

# Hard evidence on soft skills

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The ascent of behavioral economics produced a union of economics with cognitive psychology and neuroscience. This article discusses a new point of contact between economics and psychology: personality psychology.<sup>1</sup> Personality psychology gives very rich descriptions of individual differences in traits and outcomes. Personality traits are important predictors of success in many areas of economic and social life. Individual variation in these personality traits—sometimes called “soft skills” or “character skills”—is an important source of inequality. Personality traits can be changed by intervention, and interventions that target personality are promising.

## What can economists take from and contribute to personality psychology?

Measures of personality are informative descriptions of human differences that supplement those offered by the standard preference parameters used in economics, such as risk aversion or preference for leisure. Economics can contribute to the field of personality psychology in defining traits, in distinguishing measurements of traits from other traits, and in determining the causal effect of traits on outcomes. And in turn, lessons from personality psychology can help economists identify hitherto unidentified sources of inequality.

## Psychological measurement systems

I begin with a brief description of psychological measurement systems. Measurement of cognition and educational attainment has been refined during the last century. Personality psychologists have constructed measures of personality traits and have shown that these traits predict many important life outcomes.

### Cognitive ability

Modern intelligence tests have been used since 1904, when the first IQ test was created.<sup>2</sup> The standardized achievement test was created in the wake of IQ tests as an objective and cost-effective measure of acquired skills. In contrast to IQ tests, thought to measure a fixed trait, standardized achievement tests were designed to measure skills that could be acquired in school and through life experience and that were widely applicable beyond the classroom.<sup>3</sup>

### Personality traits

IQ and achievement tests measure skills that have payoffs in labor markets. They do not measure personality traits that are also valued in the labor market, in school, and elsewhere in life. Personality psychologists have generally agreed on a taxonomy of traits called the “Big Five,” which are Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism—OCEAN for short. Table 1 defines these traits and their facets.

### How are psychological measurements validated?

The measurements of traits offered by psychologists should be taken with a grain of salt. Many of the validation studies in psychology have very limited objectives. For example, the validity of the SAT standardized assessment test is often based on how well it correlates with first-year college grades. There is a circular quality to many of these validation studies. For example, the validities of IQ tests are often based on correlations with other intelligence tests or with grades or scores on achievement tests. The validity standards for personality measurements are a bit better, as personality tests are often constructed to predict a wide array of behaviors, and thus may be validated by observing those behaviors.

### The predictive power of personality

There are several difficulties involved in synthesizing the evidence of the effect of personality on outcomes. First, measures of personality and cognition differ among studies. Even the Big Five set of traits identified above, while having fairly wide acceptance, is not universally agreed upon. Second, different studies use different notions of the predictive power of the measures. Third, very few studies address the question of causality. That is, does the measured trait cause, rather than simply predict, the outcome of interest?

The existing studies on the power of personality can be summarized briefly as follows: Conscientiousness—the tendency to be hardworking and organized—is the most predictive Big Five trait across a variety of outcomes. For example, a study of correlations of the Big Five and intelligence with college course grades found that Conscientiousness was just as important a predictor as intelligence, as measured by an IQ test.<sup>4</sup> My colleagues and I have consistently found that cognitive and personality traits are equally predictive across a great variety of labor market and social outcomes.<sup>5</sup> The SAT provides an interesting example, as it is so widely used in college admissions decisions. Multiple studies have shown that in comparing the relative predictive power of Conscientiousness and SAT scores for college grades (the very thing that SAT scores were designed to predict), Conscientiousness is just as predictive as the SAT, though neither is very predictive.<sup>6</sup>

**Table 1**  
**The Big Five Domains and Their Facets**

Big Five Personality Factor	American Psychology Association Dictionary Description	Facets (and Correlated Trait Adjective)	Related Traits	Analogous Childhood Temperament Traits
Openness to Experience	“The tendency to be open to new aesthetic, cultural, or intellectual experiences.”	Fantasy (imaginative), Aesthetic (artistic), Feelings (excitable), Actions (wide interests), Ideas (curious), and Values (unconventional)		Sensory sensitivity, Pleasure in low-intensity activities, and Curiosity
Conscientiousness	“The tendency to be organized, responsible, and hardworking.”	Competence (efficient), Order (organized), Dutifulness (not careless), Achievement striving (ambitious), Self-discipline (not lazy), and Deliberation (not impulsive)	Grit, Perseverance, Delay of gratification, Impulse control, Achievement striving, Ambition, and Work ethic	Attention/(lack of) distractibility, Effortful control, Impulse control/ delay of gratification, Persistence, and Activity <sup>a</sup>
Extraversion	“An orientation of one’s interests and energies toward the outer world of people and things rather than the inner world of subjective experience; characterized by positive affect and sociability.”	Warmth (friendly), Gregariousness (sociable), Assertiveness (self-confident), Activity (energetic), Excitement seeking (adventurous), and Positive emotions (enthusiastic)		Surgency, Social dominance, Social vitality, Sensation seeking, Shyness <sup>a</sup> , Activity <sup>a</sup> , Positive emotionality, and Sociability/affiliation
Agreeableness	“The tendency to act in a cooperative, unselfish manner.”	Trust (forgiving), Straightforwardness (not demanding), Altruism (warm), Compliance (not stubborn), Modesty (not show-off), and Tender-mindedness (sympathetic)	Empathy, Perspective taking, Cooperation, and Competitiveness	Irritability <sup>a</sup> , Aggressiveness, and Willfulness
Neuroticism / Emotional Stability	Emotional stability is “predictability and consistency in emotional reactions, with absence of rapid mood changes.” Neuroticism is “a chronic level of emotional instability and proneness to psychological distress.”	Anxiety (worrying), Hostility (irritable), Depression (not contented), Self-consciousness (shy), Impulsiveness (moody), Vulnerability to stress (not self-confident)	Internal vs. External, Locus of control, Core self-evaluation, Self-esteem, Self-efficacy, Optimism, and Axis I psychopathologies (mental disorders) including depression and anxiety disorders	Fearfulness / behavioral inhibition, Shyness <sup>a</sup> , Irritability <sup>a</sup> , Frustration, (Lack of) soothability, Sadness

**Source:** Adapted from O. P. John and S. Srivastava, “The Big Five Trait Taxonomy: History, Measurement, and Theoretical Perspectives,” in *Handbook of Personality: Theory and Research*, Second Edition, eds. L. A. Pervin and O. P. John (New York: Guilford Press, 1999).

**Notes:** Trait adjectives in parentheses from the Adjective Check List (H. G. Gough and A. B. Heilbrun, Jr. *The Adjective Check List Manual* (Palo Alto, CA: Consulting Psychologists Press, 1983)). <sup>a</sup>These temperament traits may be related to two Big Five factors.

## An economic framework for defining and measuring traits

All measurement systems in psychology are based on performance on tasks, such as tests, or in observations of behavior by analysts. An IQ test measures how well the examinee performs on the task of taking the IQ test. A behavioral report on a student filed by a teacher measures how well the student performs on the tasks of being respectful of others and disciplined. Performances on tasks are frequently equated with traits.

It is important to distinguish traits from measurements of traits that are affected by multiple factors. Economics can assist in making this distinction. For example, productivity on tasks that the measurements capture can be modeled as a response function that depends on traits and effort. The behaviors that constitute the measurements of personality are patterns of actions in response to the constraints, endowments, and incentives that individuals face, given their goals and preferences.<sup>7</sup> If incentives and constraints are changed, then the measures will in turn change. These considerations complicate the interpretation of measured traits.

### Distinguishing traits from measurements of traits

How can analysts recover traits from measurements of traits? Productivity can be observed in outcomes such as grades, test scores, and accomplishment of tasks. One challenge is to distinguish traits from effort, that is, to standardize for effort. Even if this is possible, it still leaves open the possibility that multiple traits may affect performance on any given task. It is extremely difficult to disentangle the separate roles of individual traits.

An important example illustrating that effort and incentives both affect performance is found in intelligence tests. Two studies in the 1970s offered incentives for performance. In both studies, those in the group that were offered incentives scored higher on intelligence tests than those in the group that was not offered incentives.<sup>8</sup> Thus, an “IQ gap” was created simply by offering incentives. Other studies have shown that levels of traits other than the traits sought to be measured matter. For example, people high in Conscientiousness are already highly motivated, and are much less likely to be influenced by incentives.<sup>9</sup> There is no “pure” measure of IQ. Even IQ scores need to be effort adjusted, and adjusted for personality traits that affect performance on IQ tests.

## Causality

Another area where economics can contribute to personality psychology is in establishing a causal relationship between traits and outcomes. There are a number of difficulties in doing this, including the issues just discussed. Parsing the different factors that produce an outcome on a task is very difficult. Added to this problem is the fact that outcomes can be influenced by incentives. This problem is even more of

a concern with personality measures than with cognition. Someone taking a personality test for a job is likely to give desirable answers even if they are not true.

These challenges are not insurmountable. I offer two examples of causal evidence of the effect of personality on outcomes—one from the GED testing program and one from a social experiment.

### Evidence from the GED testing program

This first study of causality demonstrates the power of personality and the costs of neglecting it. The GED is a standardized achievement test that provides an alternative to a high school diploma. High school dropouts who pass the GED test are certified as high school graduate “equivalents.” GED recipients have about the same cognitive ability as high school graduates, but differ in their personality traits. Figure 1 shows that the distributions of ability for GED recipients and high school graduates who do not go on to college are very similar, while the distribution for high school dropouts is very different and shifted to the left.

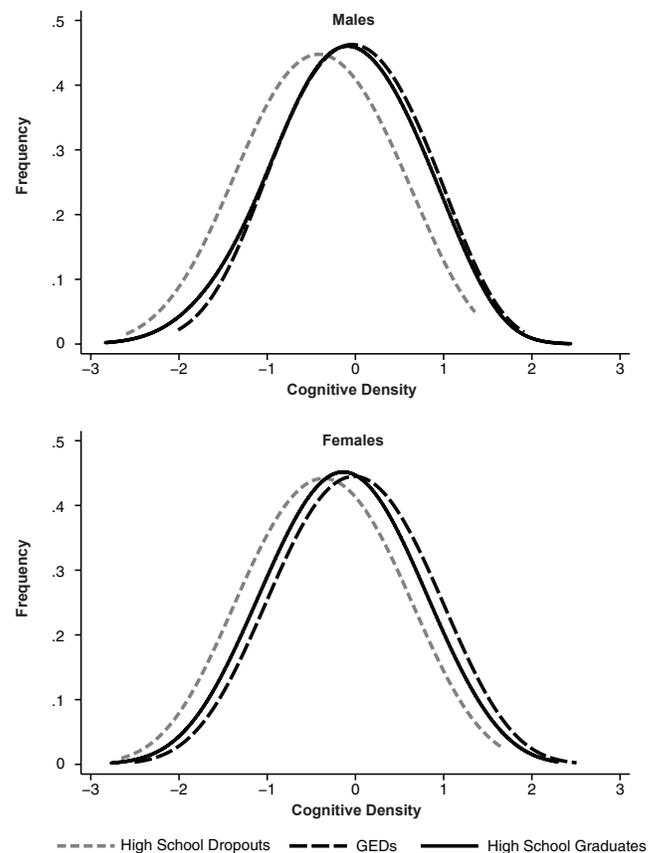


Figure 1. Cognitive ability by educational status.

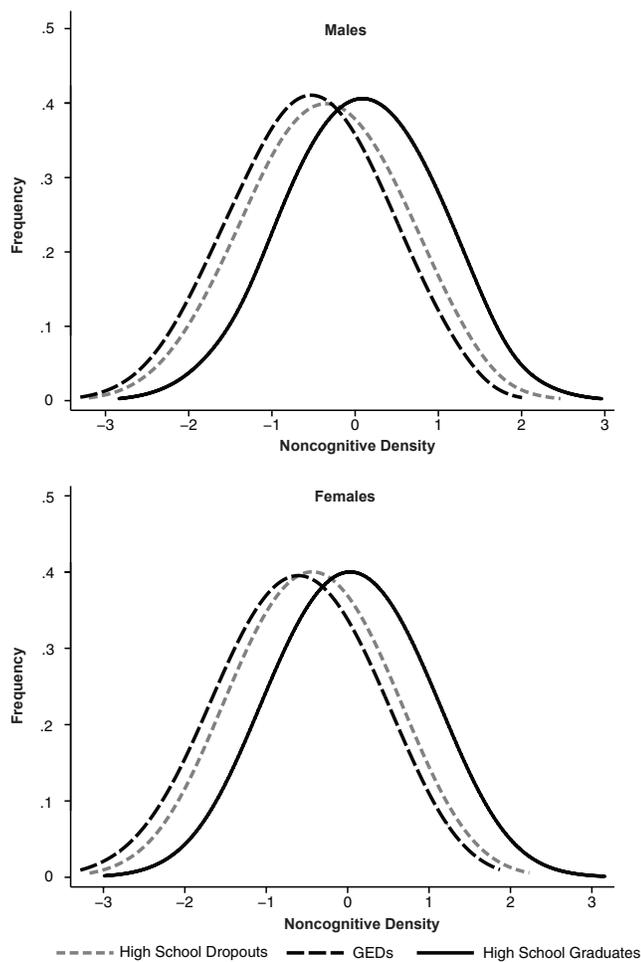
Source: J. J. Heckman, J. E. Humphries, S. Urzua, and G. Veramendi, “The Effects of Educational Choices on Labor Market, Health, and Social Outcomes,” *Journal of Political Economy*, (2013, under revision).

Note: Those who went on to college are not included in the figure.

Examining the distribution of noncognitive skills, on the other hand, tells a very different story. Figure 2 shows that the noncognitive density for GED recipients is very similar to that of high school dropouts, while that of high school graduates is shifted to the right.<sup>10</sup>

While many people with a GED go to college, their college graduation rates are much lower than those of high school graduates. Overall, those with a GED have similar earnings, employment, labor force participation, and hours worked as those who drop out of high school and do not GED certify. Without the ability to randomly assign noncognitive skills, it is difficult to definitively prove causality. However, in a forthcoming book, my coauthors—John Eric Humphries and Tim Kautz—and I estimate thousands of different empirical models on multiple datasets, and consistently find substantial differences in outcomes between those with a GED and those with a regular high school diploma.<sup>11</sup>

For males (the subject of the majority of studies on the effectiveness of the GED), there is no consistent evidence of



**Figure 2. Noncognitive skills by educational status.**

**Source:** J. J. Heckman, J. E. Humphries, S. Urzua, and G. Veramendi, “The Effects of Educational Choices on Labor Market, Health, and Social Outcomes,” *Journal of Political Economy*, (2013, under revision).

**Note:** Those who went on to college are not included in the figure.

any difference in outcomes between those with a GED and other high school dropouts. For females, however, there is some hint of a GED “effect.” After accounting for differences in cognitive ability, female GED recipients have higher annual earnings than high school dropouts. Although there is no difference in their hourly wages, female GED recipients are more likely than their uncertified high school dropout counterparts to participate in the labor force. However, we cannot be sure of the source of this effect. The estimated GED effect appears to be a selection effect. As a group, GED females have better personality skills than their male GED counterparts. Women more motivated to work may take the GED regardless of any causal effect of the GED on their labor force participation.<sup>12</sup>

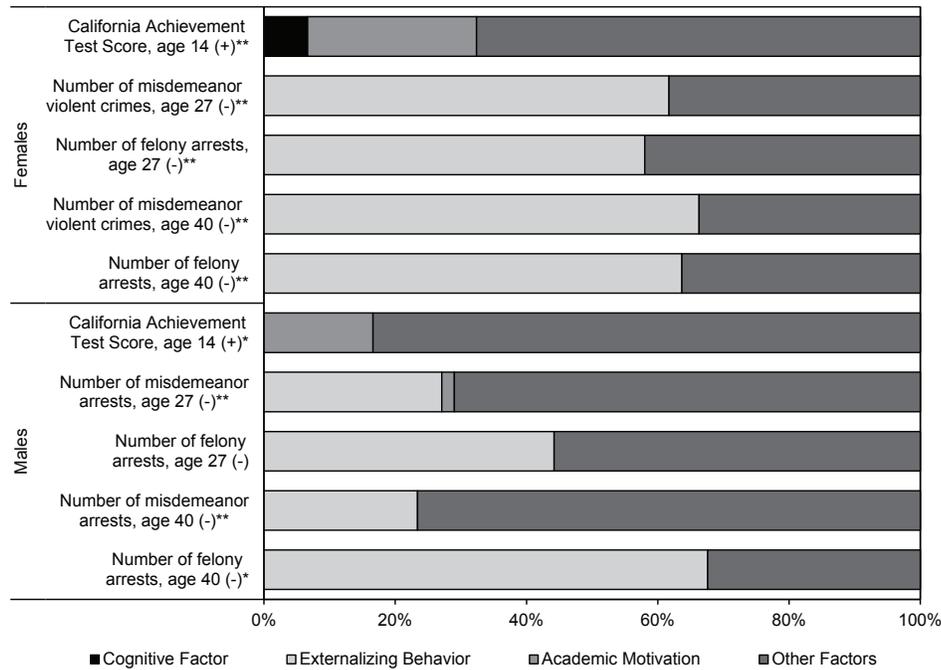
### Are traits set in stone?

Some psychologists have argued that personality traits are not stable over situations or over time.<sup>13</sup> However, the stability of traits and behaviors before and after GED certification found for most GEDs argues against preference change. There is an evolution of traits as people age, although the mechanisms producing this change are still not well understood. There is, however, evidence that Conscientiousness, previously identified as particularly important among personality traits, increases as people age.<sup>14</sup> Other traits, such as Openness to Experience, appear to decrease with age. Interventions can change traits.

### Evidence from a randomized intervention

My second study of causality and personality uses evidence from the Perry Preschool Program to show how personality traits can be changed in ways that produce beneficial lifetime outcomes. This enrichment program, carried out in the 1960s, was targeted to three- and four-year-old low-income black children who had IQs below 85 at age three. Participants were taught social skills, and home visits promoted parent-child interactions. A random-assignment evaluation of this program found no lasting program effects on IQ, leading some critics to dismiss the value of early education.<sup>15</sup> However, the evaluation did identify a variety of improved outcomes for participants with a statistically significant rate of return of 7 to 10 percent per year.<sup>16</sup> The program worked primarily through improving personality traits. Members in the treatment group have better measures of personal behavior, as well as “Externalizing Behavior,” a psychological construct related to Agreeableness and Conscientiousness. For girls, the program also improved Openness to Experience. The program improved scores on the California Achievement Test, despite the finding of no program effect on IQ. This result is consistent with the notion that performance on achievement tests, generally regarded as measures of cognition, also reflects personality traits. Achievement tests capture acquired knowledge and higher levels of motivation that lead to greater learning.

Decomposing treatment effects into their experimentally determined sources produces an interesting pattern. Figure 3 shows the results of this analysis for a number of outcomes.



**Figure 3. Decompositions of treatment effects on outcomes.**

**Source:** J. J. Heckman, R. Pinto, and P. Savalyev, “Understanding the Mechanisms Through Which an Influential Early Childhood Program Boosted Adult Outcomes,” *American Economic Review* (2013, forthcoming).

**Notes:** Each bar represents the total treatment effect normalized to 100%. “(+)” and “(-)” indicate positive and negative total treatment effects. Statistical significance levels of decompositions are indicated as \*\* = 5 percent; \* = 10 percent.

All reported treatment effects are statistically significant even after adjusting for the effect of multiple-hypothesis testing. The figure shows the proportion of the treatment effect displayed due to the indicated factors. Boosts in Externalizing Behavior play a major role in producing the Perry treatment effects. This evidence suggests that a policy that expands exposure to preschool can make a difference, not only in improving scores on achievement tests, but also in improving noncognitive outcomes—personality skills—where gains persist even into adulthood.

## Conclusions

Economists can learn from and contribute to personality psychology. Measures of personality predict many behaviors, sometimes with the same strength as conventional measures of cognitive traits and sometimes even more strongly, as in the Perry Preschool effects of treatment-induced Externalizing Behavior on adult outcomes. Using personality traits augments our ability to predict behaviors.

Personality psychology considers a wider array of actions than are usually considered by economists. Drawing on the lessons of personality psychology enlarges the economist’s ability to describe and model the world and understand the sources of poverty. Personality measures explain some of the variation in outcomes that produce inequality, though there is still much to be learned. Understanding personality helps us understand the nature of the tests that are used to monitor

schools and societies. For example, tests intended to measure cognition, such as those used for No Child Left Behind, also partly measure motivation and effort.

Personality traits persist across situations. They are not set in stone, but change in stable ways over the life cycle. They are a possible avenue for effective interventions and wise public policy.

Economists can contribute to personality psychology by providing the precise models that personality psychologists lack. Economics provides a framework for recasting the field and collecting incentive-adjusted measures of personality, achievement, and IQ.

Economics is now playing a role in clarifying the concepts and empirical content of psychology. More precise models reveal basic identification problems that plague the measurements collected in psychology and warn economists not to use uncritically the measures developed by psychologists. The next wave of personality measures will incorporate and be improved by this research.

Economics can also be used to interpret the correlations reported in personality psychology. Many contemporaneously measured relationships between traits and behaviors are plagued by the problem of reverse causality. Economists can apply their tools to define and estimate causal mechanisms and to thus understand the causes of effects and not just the correlations among variables.

## Future research

Future research in economics and psychology holds both challenges and research opportunities. Personality parameters and economic preference parameters do not correspond very closely.<sup>17</sup> However, the research required to control for the major confounding factors that determine psychological measurements has just started. It is possible that a tighter connection will emerge. More work needs to be done in developing rigorous methods for analyzing causal relationships in both fields. Since important policy decisions are being made based on findings reported in psychology, it is important to strive to establish which empirical relationships are causal.

It will also be necessary to develop a common language and framework to promote exchange between economics and personality psychology. Economists must be careful not to assume that basic questions of content and identification have been answered by psychologists at the level required for rigorous economic analysis. These questions should be reexamined using economic frameworks.

Economists should promote better systems of data collection that address the basic identification questions in the field. Personality measurements are being collected worldwide in a variety of contexts, and economists have the opportunity to contribute to and improve these measures. This offers a great opportunity to obtain a greater understanding of an important source of individual differences. ■

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<sup>1</sup>The work described in this article is detailed in J. J. Heckman and T. Kautz, "Hard Evidence on Soft Skills," *Labour Economics* 19, No. 4 (2012): 451–464.

<sup>2</sup>In 1904, La Société Libre pour l'Etude Psychologique de L'Enfant appointed a commission, led by Alfred Binet, to create a mechanism for identifying students in need of specialized education programs.

<sup>3</sup>See E. F. Lindquist, "Preliminary Considerations in Objective Test Construction," in *Educational Measurement*, ed. E. F. Lindquist, (Washington, D.C.: American Council on Education, 1951).

<sup>4</sup>A. E. Poropat, "A Meta-Analysis of the Five-Factor Model of Personality and Academic Performance," *Psychological Bulletin* 135, No. 2 (2009): 322–338.

<sup>5</sup>J. J. Heckman, J. E. Humphries, S. Urzua, and G. Veramendi, "The Effects of Educational Choices on Labor Market, Health, and Social Outcomes," *Journal of Political Economy*, (2013, under revision).

<sup>6</sup>See for example, E. E. Nofle and R. W. Robins, "Personality Predictors of Academic Outcomes: Big Five Correlates of GPA and SAT scores," *Journal of Personality and Social Psychology* 93, No. 1 (2007): 116–130; and R. N. Wolfe and S. D. Johnson, "Personality as a Predictor of College Performance," *Educational and Psychological Measurement* 55, No. 2 (1995): 177–185.

<sup>7</sup>See M. Almlund, A. Duckworth, J. J. Heckman, and T. Kautz, "Personality, Psychology, and Economics," in *Handbook of the Economics of Education*, Vol. 4, 2011, pp. 1–181; and Heckman and Kautz, "Hard Evidence on Soft Skills."

<sup>8</sup>C. V. Edlund, "The Effect on the Behavior of Children, as Reflected in the IQ Scores, When Reinforced After Each Correct Response," *Journal of Applied Behavior Analysis* 5, No. 3 (1972): 317–319; and S. E. Breuning and W. F. Zella, "Effects of Individualized Incentives on Norm-Referenced IQ

Test Performance of High School Students in Special Education Classes," *Journal of School Psychology* 16, No. 3 (1978): 220–226.

<sup>9</sup>L. Borghans, H. Meijers, and B. ter Weel, "The Role of Noncognitive Skills in Explaining Cognitive Test Scores," *Economic Inquiry* 46, No. 1 (2008): 2–12.

<sup>10</sup>Noncognitive skills can be measured by participation in risky behaviors such as crime, violence, sexual activity, smoking, and alcohol use during the adolescent years. The proportions of GED recipients and high school dropouts who exhibit these behaviors are similar, and much higher than those of high school graduates.

<sup>11</sup>J. J. Heckman, J. E. Humphries, and T. Kautz, eds., *The GED and the Problem of Character in American Life*, (Chicago: University of Chicago Press, forthcoming). See especially Chapter 5.

<sup>12</sup>For further discussion, see Heckman et al., *The GED and the Problem of Character*.

<sup>13</sup>W. Mischel, *Personality and Assessment* (New York: Wiley, 1968); and R. H. Thaler, "Short Course in Behavioral Economics," Edge Master Class, Sonoma, CA, July 25–27, 2008, at [http://www.edge.org/3rd\\_culture/thaler\\_sendhil08/thaler\\_sendhil\\_index.html](http://www.edge.org/3rd_culture/thaler_sendhil08/thaler_sendhil_index.html).

<sup>14</sup>See the evidence cited in L. Borghans, A. Duckworth, J. J. Heckman, and B. ter Weel, "The Economics and Psychology of Personality Traits," *Journal of Human Resources* 43, No. 4 (2008): 972–1059.

<sup>15</sup>For a summary of the literature see, for example, F. Cunha, J. J. Heckman, L. J. Lochner, and D. V. Masterov, "Interpreting the Evidence on Life Cycle Skill Formation," in *Handbook of the Economics of Education*, eds. E. A. Hanushek and F. Welch (Amsterdam: North-Holland, 2006), pp. 697–812; and J. J. Heckman and D. V. Masterov, "The Productivity Argument for Investing in Young Children," *Review of Agricultural Economics* 29, No. 3 (2007): 446–493.

<sup>16</sup>J. J. Heckman, S. H. Moon, R. Pinto, and A. Q. Yavitz, "The Rate of Return to the High Scope Perry Preschool Program," *Journal of Public Economics* 94, No. 1–2 (2010): 114–128.

<sup>17</sup>A. Becker, T. Deckers, T. Dohmen, A. Falk, and F. Kosse, "The Relationship between Economic Preferences and Psychological Personality Measures," *Annual Review of Economics* 4 (2012): 453–478.