately 33 percent of the lower earnings experienced by African American respondents compared to Whites, while noncognitive behaviors explain only 4 percent. Similarly, cognitive ability explains over 40 percent of the Hispanic–White earnings gap compared to 12 percent by noncognitive behaviors. Similar to the results for educational attainment, noncognitive behaviors actually help to explain slightly more (15 percent) of the Asian advantage in earnings compared to cognitive ability (4 percent). The finding that lower cognitive skills explains a substantial portion of the lower earnings experienced by African Americans and Hispanics was also reported by Farkas et al. (1997) using data from the National Longitudinal Survey (NLSY) and for Hispanics by Rosenbaum (2001). Adding cognitive skills only slightly reduces the sex gap in earnings and once noncognitive behaviors are controlled female respondents have even lower earnings.<sup>14</sup>

Overall, when cognitive skills and noncognitive behaviors are entered individually, the explanatory power of the models predicting earnings increases, and more so for noncognitive behaviors. The measure for cognitive ability increases the explanatory power of the model by approximately 6 percent, whereas the noncognitive measures increase the explanatory power by 14 percent. Further, the results presented in column 4 indicate that when cognitive skills and noncognitive behaviors are entered together into a model predicting earnings, each makes a significant and unique contribution given that many

<sup>14</sup> Rosenbaum (2001) had a similar finding when using data from the High School and Beyond survey (1982).

of the noncognitive behavioral coefficients remain significant and relatively unchanged. The decline of the SES coefficient by 18 percent also suggests that part of the SES advantage after controlling for cognitive skill is due to better noncognitive behaviors.

In column 5, educational attainment is entered into the equation predicting earnings. Educational attainment explains slightly more of the overall variance (23 percent) in earnings compared to the model with both cognitive skills and noncognitive behaviors (18 percent). By itself, educational attainment explains more of the higher earnings among respondents from higher SES families compared to models with cognitive skills or noncognitive behaviors, but does not explain as much of the lower earnings among Hispanic and African American respondents when compared to cognitive skills (model 2). This could be indicative of racial and ethnic differences in post-secondary educational attainment and the kinds of post-secondary education completed by respondents. Prior research has shown that African American and Hispanic students are more likely to drop out of college and also tend to be overrepresented in community colleges which are often associated with poorer outcomes in the labor market (Kalsner, 1991; Camburn, 1990; Dougherty, 1994; Karen, 2002).

In the final model (column 6), cognitive skills, noncognitive behaviors, and educational attainment are all entered together into the model predicting earnings. These results indicate that cognitive skills and most of the noncognitive behaviors in high school have a significant positive effect on later earnings in young adulthood, even after controlling for educational attainment (although homework is no longer significant). The exception being that respondents who participated in fine arts still experience lower earnings in the labor market. That is, regardless of their educational attainment, students who were perceived by their teachers to relate well with other students, to be less passive during class, and who participated in extra-curricular academic and sports activities in high school activities had higher earnings 10 years later.

A substantial portion of the relationship between cognitive skill and later earnings is mediated by educational attainment. More than one-half of the effect of greater cognitive skill on earnings is explained by higher educational attainment. This is similar to the results found by Rosenbaum (2001). Likewise, the effect of homework on earnings is completely accounted for by educational attainment. The measures of motivation and sociability (passive and relate) are less affected by the addition of educational attainment to the model, suggesting that less of the relationship between these behaviors and earnings is mediated by educational attainment. However, more of the relationship between sports and academic participation and earnings seems to be mediated by educational attainment, since both effects are reduced by approximately 22 percent.

Cognitive skills, noncognitive behaviors, and educational attainment together explain a substantial portion of the earnings advantage among individuals from higher SES backgrounds. Further, these three variables reduce the African American–White earnings gap by about 12 percent, although it remains significant. The Hispanic–White and Asian–White gaps are also reduced and more importantly are now non-significant. The sex gap has remained relatively unchanged when all three sets of measures were entered into the final model, suggesting that female wages are lower even after when noncognitive behaviors, cognitive skills, and educational attainment are taken into account.

As in the model of educational attainment, a series of interactions between individual characteristics and the cognitive and noncognitive measures were entered separately into the final model predicting earnings. The results indicated that individuals from lower SES backgrounds gained significantly more in terms of later earnings from having higher cognitive ability in high school. Further, respondents from lower SES families experienced greater returns on earnings from participating in sports and academic activities compared to respondents from higher SES families. The results also showed significant differences in the returns to cognitive and noncognitive measures across males and females. Female students benefited more in terms of earnings from having higher cognitive skill, being more conscientious and having better work habits (homework, work hard, less tardy), and participating in academic and fine arts activities in high school. There were also some significant interactions between race/ethnicity and cognitive skills and noncognitive behaviors on earnings. African American respondents had greater returns on their earnings if they had higher achievement test scores compared to similar White respondents. African Americans also benefited more from being less disruptive and participating in academic activities, although the latter interaction was only significant at the .10 level. Interestingly, while the main effect of fine arts participation on earnings was negative, the interactions indicated that African American and Hispanics who participated in fine arts actually had higher earnings compared to Whites. In other words, participation in fine arts for these groups, as well as females, was actually beneficial in terms of later earnings.

## 7. Summary and discussion

Early opportunities and experiences often shape later life chances and success. One of the main mechanisms involved in determining labor market outcomes is the educational system. Indeed, sociologists have argued for decades that schools play a central role not only in teaching students the basic skills needed to succeed in the labor market but also in demanding and rewarding behaviors and attitudes that are also valued by employers. The overall goal of this study was to examine the effects of a range of school-related noncognitive behaviors, in addition to cognitive skills, on the educational attainment and earnings of a cohort of tenth grade students, measured 10 years later in 2000, when many of the respondents had completed their education and the majority were working full-time in the labor market. The results suggest that noncognitive behaviors are as important and perhaps more important than cognitive abilities (measured by achievement tests), in predicting individual educational and occupational success. Noncognitive measures alone predict slightly more of the variance in educational attainment and earnings compared to the models which only include measures of cognitive ability. The findings

also suggest that differences in noncognitive behaviors play an important role in explaining group differences in later stratification outcomes. Noncognitive behaviors explain about one-fourth of the educational advantage among higher SES respondents and play a much more important role than cognitive skills in explaining the educational and earnings advantage among females and Asians. While some of the relationship between noncognitive behaviors and earnings is mediated by educational attainment, many of the behaviors measured in high school remain significant predictors of earnings 10 years later, even after taking into account differences in education.

Overall, individuals who were judged by their teachers to be more motivated and to get along well with other students in high school completed more education and had higher earnings, even after controlling for cognitive abilities, family socioeconomic background, and educational attainment. Further, the findings regarding extracurricular participation indicate that overall greater participation in sports and academic related activities, not fine arts, was associated with greater educational attainment and earnings. However, for African American and Hispanics, participation in fine arts was actually associated with significantly higher earnings compared to Whites (results not shown). Research suggests that different extracurricular activities are associated with different kinds of skills and learned behaviors (Hansen et al., 2003; Broh, 2002). It might be that participation in fine arts as opposed to other kinds of activities fosters more higher order thinking skills and promotes cooperative behavior and self-knowledge which leads to better employment outcomes for racial and ethnic minorities (Hansen et al., 2003; McNeal, 1995).

Cognitive skills and noncognitive behaviors together explain a significant portion of the class, sex, and racial and ethnic differences in educational attainment and later earnings. In predicting educational attainment, adding noncognitive behaviors to the model reduces the sex gap by almost one-half and the educational advantage among higher SES students by about 13 percent. In addition, once test scores and behaviors are controlled, African American and Hispanic students are much more likely to have higher educational attainment compared to similar White students. This suggests that given the same opportunities to learn in secondary schooling, these students are able to take advantage and secure post-secondary education and training. The greater educational advantage experienced by Asians, however, seems to be much more attributed to their better noncognitive behaviors rather than their cognitive abilities.

In the analysis of earnings, adding cognitive skills and noncognitive behaviors to the model does not change the sex gap very much, but explains almost half of the earnings advantage experienced by respondents from higher SES backgrounds. Cognitive skills and noncognitive behaviors explain more of the lower earnings experienced by African American and Hispanics compared to educational attainment. Together, these measures reduce the African American gap in earnings by about 20 percent, and completely explain the earnings difference between Hispanic and White respondents. Finally, the results show that only some of the effects of noncognitive behaviors on earnings are mediated by educational attainment, in particular measures of conscientiousness and work habits. However, regardless of their educational attainment, respondents who were more motivated and social in high school had higher earnings 10 years later.

The measures of cognitive skill and noncognitive behaviors used in the analysis were meant to approximate the kinds of skills and behaviors reported in prior research to be both rewarded by teachers in school and sought after and rewarded by employers in the labor market. The results show that both cognitive skills and a range of school-related noncognitive behaviors impact later educational attainment and earnings in the current labor market. While there is no way to verify whether the kinds of noncognitive behaviors that are measured in high school are exactly the same as those also shown to be rewarded by employers, the fact that these behaviors do predict educational and occupational outcomes after controlling for a number of factors suggests that either the rewarded behaviors measured in late adolescence are somewhat stable into early adulthood or that these behaviors observed in high school are the antecedents of similar behaviors that are rewarded in the labor market.

Despite utilizing different methods and data from different time periods, the results of this study are also in line with some of the prior findings by Rosenbaum (2001) who uses primarily student reports and support the conclusions reached by Jencks (1979) almost 30 years ago.<sup>15</sup> Like Rosenbaum and Jencks, this study shows that student work habits and conscientiousness are positively related to educational attainment and this in turn, results in higher earnings. That is, students who have better work habits have higher earnings in the labor market because they are able to complete more years of schooling. In addition, both this study and that of Rosenbaum point to the persistent importance of motivation in predicting earnings, even after taking into account education. Finally, the results of this study support the conclusions reached by Jencks and his colleagues (1979) that noncognitive behaviors of secondary students were as important as cognitive skills in predicting later earnings.

This research also extends the findings by Rosenbaum (2001) and Jencks (1979) by showing that other noncognitive measures such as the ability to get along well with others and participation in academic and sports activities, in particular, were important for adult socioeconomic success. While both Rosenbaum and Jencks find no effect of participation in group activities on earnings, this study shows that students who participated in extracurricular activities (i.e., sports and academic related) were significantly more likely to have higher earnings, even after controlling for educational attainment. Further, Jencks and his colleagues find no effect of cooperativeness as measured by teacher reports on earnings once educational attainment is controlled. In contrast, this study finds a persistent significant effect of teachers' reports of whether the student relates well with others on earnings. Finally, this study demonstrates that noncognitive behaviors play an important role in

<sup>15</sup> Rosenbaum (2001) utilizes student reports of time spent on homework per week and the number of days they report being absent from school, as well as student reports of whether they are interested in school. This study, in contrast, examines teacher reports of whether the student completes homework on time, is tardy to class, and is passive during class.

explaining the lower earnings among African Americans and Hispanics. Taken together, the findings from the current study suggest that the labor market may have changed over the past several decades such that individuals with greater social skills are rewarded more in the labor market today compared to in the past. This would be in line with the shift from an industrial to service based economy. Alternatively, it is also possible that social skills have always been valued in the workplace but increased competition in the current labor market due to greater post-secondary educational attainment may lead employers to reward employees in terms of their social skills more than before.

The measures used in this study may not capture all the sorts of behaviors employers look for when deciding whom to hire and which individuals to promote. For example, respondents who differ on cognitive and noncognitive skills and behaviors may also differ in their expectations and attitudes. In addition, although not measured in this study, it is certainly plausible that cognitive skills, noncognitive behaviors, and attitudes affect one another and in that sense operate as a feedback process to influence educational and occupational outcomes (Lleras, 2008). Future analyses, which incorporate additional measures of behavior and attitudes, should investigate the extent to which skills, behaviors, and attitudes influence one another over time to affect socioeconomic outcomes in adulthood.

Future research should also examine *how* cognitive skills and more importantly noncognitive behaviors influence later earnings and other employment outcomes. For example, are cognitive skills and noncognitive behaviors more predictive of first jobs out of high school and thus, influencing later earnings by affecting early employment trajectories? Are respondents with greater cognitive skill and noncognitive behaviors better able to seek out and capture employment opportunities and if so, is this due to their ability to acquire and utilize social capital more effectively? According to Granovetter (1988), social networks are one of the most important factors determining job mobility among workers (Granovetter, 1988). It is plausible that certain noncognitive behaviors (e.g., the ability to get along well with others) may enhance an individual's ability to form ties with others and then use those ties to locate and capture labor market opportunities. Enhanced sociability could improve an individual's labor market position either by increasing their own set of skills and behaviors or by enhancing the extent and quality of their social networks, which would enable them to better locate and secure job opportunities. An important step for future research would be to incorporate social capital into models using cognitive skills and noncognitive behaviors to predict educational and occupational success.

A final limitation of this study is that the analyses were restricted to include only the early years of employment, which are often characterized by high mobility and uncertainty. It is nonetheless impressive that behaviors measured in high school have a significant and unique contribution to earnings so many years later and even after controlling for cognitive skill and educational attainment.<sup>16</sup> Overall, the results from this study support the conclusions drawn by Bowles and Gintis (1976) and Jencks (1979) more than 30 years ago and more recently by Rosenbaum (2001) and others (Heckman et al., 2006) that employers are in fact seeking out and rewarding some of the same kinds of skills and behaviors that are fostered and rewarded by teachers in school.<sup>17</sup> For example, Heckman and his colleagues (2006) analyzing data from the National Longitudinal Study of Youth, 1979 (NLSY) found motivation, persistence and self-esteem were significantly related to a range of employment outcomes including status, work experience, and earnings, as well as other variables measuring social success, including the likelihood of participating in illegal activities and the probability of teenage pregnancy.<sup>18</sup>

Educational attainment is often viewed as the first stratification outcome young people encounter as they transition to adulthood. While most adolescents in the U.S., expect to go to college, the reality is that low-income, African American, and Hispanic youths are less likely to complete high school, and enroll in and complete post-secondary education as well (Kao and Thompson, 2003). Indeed, a substantial number of students, and racial minorities and low-income students in particular, enter the 'world of work' after high school. However, there is evidence that youths across the country are facing increasing difficulty finding employment and the jobs they do secure are often characterized by lower wages, fewer benefits, and less chances for upward mobility (Bound and Freeman, 1992; Coleman, 1994). There is also increasing awareness that the transition to adulthood may be less predictable and more uncertain for many low-income and racial and ethnic minorities compared with whites, leading to diminished social mobility and socioeconomic achievement in adulthood. In addition, low-income and racial minority students continue to be concentrated in the lowest quality schools characterized by diminished opportunities for extracurricular participation, poorer disciplinary and academic climates, and lower quality teachers.

The results from this study challenge the view that the only way to better prepare individuals for higher education and the world of work is through improving cognitive skills, traditionally measured by standardized achievement tests. Rather, these results suggest that schools can play an equally important role in preparing young adults by modeling, demanding, and rewarding behaviors that help them to complete higher levels of education and secure better employment. The findings presented here also highlight the importance of reducing achievement gaps in school as a way of reducing incremental inequality into early adulthood. Perhaps more importantly, the results stress the importance of examining inequality in the kinds of

<sup>16</sup> The sample was restricted to respondents who were primarily working at least 35 h per week in 1999, as opposed to going to school, to better estimate the willingness of employers to pay for skills and behaviors. However, this does not address the possibility that the impact of these cognitive and noncognitive measures are underestimated, since they may not appear until the respondents are more settled into the labor market.

<sup>17</sup> As noted previously, the fact that the noncognitive behaviors measured in this study during high school are predictive of later outcomes measured in adulthood suggests that these behaviors are either stable over time or are the antecedents to behaviors that are rewarded in the workplace.

<sup>18</sup> Heckman et al. (2006) utilizes the Rotter Locus of Control Scale and the Rosenberg Self-Esteem Scale to measure noncognitive behaviors in the NLSY sample.

opportunities and school climates which student's encounter that differentially prepares them for post-secondary education and the world of work in terms of noncognitive behaviors.

## References

- Ainsworth-Darnell, J., Downey, D., 1998. Assessing the oppositional culture explanation for racial/ethnic differences in school performance. *American Sociological Review* 63, 536–553.
- Alexander, K.L., Entwisle, D.R., Thompson, M.S., 1987. School performance, status relations, and the structure of sentiment: bringing the teacher back in. *American Sociological Review* 52, 665–682.
- Barrick, M., Mount, M., 1991. The big five personality dimensions and job performance: a meta-analysis. *Personnel Psychology* 44, 1–26.
- Bowles, S., Gintis, H., 1976. *Schooling in Capitalist America*. Basic Books, New York.
- Bowles, S., Gintis, H., 2002. Schooling in capitalist America revisited. *Sociology of Education* 75, 1–18.
- Bowles, S., Gintis, H., Osborne, M., 2001. The determinants of earnings: a behavioral approach. *Journal of Economic Literature* 39, 1137–1176.
- Bound, J., Freeman, R., 1992. What went wrong? The erosion of relative earnings and employment among young black men in the 1980s. *The Quarterly Journal of Economics* 107, 201–232.
- Broh, B., 2002. Linking extracurricular programming to academic achievement: who benefits and why? *Sociology of Education* 75, 69–95.
- Camburn, E.M., 1990. College completion among students from high schools located in large metropolitan areas. *American Journal of Education* 98, 551–569.
- Coleman, J.S., 1994. Social capital, human capital, and investment in youth. In: Peterson, A., Mortimer, J. (Eds.), *Youth Unemployment and Society*. Cambridge University Press, Cambridge, pp. 34–50.
- Deluca, S., Rosenbaum, J., 2001. Individual agency and the life course: do low SES students get less long-term payoff for their school efforts? *Sociological Focus* 34, 357–374.
- Dougherty, K., 1994. *The Contradictory College: The Conflicting Origins, Impacts and Futures of the Community College*. State University New York Press, Albany.
- Downey, D.B., Pribesh, S., 2004. When race matters: teachers' evaluations of students' behavior. *Sociology of Education* 77, 267–282.
- Farkas, G., Grobe, R., Sheehan, D., Shuan, Y., 1990. Coursework mastery and school success: gender, ethnicity, and poverty groups within an urban school district. *American Educational Research Journal* 27, 807–827.
- Farkas, G., England, P., Vicknair, K., Kilbourne, B., 1997. Cognitive skill, skill demands of jobs, and earnings among young European American, African-American, and Mexican-American workers. *Social Forces* 75, 913–940.
- Farkas, G., 1996. Human Capital or Cultural Capital? Ethnicity and Poverty Groups in an Urban School District. Aldine De Gruyter, New York.
- Farkas, G., 2003. Cognitive skills and noncognitive traits and behaviors in stratification processes. *Annual Review of Sociology* 29, 541–562.
- Gamoran, A., 1992. The variable effects of high school tracking. *American Sociological Review* 57, 812–828.
- Granovetter, M., 1988. The sociological and economic approaches to labor market analysis: a social structural view. In: Farkas, G., England, P. (Eds.), *Industries, Firms, and Jobs*. Plenum, New York, pp. 187–212.
- Hansen, D., Larson, R., Dworkin, J., 2003. What adolescents learn in organized youth activities: a survey of self-reported developmental experiences. *Journal of Research on Adolescence* 13, 25–55.
- Heckman, J., Stixrud, J., Urzua, S., 2006. The effects of cognitive and noncognitive abilities on labor market outcomes and social behavior. *Journal of Labor Economics* 24, 411–482.
- Holzer, H., 1996. *What Employers Want: Job Prospects for Less-Educated Workers*. Russell Sage Foundation Press, New York.
- Jencks, C., 1979. *Who Gets Ahead? The Determinants of Economic Success in America?* Basic Books, New York.
- Jencks, C., 1985. How much do high school students learn? *Sociology of Education* 58, 128–135.
- Kalsner, L., 1991. Issues in college student retention. *Higher Education Extension Service Review* 3, 3–10.
- Kao, G., Thompson, J., 2003. Race and ethnic stratification in educational achievement and attainment. *Annual Review of Sociology* 29, 417–442.
- Karen, D., 2002. Changes in access to higher education in the United States: 1980–1992. *Sociology of Education* 75, 191–210.
- Kerckhoff, A., Raudenbush, S., Glennie, E., 2001. Education, cognitive skill, and labor force outcomes. *Sociology of Education* 74, 1–24.
- Lleras, C., 2008. Race, racial concentration and the dynamics of educational inequality across urban and suburban schools. *American Educational Research Journal*, in press.
- Madon, S., Jussim, L., Keiper, K., Eccles, J., Palumbo, P., 1998. The accuracy and power of sex, social class, and ethnic stereotypes: a naturalistic study in person perception. *Personality and Social Psychology Bulletin* 24, 1304–1318.
- Mare, R., Winship, C., 1988. Ethnic and racial patterns of educational attainment and school enrollment. In: Sandefur, G., Tienda, M. (Eds.), *Divided Opportunities: Minorities, Poverty, and Social Policy*. Plenum, New York, pp. 173–206.
- Marsh, H., Kleitman, S., 2002. Extracurricular school activities: the good, the bad, and the nonlinear. *Harvard Educational Review* 72, 464–514.
- McNeal, R., 1995. Extracurricular activities and high-school dropouts. *Sociology of Education* 68, 62–80.
- Muller, C., Katz, S.C., Dance, J.L., 1999. Investing in teaching and learning. *Urban Education* 34, 292–337.
- Murnane, R., Levy, F., 1996. *Teaching The New Basic Skills: Principles for Educating Children to Thrive in a Changing Economy*. The Free Press, New York.
- Murnane, R., Willett, J., Duhaldeborde, Y., Tyler, J., 2000. How important are the cognitive skills of teenagers in predicting subsequent earnings? *Journal of Policy Analysis and Management* 19, 547–568.
- National Center for Education Statistics, 2000. *Fourth Follow-Up: Student Component Data File User's Manual: National Education Longitudinal Study of 1988*. U.S. Department of Education, Washington, DC.
- National Center for Education Statistics, 1992. *First Follow-Up: Student Component Data File User's Manual: National Education Longitudinal Study of 1988*. U.S. Department of Education, Washington, DC.
- Raudenbush, S., Kasim, R., 1998. Cognitive skill and economic inequality: findings from the National Adult Literacy Survey. *Harvard Educational Review* 68, 33–79.
- Rosenbaum, J., 2001. *Beyond College for All: Career Paths for the Forgotten Half*. Russell Sage Foundation, New York.
- Roscigno, V., Ainsworth-Darnell, J., 1999. Race, cultural capital, and educational resources: persistent inequalities and achievement returns. *Sociology of Education* 72, 158–178.
- Royston, P., 2004. Multiple imputation of missing values. *Stata Journal* 4, 227–241.
- Sewell, W., Hauser, R., 1975. *Education, Occupation, and Earnings*. Academic Press, New York.
- Sewell, W., Haller, A., Portes, A., 1969. The educational and early occupational attainment process. *American Sociological Review* 34, 82–92.
- Shouse, R., Schneider, B., Plank, S., 1992. Teacher assessments of student effort: effects of student characteristics and school type. *Educational Policy* 6, 266–288.
- Szasz, C., 2001. Assessing skills for work: two perspectives. *Oxford Economic Papers* 53, 385–405.
- Stata, 2003. *Stata Users Manual Release 8*. StataCorp, College Station, TX.
- Studenmund, A., 2001. *Using Econometrics: A Practical Guide*. Addison Wesley Longman, Inc.
- Woelfel, J., Haller, A., 1971. Significant others, the self-reflexive act, and the attitude formation process. *American Sociological Review* 36, 74–87.