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The American Economic Review, Vol. 91, No. 2, Papers and Proceedings of the Hundred Thirteenth Annual Meeting of the American Economic Association (May, 2001), 145-149.

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The Importance of Noncognitive Skills: Lessons from the GED Testing Program

By JAMES J. HECKMAN AND YONA RUBINSTEIN*

It is common knowledge outside of academic journals that motivation, tenacity, trustworthiness, and perseverance are important traits for success in life. Thomas Edison wrote that "genius is 1 percent inspiration and 99 percent perspiration." Most parents read the Aesop fable of the "Tortoise and The Hare" to their young children at about the same time they read them the story of "The Little Train That Could." Numerous instances can be cited of high-IQ people who failed to achieve success in life because they lacked self discipline and low-IQ people who succeeded by virtue of persistence, reliability, and self-discipline. The value of trustworthiness has recently been demonstrated when market systems were extended to Eastern European societies with traditions of corruption and deceit.

It is thus surprising that academic discussions of skill and skill formation almost exclusively focus on measures of cognitive ability and ignore noncognitive skills. The early literature on human capital (e.g. Gary Becker, 1964) contrasted cognitive-ability models of earnings with human capital models, ignoring noncognitive traits entirely. The signaling literature (e.g., Michael Spence, 1974), emphasized that education was a signal of a one-dimensional ability, usually interpreted as a cognitive skill. Most discussions of ability bias in the estimated return to education treat omitted ability as cognitive ability and attempt to proxy the missing ability by cognitive tests. Most assessments of school reforms stress the gain from reforms as measured by the ability of students to perform on a standardized achievement test. Widespread use of standardized achievement and ability tests for admissions and educational evaluation are premised on the belief that the skills that can be tested are essential for success in schooling, a central premise of the educational-testing movement since its inception.

Much of the neglect of noncognitive skills in analyses of earnings, schooling, and other lifetime outcomes is due to the lack of any reliable measure of them. Many different personality and motivational traits are lumped into the category of noncognitive skills. Psychologists have developed batteries of tests to measure noncognitive skills (e.g., Robert Sternberg, 1985). These tests are used by companies to screen workers but are not yet used to ascertain college readiness or to evaluate the effectiveness of schools or reforms of schools. The literature on cognitive tests ascertains that one dominant factor ("*g*") summarizes cognitive tests and their effects on outcomes. No single factor has yet emerged to date in the literature on noncognitive skills, and it is unlikely that one will ever be found, given the diversity of traits subsumed under the category of noncognitive skills.

Studies by Samuel Bowles and Herbert Gintis (1976), Rick Edwards (1976), and Roger Klein et al. (1991) demonstrate that job stability and dependability are traits most valued by employers as ascertained by supervisor ratings and questions of employers although they present no direct evidence on wages and educational

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attainment. Perseverance, dependability, and consistency are the most important predictors of grades in school (Bowles and Gintis, 1976).

Self-reported measures of persistence, self-esteem, optimism, time preference, and the like are now being collected, and some of the papers in this session discuss estimates of the effects of these measures on earnings and schooling outcomes. These studies shed new light on the importance of noncognitive skills. Yet they are not without controversy. For example, *ex post* assessments of self-esteem may be as much the consequence as the cause of the measures being investigated.

This paper avoids these problems by using evidence from the General Educational Development (GED) testing program in the United States to demonstrate the quantitative importance of noncognitive skills in determining earnings and educational attainment. The GED program is a second-chance program that administers a battery of cognitive tests to self-selected high-school dropouts to determine whether or not they are the academic equivalents of high-school graduates.

We summarize major findings reported in Heckman et al. (2000). The GED exam is successful in psychometrically equating GED test-takers with ordinary high-school graduates who do not go on to college. Recipients are as smart as ordinary high-school graduates who do not go on to college, where cognitive ability is measured by an average of cognitive components of the Armed Forces Qualifying Test (AFQT) or by the first principle component (g). By these same measures, GED recipients are smarter than other high-school dropouts who do not obtain a GED (see Fig. 1 for white males). The pattern is the same for other groups. GED recipients earn more than other high-school dropouts, have higher hourly wages, and finish more years of high school before they drop out. This is entirely consistent with the literature that emphasizes the importance of cognitive skills in determining labor-market outcomes.

Controlling for measured ability, however, GED recipients earn *less,* have lower hourly wages, and obtain lower levels of schooling than other high-school dropouts. Some unmeasured factor accounts for their relatively poor performance compared to other dropouts. We identify this factor as noncognitive skill, recognizing that a subsequent analysis should parcel out which specific noncognitive factors are the most important.

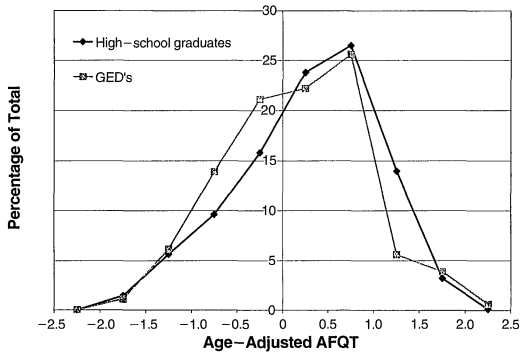

FIGURE 1. DENSITY OF AGE-ADJUSTED AFQT SCORES FOR WHITE MALE GED RECIPIENTS AND HIGH-SCHOOL GRADUATES WITH 12 YEARS OF SCHOOLING

The GED is a mixed signal. Dropouts who take the GED are smarter (have higher cognitive skills) than other high-school dropouts and yet at the same time have lower levels of noncognitive skills. Both types of skill are valued in the market and affect schooling choices. Our finding challenges the conventional signaling literature, which assumes a single skill. It also demonstrates the folly of a psychometrically oriented educational evaluation policy that assumes cognitive skills to be all that matter. Inadvertently, a test has been created that separates out bright but nonpersistent and undisciplined dropouts from other dropouts. It is, then, no surprise that GED recipients are the ones who drop out of school, fail to complete college (Stephen Cameron and James Heckman, 1993) and who fail to persist in the military (Janice Laurence, 2000). GED's are "wiseguys," who lack the abilities to think ahead, to persist in tasks, or to adapt to their environments. The performance of the GED recipients compared to both high-school dropouts of the same ability and high-school graduates demonstrates the importance of noncognitive skills in economic life.

I. Evidence from the GED Program

David Boesel et al. (1998) present a comprehensive review of evidence on the GED program. Currently one in two high-school dropouts and one in five high-school graduates,

as classified by the U.S. Census, is a GED recipient.[1] In a series of papers using National Longitudinal Survey of Youth (NLSY) data (Cameron and Heckman, 1993; Heckman et al., 2000), the following facts have been established about white males: (i) In unadjusted cross-sectional comparisons, GED recipients earn hourly wage rates and annual earnings substantially less than those of high-school graduates and earn slightly more than other high-school dropouts. GED recipients also have slightly more years of schooling than other dropouts. Accounting for their higher years of schooling, and for their higher AFQT scores, GED recipients earn *less* than other high-school dropouts and have lower hourly wages. These results are statistically significant. (ii) Controlling for fixed effects, longitudinal studies reveal that there is no evidence of a permanent effect of GED certification on wages, employment, or job turnover for persons who take the GED after age 17. GED recipients are more likely to change jobs, both before and after taking the exam. (iii) Both cognitive and noncognitive skills promote educational attainment. (iv) Persons with higher AFQT scores take the GED earlier. This accounts for an larger initial positive effect of GED certification on earnings for younger recipients that disappears with age. (v) In a model that explicitly accounts for both unmeasured (or badly measured) cognitive and noncognitive skills, in the short run GED certification appears to have an effect of boosting wages for persons who take the GED exam at young ages (younger than age 20), holding constant noncognitive skills, by signaling greater cognitive ability of workers. This effect fades quickly as employers rapidly learn about cognitive ability. In the long run, holding ability constant, GED recipients earn lower wages as their adverse noncognitive characteristics are revealed. (vi) The story for white females is slightly different. Girls who drop out of school because of pregnancy typically do so with fewer years of schooling attained than other girls who drop out. Girls who drop out for reasons other than pregnancy are like teenage boys who drop out (i.e., they earn less than other dropouts, conditioning on AFQT or schooling). As for teenage mothers, GED recipients earn the same as other high-school dropouts once AFQT scores and years of schooling are accounted for. (vii) There is some suggestion that white male GED recipients show the highest level of participation in (almost) every category of participation in illegal activity, compared to other high-school dropouts. This is true even when the outcomes are not adjusted for differences in AFQT and educational attainment. It is also true when we drop persons who acquire the GED in prison, or all persons who have been in prison, to avoid a spurious causal relationship arising from prisoners, and hence people with a greater participation in crime, acquiring the GED (see Table 1). The same applies for white females, except for teenage mothers, who are much less likely to get the GED in prison. GED recipients are more likely to participate in illegal drug use, drug-selling, fighting in school, vandalism, shoplifting, theft, robberies, and school absenteeism than are other dropouts.[2] (viii) The labor-force participation and employment rates of GED recipients are lower than those of other dropouts.[3] Their turnover rates are higher. These rates do not change with the acquisition of the GED. Hence, GED recipients accumulate less work experience over the life cycle. (ix) The correlation between AFQT scores and an index of participation in illicit activity defined in Heckman et al. (2000) is statistically significantly negative in the population at large (see Table 2). Individuals with higher AFQT scores are less likely to participate in illicit behavior. Yet this relationship does not hold within education groups. The correlation between AFQT scores and our index among all high-school dropouts and among high-school graduates (with 12 years of schooling) is positive and statistically significant. It is especially strong for all dropouts, suggesting that, among high-school dropouts, the higher the AFQT score, the more likely

[1] When GED recipients are counted as dropouts, the U.S. high-school dropout rate increased between 1975 and 1988 (see Heckman et al., 2000). In Heckman et al. (2000), we also document that the growth in GED certification among minorities accounts for a substantial component of the gap between black and white high-school graduates.

[2] Excluding GED recipients, the rate of illegal and delinquent behavior decreases monotonically as education levels rise.

[3] Conditional on AFQT scores and years of schooling completed.

TABLE 1—ILLICIT ACTIVITY BY WHITES, SHOWN SEPARATELY FOR HIGH-SCHOOL DROPOUTS, GED RECIPIENTS, AND HIGH-SCHOOL GRADUATES

Behavior	HSD	GED	HSG
Males:			
Index of illicit activity (ILA)	0.11 (0.012)	0.18* (0.017)	0.05 (0.006)
Particular questions:			
Skipped school in last year	0.13 (0.023)	0.10 (0.030)	0.00 (0.011)
Shoplifted last year	0.05 (0.027)	0.15* (0.039)	0.01 (0.014)
Used drugs last year	0.10 (0.026)	0.26* (0.039)	0.03 (0.013)
Ever stopped by police	0.16 (0.028)	0.25* (0.039)	0.09 (0.014)
Females:			
Index of illicit activity (ILA)	−0.01 (0.013)	0.05* (0.015)	−0.04 (0.004)
Particular questions:			
Skipped school in last year	0.00 (0.030)	0.13* (0.035)	0.00 (0.011)
Shoplifted last year	0.00 (0.038)	0.17* (0.045)	−0.03 (0.014)
Used drugs last year	0.09 (0.038)	0.24* (0.045)	0.03 (0.013)
Ever stopped by police	−0.03 (0.030)	0.00 (0.035)	−0.09 (0.009)

Notes: The table shows means (with standard errors in parentheses) from the NLSY for 22 yes/no questions regarding illegal and delinquent behavior, surveyed in 1980. Responses are age-adjusted and standardized to 0 mean in the population sample. ILA is the average score on the 22 yes/no questions regarding illicit and delinquent behavior. The male subsample excludes males reporting being in prison, for any period of time, in the years 1979–1994. The female subsample excludes teenage mothers. Abbreviations: HSD = high-school dropouts who do not get a GED degree; GED = GED recipients; HSG = high-school graduates who do not take further schooling (12 years of schooling).

* Significantly different from HSD figures at the 5-percent level.

TABLE 2—NORMALIZED REGRESSION COEFFICIENTS OF AFQT SCORES ON INDEX OF ILLICIT ACTIVITY (ILA) FOR WHITE MALES

	All		All dropouts[a]		HSG[b]
Variable	(i)	(ii)	(iii)	(iv)	(v)
ILA	−0.114 (0.031)	0.076 (0.028)	0.205 (0.069)	0.209 (0.063)	0.109 (0.05)
Schooling[c]		0.639 (0.025)		0.362 (0.061)	

Notes: ILA is the average score on 22 yes/no questions regarding illicit and delinquent behavior from the NLSY. The table reports results for a subsample of white males aged 16–18 when behavior was surveyed (1980). The subsample excludes people reporting being in prison, for any period of time, in the years 1979–1994. Standard errors are given in parentheses.

[a] GED recipients and other high-school dropouts.

[b] High-school graduates who do not take further schooling.

[c] For all dropouts, highest grade completed when they dropped out; for all others, highest grade completed (in 1994).

is participation in illicit activity. Such a tradeoff is entirely consistent with the view that both cognitive and noncognitive traits play important roles in determining graduation from high school.

II. Implications for Policy and Research

There are three main conclusions that we draw from our analysis apart from the conclusion that the GED is a mixed signal that characterizes its recipients as smart but unreliable. (i) Current systems of evaluating educational reforms are based on changes in scores on cognitive tests. These tests capture only one of the many skills required for a successful life (see Heckman, 1999). A more comprehensive evaluation of educational systems would account for their effects on producing the noncognitive traits that are also valued in the market. There is substantial evidence that mentoring and motivational programs oriented toward disadvantaged teenagers are effective. Much of the effectiveness of early-childhood interventions comes in boosting noncognitive skills and in fostering motivation (see Heckman [2000] for a comprehensive review of the literature). It has long been conjectured that the greater effectiveness of Catholic schools comes in producing more motivated and self-disciplined students (James Coleman and Thomas Hoffer, 1983). It has also been conjectured that the decline in discipline in inner-city public schools is a major source of their failure. It would be valuable to gather more systematic information on noncognitive effects of alternative education systems. (ii) IQ is fairly well set by age 8. Motivation and self discipline are more malleable at later ages (Heckman, 2000). Given the evidence on the

quantitative importance of noncognitive traits, social policy should be more active in attempting to alter them, especially for children from disadvantaged environments who receive poor discipline and encouragement at home. This would include mentoring programs and stricter enforcement of discipline in the schools. Such interventions will benefit the child and the larger society but at the same time may conflict with the liberal value of the sanctity of families that undervalue self-discipline and motivation and resent the imposition of middle-class values on their children. (iii) A more technical conclusion concerns the formulation of signaling models. Much of the current literature on labor-market signaling assumes a single hidden skill that is partially revealed by a test or a choice. Our evidence suggests that the GED is a mixed signal and conveys information about both cognitive and noncognitive skills. Mixed signals pose a challenge to economic theory because in general the "single crossing property" is violated. This requires a reformulation of signaling theory. Aloisio Araujo and Humberto Moreira (1999) develop such a reformulation.

This paper is written in the spirit of "dark matter" research in astrophysics. We have established the quantitative importance of noncognitive skills without identifying any specific noncognitive skill. Research in the field is in its infancy. Too little is understood about the formation of these skills or about the separate effects of all of these diverse traits currently subsumed under the rubric of noncognitive skills.[4] What we currently know, however, suggests that further research on the topic is likely to be very fruitful.

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[4] Heckman et al. (2000) note that GED recipients are more likely to come from affluent, but broken, homes than are other dropouts.