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Causes and Consequences of Cognitive Functioning Across the Life Course

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Abstract

Research on variation in cognitive abilities has focused largely on their genetic or experiential sources and on their economic consequences. This article takes a broader look at the consequences of cognitive ability—IQ—across the life course. Contrary to received wisdom, the effects of IQ on economic success are almost entirely mediated by educational attainment. Among persons with equal levels of schooling, IQ has little influence on job performance, occupational standing, earnings, or wealth. But there are other, sometimes surprising consequences of IQ throughout adult life. The long-term correlates of adolescent cognition include drinking behavior, survey participation, Internet use, and the timing of menopause. These are surveyed primarily using findings from the Wisconsin Longitudinal Study.

Keywords

educational attainment; IQ; life course; occupation

Despite occasional references to Michael Young's (1958) satirical essay, *The Rise of the Meritocracy*, and periodic public interest in the place of intelligence in society, social scientists, policy analysts, and policy makers mainly ignore cognitive abilities and their consequences. Neither is much attention paid to the larger issues raised by Young's essay, namely, what would be the political and social consequences of equalization of opportunity and of the universal use of ability or achievement tests as tools of social selection? Perhaps the lack of attention to Young's argument follows from the facts that children's opportunities are anything but equal and that cognitive mediocrity prevails in much of our public life.

To be sure, there is great interest in the use of tests to make decisions about individuals—in school and on the job—but the focus is more on the causes and consequences of the testing phenomenon than on the causes or consequences of the things that tests purport to measure (National Research Council, Committee on Appropriate Test Use, 1999). There is also sustained research and policy interest in the sources of Black–White differences in school achievement (Jencks & Phillips, 1998)—surely a critically important issue—but again that issue is often treated in isolation, assuming, but not examining, the effects of cognitive abilities across the life course.

Those who ignore variation in cognitive abilities are open to the accusation that they have failed to consider the full range of factors affecting social and economic success, and they leave the field open to advocates who claim, with remarkably thin evidence and questionable motives, that cognitive ability is or will become the key variable in social stratification. Such claims are revived periodically, for example, in the wake of Jensen's

(1969) article "How Much Can We Boost IQ and Scholastic Achievement?" and a decade and a half ago in the controversy surrounding Herrnstein and Murray's (1994) *The Bell Curve* (Devlin, Fienberg, Resnick, & Roeder, 1997; Fischer et al., 1996; Fraser, 1995; Jacoby & Glauberman, 1995; Kincheloe, Steinberg, & Gresson, 1996). No doubt, it will happen again, possibly encouraged by consequences of test-driven educational reform. In my opinion, the best way to prepare for the next round will be to have the facts well in hand, well in advance. There is much to be learned from careful study and consideration of the correlates and consequences of cognitive functioning across the life course.

In this essay, I first review some features of the psychometric argument and evidence commonly offered to support it, with particular emphasis on the relationship between academic ability and occupational status, which is an excellent signal of socioeconomic standing—perhaps better than income or wealth for persons of working age (Hauser & Warren, 1997). Relative to the national fixation on academic achievement as the sine qua non of the schooling process, the evidence that it matters directly in adult socioeconomic success is sparse. Following that review, I turn to other areas in which there is evidence of a persisting, direct influence of academic ability. These include drinking behavior, survey participation, Internet use, and the timing of menopause.

Why Neglect Abilities?

I believe that a predilection toward social structural explanation partly explains the small part played by cognitive ability (and, for that matter, other social psychological variables) in much current research on social stratification and inequality.[1] In addition, Herrnstein and Murray argue that, since the 1960s, and especially since the publication of Arthur Jensen's (1969) controversial article in the *Harvard Educational Review*, it has been politically incorrect to study the role of intelligence in social life (Herrnstein & Murray, 1994, pp. 7–14). They offer this caricature of the conventional wisdom:

> Intelligence is a bankrupt concept. Whatever it might mean—and nobody really knows even how to define it—intelligence is so ephemeral that no one can measure it accurately. IQ tests are, of course, culturally biased, and so are all the other "aptitude" tests, such as the SAT. To the extent that tests such as IQ and SAT measure anything, it certainly is not an innate "intelligence." IQ scores are not constant; they often change significantly over an individual's life span. The scores of entire populations can be expected to change over time—look at the Jews, who early in the twentieth century scored below average on IQ scores and now score well above the average. Furthermore, the tests are nearly useless as tools, as confirmed by the well-documented fact that such tests do not predict anything except success in school. Earnings, occupation, productivity—all the important measures of success—are unrelated to the test scores. All that tests really accomplish is to label youngsters, stigmatizing the ones who do not do well and creating a self-fulfilling prophecy that injures the socioeconomically disadvantaged in general and blacks in particular. (pp. 12–13)

Like much of Herrnstein and Murray's text, this is an odd mixture of fact and fiction, both in content and as a characterization of the beliefs and practices of social scientists. It is unfortunately easy to find support for some of the less valid beliefs expressed in the caricature, both in the history to which Herrnstein and Murray refer and in some public responses to *The Bell Curve* (Fraser, 1995; Jacoby & Glauberman, 1995; Kincheloe et al., 1996). There is also contrary evidence, not least among which is the useful time series of

[1]One account of the social psychology of stratification ignores cognitive ability and makes only passing reference to academic performance (Mortimer, 1996).

cross-sectional measurements of verbal ability in the General Social Survey (GSS) from 1974 to the present (Hauser & Huang, 1997; Huang & Hauser, 1998, 2001; Weakliem, McQuillan, & Schauer, 1995).

I have never thought it disreputable or risky either to teach about or to investigate relationships of measured cognitive ability with social or economic variables. The greatest barriers to more thorough examination of these relationships are the scarcity of suitable data and the difficulty of obtaining more of them. Social scientists are often reluctant to include measures of cognitive functioning in social surveys, believing either that it takes too much time, that survey interviewers will be reluctant to test respondents, or that survey respondents will refuse to respond. In fact, as demonstrated by long practice in the GSS, the Health and Retirement Study, and the Wisconsin Longitudinal Study (WLS), research participants are more than willing to respond to cognitive assessments in social surveys. Moreover, recent developments in adaptive testing will increase the validity and efficiency of such assessments.[2]

Ability and What Else?

My reading of the available evidence is that general cognitive ability is—and long has been—of sufficient importance in American society to justify its inclusion in any serious effort to model the process of stratification. At the same time, I think that it is entirely reasonable to ignore cognitive ability in many contexts, for example, in many trend measurements. The importance of cognitive ability is by no means as great, nor its malleability as slight, as is suggested by advocates like Herrnstein and Murray (Herrnstein, 1973; Herrnstein & Murray, 1994), Eysenck (1971), Jensen (1980, 1998), Seligman (1992), and Gottfredson (1997b). Moreover, other social psychological variables are also, too often, ignored in studies of the stratification process, and their claim on our theoretical interest is quite as large as that of cognitive ability. In short, we cannot claim to offer a scientific account of social stratification if our vision of the world is limited to social and economic variables; nevertheless, a vision that includes those variables, plus general cognitive ability alone, is scarcely less limiting.

It is not clear, except through the unfortunate history of social Darwinism (Gould, 1981, 1994), why the idea of merit should be identified so closely with mental ability, as distinct from many other conditions and traits other than social origins and schooling that improve the chances of social and economic success.[3] Among these, for example, one might list ambition or drive, perseverance, responsibility, personal attractiveness, and physical or artistic skills or talents, along with access to social support and to favorable social and economic networks and resources.[4] To be sure, cognitive functioning plays an important role in the social structure of complex societies, but it is only one among the several identifiable factors in achievement beyond the initial conditions of race, gender, geographic location, and socioeconomic origin.

What questions ought we to be asking, more often and in more detail? Here are some examples. What roles are played in the stratification process by abilities, either the general cognitive factor, *g*, abstracted by many psychometricians, or other more specific abilities?

[2]Of course, serious problems of model specification occur when cognitive ability is measured contemporaneously with its supposed consequences. As a measurement strategy, it is far better to collect prospective, longitudinal data.

[3]Also, see Goldthorpe, Erikson, and Jonsson's (1996) discussion of Michael Young's (1958) satirical essay, "The Rise of the Meritocracy," in which they note Young's equation of merit with "ability plus effort." When Herrnstein (1973) adopted Young's neologism, he never referred to the latter term, and Herrnstein and Murray (1994) did not cite Young at all. Herrnstein might have been forgiven this slip, for Young's essay dwells heavily on ability, and "effort" plays no part in the hypothetical history.

[4]See, for example, the work of Clausen (1993), *American Lives*, which follows the careers of a small California sample from youth to old age.

What are their causes and consequences? How and to what extent are conceptions of abilities socially defined, and how do these definitions vary across time and place? To what extent are abilities stable across childhood and the life course? How do they change? How does social organization affect their changes or their consequences?[5] For example, how have social welfare systems altered the possible effects of cognitive ability on life chances? How has the institutionalization of ability testing affected either the sources or consequences of measured abilities (Lemann, 1995a, 1995b, 1996, 1999)? How will the increased use of large-scale assessments in primary and secondary education affect the importance of cognitive functioning in the stratification process? How will it affect the progress of students through school and their later life chances (National Research Council, Committee on Appropriate Test Use, 1999)? More generally, how have cognitive ability differentials and their consequences varied within and among populations and across time and place? In the remainder of this essay, I try to address some of these questions—with specific reference to general cognitive ability—and, to the extent possible, bring data to bear on them. My intention is not to cover the subject fully but to provide illustrations both of what we know and of what we do not know.

What Is Cognitive Ability?

The notion that people have a general and persistent level of cognitive ability arose from the work of Spearman, who observed positive correlations among performance in different mental tasks and suggested that these correlations could be explained by a single, unmeasured, common or general factor (Spearman, 1904, 1923, 1927).[6] The subsequent history of psychometric research is filled, on the one hand, with confirmations of the finding that performances on cognitive tasks are always positively correlated and, on the other, with arguments about the existence both of a general factor and of less general subfactors. That is, the psychometric accounts of ability are variations on a hierarchical theme including task-specific factors, factors general to like tasks, and a factor general to all tasks.

There is even less agreement about what, exactly, the general factor is and whether it is a purely statistical construct or an actual entity.[7] That is, what is in common among the tasks that display consistent evidence of common factor causation? For example, Gottfredson (1997b) describes *g* as “the ability to deal with complexity” (pp. 81, 93). Gottfredson’s account of *g* appears in a special issue of *Intelligence* “designed to be an informative extension of the collective statement, ‘Mainstream Science on Intelligence,’” which was originally published in the *Wall Street Journal* in December 1994. The “Mainstream Science” statement defined intelligence more broadly:

> Intelligence is a very general mental capability that, among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly, and learn from experience. It is not merely book-learning, a narrow academic skill, or test-taking smarts. Rather, it reflects a broader and deeper capability for comprehending our surroundings “catching on,” “making sense” of things, or “figuring out” what to do. (Gottfredson 1997a, p. 13)

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[5]Fischer et al. (1996) make the social control of relationships between ability and life chances the major theme of their critique of *The Bell Curve*.

[6]I have unfortunately neglected other major developments in cognitive psychology, which include the specification of different types of intelligence, for example, Sternberg’s (1995) work on practical versus academic intelligence. My neglect is not because I think this work is unimportant, invalid, or uninteresting. Rather, I am seeking here to take on the claims of old-fashioned psychometrics on its own terms, and I am looking for the kind of evidence that is presently available in large samples.

[7]This same problem occurs in all structural equation models that contain unobservable variables. In many instances, “unobservables” are no more than the true values of variables measured with error, but *g*, the general cognitive factor, is at least a second-order factor. That is, *g* would be unobservable in the simplest psychometric accounts of ability, even if there were no measurement error. It is striking that, among observables, only general ability appears to be important enough for us to try to decide whether we are really dealing with a concrete entity rather than a hypothetical construct.

Within the same volume of *Intelligence,* Carroll's judicious review cites numerous efforts to define the meaning of intelligence and reports little agreement. For example, in describing a recent volume on theories of intelligence, he credits various experts with "the total intellectual repertoire of behavioral responses," "some general property or quality … of the brain," "reaction-time and physiological measures," and "many different information-processing abilities" (Carroll, 1997, p. 41). Ultimately he focuses on "the rate with which learning occurs or the time required for learning" (p. 43). Again, within the same volume, Plomin and Petrill (1997) write, "What we mean by intelligence is general cognitive functioning (*g*) as assessed in the psychometric tradition of a general factor derived from a battery of diverse cognitive ability tests" (p. 56). In this last definition, "intelligence" is what intelligence tests measure.

It is easy to make fun of a discipline that cannot agree on the meaning of its central construct, even within a work intended to display consensual views. However, despite vagaries of definition, I admit the possible utility of the intelligence construct, strictly on the consistent evidence of its operational properties. There is still a fundamental conceptual and operational weakness of the psychometric project, which affects both the validity of that enterprise and the availability of data appropriate for stratification research. The psychometric concept of ability and of the structure of abilities is formed entirely from the relationships among test scores. It thus ignores the relationships between the scores, factors based on the scores, and all other variables, whether they be conceived as causes, effects, or merely correlates of ability factors. For example, in his magnum opus, a mammoth review and analytic synthesis of classic mental test data, Carroll (1993) writes,

> This book deals with a very wide variety of abilities—that is, all that can be demonstrated from empirical studies, regardless of whether their importance can be shown …. We cannot adequately appraise the importance of different human abilities until we have mapped the whole spectrum of those abilities. (p. 15)

This limited and parochial goal of psychometrics has two undesirable consequences.

First, it implies that any variable other than a test score should be related to test scores and their primary, secondary, or general factors only through its relationship with *g.* Indeed, some psychologists claim this is the case, both with respect to job performance (Hunter, 1980, 1986; Ree, Earles, & Teachout, 1994) and across a wide range of social, economic, and political outcomes (Herrnstein & Murray, 1994). If one focuses only on relationships among test scores, it is impossible to find evidence contrary to the hierarchical model in relationships between test scores and external criteria.

In fact, there is contrary evidence from external validation studies, that is, evidence that IQ or *g* is neither the sole nor necessarily the most important cognitive factor in adult socioeconomic success.[8] For example, in the National Longitudinal Study of Youth, the same data analyzed by Herrnstein and Murray in *The Bell Curve,* the Numerical Operations (NO) and Computational Speed (CS) components of the Armed Services Vocational Aptitude Battery (ASVAB) are not closely related to the IQ factor measured by the four components of the ASVAB that make up the Armed Forces Qualification Test (AFQT; Herrnstein & Murray, 1994, pp. 580–583). Yet Goldberger (1995) and Heckman (1995) have each found that NO and CS are at least as important as the AFQT in determining the earnings of young workers. That is, the several outcomes analyzed in *The Bell Curve* appear to respond differentially to the several components of the ASVAB, and the differential responses are not explained by the closeness of the components to a general ability factor.

[8]Evidence of this kind is well known in the psychometric community, but it appears to have had little effect on beliefs about the importance of *g* (Jensen, 1986).

Second, the belief that cognitive abilities are ultimately unitary in their implications has discouraged researchers from including a range or variety of measures in studies of the sources and consequences of cognitive abilities. A most valuable resource, the Project Talent study of the 1960s in the United States, has been abandoned for decades. The school-based longitudinal studies—the 1972 national longitudinal study High School and Beyond (1980), and the National Educational Longitudinal Study of 1988—do contain multiple measures of school achievement, for example, test scores in verbal and mathematical skills, but many other ability measures have not been included. Perhaps the most important American data resource is the National Longitudinal Study of Youth of 1979, which includes all of the measures making up the ASVAB; the sample has now been followed to ages 44 to 51 (in 2009). However, the National Longitudinal Study of Youth test scores are problematic because they increased with age and level of schooling at test administration and dropped among youth who were no longer enrolled in school (Neal & Johnson 1996). Unfortunately, there are no national longitudinal data in which the effects of a full range of test performances can be assessed across a broad array of life outcomes.

Occupational Differentials in Ability: A Psychometric View

One standard validation of the psychometric argument is differential ability by occupation. Standard works on testing have regularly included reviews of data on cognitive ability by occupation (Gottfredson, 1997b; Jensen, 1980; Matarazzo, 1972; Tyler, 1965; Wechsler, 1958), and there is, no doubt, a clear gradient in average levels of measured cognitive ability across occupations. The interesting questions are how steep the gradient is, just how ability distributions differ across occupations, and how those differentials come about.

Jensen's (1980, pp. 339–347) discussion of occupational differentials in intelligence provides a fascinatingly flawed example of psychometric thinking on the subject. Jensen begins by noting a well-known social fact—familiar to sociologists—that "people's average ranking of occupations is much the same regardless of the basis on which they were told to rank them" (p. 340; Hodge, 1981; Hodge, Siegel, & Rossi, 1964; Kraus, Schild, & Hodge, 1978; Treiman, 1975, 1977). In parallel with Duncan, Featherman, and Duncan (1972, pp. 69–79), Jensen notes the high correlation between ratings of the intelligence required in various occupations and other measures of occupational standing. In Jensen's account, in 1920 F. E. Barr arranged for "30 psychological judges" to rate "120 specific occupations, each definitely and concretely described, … according to the level of general intelligence required for ordinary success in the occupation" (p. 340). These "subjective intelligence requirements" were correlated .91 with 1964 National Opinion Research Center (NORC) prestige ratings of the "subjectively opined prestige" of the occupations and .81 with the assignment by the 1960 *U.S. Census of Population: Classified Index of Occupations and Industries* of "a composite index score based on the average income and educational level prevailing in the occupation."

This garbled account is evidently drawn straight from Duncan et al.'s (1972) analysis of scores from the Barr scale, as reported by Terman (1925, p. 66). However, Jensen (1980) *never* cites Duncan et al., nor does he cite Terman's work in the passage in question.[9] The lower of the correlations cited by Jensen, .81 between the "composite index score" and the Barr scale, pertained to 96 matches between Barr and Census occupation titles; the higher cited correlation, .91 between the Barr scale and prestige ratings, pertained to 47 matches between Barr titles and NORC titles. In that same set of 47 titles, Jensen ignored Duncan et

[9]One interesting bit of evidence that Jensen relied on Duncan, Featherman, and Duncan (1972) is the fact that both erred in reporting that Barr used 30 judges; Terman (1925, p. 66) reports that there were 20 judges. None of these sources cites a publication by Barr, and I have not been able to locate such an independent publication.

al.'s report of a virtually equal correlation, .90, between the Barr scale and the "composite index score." Moreover, the "composite index score" was not assigned by the Bureau of the Census, but was Duncan's (1961) socioeconomic index for occupations.

After noting the persistence of occupational prestige ratings across time, Jensen (1980) goes on to observe that "the correlations between *average* prestige ratings and *average* IQs in occupations are very high—.90 to .95—when the averages are based on a large number of raters and a wide range of rated occupations." He concludes, "This means that the average of many people's subjective perceptions conforms closely to an objective criterion, namely, tested IQ" (p. 340). That is, IQ differences among occupations are the root cause of people's perceptions of occupational prestige.

Duncan et al.'s (1972) conclusion—from essentially the same data—is notably different from that of Jensen:

> The psychologist' s conception of the "intelligence demands" of an occupation is very much like the general public's concept of the prestige or "social standing" of an occupation. Both are closely related to independent measures of the aggregate social and economic status of the persons pursuing an occupation …. Intelligence is a socially defined quality and this social definition is not essentially different from that of achievement or status in the occupational sphere. (p. 77)

That is, intelligence is socially defined in terms of what is socially valued in occupations (pp. 77–78), and "a correlation between IQ and occupational achievement was more or less built into IQ tests, by virtue of the psychologists' implicit acceptance of the social standards of the general populace."

Jensen (1980) next argues that

> evidence contradicts the notion that IQ differences between occupations are a result rather than a cause of the occupational difference. Professional occupations do not score higher than unskilled laborers on IQ tests because the professionals have had more education or have learned more of the test's content in pursuit of their occupations. (p. 341)

This is incorrect, he argues, because "childhood IQs of 219 men correlated substantially with adult occupational status as measured on the Barr scale some 14 to 19 years later (Ball, 1938)" and because average IQs differed between high- and low-status occupations held later in life by 10,000 World War II Air Force cadets, who were above average in IQ and educational attainment (Thorndike & Hagen, 1959). It is not clear to me how either of these observations supports the argument.

Finally, Jensen (1980) cites several sources of data, providing IQ distributions for detailed occupations in support of the argument that

> a certain threshold level of intelligence is a necessary but not sufficient condition for success in most occupations. Therefore a low IQ is much more predictive of occupational level than is a high IQ. A person with a high IQ may be anything from an unskilled laborer to a Nobel Prize–winning scientist. But low-IQ persons are not found at all in the sciences or an in any of the learned professions. (p. 344)

In this connection, for example, Jensen reports,

> It is a consistent finding in all the studies of occupations and IQ that the standard deviation of scores within occupations steadily *decreases* as one moves from the lowest to the highest occupational levels on the intelligence scale. In other words, a diminishing percentage of the population is intellectually capable of satisfactory

> performance in occupations the higher the occupations stand on the scale of occupational status. (p. 344)

What sort of evidence does Jensen provide in support of this argument, and how is it described and used? According to Jensen (1980),

> A representative sample of 39,600 of the employed U.S. labor force in the age range from 18 to 54 years was given the U.S. Employment Services General Aptitude Test Battery [GATB]. The sample contains 444 of the specific occupations listed in the U.S. Department of Labor's *Dictionary of Occupational Titles*. (p. 342)

The cited source, U.S. Manpower Administration (U.S. Department of Labor, Manpower Administration, 1970), does contain data for 39,600 individuals in those 444 occupations, but they are scarcely "a representative sample." For example, the source states that

> the continuing program of GATB research is conducted on a decentralized basis with State employment services gathering data in cooperation with employers, schools, and colleges and feeding it into the national office …. The type of sample is designated as applicant, apprentice, employee, student, or trainee, representing the status of the individuals comprising the sample at the time the tests were administered. (p. 63)

In other words, the GATB data were collected somewhat haphazardly, over a period of years, from the late 1940s to the late 1960s (U.S. Department of Labor, Manpower Administration, 1970, Table 9–1, pp. 70–94), and in "samples" of highly variable size, definition, and quality.

Although Jensen (1980) displays the distributions of mean occupational *g* and of the standard deviation of *g* in the GATB "samples," he does not actually describe the relationship between mean intelligence and its variability across occupations in those data. I have computed the correlation between the occupation-specific mean and standard deviation, which is –.32—modest, but consistent with Jensen's expectations. Rather, Jensen here relies mainly on a well-known set of data from World War II, giving scores of 18,782 White enlisted men in the Army Air Force on the Army General Classification Test (AGCT) along with previous civilian occupation (Harrell & Harrell, 1945). He describes the inverse relationship between the occupational test score and its standard deviation only with a series of anecdotes, but the correlation is remarkably high. I have calculated it as .89 across the 74 civilian occupation titles reported by Harrell and Harrell.

In Figure 1, I have shown the minimum, median, and maximum test scores by occupation in the Harrell and Harrell data, ranked from low to high in mean AGCT scores. It appears from the diagram that the test has an effective maximum, slightly below its nominal maximum, and that average scores increase largely as the minimum score increases. This pattern of scores could have several sources. One is the threshold described by Jensen. Two others are that the AGCT had a relatively low maximum value and that there was truncation at the top of the distribution. The AGCT, like other later tests developed for the military, for example, the ASVAB, was designed primarily to discriminate among lower levels of ability. Moreover, civilians who scored exceptionally well were often placed in the officer ranks; that is, high scorers did not tend to show up among enlisted men. According to Harrell and Harrell (1945), "It is possible that averages among the professional occupations are too low since conceivably many of the best men in the profession would have been officer material" (pp. 229–230).[10] In this context, the conventional wisdom of psychometrics appears to be no more than statistical folklore.

There are two more central questions about the relationship between measured cognitive ability and occupations: How strong is the segregation of measured ability by occupation, and what accounts for it? The conventional wisdom of psychometrics is that segregation is great and that it is accountable in terms of the cognitive demands of occupations—specifically not by their educational requirements. Recall Jensen's (1980) declaration, "Professional occupations do not score higher than unskilled laborers on IQ tests because the professionals have had more education or have learned more of the test's content in pursuit of their occupations" (p. 341). Or consider Herrnstein and Murray's (1994) exposition:

> To this point in the discussion, the forces that sort people into jobs according to their cognitive ability remain ambiguous. There are three main possibilities …. IQ really reflects education …. IQ is correlated with job status because we live in a world of artificial credentials …. The third possibility is that cognitive ability itself—sheer intellectual horsepower, independent of education—has market value. Seen from this perspective, the college degree is not a credential but an indirect measure of intelligence …. The first two explanations have some validity for some occupations …. But whatever the mix of truth and fiction in the first two explanations, the third explanation is almost always relevant and almost always ignored …. Intelligence is fundamental to productivity. (pp. 64–65)

How strong is the correlation between IQ and occupation? From the GATB data, Jensen (1980, p. 343) estimated that 47% of the variance in IQ was within occupations, thus implying a correlation of .69 between IQ and occupational position. Gottfredson (1997b, pp. 87–88) reports that the median standard deviation of scores of job applicants on the Wonderlic Personnel Test is 6.3 within occupations, whereas the standard deviation on that test in the entire working population is 7.6. This would imply a correlation between test score and occupation of .56. However, Gottfredson (p. 90) extends her argument to a comparison of variation in IQ among job incumbents—not applicants—within occupations and in the general population, not just workers. Her discussion implies that the variance of IQ among workers within occupations is only 25% to 33% as large as in the general population; that is, 67% to 75% of the variance in IQ occurs between occupations.

Cognitive Ability in Models of Status Attainment

Blau and Duncan (1967) opened the modern era of research on social stratification and mobility with their classic monograph, *The American Occupational Structure*. For the first time, their 1962 Occupational Changes in a Generation survey obtained contemporaneous and retrospective measures of socioeconomic variables in a large national sample of American men. Blau and Duncan analyzed those data most insightfully with a combination of regression and path analysis and methods of discrete multivariate analysis. The modern era of research on cognitive ability in the stratification process was heralded by the pioneering research of William H. Sewell, Archibald O. Haller, and their colleagues, with the WLS (Sewell, Haller, & Ohlendorf, 1970; Sewell, Haller, & Portes, 1969; Sewell & Hauser, 1975; Sewell & Shah, 1967), and by the parallel efforts of Christopher Jencks and associates (Jencks et al., 1972; Jencks et al., 1979) and O. D. Duncan and associates (Duncan, 1968; Duncan et al., 1972) to piece together key features of an expanded model of the process of social stratification from diverse and fragmentary data. A review of the data then available to Jencks, Duncan, and their colleagues provides convincing evidence of scientific progress in the past 40 years.

[10]My interpretation is supported in another large set of data from the same era, reported by Stewart (1947), data that are also widely cited in the psychometric literature, for example, by Tyler (1965, p. 337)—although not by Jensen. These data pertain to some 81,553 White enlisted men in 227 different occupations, drawn from U.S. Army records in 1944.

Cognitive ability played a central role in the new models as an exogenous variable, potentially comparable in theoretical and empirical importance to social and economic background. The main theme of the expanded research agenda was not to stage a contest between the explanatory power of social background and test scores, but to explain how social background and cognitive ability affect educational, occupational, and economic life chances. For example, Sewell and his associates developed the so-called Wisconsin Model, which posits that social background and ability affect educational attainment through a modified causal chain in which academic performance, social influences, and aspirations each play important intervening roles (Hauser, Tsai, & Sewell, 1983; Sewell et al., 1969; Sewell et al., 1970; Sewell & Hauser, 1975; Sewell, Hauser, & Wolf, 1980).

The new line of research on "status attainment" had broad appeal. As of June 2001, there had been more than 1,600 references in the Social Science Citation Index to just eight key publications from the Wisconsin project. In the United States, relevant measurements were repeated in national longitudinal surveys, for example, in the National Longitudinal Study of 1972 and successive school-based surveys and in the National Longitudinal Surveys of Youth, household-based surveys that were initiated in 1979 and 1997. Many studies claimed either to confirm or to refute particular findings in the first round of status attainment research, whereas others expanded or elaborated the early models, for example, by comparing population groups within or across societies and developing structural models of school and family effects on socioeconomic achievement. Major lines of research now often use common ideas, data, and models, and they cut across the disciplinary boundaries of sociology, economics, psychology, and education.

The Wisconsin Longitudinal Study

Along with the late William H. Sewell and many other collaborators and students, I have followed a cohort of 10,000 Wisconsin high school students since their graduation in 1957 (Sewell, Hauser, Springer, & Hauser, 2004). The most recent follow-ups of the WLS were in 1992–1993 and 2004–2005, when the sample was 53 to 54 and 65 to 66 years old. It thus provides a valuable look at the role of cognitive ability, among other variables, across the life course.

A survey of background, school experiences, and aspirations among all high school seniors in Wisconsin public, private, and parochial schools was conducted in the spring of 1957. From this survey, a one-third random sample of 4,994 men and 5,323 women was drawn. Information on parental income, student's measured intelligence, and high school rank was taken from school and public records, with proper precautions to protect the confidentiality of individual information. In 1975 a follow-up study was conducted in which almost 90% of the original sample members were located and interviewed by telephone (Clarridge, Sheehy, & Hauser, 1977). These data provide a full record of social background, youthful aspirations, schooling, military service, family formation, labor market experiences, and social participation of the original respondents. During 1992 and 1993, we followed up with the sample for the first time since 1975, and we interviewed 91% of surviving 1975 respondents; in 2004–2005, the coverage was 85% of survivors.

The WLS sample is broadly representative of middle-age White American men and women with at least a high school education—who constitute two thirds of Americans of their ages. Thus, we think that the experience of the Wisconsin cohort is highly relevant to contemporary discussions of meritocracy and inequality. Some strata of American society are not represented in the WLS. Everyone in the original sample graduated from high school. Minorities are not well represented; there is only a handful of African American, Hispanic, or Asian persons in the sample. About 19% of the WLS sample is of farm origin, and that is consistent with national estimates of persons of farm origin in cohorts born in the late 1930s. At each follow-up, roughly 70% of the sample lived in Wisconsin, and 30% lived elsewhere in the United States or abroad. The WLS has fared well in comparisons of findings with national studies of comparable populations (Corcoran, Gordon, Laren, & Solon 1992; Jencks, Crouse, & Mueser, 1983; Sewell & Hauser, 1975).

Revisiting Occupational Differentials in Ability

I first examined the data of Harrell and Harrell (and of Stewart) long before the specter of IQ dominance was raised by Herrnstein and Murray, and I wondered whether other data, not subject to the selection and truncation of the scores for enlisted men in the Armed Forces, would show the same pattern of variability of test scores across occupations. I looked first at variation in verbal ability among occupation groups of American adults interviewed in their households by the NORC GSS from 1974 to 1989. In almost every year, the entire GSS sample or a large, randomly selected fraction of it was administered a 10-item vocabulary test, WORDSUM, which was selected from items originally constructed for a standard IQ test (Miner, 1957; Thorndike, 1942; Thorndike & Gallup, 1944; Thorndike & Hagen, 1952). For each of 10 WORDSUM items, GSS respondents are asked to choose the one word out of five possible matches that comes closest in meaning to a target word.

Figure 2 shows the variation in WORDSUM within each of 31 occupation groups, formed by their similarity in occupational prestige but arrayed in order of mean verbal ability.[11] The central line on the graph shows a unit slope corresponding to the mean level of verbal ability in each occupation. The two parallel lines above and below the central line are at an average, within-occupation standard deviation away from the mean. Each pair of markers, above and below the central line, is located at one standard deviation above and below the mean of a single occupation group. The graph suggests that there is a tendency for intraoccupational variation to decline as the average ability level increases. The correlation between the mean and standard deviation of WORDSUM is –.65, but the slope is quite small, –.081. However, once a correction for truncation has been introduced, the estimated variation is larger in the two highest ranking occupation groups than in any lower ranking groups, and the correlation between the mean and standard deviation is reversed, .53.

Although the GSS data represent a cross-section of the adult U.S. population over a period of years, I thought that it would be useful to look at better test data and to consider variation across age and sex in the relationship between test scores and occupations. For example, the traditional psychometric data pertain only to men, and Jensen (1980) argues that the relationship between IQ and occupation increases from youth to maturity:

> The size of the correlation … seems to depend mostly on the age of the persons whose IQs are correlated with occupational status. IQ and occupation are correlated 0.50 to 0.60 for young men ages 18 to 26 and about 0.70 for men over 40. (p. 341)

In this context, there is some disadvantage to working with data from the WLS, because of the truncation of the educational distribution at the lower end and its incidental effect on the ability distribution. However, high school graduation rates were high even in 1957—about 75% among men, and higher among women (Sewell & Hauser, 1975)—and the data permit us to look at the occupation–ability relationship across the life course in a large sample of graduates and their randomly selected brothers and sisters:[12] first, full-time civilian job after leaving school for the last time; current or last job in 1975 (age 36); and current or last job in 1992–1994 (age 53–55).

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[11]I thank Min-Hsiung Huang for his assistance with this part of the analysis.

[12]I thank Jennifer Sheridan for her assistance with this part of the analysis.

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There were insufficient data to tabulate test scores for detailed census codes, so we constructed 62 intermediate categories for women and 65 intermediate categories for men. As expected, there was a consistent ordering of occupations by ability across the life course. However, there were weak relationships between occupational standing and the range of variability in the ability distributions. The regression of the standard deviation of Henmon-Nelson IQ on the mean was negative among men for all three jobs, but the slope was statistically significant only for first job and the job in 1975–1977. The regression was negative for women's first jobs, positive for the two later jobs, and in no case statistically significant. The largest negative slope among men was –0.057 in the case of first jobs, implying a reduction of just 1.5 in the within-occupation standard deviation of Henmon-Nelson IQ across the range of mean occupational IQ, from 92.4 to 118.7. If there is an inverse relationship between cognitive ability and the range of abilities within occupations, it is certainly not large or consistent enough among Wisconsin men to justify more than brief mention. There is no such relationship among the Wisconsin women.

What about the correlation between occupation and cognitive ability? How large is it, and does it vary across the life course? Table 1 gives summary statistics for the ability–occupation relationship by sex and job in the Wisconsin data. Depending on the job, there are from 6,000 to 6,800 observations for women or men at each stage of the life course. The correlation between occupation and Henmon-Nelson score is no more than moderate: .39 to .44. The correlation is slightly larger for men than for women, and—contrary to Jensen's expectation—it declines with age. Correspondingly, the within-occupation standard deviations increase slightly with age. Finally, a plausible correction for unreliability in the Wisconsin test scores (.8), based on repeated measurements in Grades 9 and 11, raised the range of IQ–occupation correlations only to .43 to .48.

Ability, Occupation, and Education

In the IQ literature, there is a schizophrenic view of the relationships among ability, schooling, and occupations. On the one hand, IQ affects schooling, but on the other hand, there is an effort to minimize the extent to which the effect of ability on occupation is realized through successful schooling. We have already seen something of this view in excerpts from Jensen's work, cited above. In fact, Jensen argues that partial (correlation) relationships between IQ and occupational standing are somehow misleading, chiefly because, he maintains, schooling cannot affect occupational chances for individuals who lack a threshold level of ability. That is, he argues that one should not accept the plentiful evidence that the partial correlation between schooling and occupational status net of ability is larger than the partial correlation between ability and occupational status net of schooling. This would appear to be strictly an empirical matter—perhaps requiring close examination of occupational standing within a cross-classification of schooling by measured ability—but he offers no direct evidence about the issue (Jensen, 1980, pp. 345–347). In the same vein, Herrnstein and Murray (1994, pp. 124–125) offer several lame excuses for failing to consider the joint and separate effects of cognitive ability and educational attainment on adult outcomes.

In other cases, the IQ literature merely accepts prima facie evidence of the association of ability with other variables as evidence of its central causal importance, without even bothering to consider any competing evidence or explanation.[13] One obvious example of this, which I have not questioned up to this point, is the hierarchy of occupations by average ability. Does this provide any evidence of the centrality of cognitive ability in the

[13]For example, consider Gottfredson's (1997b, pp. 109–116) discussion of zero-order associations between adult literacy scores and “cumulative life outcomes.”

stratification system? I think not, in the absence of data showing that other candidate variables are not equally central.[14] For example, in the Wisconsin data, for each of the sets of job data, I have computed correlations among six occupational characteristics: Average Henmon-Nelson IQ score, average occupational education (from the 1970 Census), average occupational income (from the 1970 Census), average rank in high school class (transformed into normal deviates), percentage aspiring to attend college, and average occupational aspiration (on the Duncan Socioeconomic Index). There is meager evidence that cognitive ability is more highly correlated with the other five variables than the other five variables are with one another. Mainly, this occurs because cognitive ability and high school rank are highly correlated across occupations, as they are across individuals, and because occupational income is less highly correlated with the other five variables than the other five variables are with one another.[15] That is, if one dropped occupational income from the analysis and ignored the correlation between high school rank and Henmon-Nelson score, it would not be possible to tell which variable was which merely by looking at the correlations. How then, would we know that cognitive ability is the central variable in the stratification process?

Has Ability Become More Central in Social Stratification?

Standardized psychological tests have been given on a massive scale in the United States since World War I—for almost a century. Research and speculation have periodically highlighted growth in the importance of cognitive ability for adult success. Recent examples of this theme include Richard Herrnstein and Charles Murray's (1994 *The Bell Curve* and Nicholas Lemann's (1995a, 1995b, 1996b, 1999) social history of college admissions testing. One can find similar themes—focusing more on cognitive and job skills than on intelligence per se—running across the political spectrum in the work of Robert Reich (1991), Mickey Kaus (1995), Barbara Ehrenreich (1989), and Earl Hunt (1995). However, we actually know very little about trends in the relationships between cognitive skills and success in schooling, jobs, or earnings, possibly excepting recent growth in the effects of ability on the earnings of young workers.[16]

Lemann presents a fascinating prima facie case for growth in the role of mental testing in college admissions—and there would appear to be visible and significant effects of testing on the chances of able students for admission to elite colleges and universities (Frank & Cook, 1995). Herrnstein and Murray (1994) argue more broadly that, in the course of this century, cognitive ability has become the key factor in socioeconomic success:

> The twentieth century dawned on a world segregated into social classes defined in terms of money, power, and status. The ancient lines of separation based on hereditary rank were being erased, replaced by a more complicated set of overlapping lines. Social standing still played a major role, … but so did out-and-out wealth, educational credentials, and, increasingly, talent. Our thesis is that the twentieth century has continued the transformation, so that the twenty-first will open on a world in which cognitive ability is the decisive dividing force … . Social class remains the vehicle of social life, but intelligence now pulls the train. (p. 25)

Herrnstein and Murray provide a great deal of evidence—much of which is flawed—about social and economic differentials that are associated with cognitive ability (Fischer et al.,

[14]Here, it would be instructive to examine Gottfredson's (1997b, pp. 97–108) presentation of correlations between occupational variables and ask whether it sustains her claim that *g* is the central factor in the occupational hierarchy.

[15]Hauser and Warren (1997) have demonstrated the weakness of occupational income as a measure of occupational social standing.

[16]Relevant work on earnings includes Levy and Murnane (1992), Card and Lemieux (1996), Blackburn and Neumark (1993), Grogger and Eide (1995), Murnane, Willett, and Levy (1995), and Heckman (1995). This work presents diverse findings about change in the effects of ability on earnings and the importance of such change for inequality of earnings.

1996), but they offer very little direct evidence to support the thesis that ability has become more central in the stratification system.

Min-Hsiung Huang and I reviewed the trend evidence offered by Herrnstein and Murray, and we have presented new evidence from the NORC GSS about relationships between verbal ability and social origins, educational attainment, occupational success, and economic success (Hauser & Huang, 1997; Huang & Hauser, 1998). We find that there are fatal flaws in *every* piece of trend evidence offered in *The Bell Curve.* For example, one key graphic, purporting to show that college attendance increased rapidly among very bright students in the years immediately following World War II, was in fact selected from a larger chart showing that college attendance grew rapidly at *every* ability level during that period (Herrnstein & Murray, 1994, p. 34; Taubman & Wales, 1972, p. 20). In another case, a graph supposedly demonstrating increasing cognitive sorting of the labor force actually showed nothing more than the growth of upper white-collar occupations (Herrnstein & Murray, 1994, p. 56).

New evidence from the GSS failed to confirm any of Herrnstein and Murray's trend hypotheses. If there have been any trends in ability differentials by social origin during the 20th century in the United States, they have been reduced effects of race, farm background, size of sibship, and Southern birth.[17] Rather than a steady increase in ability differentials between high school graduates and college attenders, there was a modest increase in the differential, which has subsequently reversed. At present, college attendance is no more selective for ability than it was in the 1920s. Likewise—but estimated over the shorter period from 1974 to the present—there has been no evidence of an increasing relationship between verbal ability and occupational status.

Ability Across the Life Course

Education and Cognitive Ability

People with more academic ability go further in school. A classic set of findings from the WLS was presented by Sewell (Sewell, 1971; Sewell & Shah, 1967). Among that sample of 10,000 Wisconsin high school graduates of 1957, 3.2% of low-ability men and only 1.8% of low-ability women graduated from college by 1964, whereas 47.2% of highly able men and 33.5% of highly able women graduated from college. Of course, there were large effects of socioeconomic status as well, and each set of differentials was preserved when the other variable was controlled. For example, among women with low socioeconomic status, college graduation rates varied from 0.2% among women with low ability to 13.8% among women with high ability, and the rates varied from 0.3% among men with low ability to 20.1% among men with high ability (Sewell & Shah, 1967, p. 15).

In the Wisconsin study, the Henmon-Nelson Test of Mental Ability was administered at the same time—the junior year of high school—to almost all members of the sample (Henmon & Nelson, 1946, 1954). Also, because the Wisconsin study controlled a valid and reliable measure of socioeconomic standing, including a 4-year average of family income from state tax records, it is clear that the net effects of cognitive ability cannot represent any class or cultural bias in the test itself, to the extent that such a bias is reflected in measured social standing. Moreover, unlike some other tests, notably the Scholastic Aptitude Test (SAT) and the American College Test (ACT), one cannot argue that Henmon-Nelson scores affect educational chances because they were used as an administrative tool in college admission; they were not so used in 1957.

[17] Also, see Huang and Hauser (1998).

Neither do the Wisconsin findings speak to potential cultural biases in testing that might affect the performance levels of Blacks or other minorities (who are almost absent from the Wisconsin sample). Almost two decades ago, in the context of an earlier round of controversy about the uses of mental tests, the National Research Council concluded that cognitive tests were not manifestly biased against minorities (National Research Council, Committee on Ability Testing, 1982). However, new research on the internalization of “stereotype threat” suggests that situational factors adversely affect the test performance of minorities (and women) in laboratory settings (Steele & Aronson, 1995) and in social surveys (Huang, 2009).

One final issue that dogs analyses of the effects of cognitive ability on schooling—and on everything that follows the completion of schooling—is whether the influence of cognitive ability is “natural” or “constructed” (Tittle & Rotolo, 2000). That is, would we find effects of measured cognitive ability in the absence of administrative and organizational mechanisms that measure, label, sort, and select students on the basis of test scores, presumably in the belief that such practices are fair, natural, or efficient? Would such labeling, sorting, and selection—including self-selection—take place in the absence of formal testing mechanisms? In the United States, this question comes up at three key thresholds of the stratification process—school tracking, college admission, and job entry. Many studies attempt to demonstrate the functioning of ability grading practices, for example, in limiting the learning opportunities of elementary and high school students or in controlling access to the social and economic opportunities of elite colleges and universities. Some view testing and tracking processes as mechanisms of class advantage—thus overrating the modest correlation between social class and test performance (Oakes, 1985). Such analyses typically ignore the class-relevant alternative, that is, on what information decisions would be made in the absence of test score data.

A key mechanism accounting for the influence of cognitive ability on the length of schooling is its effect on the quality of academic work—high school grades. In the Wisconsin cohort—and among recent entrants to college (Bowen, Chingos, & McPherson, 2009)—high school grades account for almost all of the association between academic aptitude and the completion of a college degree.[18]

Cognitive Ability and Occupational Status

In the Wisconsin cohort, cognitive ability affects the occupational attainments of women and men across the life course primarily by way of its effect on educational attainment, especially in the early career. In models estimated for the graduates alone, there are persistent, but very modest, direct effects of IQ on occupational status across the entire career (Hauser, 2002), but when the occupational attainments of graduates and their siblings are analyzed jointly—thus accounting fully for shared effects of social origins—the net effects of IQ on occupational status are yet smaller (Warren, Hauser, & Sheridan, 2002). Such effects would seem unlikely to dominate the process of social stratification in the United States.

Cognitive Ability and Economic Success

Self-employment would appear to present an opportunity for cognitive ability to affect economic success without the usual organizational constraints. Thus, in a review of Le, Oh, Shaffer, and Schmidt’s (2007) claims for the value of ability testing in employment decisions, Hauser (2007) looked at the effects of IQ on earnings of self-employed women

[18]In the Wisconsin Longitudinal Study, high school grades also mediate the effects of IQ on other outcomes: quitting smoking, excessive drinking, and mortality.

and men in the Wisconsin sample at ages 35 to 36 and 53 to 54. When educational attainment was ignored, there was a substantial economic payoff to adolescent IQ among men at ages 35 to 36 and 53 to 54 and among women at ages 53 to 54 (but not at ages 35–36). For example, among men aged 53 to 54 in 1993, there was a 1.5% increase in self-employment earnings for each one-point increase in IQ. However, once educational attainment was controlled, the effect of cognitive ability was no longer statistically significant for women or for men at either age. Among the self-employed, the economic payoff to superior ability was entirely mediated by increased postsecondary education.

There was even less evidence among the Wisconsin graduates that cognition affected the accumulation of wealth, which was measured in 1993 and 2004. There was no effect of IQ in 1993 or in 1994 among women, or among men in 1993. In 2004, there was a small effect of IQ among men, but it was mediated entirely by educational attainment.

Job Complexity and Cognition

Data from the Wisconsin study support earlier findings that the complexity of jobs has a reciprocal relationship with cognitive ability (Kohn & Schooler, 1973, 1978, 1983). That is, more able and more highly educated individuals are recruited into more complex jobs, but work in a complex job also increases intellectual performance (Hauser & Roan, 2007). The latter effects are substantial even at ages 53 to 54 but disappear by ages 65 to 66.

Cognition and Drinking Behavior

Although the direct effects of cognitive ability on socioeconomic achievements are far smaller than some have claimed, in other instances there are substantial and persistent effects of adolescent cognition. For example, a much-replicated finding in social epidemiology holds that older persons who drink alcohol moderately perform better on cognitive assessments than those who either abstain or drink to excess, thus suggesting a beneficial effect of drinking in moderation (Christian et al., 1995; Elias, Elias, D'Agostino, Silbershatz, & Wolf, 1999; Galanis et al., 2000; Goodwin et al., 1987; Hebert et al., 1993; Hendrie, Gao, Hall, Hui, & Unverzagt, 1996; Launer, Feskens, Kalmijn, & Kromhout, 1996). Unfortunately, these studies share designs with poor control of prior cognitive ability. At both ages 53 to 54 and 65 to 66, WLS graduates who drank moderately (1 to 29 drinks in the past month) scored higher in cognitive assessments than those who drank more or less, but these differentials were explained entirely by a tendency of those with higher IQs in adolescence to drink in moderation and to maintain their initial advantage in cognition (Krahn, Freese, Hauser, Barry, & Goodman, 2003; Yonker, Krahn, Freese, & Hauser, 2007). Our hypothesis was that drinking patterns were a feature of lifestyle associated with levels of completed schooling, but the effect of adolescent IQ on drinking behavior scarcely changed when educational attainment was controlled.

Cognition and Survey Participation

Social and economic differentials in social survey participation are strong and well documented. Possibly excepting the social and political elite, those with more education and higher income are more likely to participate in surveys, and women are more willing than men to participate. For example, high attrition among low-income households was a major reason for the failure of the Census Bureau's longitudinal Survey of Income and Program Participation (National Research Council, 2009). Only a few surveys have ascertained cognitive ability before entering the field. In the initial rounds of the WLS—1964 and 1975—there did not appear to be differentials in response by social or psychological characteristics, but by 2004 the WLS data displayed the usual differentials in response by educational attainment and gender. However, there was a clear gradient in response by IQ, with an especially low level of participation among men in the bottom 10th of the distribution. In fact, the associations of educational attainment and gender with survey response were entirely explained by the effects of IQ and high school grades (Hauser, 2005). That is, unlike the cases of educational attainment and socioeconomic achievement, here academic ability and performance are the key causal factors.

Cognition and Internet Access

The so-called digital divide separates a large fraction of the population from the advantages (and disadvantages) of access to the Internet, but the literature on Internet access has focused almost exclusively on education and income as barriers to Internet adoption. In the WLS, at ages 65 to 66 in 2004, about 60% of graduates had access to the Internet from their own homes, and educational attainment was correlated with access. Also, two psychological variables, adolescent IQ and openness to new experience—one of the psychologist's Big Five personality characteristics—had substantial effects on Internet adoption. Moreover, there was an interaction effect between education and the psychological variables such that their effects were larger among WLS graduates who had fewer socioeconomic resources (Freese & Rivas, 2006; Freese, Rivas, & Hargittai, 2006).

Cognition and the Timing of Menopause

In the late 1990s, a graduate student at Madison carried out a competing risk analysis of time to menopause among women participants in the WLS. The original object of the study was to distinguish among the social and economic factors and health-related behaviors leading to hysterectomy or oophorectomy and those associated with natural menopause. However, it turned out that age at natural menopause varied positively with a combination of IQ and high school grades, even after controlling education, occupation, family background, fertility experience, smoking behavior, and use of hormone therapy (Shinberg, 1998). We have found it hard to suggest a social or psychological explanation of this phenomenon, but it has now been cross-validated three times (Kuh et al., 2005; Richards, Kuh, Hardy, & Wadsworth, 1999; Whalley, Fox, Starr, & Deary, 2004).

Conclusion and Epilogue

On the basis of the evidence reviewed here, I think it is fair to conclude that the traditional psychometric literature on cognitive ability—popularly resurrected in *The Bell Curve*—vastly overstates the case for the role of IQ in the process of social stratification. On the other hand, to say that the case has been overstated—even that it has been overstated with great lapses of scholarship and with racist overtones—does not say that there is no place for cognitive ability in our understanding of the stratification process. Both as defense against excessive claims on both sides of the "IQ debate" and in pursuit of the scientific enterprise, we ought to seek and produce new evidence of the role of cognitive abilities across the life course.

Perhaps a more compelling reason to invest in studies of the effects of test performance is the growing role of tests in the schooling process from elementary school onward. The issue is not "meritocracy," but "testocracy." That term, in my opinion, is more descriptive of the dystopias that Michael Young described and toward which we may now be headed. It is fair to say, without ignoring the substantial history of test use and misuse in the past century (National Research Council, Committee on Appropriate Test Use, 1999, chap. 2), that we have been and are now experiencing an unprecedented growth in scholastic testing that almost outstrips Michael Young's imagination.

To many observers, college entrance exams are the most visible manifestation of testing in the American educational system. Surely, their effects have been more studied and debated than those of tests at other levels of schooling (Lemann, 1999), and we are now seeing major changes in the design and content of the SAT to move its focus from scholastic ability to academic achievement. However, standardized college entrance exams have been around for nearly 80 years and have been in wide use for half a century.

The most significant changes in the use of tests are in secondary and elementary schools. There is a powerful movement for more extensive use of high school exit exams with passing levels set well above minimum competencies. A reasonable speculation is that these exams will encourage early school dropout, especially among African American and Hispanic youth, and that they will create new barriers to postsecondary education and training and to labor-market entry. High-stakes exit exams will also deny high school diplomas to large numbers of nonminority students, and we have yet to learn the social and political consequences of reversing the common expectation that the children of the middle class will at least graduate from high school.

The No Child Left Behind Act (NCLB) introduced a federal mandate for testing of all schoolchildren in Grades 3 through 8. Unlike the Clinton administration's proposal for Voluntary National Tests, NCLB required major revisions in many of the more progressive and innovative state testing programs, to permit assessment of every child at the mandated grade level. There is every likelihood that new and old tests will be used to raise rates of grade retention, which are already too high in many places. These tests will often be used in violation of professional standards of appropriate test use (American Educational Research Association, American Psychological Association, & National Council on Measurement in Education, 1985, 1999; American Educational Research Association, 2000) and with negative long-term consequences for academic achievement and high school completion (Hauser, 2001, 2004; Hauser, Pager, & Simmons, 2004; Hauser, Simmons, & Pager, 2004).

There is much more to be said about the reasons for the current public fixation on tests as a tool of educational reform and about its immediate consequences for the educational system. We ought also to take a longer view and start thinking now about how to measure, analyze, and assess the long-term consequences of test use for life chances. The relatively benign story of the Wisconsin cohort began more than 60 years ago, but we had to wait half a century to learn how it all turned out. What will we know half a century from now about the role of tests and of abilities in the life chances of today's youth?

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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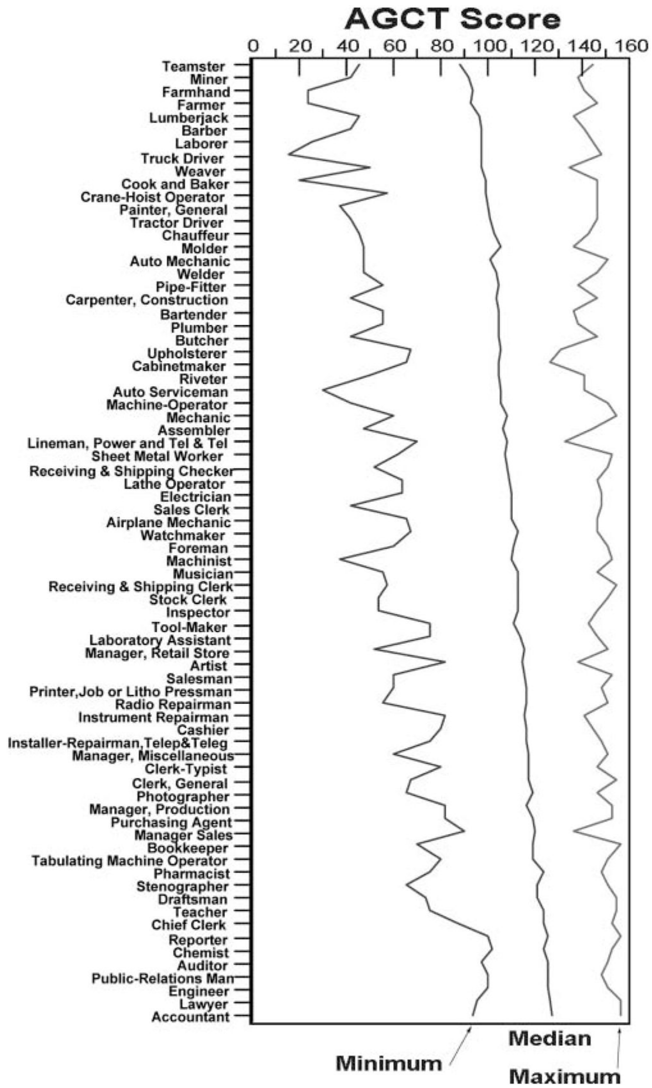

FIGURE 1.
Army General Classification Test Score distributions of civilian occupations: 18,782 White Army Air Force enlisted men in World War II. Data from Harrell and Harrell (1945).

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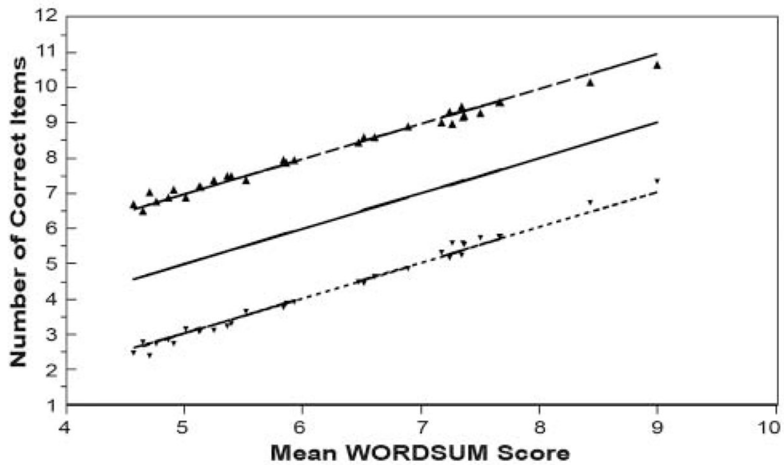

FIGURE 2.
Dispersion in verbal ability (WORDSUM) of occupational groups: National Opinion Research Center General Social Surveys, 1974 to 1989.

Table 1

Henmon-Nelson IQ Scores of Wisconsin Graduates and Siblings by Job

				Percentiles					Observed		Corrected	
	n	***M***	***SD***	**10th**	**25th**	**Median**	**75th**	**90th**	***r***	***s***	***r***	***s***
First job												
Men	6,347	101.23	15.52	81	91	101	112	121	.441	14.00	.481	12.52
Women	6,779	100.82	14.71	82	91	101	111	121	.413	13.46	.452	12.04
1975–1977 job												
Men	6,792	101.55	15.56	82	91	101	112	123	.418	14.21	.458	12.71
Women	6,421	101.59	14.72	83	92	101	111	121	.403	13.54	.442	12.11
1992–1993 job												
Men	6,039	102.01	15.50	82	92	102	112	123	.414	14.19	.453	12.69
Women	6,484	101.86	14.77	83	92	102	112	121	.391	13.66	.430	12.22