Meritocracy, Cognitive Ability, and the Sources of Occupational Success[1]

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Meritocracy, Ability, and the Sources of Occupational Success

Despite occasional references to Michael Young's (1958) satyrical essay, *The Rise of the Meritocracy*, and periodic public interest in the place of intelligence in society, students of social stratification mainly ignore cognitive abilities and their consequences. Neither is there any sign that sociologists are actively considering the larger issues raised by Young's essay, namely, what would be the political and social consequences of equalization of opportunity and by universal use of ability or achievement tests as tools of social selection? Perhaps this lack of attention follows appropriately from the facts that children's opportunities are anything but equal and that cognitive mediocrity dominates our public life.

To be sure, there is some sociological interest in the use of tests to make decisions about individuals – in school and on the job – but the focus here is more on the testing phenomenon than on the causes or consequences of the things that tests purport to measure. There is also increasing sociological interest in the sources of Black-White differences in school achievement – surely an important issue – but again that issue is treated in isolation, assuming, but not examining the importance of cognitive abilities in society.

By ignoring cognitive abilities, sociologists 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 Arthur Jensen's (1969) paper, "How Much Can We Boost IQ and Scholastic Achievement?" and, more recently, in the controversy surrounding *The Bell Curve* (Herrnstein and Murray 1994). 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 paper, I review some features of the psychometric argument and evidence commonly offered to support it, with particular emphasis on the relationship between cognitive ability and occupational standing. Much of the standard psychometric evidence is weak, but ability does play a significant role in social stratification, primarily by way of its influence on schooling. There is no clear evidence of trend in the role of cognitive ability in the stratification process, and other social psychological variables may be equally important. There is no evidence that cognitive ability is *the* central variable in the process of stratification, but there is ample reason for concern that recent and prospective changes in the structure of American education will raise its importance. All of my evidence is drawn from the U.S., and I offer it partly as encouragement for other scholars to address similar questions in their own societies and cross-nationally.[2]

Cognitive Ability in Models of Status Attainment

Peter M. Blau and Otis Dudley Duncan (1967) opened the modern era of research on social stratification and mobility with their classic monograph, *The American Occupational Structure*. The 1962 Occupational Changes in a Generation survey (OCG), measured contemporaneous and retrospective measures of socioeconomic variables in a large national

[2] To anyone who doubts the importance of cognitive functioning in social life, I would recommend a study of the problems of developmentally disability among children and cognitive impairment among the elderly. It would be instructive to reconcile these cases with what we believe, or want to believe, about the consequences of less extreme variations in ability.

sample of American men. The Blau-Duncan monograph analyzed those data most insightfully with a combination of regression and path analysis and methods of discrete multivariate analysis. A key conceptual innovation was the shift from mobility analysis—literally, the analysis of moves—to an analysis of the dependence of adult statuses on social origins. While David Glass's (1954) study of mobility in Great Britain provides an earlier and admirable model of the national mobility survey, for the past three decades the Blau-Duncan study has been either a positive model for research or a target for theoretical or methodological criticism. In both ways it has transformed the design and conduct of stratification research (Powell 1992).

Following publication of the Blau-Duncan book, 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 Wisconsin Longitudinal Study (Sewell and Shah 1967; Sewell, Haller, and Portes 1969; Sewell, Haller, and Ohlendorf 1970; Sewell and Hauser 1975) 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, Featherman, and Duncan 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 fragmentary data then available to Jencks, Duncan, and their colleagues provides convincing evidence of scientific progress in the past thirty years.

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—of which the obvious

negative exemplar is Herrnstein and Murray's (1994) *The Bell Curve*—but to understand 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 (Sewell et al. 1969; Sewell et al. 1970; Sewell, Hauser, and Wolf 1980; Hauser, Tsai, and Sewell 1983).[3]

The new line of research on "status attainment" had broad appeal. As of June 2001, there had been more than 1600 citations in the Social Science Citation Index to just eight key publications from the Wisconsin project.[4] In the United States, relevant measurements were repeated in national longitudinal surveys, e.g., in the National Longitudinal Study of 1972 and successive school-based surveys and in the National Longitudinal Survey of Youth, a household-based survey. Also, superior analytic methods were developed and applied; these included more sophisticated methods of structural equation modeling and multi-level models for hierarchical data. Many studies claimed either to confirm or refute particular findings in the first round of status attainment research, while others expanded or elaborated the early models, e.g., by comparing population groups within or across societies and developing structural models of

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[3] In some accounts, the major theoretical and empirical innovation in the Wisconsin Model has been ignored, leaving only the partial truth that it conditions achievement both on social background and ability (Clausen 1991; Clausen 1993).

[4] These are Sewell and Shah (1967), Sewell, Haller, and Portes (1969), Sewell, Haller, and Ohlendorf (1970), Sewell and Hauser (1972; 1975), Sewell, Hauser, and Wolf (1980), Hauser, Tsai, and Sewell (1983), and Hauser and Sewell (1986).

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.

However, over the years, much of the original impetus and popularity of status attainment research has dissipated within the sociological community that gave birth to it. No doubt, this devolution has many sources. Chief among them, perhaps is a combination of factors encouraging an inordinate and singular emphasis of research on the analysis of intergenerational social mobility tables. To be sure, there is a lot to be learned from such tables. It is also a great deal easier and less expensive to collect retrospective data on social mobility between parents and adult children than to follow the trajectories of many variables through the diverse paths of cohort members from birth to adulthood. One of the attractive consequences of the Blau-Duncan project was its inspiration of a new cohort of such studies in national populations during the 1970s, which were to some extent been comparable in design and content (Featherman, Hauser, and Sewell 1974). Many researchers rejected the expression of occupational position or social class in gradational terms—a convenient and typical, but by no means necessary feature of status attainment research. This left them free to analyze mobility classifications using elaborations or modifications of traditional sociological conceptions of class (Erikson and Goldthorpe 1992; Wright 1985; Wright 1997).[5] Finally, there has been an explosion of

[5] A second recent contribution to comparative, cross-national research on educational mobility is equally dependent on data that can easily be obtained from one-time cross-section surveys (Shavit and Blossfeld 1993). I do not intend to understate either the importance or the difficulty of conducting such studies, but rather to emphasize what else we ought to do and how difficult it may be to do.

sophisticated, powerful, and ever-more general methods for the analysis of cross-classification tables, and thus researchers are far better equipped to address traditional questions of mobility analysis with available data (Goodman 1984; Goodman and Hout 1998; Logan 1996a; Logan 1996c; Logan 1996b).

Other factors have also turned researchers away from the original focus of status attainment research. The focus on social psychological mechanisms of stratification by Sewell and his colleagues, along with the failure to find strong empirical evidence that specific social institutions and settings added much to the explanation of attainments in the United States (Sewell and Armer 1966; Hauser, Sewell, and Alwin 1976; Alwin 1976), led some scholars to reject their methods and models and to look elsewhere for evidence of the importance of social structure. For example, one prominent line of work—now largely abandoned—focused on the relationship between labor market segmentation, earnings, and occupations (Beck, Tolbert, and Horan 1978; Horan 1978; Tolbert, Horan, and Beck 1979; Tolbert 1983). Other exemplars of "the new structuralism" have focused so closely on labor market functioning that they have doubtful relevance to our understanding of the stratification process.

To be sure, this is both a stylized and incomplete account of the development of stratification research. For example, Baron's balanced review outlines the social-structural foundations of status attainment research and identifies the failure of self-identified structuralists "to discern individuals and social interaction in their accounts" (Baron 1994:385-88). Alan Kerckhoff both led and exemplified a careful effort to join structural and individual explanations of social and economic success across the life course (Kerckhoff 1990; Kerckhoff 1993; Kerckhoff 1996).

Why Neglect Abilities?

Despite the notable exceptions, I believe that our predilection toward social structure in general and mobility tables in particular partly explain the small part played by cognitive ability (and, for that matter, other social psychological variables) in current research on social stratification and inequality.[6] Consider, for example, the topics of papers delivered at meetings of the Research Committee on Social Stratification of the International Sociological Association (ISA). The agendas of the leading international research group on social stratification offer scant evidence that there is serious or sustained interest in the role of social psychological variables or processes in social stratification. From 1990 to 1998, I found only three explicit references to cognitive ability in the titles and abstracts of papers presented at meetings of the Research Committee on Social Stratification. No doubt, in the context of the ISA, the difficulty of establishing cross-nationally comparable data also contributes to this gap. For example, neither Shavit and Blossfeld's (1993) cross-national comparative study or educational stratification, nor Erikson and Jonsson's collection of essays on educational equality in Sweden provides any evidence about the role of cognitive skills, even in educational attainment (Erikson and Jonsson 1996a).[7] Similarly, Shavit and Mueller's (Shavit and Mueller 1998) compendium of thirteen

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

[7] Effects of cognitive functioning are not minimized in Erikson and Jonsson's collection. They are first reviewed and then ignored: "Which of these mechanisms is the most important? For educational attainment generally, the single most important is the first ['Academic performance is better among children from higher social classes.'], though, admittedly, this is more of an empirical statement than an explanation. Since we anyway expect social class differences in ability and educational performance to be fairly stable over time and across countries, the most important question for us here is which of the latter four mechanisms is the

national studies of the early occupational career includes only one contribution—from Great Britain (Heath and Cheung 1998)—in which cognitive ability enters the analysis.

Likewise, the three leading journals of sociology, *The American Sociological Review, The American Journal of Sociology,* and *Social Forces,* have paid scant attention to the distribution, sources, or consequences of cognitive functioning. In a quick scan of those three journals, since the beginning of 1998, I have found just one paper that directly addresses the theoretical claims of Herrnstein and Murray (Tittle and Rotolo 2000); a methodological controversy over trends in the average level of cognitive ability in the U.S. population (Alwin 1991; Glenn 1994; Wilson and Gove 1999; Glenn 1999; Alwin and McCammon 1999); and several papers about peer rejection as a source of low academic achievement among African-American students in high school and elementary school (Ainsworth-Darnell and Downey 1998; Farkas, Lleras, and Maczuga 2002; Downey and Ainsworth-Darnell 2002; Tyson 2002).

There are other significant, but partial explanations for the failure of many social scientists to address relationships between cognitive ability and social or economic success. Herrnstein and Murray argue that, since the 1960s, and especially since the publication of Jensen's controversial paper in *The Harvard Educational Review* (Jensen 1969), it has been politically incorrect to study the role of intelligence in social life (Herrnstein and Murray 1994: 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

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most salient for educational decisions" (Erikson and Jonsson 1996b: 55).

> 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 public responses to *The Bell Curve* (Jacoby and Glauberman 1995; Fraser 1995; Kincheloe, Steinberg, and Gresson Iii 1996). There is also contrary evidence, not least among which is the useful time-series of cross-sectional measurements of verbal ability in the General Social Survey from 1974 to 1996 (Weakliem, McQuillan, and Schauer 1995; Hauser and Huang 1997; Huang and Hauser 1998; Huang and Hauser 2001).

In the late 1980s and early 1990s—well before publication of *The Bell Curve*—I was occasionally dismayed to find that some graduate student was reluctant to include cognitive test scores in her analyses of educational attainment or labor market success. My own least favorite example of this form of political correctness was the regular series of reports on trends and differentials in high school dropout, issued by the U.S. Department of Education, National Center for Education Statistics. For several years, the closest thing to a reported relationship between academic achievement and school dropout was a set of marginal distributions showing that high school dropouts often reported that they "could not keep up with schoolwork" or were "failing school" (McMillen, Kaufman, and Whitener 1994: 46, 86). However, a subsequent report (for 1995) includes brief discussions of school dropout by previous grade retention and among students with disabilities, including learning disabilities (McMillen and Kaufman 1997: 40-51).

On the other hand, through more than thirty years of teaching applied statistics courses, I have used an analysis of the effects of social background and test scores on post-secondary schooling as a didactic example of the application of multiple regression analysis. In data for men and women the Wisconsin Longitudinal Study, the correlation between measured ability and social background, however measured, accounts for much of the association between social background and post-secondary schooling. Obversely, the same correlation accounts for little of the association between measured cognitive ability and post-secondary schooling. In my experience, students have often been challenged by the example, but only once did a student respond to the analysis in ideological or political terms.

Throughout my career, 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. In

fact, my initial response to Herrnstein and Murray's account was to suggest that the greatest barriers to more thorough examination of these relationships were the scarcity of suitable data and the difficulties of obtaining more of them. Social scientists are often reluctant to include standard measures of cognitive functioning in social surveys, either because it takes too much time to obtain a broad and reliable measure, because survey interviewers may be reluctant to test respondents, or because researchers believe, contrary to fact, that survey respondents will refuse to respond to such items. In fact, as demonstrated by long practice in the General Social Survey and by the recent experience of the Health and Retirement Survey, the Wisconsin Longitudinal Study, and the Study of American Families, respondents are more than willing to respond to cognitive tests in social surveys.[8] The immediate measurement problem is to fit standard test items and procedures into the survey format.[9]

Whatever the sources of our neglect of cognitive abilities in the analysis of social stratification, it is most unfortunate. The main theme of this paper is that we could learn more about the stratification process by investigating the sources and consequences of abilities —and of other social psychological variables. Our neglect is doubly unfortunate. First, we have failed to create new data resources and exploit available data. We have thus failed to learn as much as we might have about the ways in which abilities interact with stratification processes. Second,

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[8] Thomas Juster, the economist who originated the Health and Retirement Survey, reported to me that his survey respondents regarded the several ability tests embedded in his first-round instrument as a welcome respite from the barrage of questions about income, assets, work, and health.

[9] 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 longitudinal data.

our neglect has left the field open to advocates of one stripe or another—chiefly those who consistently over-estimate the centrality and importance of general cognitive ability.

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 little, as is suggested by advocates like Herrnstein, Murray, Eysenck, Jensen, Seligman, or Gottfredson (Herrnstein 1973; Herrnstein and Murray 1994; Eysenck 1971; Eysenck and Kamin 1981; Jensen 1980a; Seligman 1992; Gottfredson 1997). Finally, 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 only to social and economic variables, but a vision that includes those variables, plus general cognitive ability alone, is scarcely less limiting.

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 by other more specific abilities? 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 change or their consequences?[10] 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 1995b; Lemann 1995b; Lemann 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 paper, 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 coverage of available material is necessarily selective, drawn mainly from research on occupational attainment in the United States. My intention is not so much to cover the subject fully, as to provide illustrations both of what we know and of what we do not know.

In reading this review, I hope that no one will draw the mistaken conclusion that I think stratification research should focus on mental ability or abilities to the neglect of other variables. It is not clear, except through the unfortunate history of social Darwinism (Gould 1981; Gould 1928), 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

[10] 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*.

of social and economic success.[11] 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.[12] To be sure, cognitive functioning plays an important role in the occupational 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.

One factor contributing to the conflation of merit with mental ability is surely the preoccupation with intelligence and its consequences in a long tradition of psychology, whose latest unfortunate manifestation is the Herrnstein and Murray (1994) book, *The Bell Curve*. In my opinion, some economic thought has also catered to this unidimensional notion of merit by treating ability as an unmeasured residual. To be sure, the theoretical content of the economic concept of ability is potentially broader, but gradually it has become identified with the psychologist's measurements of the same name, rather than with an array of variables beyond those that are most easily quantifiable in economic research.

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[11] Also, see Goldthorpe's discussion of Michael Young's satyrical essay, *The Rise of the Meritocracy* (1958), in which he notes Young's equation of merit with "ability plus effort" (Goldthorpe 1996). 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.

[12] 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 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; Spearman 1923; Spearman 1927).[13] 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. Figure 1 shows this general scheme, modeled after Carroll (1997: 31). The general factor at the left, *g*, affects three lower order factors, η_1, η_2, and η_3, each of which in turn effects three primary factors. For example η_1 affects η_{11}, η_{12}, and η_{13}. Each of the primary factors has a bi-factor structure, that is, it is affected by a primary common factor and, also, by a unique or specific factor, e.g., ζ_{11}, which is neither affected by or correlated with any other variable in the system.

[13] I have unfortunately neglected other major developments in cognitive psychology, which include the specification of different types of intelligence, e.g., Sternberg's work on practical vs. academic intelligence (Sternberg 1995). 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 their own terms, and I am looking for the kind of evidence that is presently available in large samples.

There is even less agreement about what, exactly, the general factor is and whether it is a purely statistical construct or an actual entity.[14] That is, what is in common among the tasks that display consistent evidence of common factor causation? For example, Gottfredson describes *g* as "the ability to deal with complexity." It is "a highly general information-processing capacity that facilitates reasoning, problem solving, decision making, and other higher order thinking skills. ... [T]here is virtual unanimity that it reflects the ability to reason, solve problems, think abstractly, and acquire knowledge. ... Intelligence is not the amount of information people know, but their ability to recognize, acquire, organize, update, select, and apply it effectively ... the active ingredient in test items seems to be their complexity" (Gottfredson 1997: 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 published in the *Wall Street Journal* in December 1994 (Detterman 1997). 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

[14] 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* 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.

deeper capability for comprehending our surroundings —'catching on,' 'making sense' of things, or 'figuring out' what to do."

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: 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: 56) 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." That is, in this last defintiion, "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.[15] But it would be foolish, especially for sociologists with an interest in social stratification, to take that argument too far. Consider the recent history of our discipline's efforts to define and measure that most central of concepts, "social class." Also, there are methodological parallels between another of our most widely measured and highly replicable constructs, occupational prestige, and the psychometric construct, general intelligence. Of course, the two constructs differ in the units that they describe,

[15] Recall Herrnstein and Murray's (Herrnstein and Murray 1994: 12) line, "nobody really knows even how to define it."

persons and occupations.[16] Both can be measured in many ways. Both display much the same statistical behavior within any population, regardless of the specific operational measure used (Hauser and Warren 1997).[17] Both can be measured reliably in diverse populations, even among children. Both display much the same statistical behavior within different populations, whether those populations are defined in terms of time, or place, or selected characteristics within a larger population (Treiman 1975; Treiman 1977). Moreover, while it does not display the factorial complexity of performance on mental tests, there is remarkably little consensus among sociologists about what occupational prestige really is and what produces it. All the same, occupational prestige remains a central concept in the study of social stratification. Even when we think we have better ideas about of occupational standing, prestige remains a standard against which we appraise the meaning and utility of alternative constructs.

Thus, 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,

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[16] There are also substantive parallels between general intelligence and occupational prestige, which I discuss later. One might also draw a similar comparison between general intelligence and socioeconomic status.

[17] Spearman coined the term, “indifference of the indicator,” to refer to the invariance of general intelligence with respect to specific measurement procedures (Spearman 1927).

or merely correlates of ability factors. For example, in his *magnum opus*, a mammoth review and analytic synthesis of classic mental test data, Carroll (Carroll 1993: 15) 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."

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

First, if one takes the model of Figure 1 as a serious theory, 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; Hunter 1986; Ree, Earles, and Teachout 1994) and across a wide range of social, economic, and political outcomes (Herrnstein and 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 evidence contrary to the model of Figure 1 from external validation studies, that is, is evidence that IQ or *g* is neither the sole nor necessarily the most important cognitive factor in adult socioeconomic success.[18] For example, there is evidence from the National Longitudinal Study of Youth (NLSY), the same data analyzed by Herrnstein and Murray in *The Bell Curve*. The Numerical Operations (NO) and Computational Speed (CS)

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

components of the Armed Forces Vocational Aptitude Battery (ASVAB) are not closely related to the IQ factor measured by the four components of the ASVAB that make up the AFQT (Herrnstein and Murray 1994: 580-83). 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. Also, Corcoran (1996) found great variation in the importance of the several components of the ASVAB in determining educational, economic, and social success. 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.

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. One potential resource of this kind, the Project Talent study of the 1960s in the United States, was abandoned after contact was lost with a large share of sample members. 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, e.g., 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, which includes all of the measures making up the Armed Forces Vocational Aptitude Battery, and the sample has now been followed to ages 37 to 44 (in 2002). It is unfortunate that there are not more longitudinal data in which the effects of a full range of test performances can be assessed across a broad array of life outcomes.

Education and Cognitive Ability

There is little argument against the proposition that people with higher ability go further in school. A classic set of findings from the Wisconsin Longitudinal Study was presented by Sewell and Shah (Sewell and Shah 1967; Sewell 1971), who showed the percentage of Wisconsin women and men in the high school class of 1957 at each combination of quartiles of socioeconomic status and of cognitive ability who planned to attend college, attended college, and graduated from college in the seven years after high school completion. For example, 3.2 percent of low ability men and only 1.8 percent of low ability women graduated from college by 1964, while 47.2 percent of highly able men and 33.5 percent 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 percent among women with low ability to 13.8 percent among women with high ability, and the rates varied 0.3 percent among men with low ability to 20.1 percent among men with high ability (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. Thus, there is no problem of endogeneity in the determination of ability—at least with respect to its effects on post-high school outcomes. That situation is far different, for example, in the National Longitudinal Study of Youth, where study participants took the Armed Forces Vocational Aptitude Battery (ASVAB) at ages from 15 to 22, when members of the sample had completed varying levels of schooling, and many had already left school for a period of years. This aspect of the NLSY design has led to a variety of efforts to estimate the reciprocal effects of ability on

schooling and of schooling on ability (Herrnstein and Murray 1994; Fischer et al. 1996; Winship and Korenman 1997; Neal and Johnson 1996; Lillard and Kilburn 1997), using auxiliary data on ability and/or on the timing of schooling withing the NLSY. Despite the correction of an egregious coding error in the paperback edition of *The Bell Curve* (Herrnstein and Murray 1996), their estimate of the influence of schooling on general cognitive ability remains much lower than other estimates (Ceci and Williams 1997).

Second, because the Wisconsin study controlled a valid and reliable measure of socioeconomic standing, 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. In fact, the effects of test scores on post-secondary schooling in the Wisconsin sample are robust with respect to much stronger controls for common family background (Hauser and Sewell 1986). 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.[19]

Of course, the Wisconsin findings do not speak to potential cultural biases in testing that might affect the performance levels of Blacks or other minorities. 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. However,

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[19] The Wisconsin State Testing Program had been created in the 1930s by a consortium of high schools and colleges in Wisconsin in order to identify academically talented students and encourage them to attend college. By the 1950s, that function had been assumed by national testing organizations.

new research on the internalization of "stereotype threat" suggests that situational factors adversely effect the test performance of minorities (and women) in laboratory settings (Steele and Aronson 1995).

A serious design problem in the Wisconsin study, which also affects the national longitudinal studies based on high school students, is truncation of the distribution of educational attainment and, thereby, of cognitive ability. In successive national longitudinal studies, this problem was addressed by lowering the initial grade level: Twelfth grade in the National Longitudinal Study of the High School Class of 1972 (NLS72), tenth grade in High School and Beyond (HSB), and eighth grade in the National Educational Longitudinal Study of 1988 (NELS88).[20] However, the potential value of these designs has been compromised by decisions to terminate the samples at relatively young ages. For example, the NLS72 was terminated after 1986, just fourteen years after high school graduation. In the household survey succeeding the NLSY of 1979, which began in 1997, this truncation problem, as well as the endogeneity of schooling, was addressed by drawing a sample of 12 to 16 year olds who were tested during the summer of 1997. However, it will be many years before we will be able to observe the adult consequences of early ability—or anything else—in this sample.

Earlier sociological thinking about the ability-schooling relationship (Boudon 1974), recently revived in the context of rational choice theories of educational attainment (Erikson and Jonsson 1996a; Goldthorpe 1996), has focused on possible rationales for interaction effects

[20] To be sure, the initial grade level was lowered because of the widespread belief that student development was more labile at lower grade levels, not because of any concern with sample truncation.

between ability and social class or social background in the determination of educational aspirations or attainments—for example, the notion that one should cast class differentials in aspiration in relative terms, so college aspirations are higher among working class than middle class youth. In my opinion, such work misses the forest for the trees. The predominant effects of social background and ability are additive, and interaction effects will be sensitive to modest differences in functional form and in the classification of measurements that are in no way determined by theoretical discourse.

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 and 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 neglecting the limited correlation between social class and test performance (Oakes 1985).[21] For

[21] Such analyses also typically ignore the class-relevant alternative, that is, on what information decisions would be made in the absence of test score data.

better or worse, we may well learn more about the effects of the administrative use of test scores through the new federal mandate to test all students in grades 3 through 8.

The central question cannot be addressed except by comparative analysis, either across time or place, between situations in which test performances are known and possibly acted upon and those where test performance is known to the researcher, but unknown to relevant decision-makers.[22] One telling, small-scale example of this is the case of *Pygmalion in the Classroom* (Rosenthal and Jacobson 1968), in which teachers were told that some of their students, chosen at random, were "late-bloomers," and—according to the authors—the changed teacher expectations led to higher academic performance. The implication is that the labeling of students by test scores will affect academic achievement, even in the absence of specific actions to achieve that end. Unfortunately, the findings were not nearly so strong or reliable as Rosenthal and Jacobson had hoped, and the main consequence of their work was a minor industry devoted to reanalysis and reassessment of it (Elashoff and Snow 1971).

Occupational Differentials in Ability: A Psychometric View

One standard validation of the psychometric argument is differentials in measured ability by occupation. Standard works on testing have regularly included reviews of data on ability by occupation (Wechsler 1958; Tyler 1965; Matarazzo 1972; Jensen 1980a; Gottfredson 1997), 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.

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[22] Adam Gamoran's recent work in Scotland takes advantage of one such analytic opportunity.

Jensen's (1980a: 339-47) discussion of occupational differentials in intelligence provides an 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." In parallel with Duncan, Featherman, and Duncan (1972: 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 0.91 with 1964 NORC prestige ratings of the "subjectively opined prestige" of the occupations and 0.81 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, Featherman, and Duncan's analysis of scores from the Barr scale, as reported by Terman (1925: 66). However, Jensen *never* cites Duncan, Featherman, and Duncan, nor does he cite Terman's work in the passage in question.[23] The lower of the correlations cited by Jensen, 0.81 between the "composite index score" and the Barr scale, pertained to 96 matches between Barr and Census

[23] One interesting bit of evidence that Jensen relied on Duncan, Featherman, and Duncan is the fact that both erred in reporting that Barr used 30 judges; Terman (1925: 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.

occupation titles; the higher cited correlation, 0.91 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, Featherman, and Duncan's report of a virtual equal correlation, 0.90, between the Barr scale and the "composite index score." Of course, the "composite index score" was not assigned by the Bureau of the Census, but was Duncan's socioeconomic status score for occupations (Duncan 1961).[24]

After noting the persistence of occupational prestige ratings across time, Jensen 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, Featherman, and Duncan's 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. ... [I]ntelligence

[24] Duncan, Featherman, and Duncan (1972: 75) merely reported that the SEI was available for entries in the *Classified Index*.

> 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 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 false, 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 and Hagen 1959). It is not clear to me how either of these observations supports the argument.

Finally, Jensen 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 than 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 that "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, "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. 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 individual 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 (Table 9-1, pp. 70-94), and in "samples" of highly variable size, definition, and quality.

While Jensen 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 Tests (AGCT) along with previous civilian occupation (Harrel and Harrel 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 2, 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, e.g., 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, "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" (Harrel and Harrel 1945: 229-30).

My interpretation is bolstered by examination of another large set of data from the same era, which is also widely cited in the psychometric literature, e.g., by Tyler (1965: 337)—though not by Jensen. These data, reported by Stewart (Stewart 1947), are reproduced in Figure 3, which is modeled after the remarkable graphic in her paper. The data pertain to some 81,553 White enlisted men in 227 different occupations, drawn from U.S. Army records in 1944. Figure 3 shows five percentile points for each civilian occupation: 10, 25, 50, 75, and 90. Here, the possibility of truncation in the upper reaches of the distributions is not so clear, for there is regular variation in the 90th percentile scores shown on the chart, as well in the lower end of the distribution. However, Stewart provides separate tabulations of the percentile points of most occupations in two service commands, the North and the South. In Figure 4 and Figure 5, I have arrayed these data in the same fashion as in Figure 3, but only for 30 occupations in which there were at least 50 cases in both the Northern and Southern commands. Scores were typically lower in the South than in the North, and there was less evidence of heteroscedasticity in the South than in the North. Indeed, there is very little evidence of it in the Southern command, excepting the very highest ranking occupations: Salesman, General Clerk, Clerk-Typist, General Bookkeeper, and Teacher. I doubt that these—at least in the case of the four clerical occupations—were the sorts of jobs that Jensen had in mind as exceptionally selective. Rather, I suspect that these jobs ranked high in test scores among Army enlisted men because of the specific skills demanded by the Army during the war years. In this context, the conventional

wisdom of psychometrics appears to be no more than statistical folklore, and I can only wonder why no one has bothered to question it in the 50 years since Stewart's data were published.

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 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" (Jensen 1980a: 341). Or consider Herrnstein and Murray's 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 (Herrnstein and Murray 1994: 64-65).

How strong is the correlation between IQ and occupation? From the GATB data, Jensen (1980b: 343) estimated that 47 percent of the variance in IQ was within occupations, thus implying a correlation of .69 between IQ and occupational classification. Gottfredson (1997: 87-88) reports that the median standard deviation of scores of job applicants on the Wonderlic Personnel Test is 6.3 within occupations, while 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 percent as large as in the general population; that is, 67 to 75 percent of the variance in IQ occurs between occupations.

Occupational Differentials in Ability: A Sociological View

I first examined the data of Stewart and of Harrell and Harrell several years ago, long before the specter of IQ was raised by Herrnstein and Murray, and it occurred to me to wonder 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 the NORC General Social Survey 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. The ten GSS vocabulary items were chosen from "Form A," one of two parallel, twenty-item vocabulary tests selected by Thorndike. Each form contained two

vocabulary test items from each of the levels of the vocabulary section of the Institute for Educational Research Intelligence Scale: Completion, Arithmetic Problems, Vocabulary, and Directions (Thorndike 1942). Form A was developed by Thorndike in response to the need for a very brief test of intelligence in a social survey (Thorndike and Gallup 1944), and it was also used in an attempt to study the feasibility of an aptitude census (Thorndike and Hagen 1952). Form A was later used by Miner (1957) in his monograph, *Intelligence in the United States*, which attempted to assess the intellectual ability of the U.S. population using a national household sample survey.[25]

For each of ten WORDSUM items, GSS respondents are asked to choose the one word out of five possible matches that comes closest in meaning to the word in capital letters. The GSS obtains personal interviews, and each item is handed to the respondent on a preprinted card. Before 1988, WORDSUM was administered to the full GSS sample, but only every other year. Since 1988 it has been administered to two-thirds of the sample, using an alternate forms design. Because the test is so short—and because it was developed in the early 1940s—its reliability and validity are serious issues.[26] In the present context, truncation bias is another potential problem. Even in the general population, there is evidence that the test has too high a floor or too low a ceiling in some population groups. This could be a serious problem in an analysis of occupation, which is at least moderately correlated with measured ability. In addition to the analysis reported

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[25] Alwin (1991) used the GSS WORDSUM data from 1974 to 1990 to show that changes in family configuration could not account for the decline of verbal ability in the verbal component of the SAT.

[26] These issues are discussed at length with respect to trend analyses and Black-White differences by Huang and Hauser (1997; Huang and Hauser 1998).

here, I have also constructed alternative series by assuming normality and estimating average scores in the two extreme categories. Those estimates provide even less support for the traditional psychometric view than those reported here.

Figure 6 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.[27] 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, are located at one standard deviation above and below the mean of a single occupation group. The graph suggests that there is a tendency for intra-occupational variation to decline as the average ability level increases. The correlation between the mean and standard deviation of WORDSUM is -0.65, but the slope is quite small, -0.081. In fact, 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, 0.53.

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 argues that the relationship between IQ and occupation increases from youth to maturity: “The size of the correlation ... seems to

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

depend mostly on the age of the person 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" (Jensen 1980a: 341).

In this context, there is some disadvantage to working with data from the Wisconsin Longitudinal Study, 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—75 to 80 percent among men and higher among women—and the data permit us to look at the occupation-ability relationship across the life course.[28] Here, I look at the relationship between occupations and scores on the Henmon-Nelson Test of Mental ability in relationship to three jobs: First, full-time civilian job after leaving school for the last time; current or last job in 1975; and current or last job in 1992-94. In order to obtain stable results, we have pooled data from the 1957 graduates and from a large, random subsample of their brothers and sisters. Among the vast majority of graduates, the Henmon-Nelson test was taken in the junior year of high school; among siblings, it was sometimes taken in the senior or sophomore year. Using national norms by grade level for the Henmon-Nelson test as well as a renorming of raw scores for graduates for whom there were test scores in both the freshman and junior year, we have estimated junior year raw scores on the Henmon-Nelson test for all of the graduates and siblings for whom any test score has been obtained. Finally, we renormed the raw scores to a set of IQ equivalents, based on the percentile distribution of scores that were observed among all Wisconsin high school juniors in 1951. Thus, our norming of the Henmon-Nelson test scores does not

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[28] I thank Jennifer Sheridan for her assistance in this part of the analysis.

depend on the obsolete concept of mental age used in the construction of Henmon-Nelson IQ scores.

There were insufficient data to tabulate test scores for the detailed, 3-digit codes of the 1970 Census classification system. Thus, we devised intermediate level codes for similar groups of less common occupations, leaving intact the most common detailed occupation groups. In each of Figures 7 through 12, percentile points of the Henmon-Nelson score distributions are shown for each of 62 intermediate categories for women and for each of 65 intermediate categories for men, omitting those categories for each job in which there were fewer than 30 incumbents in the pooled samples of graduates and siblings. In each figure, the occupations are arrayed from lowest to highest median Henmon-Nelson score. Thus, slightly different groups of occupations appear in slightly different order in each figure.

Obviously, the graphics do show an occupational hierarchy of ability distributions, which is generally similar across the life course. However, there are only weak relationships between occupational standing and the range of variability in the ability distributions. Those relationships are weak enough so it is very difficult to see them in the figures. The regression of the standard deviation of Henmon-Nelson IQ on the mean is negative among men for all three jobs, but the slope is statistically significant only for first job and job in 1975-77. The regression is negative for women's first jobs, but positive for the two later jobs. In no case is the slope statistically significant for women. The largest negative slope among men is -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 occupational means, 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 6000 to 6800 observations for women or men at each stage of the life course. The average IQ is slightly greater than 100, as one might expect from the norming of scores on the distribution among Wisconsin high school juniors. Scores are slightly more variable among men than among women. The correlation between occupation and Henmon-Nelson score is no more than moderate: 0.39 to 0.44. 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 very slightly with age. That is, there is no evidence in the Wisconsin data that occupational segregation by ability becomes greater as populations grow older; if there is any trend, it is in the opposite direction.

Finally, I wondered whether a correction for unreliability in the Henmon-Nelson Test would render the Wisconsin files more comparable to those cited above—even though the former studies have not introduced such a correction. Fortunately, for about 6500 of the Wisconsin graduates, we have obtained scores from a second, earlier administration of the Henmon-Nelson test, during the freshman year of high school, and I have estimated the reliability of the test from the freshman to the junior year in several subsamples defined by gender of graduate and sibling. The reliability estimates range from 0.75 (in one subgroup) to 0.86 (in three other subgroups). For the sake of argument, I corrected the estimates of Table 1 using a reliability of 0.80 for the

Henmon-Nelson score. This raised the range of correlations between occupation and test score only to .43 to .48.

Why are the ability-occupation correlations so much lower in the Wisconsin data than in Gottfredson's estimates? There could be an effect of restricted range in the Wisconsin sample, but it is not obvious how large such a correction might be, given the high graduation rates in Wisconsin. Another possibility, which I have yet to confirm, is that the Wonderlic data used by Gottfredson come from a commercial source—firms that use the Wonderlic Personnel Test to screen job entrants—thus leading to greater occupational segregation by ability than in the general population. Yet a third possibility, of course, is that ability changes to some degree between the adolescent years and mature adulthood, e.g., as a consequence of more or less post-high school education, thus attenuating the relationship between occupation and ability. To be sure, some deny that measured ability changes in response to schooling (or anything else), but the preponderance of recent evidence supports the view that schooling increases cognitive ability (Herrnstein and Murray 1996; Fischer et al. 1996; Winship and Korenman 1997; Neal and Johnson 1996; Lillard and Kilburn 1997).

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 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 individual who lack a threshold level of ability. That is, he argues 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 1980a: 345-47).

Jensen is not alone in taking this position. For example, Herrnstein and Murray (1994: 124-5) offer four lame excuses for failing to consider the joint and separate effects of cognitive ability and educational attainment on adult outcomes:

> "First, the number of years of education that a youth gets is *caused* to an important degree by both the parents' SES and the youth's own academic ability. ... This means that when educational attainment is used as an independent variable, it is to some degree expressing the effects of SES and IQ in another form. Second, any role that education plays independent of intelligence is likely to be discontinuous. Third, variables that are closely related can in some circumstances produce a technical problem called multicolinearity, whereby the solutions produced by regression equations are unstable and often misleading. Fourth and finally, to take education's regression coefficient seriously tacitly assumes that intelligence and education could vary independently and produce similar results."

On the first point, it is a serious, practical matter whether effects of cognitive ability are direct or whether they are mediated through schooling. Second, there is of course no particular problem in

estimating effects of schooling in discrete form; it is done all the time using dummy variable regression. If schooling—mis-specified as a continuous variable—dominates measured ability in an occupational status regression, does that not suggest that the effect of school would be yet larger if its nonlinear effects were estimated? Third, schooling and ability are not so highly correlated as to preclude estimating the effects of both variables in any moderately large sample. Moreover, if colinearity precludes estimating effects of schooling, how does it not also preclude estimating effects of ability? Finally, as in the case of discontinuous effects of schooling, so also interaction effects of ability and schooling are a matter for empirical analysis.

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.[29] One obvious example of this, which I have unquestioningly accepted 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 stratification system? I think not, in the absence of data that other candidate variables are not equally central.[30] For example, in the Wisconsin data, for each of the sets of job data used in Figures 7 to 12, I have computed correlations among six occupational characteristics: Average Henmon-Nelson 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

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[29] For example, consider Gottfredson's (1997: 109-116) discussion of zero-order associations between adult literacy scores and "cumulative life outcomes."

[30] Here, it would be instructive to examine Gottfredson's (1997: 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.

aspiring to attend college, and average occupational aspiration (on the Duncan SEI). 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.[31] 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, do 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—more than three-quarters of a century. Research and speculation has 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 (1995b; 1995a; 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

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

earnings, possibly excepting very recent growth in the effects of ability on the earnings of young workers.[32]

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 and Cook 1995). Herrnstein and Murray (1994: 25) 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."

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

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[32] Relevant work on earnings includes Levy and Murnane (1992), Card and Lemieux (1993), 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.

Min-Hsiung Huang and I reviewed the trend evidence offered by Herrnstein and Murray, and we have presented new evidence from the NORC General Social Survey about relationships between verbal ability and social origins, educational attainment, occupational success, and economic success (Hauser and Huang 1997; Huang and 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 and Murray 1994: 34; Taubman and Wales 1972: 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 and Murray 1994: 56).

New evidence from the General Social Survey failed to confirm any of Herrnstein and Murray's trend hypotheses. If there have been any trends in ability differentials by social origin during this century in the United States, they have been reduced effects of race, farm background, size of sibship, and Southern birth.[33] 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 or earnings. To be sure, we consider both the weaknesses and strengths of the

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

GSS data, but no methodological problems appear to preclude our observing any indication of a master trend toward ever increasing effects of cognitive ability.

Ability Across the Life Course

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, and Hauser 2002). The most recent follow-up of the Wisconsin Longitudinal Study (WLS) was in 1992-93, when the sample was 53 to 54 years old (Hauser et al. 1992). It thus provides a valuable opportunity for us to look at the evolution of socioeconomic achievements over much of the life course and at the role of cognitive ability, among other variables, in that evolution.

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 were 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 percent of the original sample members were located and interviewed by telephone (Clarridge, Sheehy, and 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 the sample for the first time since 1975, and we interviewed 91 percent of surviving 1975 respondents.

The WLS sample is broadly representative of middle-aged white American men and women who have completed at least a high school education. Thus, we think that the experience of the Wisconsin cohort is highly relevant to the contemporary discussion 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 are only a handful of African American, Hispanic, or Asian persons in the sample. About 19 percent 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 reinterview, roughly 70 percent of the sample lived in Wisconsin, and 30 percent lived elsewhere in the U.S. or abroad.

Despite its limitations, the WLS provides a long-term look at the development of the life course from adolescence to midlife in a cohort of men and women who resemble a large segment of the U.S. population. The sample is large, and sample retention is very high; compare Jencks et al. (1979: 6-7) and Center for Human Resource Research (1992). Measurements are of high (and often of known) quality. Moreover, the WLS has fared well in comparisons of findings with national studies of comparable populations (Sewell and Hauser 1975; Jencks, Crouse, and Mueser 1983; Corcoran, Gordon, Laren, and Solon 1992).

Our findings from the WLS data are based upon the well known social psychological model of attainment that was originally developed using data for the same cohort from the senior year of high school, 1957, through the seven years that usually encompass college attendance and entry into careers and marriage (Sewell et al. 1969; Sewell et al. 1970; Sewell 1971; Sewell and Hauser 1975). However, in recent studies we have asked whether, and in what ways, the conditions of early career success continue to influence socioeconomic outcomes later in life

(Hauser, Sheridan, and Warren 1999; Hauser, Warren, Huang, and Carter 2000; Warren, Sheridan, and Hauser 2002).

To anticipate some findings, adolescent IQ and educational attainment are both moderately correlated with occupational status from youth to maturity, but the educational correlations are much larger, at least early in the career. Among WLS men, the correlation between years of schooling and the status of first, full-time civilian jobs is 0.77, and among WLS women, the correlation is 0.50. By age 53-54, these correlations fall to 0.54 and 0.37, respectively. The correlation between Henmon-Nelson IQ score and status of the first job is 0.44 among men and 0.33 among women. At ages 53-54, the correlations are 0.39 and 0.37. Thus, the correlations of occupation with educational attainment decline across the life course, while those with IQ are relatively stable. This suggests that there is something more to ability than its validation through schooling, but the correlation of IQ with occupational status is also not impressively large.

A Social Psychological Model of Attainment

The social psychological model of attainment is shown schematically in Figure 13. Briefly, it elaborates the well-known Blau-Duncan model of occupational achievement by introducing social psychological variables related to school experience and aspiration, as well as a more extensive set of social background characteristics.[34] The model is block-recursive, and all save two of the blocks shown in Figure 13 represent more than one variable. The idea of the model is that social background affects school performance, while background and performance affect social

[34] Our work with the model is reviewed by Sewell et al. (2002). It has been used previously in three comparative analyses of the attainment of women and men in young adulthood (Sewell 1971; Hauser et al. 1976; Sewell et al. 1980). We have modified the content of some of the blocks of variables in the model, relative to earlier analyses.

support for post-high school education. All three prior constructs affect levels of aspiration, which in turn affect the ultimate level of post-high school educational attainment. Finally, educational attainment, along with all of the previous variables, affects occupational status. While the diagram and our description of it suggest that each variable in turn can directly affect all of the variables in the blocks that follow it, we expect to find that the major affects approximate a modified causal chain (Sewell et al. 1969; Sewell et al. 1970; Hauser et al. 1983). The most important paths in the model, noted with asterisks in the diagram, are those from social background to school performance, from social background and school performance to the social influences, from the social influences to aspiration, from aspiration to schooling and socioeconomic attainment, and from schooling to attainment. Thus, the model purports to account for the influence of social background and school performance on attainment by way of social support and aspiration.

Variables

Social background variables include parents' income, father's occupation, mother's and father's educational attainments, farm origin, family structure (intact or non-intact), and number of siblings. Parent's income was obtained from Wisconsin state tax records for 1957 to 1960, the years during which respondents were most likely to have attended college. It is expressed here as the natural log of the four year average. Father's occupation and the educational attainment of each parent were reported in the 1975 survey; in a small number of cases missing data were filled in with information from tax records or from the 1957 survey. Father's occupation was coded into categories of the classification of occupations and industries for the U.S. Census of 1970 and, for the regression analysis, this was mapped into the Duncan SEI.

School performance includes mental ability, high school program, and rank in high school class. Mental ability is based on the Henmon-Nelson test, normed on the population of Wisconsin high school juniors to which it was routinely administered during the 1950s. The scores were obtained from records of the Wisconsin State Testing Service at the University of Wisconsin-Madison. High school program is a dummy variable, obtained by comparing student's 1957 report of the number of courses taken in several subject matter areas to the contemporary requirements for entrance to the University of Wisconsin. Students were coded as in a college preparatory program if they reported completing the University of Wisconsin entrance requirements. Rank in high school class was reported by the schools, transformed to percentile rank and, then, to a normal deviate with a mean of 100 and a standard deviation of 15. It is thus expressed in the same metric and has nominally the same distribution as the Henmon-Nelson IQ scores.

Social influences are represented by the respondent's perception of encouragement from parents and from teachers to attend college and by perception of whether most friends planned to attend college. Aspirations include educational plans in the year after high school graduation and the occupation that the respondent eventually hoped to enter. For this analysis, we used the student's reports from the 1957 survey. The 1957 reports of occupational aspiration were recently recoded to 1970 Census standards and mapped into the Duncan scale.

Educational attainment is the number of years of regular (academic) schooling completed by the respondent, as reported in the 1975 survey. Occupational status is based on reports of occupation, industry, and class of worker from the 1975 and 1992 surveys: first full time job after leaving school for the last time, job in 1970, current or last job in 1975 (as reported in 1975), job in

1975 (as reported in 1992/93), and current or last job in 1992-93.[35] All of the occupations held by respondents were mapped into the Duncan SEI.

There were significant differences between women and men in late adolescence. There were no sex differences in social background or mental ability, but 66 percent of men and only 55 percent of women completed a college preparatory program in high school. At the same time, women's high school ranks were substantially higher than those of men (by 7 points or nearly half a standard deviation). Despite the higher grades of women, men were slightly more likely than women to report that their teachers had encouraged them to attend college (46 percent vs. 43 percent), but men were much more likely than women to report that their parents had encouraged college attendance (60 percent vs. 48 percent). Consequently, it was somewhat surprising to find that women were more likely than men to report that their friends were planning to attend college, and that women were more likely than men to plan to attend college in the year following high school graduation.[36] However, women aspired to lower status occupations than men.

Ultimately, men of the WLS obtained almost a year more of schooling than women. Men gained about 10 points in status from their first to 1970 occupations, but little growth occurred after that. Among all women, there was virtually no change in occupational status from first jobs

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[35] We collected an occupational history from 1975 to 1992-93 of up to four employers or businesses and the first and last jobs with each employer/business, and we plan to include other occupations held from 1975 to 1992-93 in future analyses. This data collection scheme does not in principle give us a continuous or complete job history. It leaves out the middle employment spells for persons who were employed in more than four establishments. However, for this cohort, employment patterns were sufficiently stable by 1975, so it gives us complete and continuous histories for more than 90 percent of respondents.

[36] However, a substantial minority of men, but not of women, planned to enter military service soon after completing high school.

to 1970 jobs. Status decreased from 1970 to 1975, but it increased by 1992-93 to a higher level than in the early career. However, among fully employed women, there was slow growth in occupational status after 1970. At every stage of the career after the first job, and regardless of continuity of employment, women's jobs were lower in status than men's jobs.

A MIMIC Model of Occupational Status

In order to discipline our interpretations of the changing effects of the variables in our model on occupational status across the life course, we specified and estimated a series of MIMIC (multiple-indicator, multiple-cause) models of occupational status (Hauser and Goldberger 1971; Joreskog and Goldberger 1975). These models specify that prior variables affect occupational status, from first jobs through jobs in 1992-93, through a single common factor, so the effects of those variables on each occupational status outcome must be proportional, if not identical to one another.[37]

First, we consider a model in which the effects of all variables on each of the five occupational status outcomes is exactly the same, while the relationships among those outcomes are completely unconstrained. This model would be rejected at conventional significance levels for men ($L^2 = 454.4$ with 64 df) and for women ($L^2 = 119.0$ with 64 df). Second, we specify a model in which the effects of prior variables on occupational status are not necessarily equal, but must be proportional to one another. Again, there is no constraint on the relationships among the status outcomes. The fit improves among men ($L^2 = 168.6$ with 60 df) and among women ($L^2 =$

[37] This summary pertains to analyses in which occupational status is expressed on the Duncan SEI; similar findings hold when analyses are carried out using occupational education or occupational income.

104.5 with 60 df).[38] Third, we accept the second model, but add the constraint that a single common factor explains the covariance structure of the occupational status outcomes. This model also fits badly (L^2 = 317.2 with 65 df among men and L^2 = 199.4 with 65 df among women), which is to say that a full model of status outcomes would needs to specify a structure for the occupational career (Warren et al. 2002).

We based our analysis on a modified version of the second model, which incorporates two specific violations of the proportionality constraints of the MIMIC model. The first change is that men's educational attainments have a larger than expected effect on the status of the first job after leaving school for the last time. The second change is that women's cognitive ability in high school has a larger than expected effect on the status of the job held in 1992-93.

The final equations account for 71, 52, 49, and 42 percent of the variance in status of men's jobs, and among women, they account for 48, 40, 34, and 27 percent of the variance. Change in the predicted variance of successive occupational status scores accounts in part for the declining power of the model to account for the variance in occupational standing across the career. In addition, the disturbance variances in occupational status increase across the career. For example, among men, the standard error of estimate for first jobs is 13.4, while it is 17.2 for jobs in 1992-93, and among women, the standard error of estimate for first jobs is 11.3, while it is 15.5 for jobs in 1992-93. The social psychological model explains a smaller share of the variance

[38] These and all other fit statistics reported herein would nominally lead to model rejection at conventional levels of statistical significance because of the relatively large sample sizes. However, the values of Raftery's (! Raftery 1995} Bayesian Information Criterion (BIC) fall into an acceptable range for all models.

for women than for men, but it also leaves a smaller component of variance unexplained for women than for men.

Table 2 gives estimates from the MIMIC model of the regressions of each occupational status on all prior variables in the model for men and women. (By reading from left to right within each panel, we can see the evolution of effects across the life course.) Among men, all effects, except that of schooling, increase slightly between the first job and the job in 1970, and the effects on later jobs decrease slightly. The effect of schooling is uniquely high at men's labor force entry, and it drops to about half the entry value at any later point in the career. Men's occupational status at career entry is modestly affected by IQ, net of other variables, and this effect increases by about a third for occupations later in the career. Among women, the model specifies no differences between effects on the status of first and 1970 jobs, but the effects of all variables except IQ decline later in the career. The direct effect of IQ on women's occupational status is unique in almost tripling between career entry and midlife.

Thus, there are persistent and, indeed, growing effects of IQ on occupational status throughout the careers of the Wisconsin high school graduates. However, relative growth does not indicate absolute importance; there is less here than meets the eye. In the reduced-form equation for occupational status in 1992-93, subject to the MIMIC constraints, the total effects of ability are 0.236 among men and 0.303 among women. That is, a 10 point shift in IQ yields 2 to 3 points in occupational status. The standardized coefficient of ability is 0.157 among men and 0.245 among women. In the final equations, the effects of ability are 0.116 among men and 0.279

among women. The corresponding standardized coefficients are 0.077 and 0.226.[39] Such effects would seem unlikely to dominate the process of social stratification in the United States.

As we might have expected from our national findings, if there is a key variable in the occupational attainment of men and women, it is educational attainment. Even after social background, ability, and other social psychological variables are controlled, there is a large and persistent effect of post-high school education on occupational success across the life course. Furthermore, adolescent occupational aspirations have strong and persistent effects on the occupational success of men and of women. In addition, there are gender-specific influences on occupational success. Farm background is a persistent handicap to men, while good high school grades continue to improve women's occupational chances. Finally, relative to ability, there are weaker, but still substantial and persistent effects of parents' income, father's occupational status, academic program, teachers' encouragement, parents' encouragement, and friends' college plans on men's occupational standing. In short, while mental ability plays a significant role in the process of occupational stratification, the Wisconsin findings also strongly support the conclusion that education and other social psychological variables are even more important. There are elements of "merit" in the schooling and psychological variables, so the Wisconsin findings lend weight to our earlier observation that it is inappropriate to identify merit too strongly with mental ability.

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[39] This relatively large effect of adolescent cognitive ability on women's occupational standing late in the career is not robust with respect to alternative measures and model specifications. Warren, Sheridan, and Hauser (2002) find no such effects on typical levels of occupational education or occupational earnings in a model of sibling resemblance in which common family background effects have been controlled.

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 stratification process. 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 pursuing the scientific enterprise, we ought to seek and produce new evidence of the role of cognitive abilities in social stratification.

Perhaps a more compelling reason to invest in studies of the effects of test performance on social stratification 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 towards 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: Ch. 2), that we have been and are now experiencing an unprecedented growth in scholastic testing that almost outdoes 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 change 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 will be in the secondary and elementary schools.[40]

There is a powerful movement for more extensive use of high school exit exams with passing levels set well above minimum competence. There is more controversy than evidence about the effects of these tests, most of it from the Texas exam (TAAS), which actually sets a rather low standard (Haney 2000; Haney 2001; Toenjes and Dworkin 2002; Carnoy, Loeb, and Smith 2001). We will soon learn the immediate consequences of the Massachusetts exit exam, MCAS, whose passing standard is set at roughly the national average, and of the revised New York Regents exams. 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 post-secondary education and training and to labor-market entry. High stakes exit exams will also deny high school diplomas to large numbers of non-minority students, and we have yet to learn the social and political consequences of that reversal of the widespread expectation that the children of the middle class will at least graduate from high school.

The No Child Left Behind Act (NCLB)–deemed "N-CLUB" by its critics–introduces a federal mandate for testing of all schoolchildren in grades 3 through 8. Unlike the Clinton administration's proposal for Voluntary National Tests, NCLB requires 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

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[40] Somewhere down the line, I firmly believe, we will also see vastly increased and, quite possibly, mandated uses of tests to certify the competence or incompetence of the elderly.

in violation of professional standards of appropriate test use (American Educational Research, American Psychological, and National Council on Measurement in 1985; American Educational Research Association and National Council on Measurement in 1999), and with negative long-term consequences for academic achievement and high school completion (Hauser, Pager, and Simmons 2000; Hauser, Simmons, and Pager 2000; Hauser 2001).

There is much more to be said about the reasons for the current public fixation on tests as a tool of educational reform (Linn 2000) and about its immediate consequences for the educational system. As sociologists, 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 apparently benign story of the Wisconsin cohort began more than sixty 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 the youth of the 1990s?

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Table 1. Henmon-Nelson IQ Scores of Wisconsin Graduates and Siblings by Job

				Percentiles					Observed		Corrected	
	N	Mean	Std. Dev.	10th	25th	Median	75th	90th	r	s	r	s
First job												
Men	6347	101.23	15.52	81	91	101	112	121	0.441	14.00	0.481	12.52
Women	6779	100.82	14.71	82	91	101	111	121	0.413	13.46	0.452	12.04
1975-77 job												
Men	6792	101.55	15.56	82	91	101	112	123	0.418	14.21	0.458	12.71
Women	6421	101.59	14.72	83	92	101	111	121	0.403	13.54	0.442	12.11
1992-93 job												
Men	6039	102.01	15.50	82	92	102	112	123	0.414	14.19	0.453	12.69
Women	6484	101.86	14.77	83	92	102	112	121	0.391	13.66	0.430	12.22

Table 2. Canonical Regression of Occupational Status (SEI) on Social Psychological Variables and Schooling: Men and Women in the Wisconsin Longitudinal Study

	Men (N = 3080)				Women (N = 1489)			
Variables Added to Model	First Job	1970 Job	1975 Job	1992-93 Job	First Job	1970 Job	1975 Job	1992-93 Job
Parents' Income	1.13	1.62	1.57	1.45	0.93	0.93	0.88	0.65
	0.41	0.58	0.56	0.52	0.74	0.74	0.70	0.51
Father's Occ. (SEI)	0.04	0.05	0.05	0.05	0.02	0.02	0.02	0.01
	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.01
Father's Education	0.01	0.02	0.02	0.02	0.20	0.20	0.18	0.14
	0.08	0.11	0.10	0.10	0.13	0.13	0.12	0.09
Mother's Education	-0.01	-0.02	-0.02	-0.02	0.02	0.02	0.02	0.01
	0.08	0.12	0.12	0.11	0.14	0.14	0.14	0.10
Farm Background	-3.72	-5.36	-5.17	-4.79	-0.05	-0.05	-0.05	-0.04
	0.61	0.84	0.81	0.75	0.94	0.94	0.88	0.65
Intact Family	-0.99	-1.42	-1.37	-1.27	1.09	1.09	1.03	0.75
	0.72	1.04	1.00	0.93	1.26	1.26	1.19	0.87
Number of Siblings	-0.02	-0.03	-0.03	-0.02	-0.17	-0.17	-0.16	-0.12
	0.08	0.12	0.12	0.11	0.14	0.14	0.13	0.09
IQ (Henmon-Nelson)	0.09	0.13	0.13	0.12	0.11	0.11	0.11	0.28
	0.02	0.03	0.03	0.02	0.03	0.03	0.03	0.04
Academic Program	1.34	1.93	1.86	1.73	-0.51	-0.51	-0.48	-0.35
	0.50	0.71	0.68	0.64	0.80	0.80	0.75	0.55
High School Rank	0.03	0.04	0.03	0.03	0.21	0.21	0.20	0.15
	0.02	0.03	0.03	0.02	0.03	0.03	0.03	0.02
Teacher's Encouragement	1.30	1.88	1.81	1.68	-1.23	-1.23	-1.15	-0.85
	0.48	0.69	0.66	0.61	0.80	0.80	0.75	0.56
Parents' Encouragment	1.41	2.04	1.96	1.82	0.26	0.26	0.25	0.18
	0.53	0.76	0.73	0.68	0.89	0.89	0.84	0.62
Friends' College Plans	1.22	1.76	1.70	1.58	0.52	0.52	0.49	0.36
	0.50	0.72	0.70	0.65	0.81	0.81	0.76	0.56
College Plans	-0.42	-0.60	-0.58	-0.54	-2.90	-2.90	-2.73	-2.00
	0.54	0.78	0.76	0.70	0.89	0.89	0.84	0.63
Occ. Aspirations (SEI)	0.09	0.13	0.13	0.12	0.18	0.18	0.17	0.12
	0.01	0.02	0.02	0.01	0.03	0.03	0.03	0.02
Education	7.11	4.07	3.93	3.64	3.75	3.75	3.54	2.60
	0.17	0.18	0.17	0.17	0.23	0.23	0.23	0.24
R-Squared	0.714	0.520	0.487	0.418	0.475	0.397	0.336	0.272
SE of Estimate	13.40	15.66	16.13	17.21	11.28	13.21	14.18	15.51

Note: Analysis is based on Duncan SEI of first full-time civilian occupation, 1970 occupation, 1975 occupation (as reported in 1975 and 1992-93), and 1992-93 occupation. Boldface entries violate canonical restrictions.

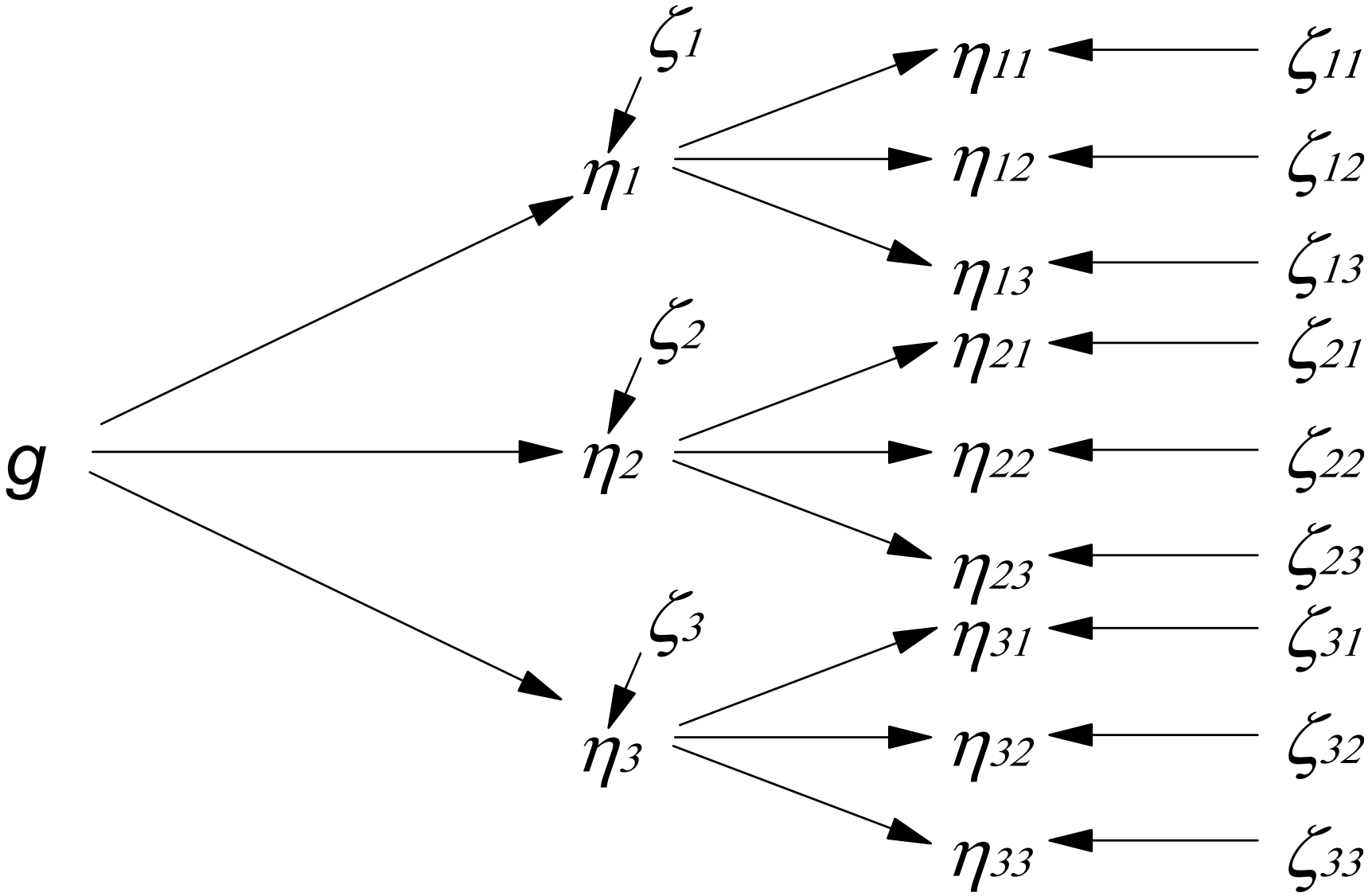
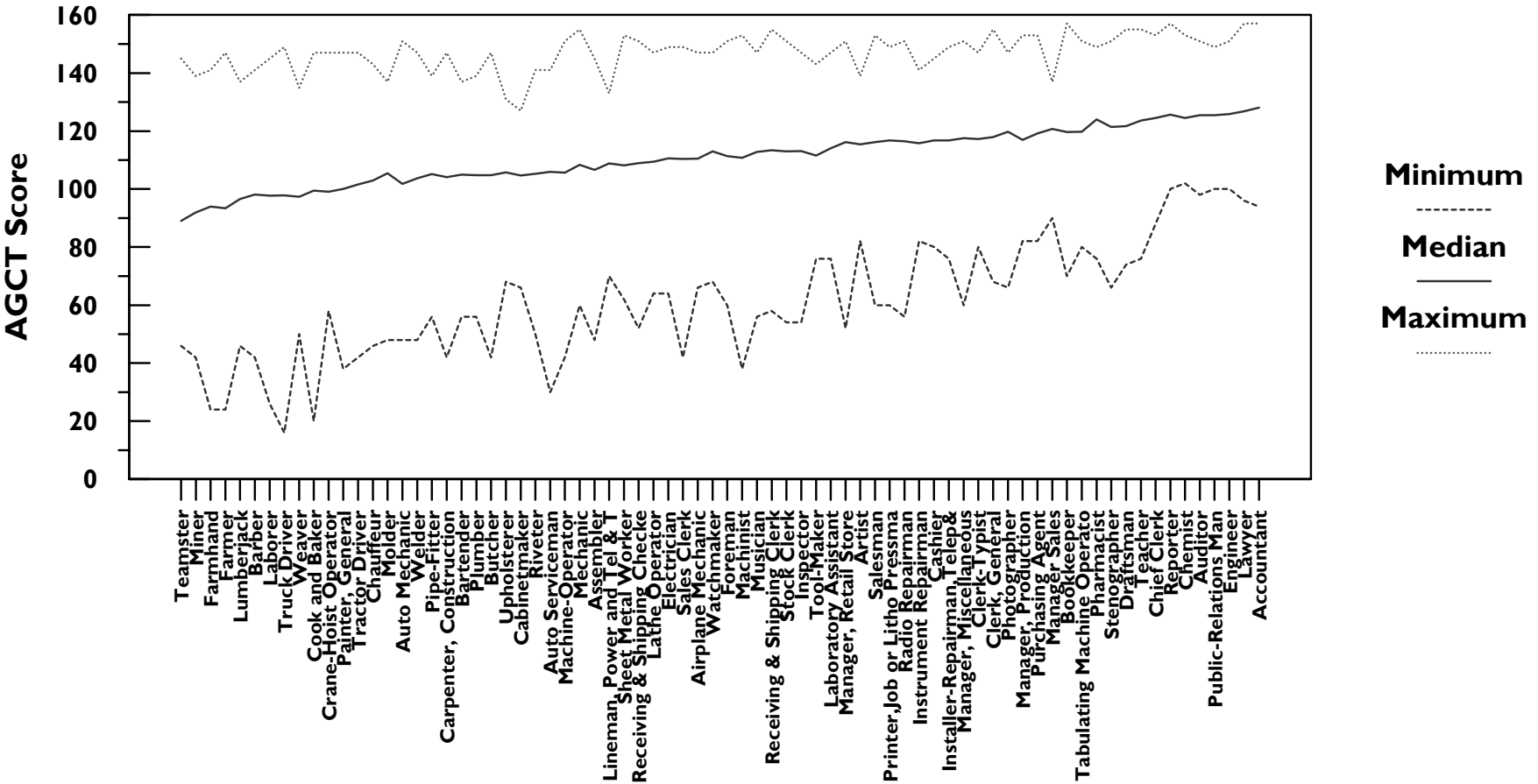


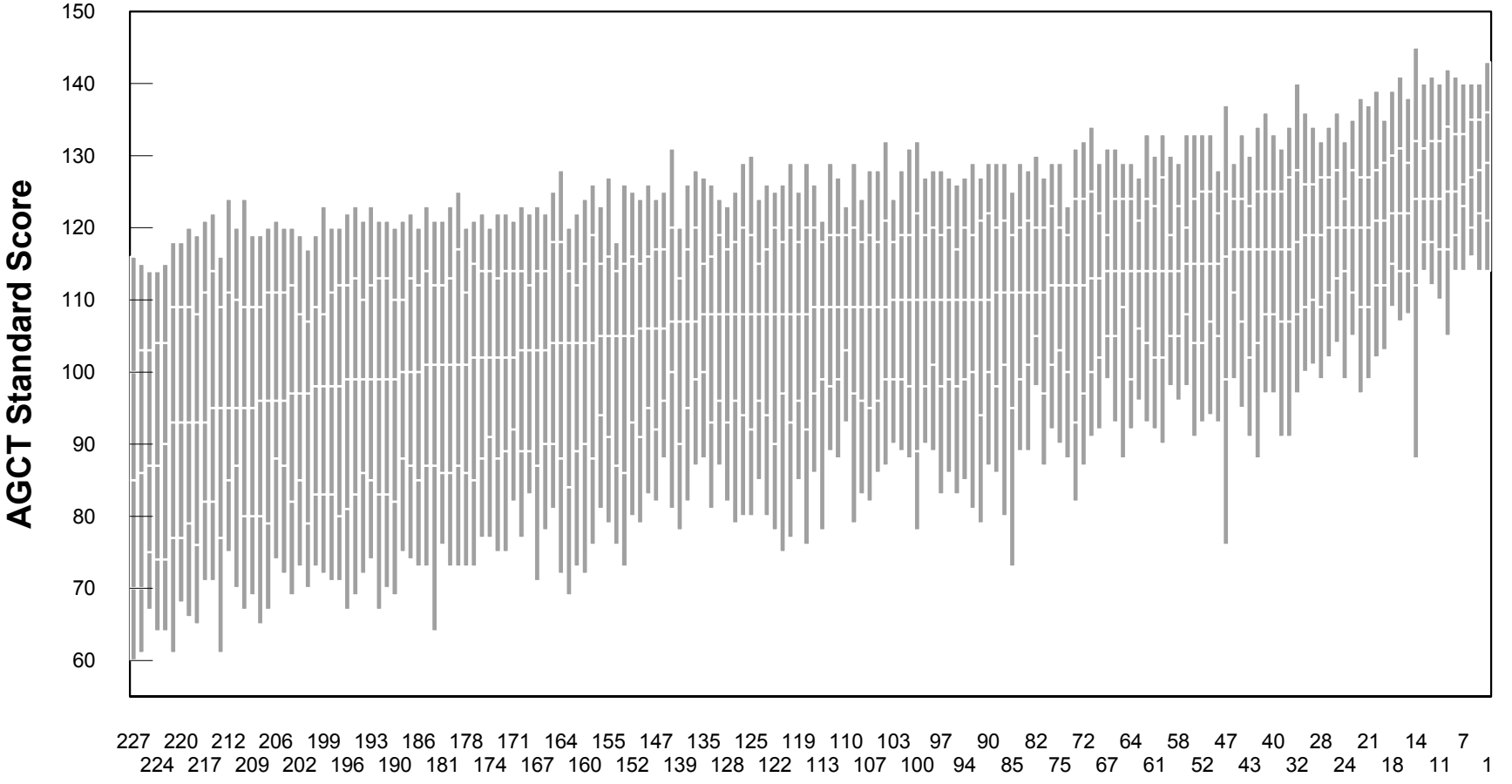
Figure 1. Hierarchical Factor Model of Cognitive Abilities

Figure 2. AGCT Score Distributions of Civilian Occupations: 18,782 White Army Air Force Enlisted Men in World War II



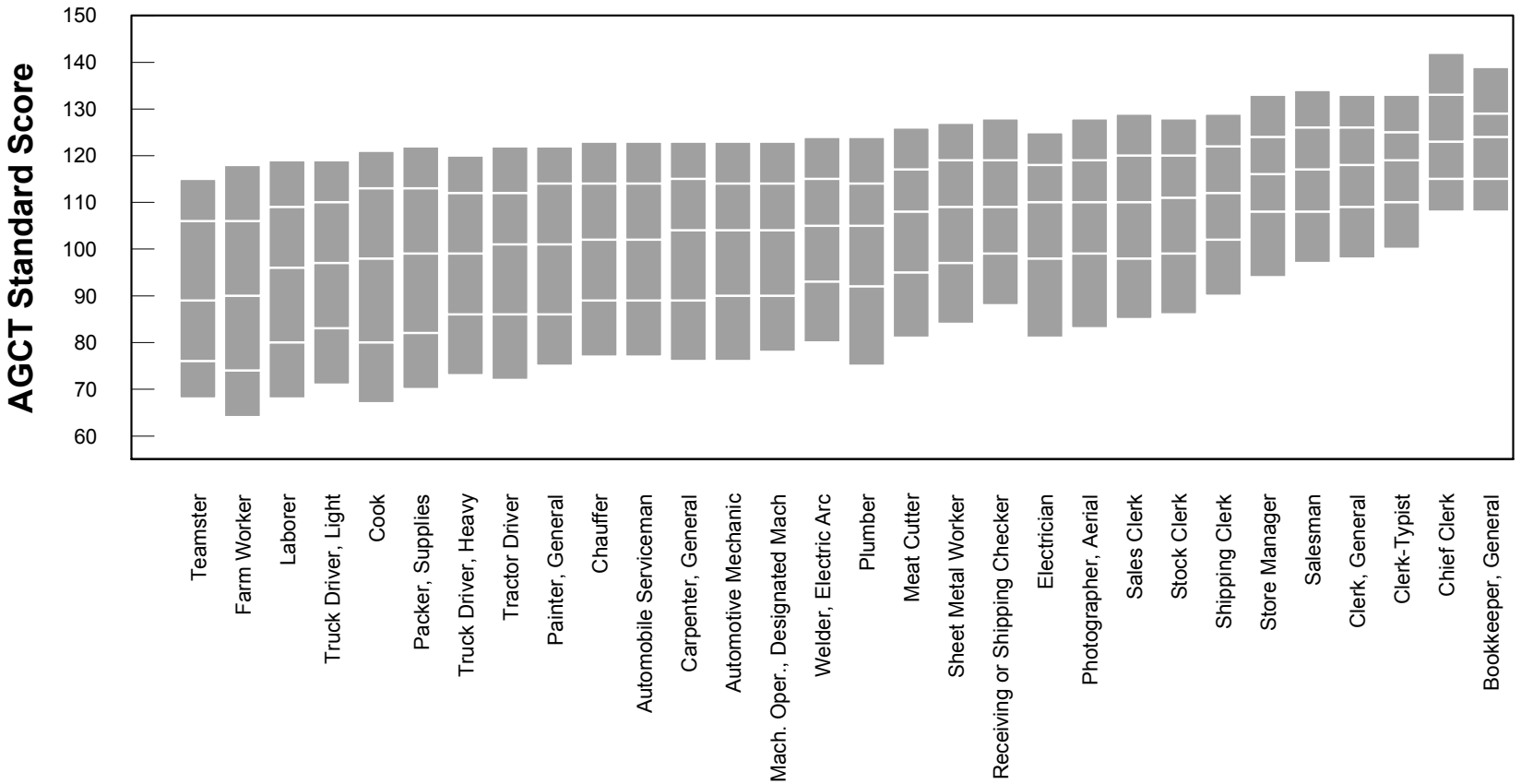
Source: Harrell and Harrell (1945)

Figure 3. Army General Classification Test Standard Score Distribution for All Occupations with 50 Cases or More



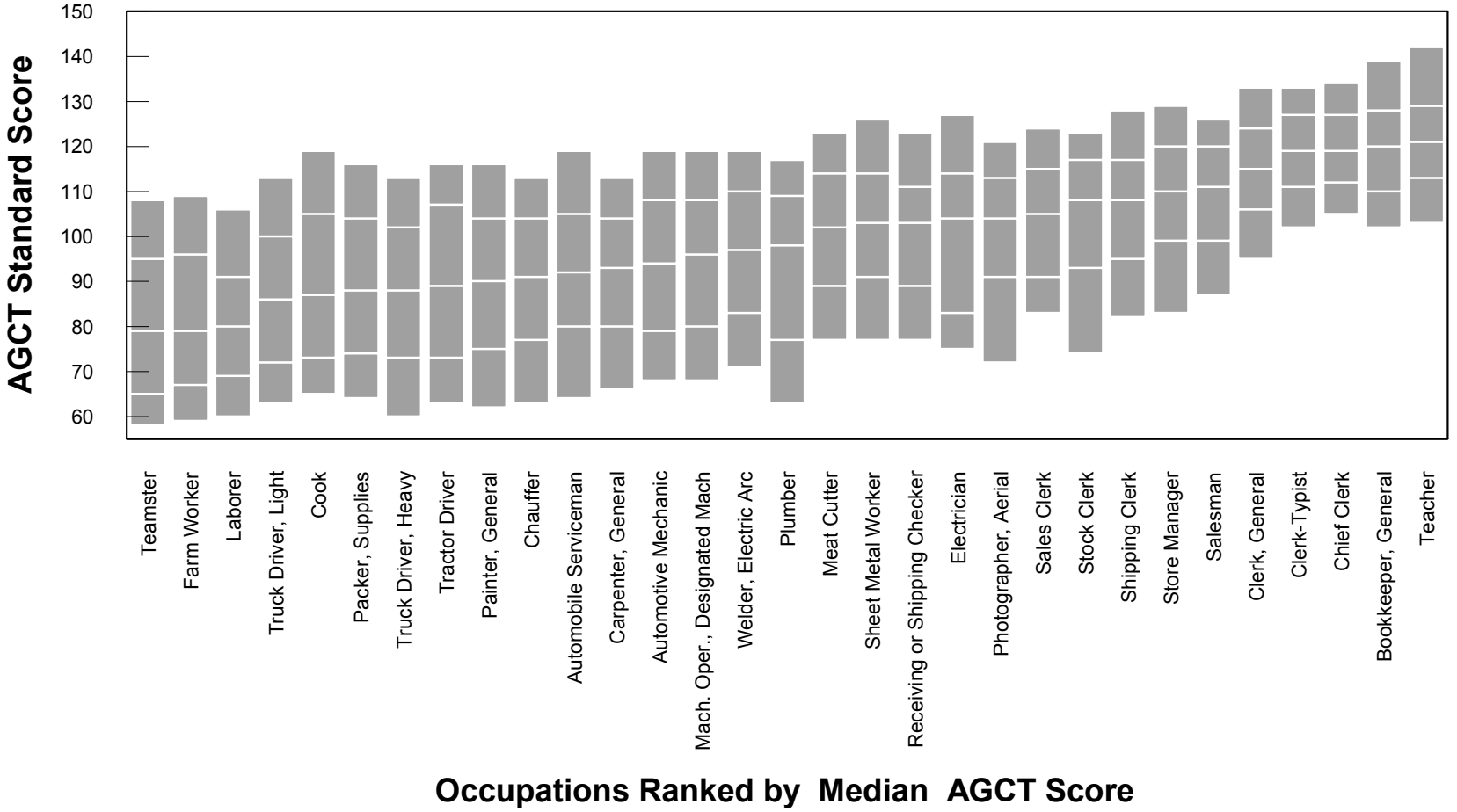
Based on White Enlisted Men in War Department Machine Records Survey Taken June 30, 1944 (after Stewart 1947:18-19). Percentiles 10, 25, 50, 75, and 90 are marked horizontally.

Figure 4. Army General Classification Test Standard Score Distribution for All Occupations with 50 Cases or More in the Northern Command (N = 33,091)



Based on White Enlisted Men in War Department Machine Records Survey Taken June 30, 1944 (after Stewart 1947:18-19). Percentiles 10, 25, 50, 75, and 90 are marked horizontally.

Figure 5. Army General Classification Test Standard Score Distribution for All Occupations with 50 Cases or More in the Southern Command (N = 10,196)



Based on White Enlisted Men in War Department Machine Records Survey Taken June 30, 1944 (after Stewart 1947:18-19). Percentiles 10, 25, 50, 75, and 90 are marked horizontally.

Figure 6. Dispersion in Verbal Ability (WORDSUM) of Occupational Groups: General Social Surveys, 1974 to 1989

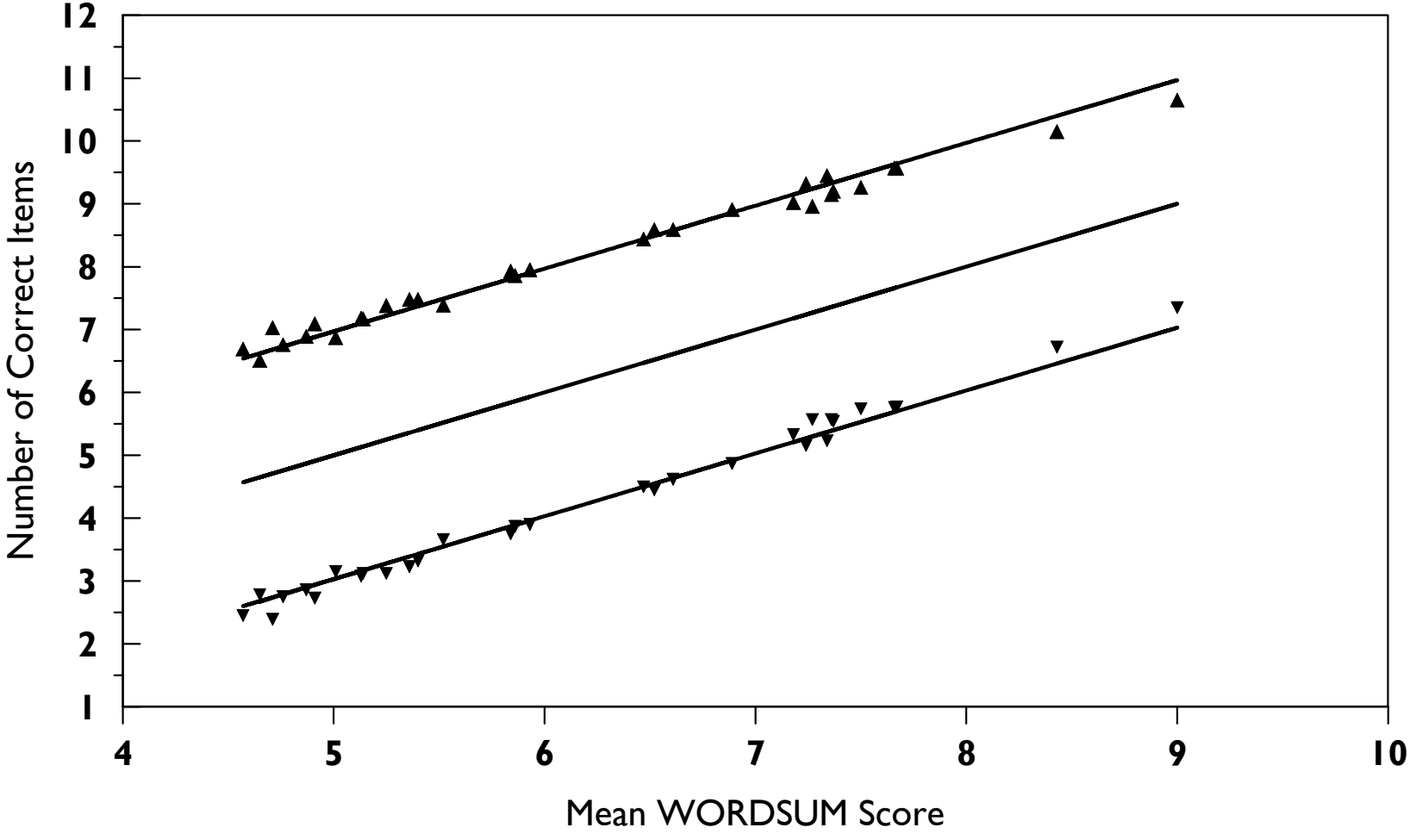
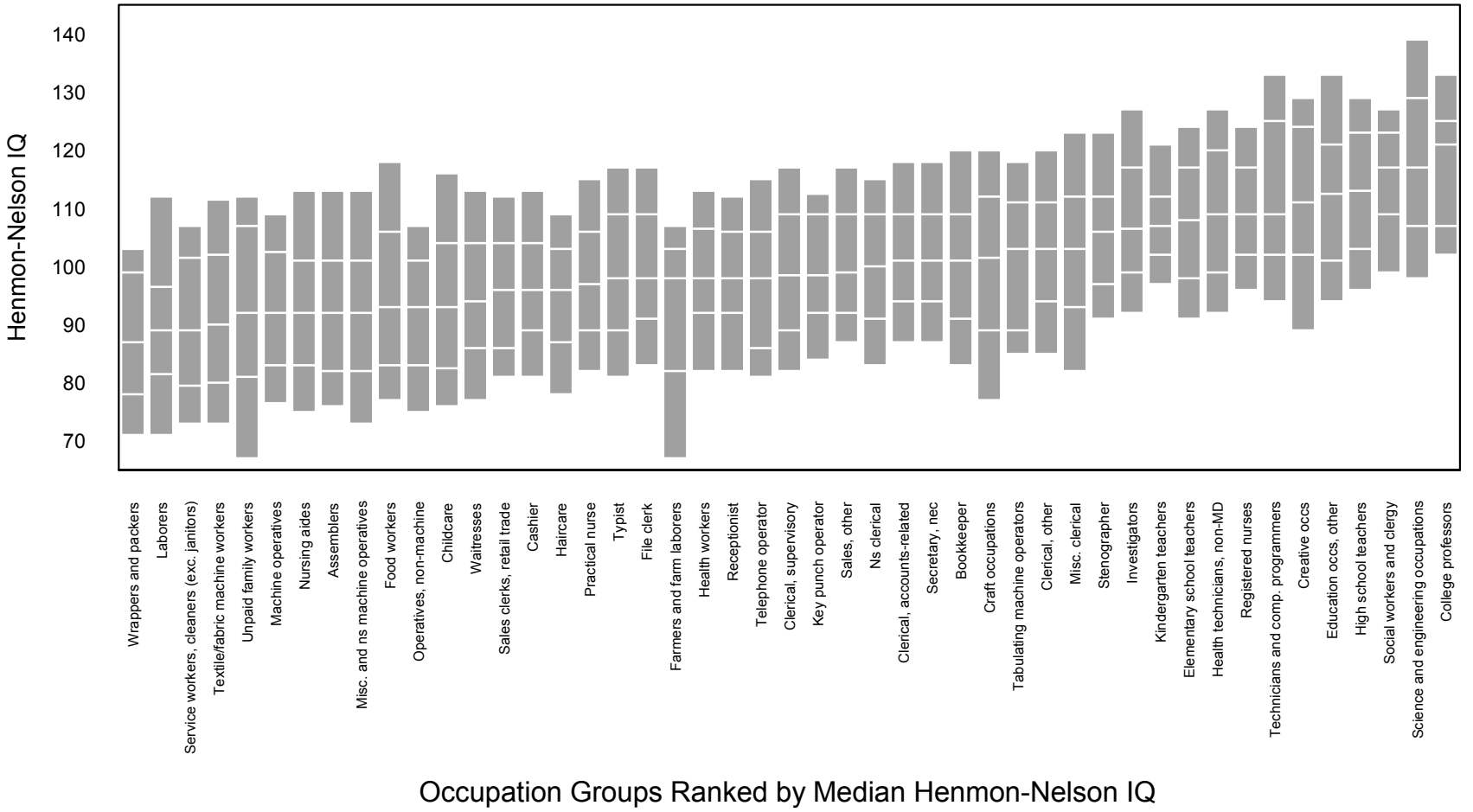
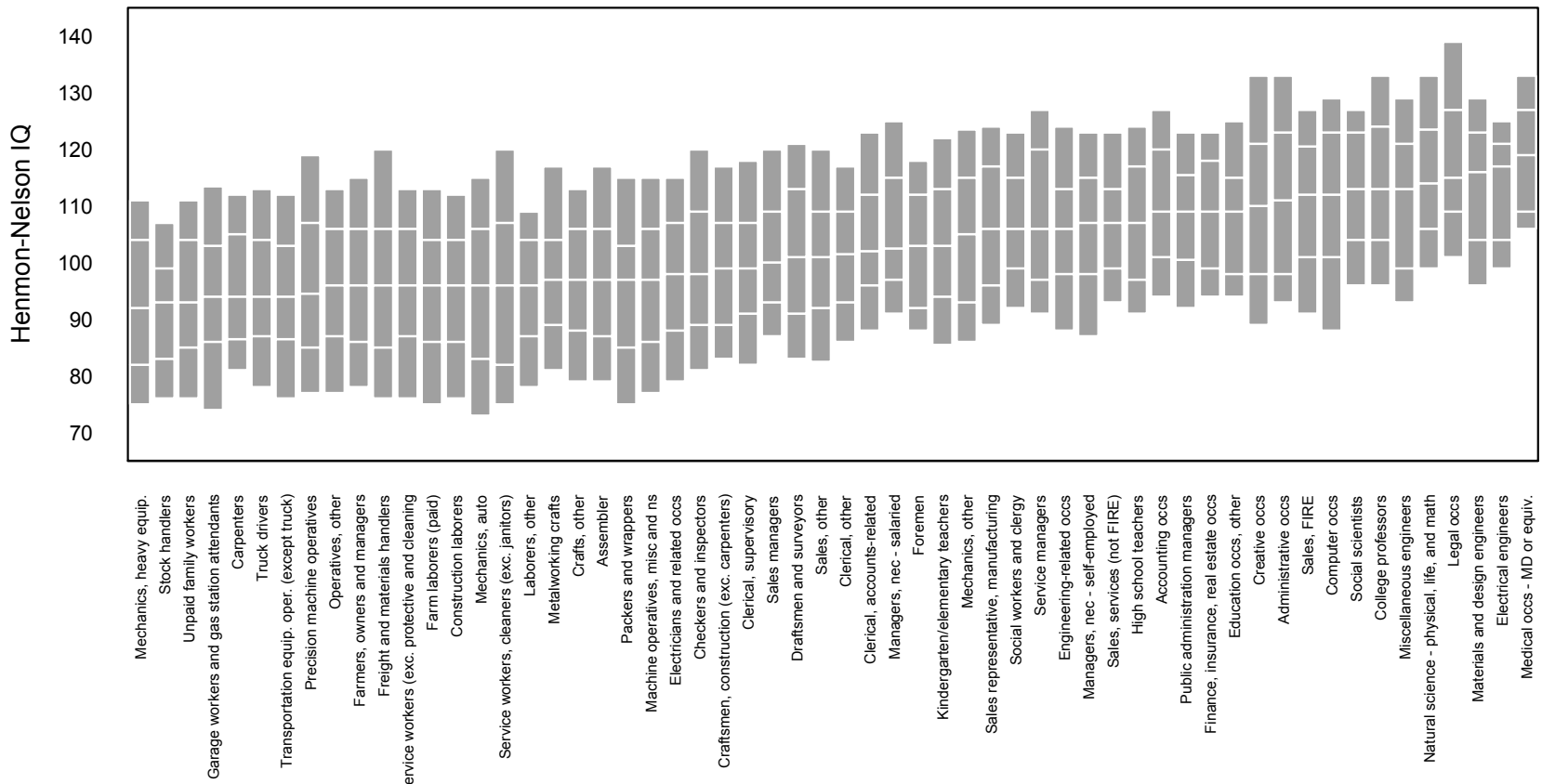


Figure 7. Wisconsin Women's Henmon-Nelson IQ Distributions for First Occupation Groups with 30 Cases or More



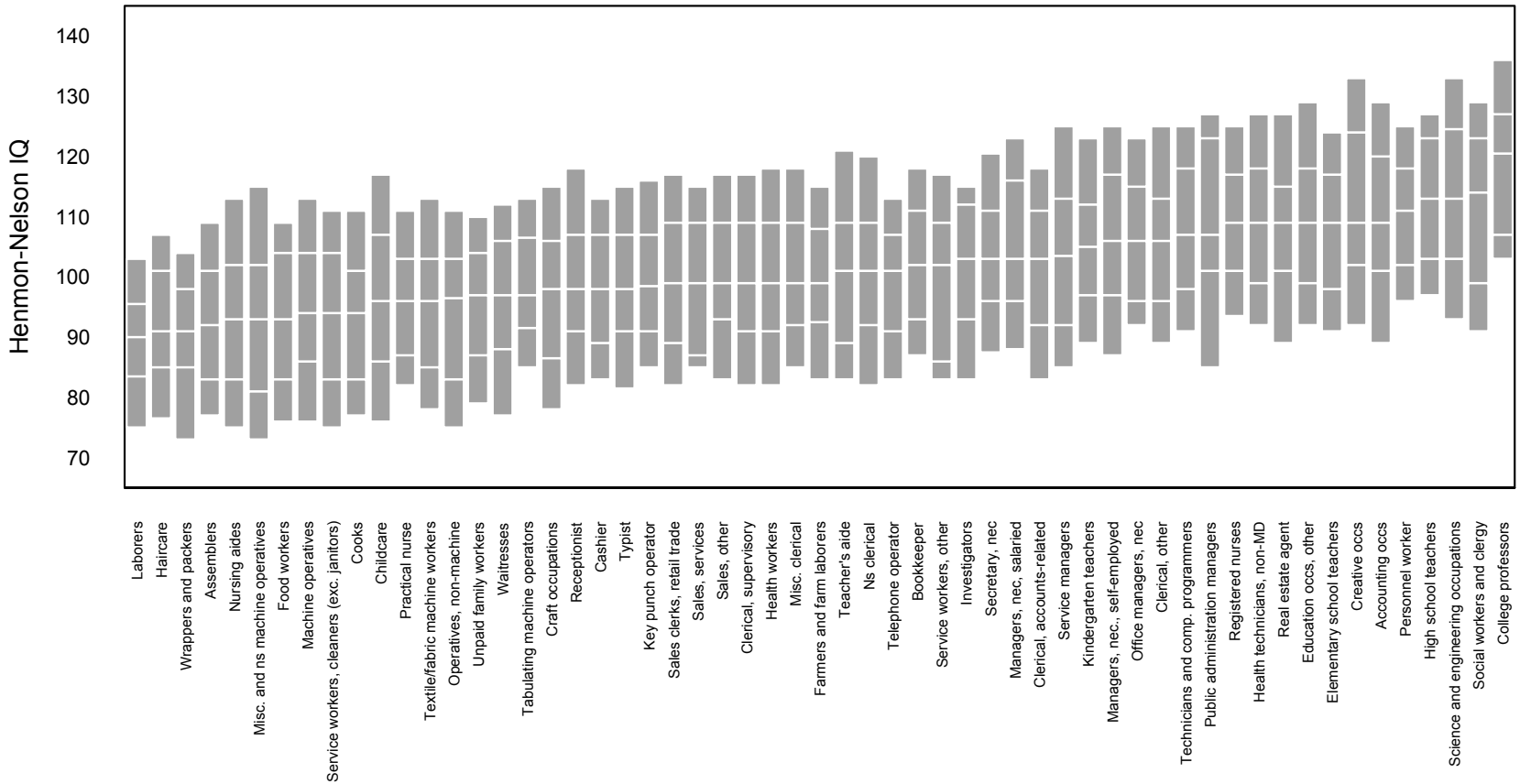
Based on female Wisconsin graduates and siblings who reported a first job after leaving school for the last time. See appendix for definitions of occupation groups. Percentiles 10, 25 ,50, 75, and 90 are marked horizontally.

Figure 8. Wisconsin Men's Henmon-Nelson IQ Distributions for First Occupation Groups with 30 Cases or More



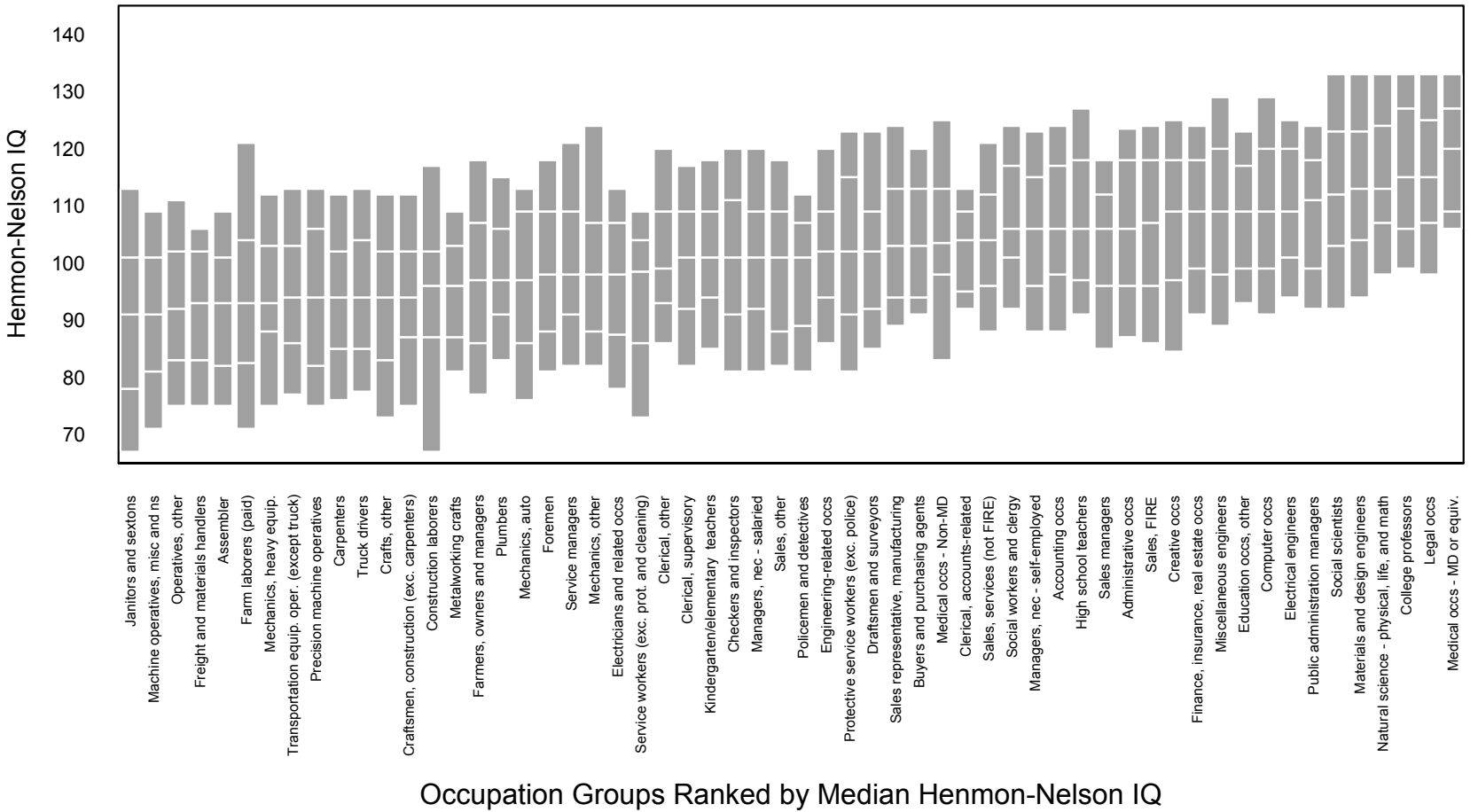
Based on male Wisconsin graduates and siblings who reported a first job after leaving school for the last time. See appendix for definitions of occupation groups. Percentiles 10, 25 ,50, 75, and 90 are marked horizontally.

Figure 9. Wisconsin Women's Henmon-Nelson IQ Distributions for 1975-77 Occupation Groups with 30 Cases or More



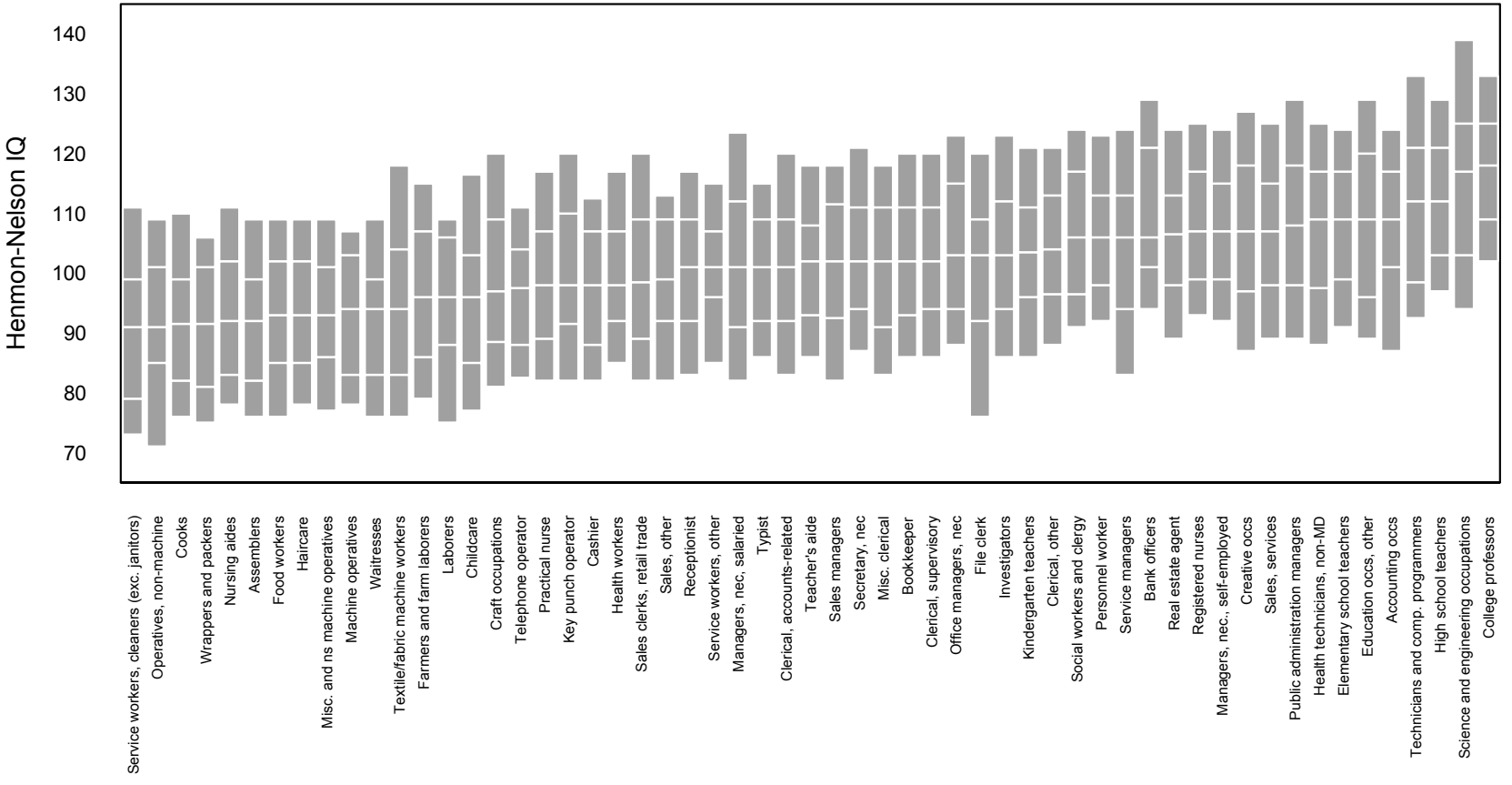
Based on female Wisconsin graduates and siblings who reported a job during 1975-77. See appendix for definitions of occupation groups. Percentiles 10, 25 ,50, 75, and 90 are marked horizontally.

Figure 10. Wisconsin Men's Henmon-Nelson IQ Distributions for 1975-77 Occupation Groups with 30 Cases or More



Based on male Wisconsin graduates and siblings who reported a job during 1975-77. See appendix for definitions of occupation groups. Percentiles 10, 25 ,50, 75, and 90 are marked horizontally.

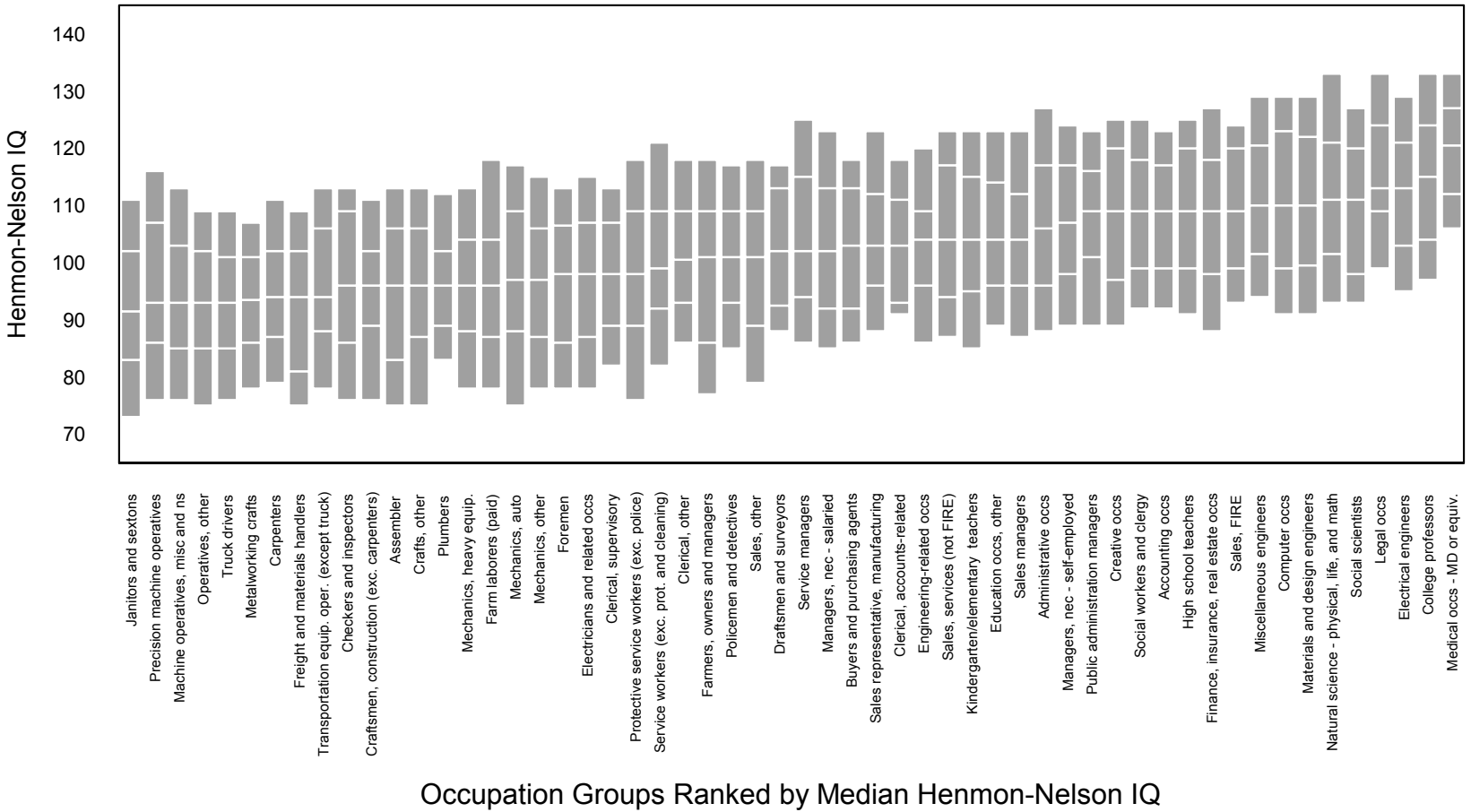
Figure 11. Wisconsin Women's Henmon-Nelson IQ Distributions for 1992-94 Occupation Groups with 30 Cases or More



Occupation Groups Ranked by Median Henmon-Nelson IQ

Based on female Wisconsin graduates and siblings who reported a job during 1992-94 See appendix for definitions of occupation groups. Percentiles 10, 25 ,50, 75, and 90 are marked horizontally.

Figure 12. Wisconsin Men's Henmon-Nelson IQ Distributions for 1992-94 Occupation Groups with 30 Cases or More



Based on male Wisconsin graduates and siblings who reported a job during 1992-94 See appendix for definitions of occupation groups. Percentiles 10, 25 ,50, 75, and 90 are marked horizontally.

Figure 13. A Social Psychological Model of Socioeconomic Attainment