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Societal Consequences of the *g* Factor in Employment

LINDA S. GOTTFREDSON

Counseling and Personnel Services, University of Maryland, College Park, and Center for Social Organization of Schools, Johns Hopkins University

This article reviews and rebuts seven common arguments that intelligence (*g*) is of little or no practical importance in employment. It then illustrates in several ways the profound effect that differences in intelligence in a work force may have on the structure and functioning of whole societies. First, evidence and theory are presented to support the position that the occupational status hierarchy, which is of central concern in the study of social inequality, is an intellectual complexity factor among occupations that has evolved in response to the wide dispersion in intelligence levels within populations. Second, the large and stubborn mean black–white difference in intelligence is used to illustrate more concretely some of the society-wide ramifications of individual and group differences in intelligence, particularly when social policies are based on misconceptions about intelligence or its impact.

Social theory has typically accorded differences in intelligence only a minor role in determining the fate of individuals, groups, or nations. Power, wealth, education, and accidents of history and geography have been presumed to be of far greater importance and often the major source of differences in intelligence themselves. Several types of evidence now indicate, however, that differences in tested intelligence are more important than most social theorists previously assumed. Namely, there is now ample evidence that general intelligence (*g*) represents real and fundamental differences in how well individuals perform cognitive tasks, that *g* is surprisingly stable at the individual level, that racial–ethnic differences are real, large, and still resistant to deliberate change, and that differences in intelligence affect performance in important noneducational arenas (Anastasi, 1982; Gordon, in press; Gottfredson & Crouse, 1986; Hunter, 1986; Hurn, 1978; Jensen, 1980, 1986; Thorndike, 1986; Wigdor & Garner, 1982). The obvious social and political implications of such research have

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generated controversy so heated that it imposes a virtual taboo against scientifically investigating the practical importance of intelligence outside of educational settings. Nonetheless, the recent evidence regarding intelligence behooves scientists and laypersons alike to reevaluate reigning social theories concerning the role of intelligence in social life.

This article synthesizes relevant evidence about the nature and impact of differences in intelligence to argue that a wide and stable dispersion of intelligence in a work force can profoundly influence the structure and functioning of whole societies. First, I review seven common arguments disputing the importance of intelligence in employment. Most such arguments have been made within the context of debates over social policy and theories of social inequality, so they are examined here within that same context. Recent research in psychometrics, personnel selection, and job analysis is also presented that contradicts those arguments, but it leaves unresolved several apparent inconsistencies in the evidence about the import of *g* in employment. Therefore, third, I present relevant elements of a new theory about the origins and maintenance of occupational hierarchies that reconcile those data. Finally, I provide a concrete example of the wide ramifications that differences in intelligence can have for a society by tracing the impact of the mean black–white difference in *g*.

THE STATUS OF COMMON ARGUMENTS FOR THE RELATIVE UNIMPORTANCE OF INTELLIGENCE IN EMPLOYMENT

Until recently, three types of evidence provided the basis for claims that intelligence is important in the work place: (a) more intelligent people tend to get higher level jobs, (b) both the minimum and average intelligence levels of workers are higher in higher level jobs, and (c) performance on mental tests helps to predict performance in training and in many jobs. Skeptics have rightly pointed out that such evidence is suggestive but hardly persuasive.

Meta-analyses within the last decade have considerably strengthened arguments for the importance of intelligence, because they have indicated that performance on the job is much more dependent on *g* than previously had been thought in the personnel testing literature (Hunter, 1986; Hunter & Hunter, 1984; Schmidt & Hunter, 1981; Thorndike, 1986). The mean corrected validity of mental tests for predicting job performance ratings is about .5 and may be even higher for performance on work samples. Moreover, *g* emerges as the single most useful worker attribute for predicting job performance, as a valid predictor in all types of jobs, and as an especially valid predictor of performance in more complex and higher level jobs.

Even so, critics remain unconvinced that differences in intelligence are of practical importance in employment. Such reluctance may seem incomprehensible to many psychologists, and certainly to personnel researchers, who are well aware of recent advances in their field. It is instructive, therefore, to review the more common arguments disputing the conclusion that intelligence, or general cognitive ability as it is often called, substantially influences job performance or plays any fundamental role in generating social inequalities. Lest one assume that such a review is merely an academic exercise, it should be realized that the skeptics' arguments represent common wisdom and therefore undergird most current social policies aimed at reducing socioeconomic inequalities.

General Social Theories Disputing the Importance of Intelligence

Most debates about the practical importance of intelligence can be subsumed under two major sociological theories of social inequality, each having its counterpart in economics. The first perspective is referred to as functional or meritocratic theory (Davis & Moore, 1945). Revisionist, radical, conflict, and neo-Marxist theories (Bowles & Gintis, 1976; Collins, 1979) are all representatives of the second perspective, which has its roots in Marx's critique of capitalism. Both perspectives argue that differences in intelligence are of little or no real importance in the work place. They lead to very different social policy recommendations, however, because the first accords great importance to education whereas the second does not. No commonly agreed upon set of assumptions and propositions exists for either theoretical perspective, but each serves as an umbrella for like-minded beliefs about workers, work, and social inequality. The following descriptions are composites of what seem to be the most common assumptions about intelligence and employment within each of the perspectives.

Functionalist theory. The major assumptions of the functionalist perspective are that there are big differences among jobs in the skills they require, that it is more equitable and efficient for a society to allocate its jobs to the most qualified contenders for those positions, and that it is both fair and functional to reward difficult work and scarce talents more highly. More specifically, it is assumed that there are job-relevant traits and accomplishments possessed by individuals *prior* to job entry that constitute evidence of their employability, promotability, or the like, and that therefore constitute legitimate bases for selecting the required number of workers from a larger pool of applicants for any particular job. Cognitive skills and knowledges obtained through schooling are assumed to improve job performance and are among the more important prior traits by which job applicants may be ranked. Underlying differences in mental ability influence who obtains more education, but they have little if any direct effect on job performance. Rather, differences in intelligence are presumed to be truly important only to the extent that they dictate which kinds of education and training will be most effective for inculcating the desired skills and knowledges. The acknowledged architects

of recent functional theory (Davis & Moore, 1945, p. 244) made these assumptions about education and intelligence explicit when they wrote, "Modern medicine, for example, is within the mental capacity of most individuals but a medical education is so burdensome and expensive that virtually none would undertake it if the position of the M.D. did not carry a reward commensurate with the sacrifice."

In short, the functionalist position implicitly draws a distinction between specific trainable cognitive skills on the one hand and general underlying abilities on the other hand, and argues that differences in job performance stem primarily from differences in workers' specific skills rather than from differences in their general abilities. Because functionalist theory also assumes that many of those skills are obtained through schooling, functionalist recommendations focus on educational policy. The expectation is that improvements in the quality of education together with more equal access to it would simultaneously promote both greater social equality and improved worker performance.

Revisionist theory. Revisionist theory also rejects the notion that intelligence has any direct effect on job performance. It differs from functionalist theory, however, in that it also rejects the notion that schools teach cognitive skills or knowledges that are useful on the job. According to one theorist (Collins, 1979, p. 54), "the great majority of all jobs can be learned through practice by almost any literate person.... How hard people work, and with what dexterity and cleverness, depends on how much other people can require them to do and on how much they can dominate other people." Differences in both intelligence and educational credentials are merely nonfunctional by-products of schooling. The theory further argues that although such differences appear to be fair bases for social selection, they actually are surrogates for social class and so help the dominant social classes preserve their favored positions in society. The traits that actually are valuable to employers, and that families and schools have been structured to create and select, are *non*cognitive traits such as compliance. These noncognitive traits do not have any direct impact on job performance, but are valuable because of the control they afford employers over their employees.

The revisionist perspective argues, moreover, that the high differentiation and specialization of work activities in our society, as well as the accompanying large differences in the entrance requirements and socioeconomic rewards among occupations, are the result of capitalists intentionally fragmenting and "deskilling" work in order to increase not the efficiency of work, but their control over workers. From this perspective, it is not actually necessary to argue that educational "credentialing" and personnel selection practices are structured to select primarily for social class—in fact a common hypothesis that has been falsified (Campbell, 1983; Eckland, 1980b)—in order to claim that the present system is unfair. According to the theory, the occupational hierarchy itself is unnecessary and therefore leads to unjustifiable differences in occupational rewards.

Instead of advocating improvements in *education and training*, as do the functionalists, revisionists advocate radically restructuring either *personnel practices* or *jobs* themselves. Like the functionalists, however, revisionists also assume that the reforms they suggest will simultaneously increase both equality and productivity.

Revisionists do not view prior education, training, skills, or abilities as legitimate bases for personnel selection because they assume that the skills contributing to good performance can be obtained on the job through practice. They sometimes urge, for example, that educational credentials be banned as criteria in personnel selection. It has further been suggested that all workers be allowed to share their society's more attractive and challenging work as well as its not so attractive and uninteresting work. Thus, workers might be rotated through jobs, as has been done in some communes. Alternatively, job ladders might be created that move all people up, over time, from less rewarding to more rewarding jobs. This may have been a motivation behind one respected sociological theorist's suggestion that people work their way up to the job of physician on a career ladder that begins with hospital orderly (Collins, 1979, p. 201). Finally, with regard to personnel practices, it is sometimes suggested that it is unnecessary to reward more difficult work or scarcer talents more highly; rather, compensation might better be equalized across workers or jobs, or workers might be paid according to their needs.

Probably the major *job* restructuring proposal from the revisionist perspective is to reverse the fragmentation and specialization of work and to invest lower level jobs with some of the responsibility, control, and challenge that have become the province of higher level jobs. Skilled crafts work is often taken as a model of less alienating work, and efforts toward worker democratization and employee ownership and control are of keen interest. Job enrichment, which is a concept in industrial psychology rather than sociology, is consistent with this perspective in so far as it involves increasing the variety, difficulty, or responsibility of jobs in order to increase worker satisfaction and motivation in the target jobs. However, job enrichment is typically promoted by industrial psychologists for a much more restricted range of jobs than the revisionists have in mind—perhaps because the revisionists assume that far more workers are underutilized than do industrial psychologists or employers.

Specific Arguments Disputing the Practical Importance of Intelligence

Seven more specific arguments are reviewed and evaluated below. Some of them arise from the functionalist theoretical perspective and others from the revisionist perspective. They are not all consistent with

each other. Because of their variety, however, they offer a broad menu of choices by which all but the best-informed people may reject the uncomfortable possibility that differences in intelligence pose inescapable dilemmas for a democratic society. Particular attention is devoted here to the third argument, which concerns the efficacy of training, because it has been the most explicit and influential in public debate.

1. Educational level does not predict differences in performance within jobs, so intelligence cannot either. This fallacious argument is rarely made explicit, but nevertheless has been influential among sociologists and economists. It runs as follows. First, it is assumed that employers have full knowledge of which worker characteristics and knowledges contribute to good performance, that employers also know how to ascertain whether applicants possess those attributes, and that they hire accordingly. In other words, it is assumed that the same attributes that enhance job performance enable job applicants to compete most successfully for jobs. Second, it is well established that education is more highly correlated than intelligence with the job status levels attained by workers. Third, there follows the assumption that because intelligence is less important for getting jobs, it surely is also less important for performing them well. Thus, because there is indeed evidence that educational credentials do not predict job performance nearly as well as expected according to functional theory (Berg, 1970), it is considered implausible, given this line of argument, that intelligence would predict performance. In fact, the evidence that education does not have its widely expected benefits for performance has enhanced the popularity of revisionist propositions that neither cognitive skills nor educational credentials have any functional importance in the work place.

The conclusion of the foregoing argument is clearly erroneous. General cognitive ability not only predicts job performance moderately well, on the average, but it also predicts performance better than does any other single worker attribute yet measured. It also predicts performance equally well for blacks, Hispanics, and whites (Hunter, Schmidt, & Rauschenberger, 1984). Moreover, the foregoing conclusions hold whether performance is measured subjectively or objectively.

The failure of this particular argument stems from its false premise. As the fields of personnel selection and performance appraisal research attest to by their very existence, good information about job performance, its precursors, and the capacities of job applicants is more difficult for employers to obtain than sociologists and economists have assumed. Furthermore, as accountants and lawyers nowadays also can verify, there are often costs outweighing the benefits of using the valid indicators with which employers are already familiar. Social scientists have attributed much more knowledge and autonomy to employers than they actually have, which is a critical mistake that I analyze further below.

Nonetheless, this line of argument is so entrenched in sociological and economic thought that many social scientists prefer to question the validity of recent research showing a strong relation between intelligence and job performance when instead they should be reevaluating the validity of their own theories in light of that research.

2. Minimum levels of intelligence may be important, but differences in intelligence above those thresholds have no impact on job performance. Support for this argument has been drawn from data on the actual intelligence levels of workers in different occupations (Stewart, 1947). Those data suggest that minimum intelligence levels, which differ for different occupations, may indeed be required for minimally satisfactory job performance, but they also reveal wide variations within all occupations in the intelligence levels of workers above those minima. The inference often drawn is that if people of such widely different capacities can be employed in the same occupation, then differences in intelligence above the minimum cannot have much impact on performance in them. If this inference were correct, then differences in intelligence above the relevant minima could be ignored when hiring for particular jobs.

Hawk (1970) has provided direct evidence that the threshold assumption is false. He analyzed the results of several hundred validation studies for the General Aptitude Test Battery (GATB; U.S. Department of Labor, 1970) and found that performance in training and on the job is linearly related to performance on all scales of the GATB, including general intelligence. On the average, increasingly higher intelligence levels are associated with increasingly better job performance. The threshold argument may be sustained in part by the common misconception that job performance is either satisfactory or not satisfactory. However, these data reflect what experienced employers know—there can be large and costly differences in performance among workers who are all minimally "satisfactory."

Adherents to the threshold argument also seem not to appreciate just how different the minimum intellectual demands are across different occupations. As the following examples illustrate, differences in minimum thresholds alone would have a large impact on employment patterns. Data show that at most only 10 to 20% of the general population possesses the intelligence level required for *minimally* acceptable performance as a physician. This contrasts with percentages of around 40 and 80%, respectively, for general duty nurse and licensed practical nurse (Gottfredson, 1984, Table 2). The occupation of physician is singled out here because it has been a favorite example, in view of its very high status, among academics seeking to debunk the importance of intelligence in social life. It is possible that many academics have underestimated the importance of *g* because they work and live in highly selected settings where most colleagues and friends are indeed intelligent enough to have

become minimally competent physicians. Physicians and Ph.D. recipients are equally extreme occupational populations, with mean IQs of at least 125 and standard deviations of about 10 (Matarazzo, 1972, chap. 7).

3. Differences in job performance depend more on training than on intelligence. Perhaps the most common argument against the apparent importance of *g* in employment is that differences in job performance stem primarily from differences in specific learned skills; thus, mental tests predict job performance only because they either measure those relevant skills or predict who is most likely to acquire them. Three types of evidence have buttressed this training argument.

First, extensive sociological research has shown that the occupational status levels attained by workers are more highly correlated with their educational levels (generally about .6) than with their intelligence levels (about .4). Moreover, intelligence has little value in predicting differences in status levels net of educational levels (Duncan, Featherman, & Duncan, 1972). Among people with the same educational credentials, higher levels of intelligence do not help and lower levels do not handicap people in obtaining good work. This finding is consistent with the functionalist assumption that schools impart the cognitive skills and knowledges that improve job performance, and that intelligence predicts job status only because it predicts who is likely to obtain more education. A similar argument among economists is that intelligence must not have much influence on job performance because it is known to have little value for predicting earnings. This argument follows from the common assumption in economics that differences in earnings reflect differences in the marginal productivity of individual workers (as distinct from categories of workers).

Second, employers do not use mental tests routinely in personnel selection. Some economists argue that if intelligence really did contribute much to marginal productivity, employers would always use mental tests when hiring workers. Education, training, and experience are more frequently used for evaluating job applicants, suggesting once again that what applicants know is more important than how smart they are.

Third, path analytic studies (Hunter, 1983a, 1986) have shown that both cognitive ability and job knowledge are highly correlated with each other and with job performance (as measured by either supervisor ratings or work samples), but that controlling for job knowledge at least halves (but does not eliminate) the apparent impact of cognitive ability on job performance. The conclusion drawn by adherents to the training argument is apparently that if all workers were educated or trained, by some means, to master the same essential job knowledge, then differences in intelligence among the workers would have no meaningful impact on job performance. According to this argument, high predictive validities for mental tests do not constitute evidence that differences in intelligence actually cause

significant differences in job performance. Rather, job performance depends primarily on job knowledge, and mental tests merely predict who happens to acquire the most job knowledge when training has not been complete or fully effective.

The argument that intelligence is important only for obtaining educational credentials and specific job-relevant skills and knowledges has led many people to conclude that differences in intelligence would no longer lead to differences in occupational status (nor presumably in job performance either) if the link between intelligence and learning or educational level were to be broken. A related conclusion has been that reductions in *educational* inequality will lead to reductions in *occupational* inequality without concomitant reductions in *ability* differences. Such conclusions appear to be the foundation of most social policies adopted recently in the United States for the purpose of decreasing occupational inequalities.

All three types of evidence described above are at best only indirect evidence for the functionalist hypothesis that training is more important than intelligence, and the value of the first two hinges entirely on the implicit assumption that the same attributes are primarily responsible for workers' occupational status levels, their performance, and their earnings levels. That assumption is false, as was suggested earlier and as will be shown later. The value of the third type of evidence hinges on the validity of two assumptions, first, that the link between job knowledge and intelligence can be broken and, second, that the relation between intelligence and job performance would vanish if the link between knowledge and intelligence were broken. Both assumptions are implausible, as will be discussed later and as is elaborated elsewhere (Gottfredson, in press).

I restrict the discussion here to evidence directly contradicting the conclusion that training does, or realistically could, compensate fully for differences in worker intelligence. I will show later, however, that all three types of evidence are consistent with the view that differences in intelligence are fundamentally the most important differences among workers in industrialized societies.

Recent meta-analyses of the predictive validity of training and experience provide evidence that claims for the prepotent role of training are mistaken. Various measures of relevant training and experience generally have low to moderate correlations with later job performance (McDaniel & Schmidt, 1985), but the predictive value of training and experience drops among workers with increasingly higher mean levels of experience. In contrast, the predictive value of cognitive ability remains high among experienced workers (McDaniel, 1986). Also, when differences in job experience are controlled, the direct impact of cognitive ability on job knowledge *rises*, as does its indirect impact on work sample performance (Schmidt, Hunter,

& Outerbridge, 1986). It appears likely, then, that more extensive training or experience in relevant job skills can temporarily render less intelligent workers equally productive as *more intelligent* but *less experienced* workers, but that the latter will outperform the former within at least a few years, if not much sooner, depending on the complexity of the job. Similarly, efforts to *equalize* performance in training can reduce differences in job performance among inexperienced workers, but they probably do nothing to prevent a growing dispersion in job performance levels as the more able workers develop expertise more quickly from the same increments in experience. It is of no small importance, either, that training time and costs tend to be substantially greater for less able trainees and that their eventual mastery levels tend to be lower even under optimum training conditions (Fox, Taylor, & Caylor, 1969). In short, training can reduce the impact of differences in intelligence, but it probably cannot eliminate their impact unless opportunities for training and experience are artifically restricted among the more intelligent workers.

An implicit assumption in the training argument is that workers can be trained adequately for all important aspects of a job and thus that the *g* loading of a job (that is, the degree to which performance on the job is correlated with *g*) is primarily, if not entirely, a function of the *g* loading of the training it requires. Research suggests that this assumption is wrong, and so provides a second line of rebuttal to the training argument. Analyses of job attribute ratings from various sources, including the *Dictionary of Occupational Titles* (DOT; U.S. Department of Labor, 1977) and the archives of the Position Analysis Questionnaire (PAQ; McCormick, Jeanneret, & Mecham, 1972), reveal that high-level (more prestigious) jobs are rated as demanding higher intelligence levels, and that such jobs do indeed require more arduous education and training (Gottfredson, 1984). But more importantly, they also require more experience, a more continual updating of knowledge, and the performance of what are presumably the more highly *g* loaded among work tasks (e.g., analyzing data and making decisions). That is, they require the exercise of more intelligence, partly because they require more continual *learning* even after general education and job-specific training are presumably complete. The evidence also suggests that some jobs are more highly *g* loaded precisely because the specific set of tasks performed is less standardized or is less predictable over time, meaning that prior training, no matter how effective, will cover only a subset of the tasks workers will be called on to perform. In short, jobs themselves are often highly *g* loaded, even when one already possesses the training and education typical for those jobs.

The training argument is partly an outgrowth of outmoded conceptions of intelligence, namely, the "specificity doctrine" (Jensen, 1984). That doctrine holds that higher scores on intelligence tests reflect the accumulation of more "bits of knowledge" rather than more of some general mental capability. However, *g* represents what is *common* to the ability to perform well on mental tests that often *differ* considerably in their manifest content, some of these tests clearly being related to what children learn or do in school (e.g., arithmetic tests) but others not (e.g., block design tests; Jensen, 1986). Moreover, the *speed* of performing even the simplest of mental tasks depends on *g*, and the correlation between *g* and the speed of making decisions increases when the decisions are more complex (that is, require the integration of more bits of information). If intelligence is conceptualized as speed and capacity for learning and performing well a wide variety of mental tasks, rather than strictly as the accumulation of specific knowledges and proficiencies, and if it is understood that jobs typically require at least some judgment and continual learning or adaptation, then it is easier to understand the pervasive impact of intelligence on job performance. So, too, is it easier to appreciate the limits of education and training for ameliorating individual differences in job performance that arise from differences in intelligence.

4. Many different worker characteristics affect performance and productivity. The statement that general intellectual ability is only one talent among many is true, of course, but it is often used to mislead people into concluding that many workers therefore have talents or character traits that compensate easily for lower intelligence.

Special talents, high motivation, and other favorable attributes do, of course, help some individuals compensate for lower levels of intelligence than may be typical in an occupation, and it is essential to take such attributes into account when providing vocational counseling. The performance requirements of some jobs even place a special premium on less intellectual aptitudes and attitudes. However, there is no evidence that less *g*-loaded traits compensate substantially for differences in intelligence, on the average. In view of the sizable correlation between intelligence and job performance, the impact of differences in intelligence could potentially be mitigated, on the average, only by a substantial *negative* correlation between intelligence and those other hypothetical worker attributes.

Specific cognitive abilities, such as verbal aptitude or mathematical reasoning, are very highly correlated with *g* and do not add much to the prediction of job performance, net of *g* (Hunter, 1986; Thorndike, 1986), so it is disingenuous to imply that they compensate for differences in *g*. Motor abilities are only weakly correlated with general mental ability, but their promise as compensatory attributes is not much higher. General psychomotor ability is a better predictor of job performance in some kinds of work than is general cognitive ability (Hunter, 1983c), which means that differences in psychomotor ability can have a bigger impact on performance in those jobs than differences in intelligence. However,

this phenomenon occurs primarily among the lowest level jobs in society. With a few exceptions (e.g., dentist), the higher the level of the job, the less the importance of psychomotor ability.

Creativity is commonly implied to be a compensatory trait, but Jensen (1980, chap. 8) has argued convincingly that there is no evidence to justify that belief. In fact, studies of creativity in various professions suggest that high intelligence is a necessary (but not sufficient) condition for highly creative contributions.

Under current circumstances, then, the multiplicity of valued human talents and character traits may blunt but by no means erases the advantages conferred on the job by superior intelligence.

5. Higher level jobs do not really require higher levels of intelligence than do lower level jobs for satisfactory performance. The intent of this traditional sociological argument is to debunk the possibility that the occupational status hierarchy may be an intelligence hierarchy among jobs and thus that social inequalities have any origin in differences in intelligence. It is argued, first, that the enormous overlap in the intelligence levels of workers in different occupations is evidence that most occupations demand similar levels of cognitive ability. It is argued, second, that the high correlation between the status of an occupation and the mean (or minimum) intelligence level of its workers is spurious. Revisionists argue that those mean differences are simply the result of employers' unfounded preferences for hiring more intelligent workers in higher level jobs. The revisionist argument is consistent with that perspective's contention that employers use intelligence and education as ostensibly fair mechanisms to provide unfair advantages to their own social class. In contrast, functionalists tend to argue that the mean differences in intelligence across occupations arise merely because the higher educational credentials required for higher level jobs tend to be obtained by more intelligent persons.

Data for job titles in the *Dictionary of Occupational Titles* (U.S. Department of Labor, 1977) reveal that job analysts rate higher level jobs as requiring higher levels of intelligence. Critics dispute the validity of those ratings, however, because they argue intelligence ratings are only proxies for education or status. Specifically, job analysts may erroneously rate jobs as more intellectually demanding when they know that they are higher in social status or that their incumbents have higher levels of education.

In order to argue more convincingly that higher levels of intelligence are really required, that is, are "functional," in some types of work than in others, it must be shown that those demands are a logical consequence of differences in the essential tasks workers perform. Such evidence has been provided recently by factor analyses of diverse job attributes for

occupational categories covering 85% of the 1970 labor force (Gottfredson, 1984). Of particular importance here is the dominant factor emerging from those factor analyses—overall intellectual difficulty or complexity of work (see also Spaeth, 1979). All of the following types of attributes were found to be correlated .8 to .9 with that factor: rated demands for general intelligence, specific cognitive aptitudes (e.g., verbal and numerical aptitudes), and level of general education and specific training; median years of education among job incumbents; occupational status; self-directedness of work activities; criticality and general responsibility within the organization; and the performance of more intellectual tasks (e.g., reasoning, decision making, analyzing information, advising) rather than physically strenuous and nonintellectual tasks (e.g., lifting, stooping, reaching).

In short, the occupational status hierarchy that is of such great interest in the study and debate over social inequality, and which is ubiquitous throughout the developed world, appears to be a *g* factor among occupations. So there are actually two *g* factors in employment—one representing differences in workers' intellectual capacities and one representing differences in occupations' intellectual demands. And, as discussed below, the latter has probably evolved in response to the former.

6. Differences among occupations in their g loadings and in their consequent status levels could be much reduced at no cost. If most workers were capable of successfully performing most kinds of work after appropriate training, as revisionists claim, then it might be logical to assume, as they do, that both productivity and fairness would be increased if job demands (and consequent rewards) were leveled across jobs.

As already argued, however, the premise of this particular argument is wrong. People do differ widely in intelligence, those differences are quite stable by late adolescence, and they influence people's likelihood of successfully performing various kinds of work. Moreover, the impact of the *same* absolute difference in intelligence is larger in higher level jobs than it is in lower level ones, because the former are intrinsically more *g* loaded. This means that a net loss in performance could be expected if the *g* loadings across different occupations were homogenized. The net loss would occur because the increases in performance due to brighter workers performing a greater proportion of a society's easier tasks would not offset the larger decreases due to a correspondingly greater proportion of demanding tasks being assigned to less intelligent workers. Homogenizing the intellectual difficulty level of jobs would have much the same effect as would assigning workers randomly to jobs by intelligence, which would be an extremely costly policy as Hunter and Schmidt (1983) have demonstrated.

The *g* loadings of jobs might be leveled to some extent without losses in performance if differences in the intelligence levels of workers were to decrease. However, there is no evidence that the *variance* of intelligence within the United States population is decreasing. On the contrary, the variance in *g* within at least the white population has remained stable over periods of time spanning at least several generations (see Wechsler, 1949, pp. 10–13, 1974, pp. 36–46, for the WISC; see Terman, 1916; Terman & Merrill, 1937, p. 37, 1972, p. 357, for the Stanford–Binet).

Even if one acknowledges that people differ in intelligence and that those differences affect job performance, one still could argue that differences in the *g* loadings of occupations might be reduced by eliminating some of the intellectual demands of higher level jobs, say, through technological change or the development of job aids. This would bring more attractive jobs within the competencies of a wider range of people. In other words, if we consider jobs to be differentially *g*-loaded mental tests, then perhaps many of these tests are unnecessarily *g* loaded and thus the division of labor has an unnecessary adverse impact on less intelligent persons—just as the incidental physical conditions of many jobs unnecessarily reduce the employment prospects of physically handicapped persons. This hypothesis is also similar to occasional arguments in education that schooling is excessively *g* loaded because of cultural biases toward abstract and linguistic academic tasks.

The more general issue is whether there might be alternative divisions of labor where the *g* factor among individuals is less important and where the *g* factor among occupations is unnecessary. This issue has yet to be investigated systematically. It is relevant to note, however, that employers often turn to job simplification when they cannot find enough workers capable of adequately performing available jobs, which suggests that job simplification may increase differences in the *g* loadings across occupations at least as often as it decreases them. For instance, various branches of the Armed Forces have explored strategies for reducing the intellectual demands of both training and jobs so that the Services might be better able to fulfill their missions when the quality (i.e., cognitive ability) of recruits drops (Christal, 1974; Sticht, 1975). Several of those potential strategies involve shredding the less intellectually demanding work tasks (or jobs) from existing jobs (or job ladders) to create new and especially easy jobs (or job ladders).

7. Worker productivity is only one of the social outcomes that our society values. The ultimate argument used by people trying to diminish the apparent importance of differences in intelligence within a society—at least by people who are willing to concede that there may be nontrivial differences in *g*—is that productivity is a worthwhile social goal, but so too is social equality. Should not a democratic society be willing to pay something to come closer to that goal? It is with this question, explicit or not, that most texts about psychological tests and assessments conclude their discussions of the social context of testing.

Although claiming the moral high ground, this question ignores the real issue of just what those costs might be. The truth is that we have no good idea of what the social and economic costs would be of successive increments in within- or between-group equality that are achieved at the expense of decrements in productivity and in the equity of personnel practices. Even to broach the issue is still considered socially unacceptable—even among scientists.

Recently developed techniques for gauging the dollar impact of increases or decreases in the validity of personnel selection procedures reveal that the monetary costs of *g*-related differences in productivity are by no means trivial. Hunter and Schmidt (1983) have estimated that the value of a 1-standard-deviation difference in usual job performance levels corresponds to about 40% of a job's annual salary and that the costs of such differences in performance are proportionately greater in higher level jobs. The value of a 1-standard-deviation difference in *g* is therefore about 20% of a job's annual salary, on the average, which is far greater than economists have typically assumed to be possible.

A NEW THEORY ABOUT THE ROLE OF INTELLIGENCE IN EMPLOYMENT

The foregoing seven arguments are the most common ones used to reject the possibility that differences in intelligence have any real importance in the work place. The first four dispute the notion that differences in job performance among workers necessarily follow from differences in their intelligence. The next two dispute the notion that differences in the status of occupations themselves have any necessary relation to their intellectual demands. Finally, the seventh disputes the notion that differences in job performance are of critical social importance. The basis of each argument was explored, as was evidence that contradicts each.

The trail of argument and counterargument leaves some major issues unresolved, however. If intelligence really is more important than training and education in determining usual differences in job performance, then why is education more important for getting good jobs? If differences in intelligence are so important, then why is there such wide variation within jobs in the intelligence levels of their incumbents? And, how can the occupational hierarchy primarily reflect a *g* factor among occupations if intelligence is not the prime determinant of who gets higher status jobs? It is unlikely that the evidence psychologists have generated regarding the importance of *g* on the job will be given the serious attention it deserves outside of psychology until that evidence is integrated into theories of social inequality that resolve the apparent inconsistencies just listed.

Table 1 lists the 10 major propositions of a new "modified functional" theory of occupational inequalities which does resolve those inconsistencies. (A fuller account of the theory and its empirical basis is provided in Gottfredson, 1984, 1985, 1986). The first four propositions derive directly from extensive empirical research in psychometrics, personnel selection, and job analysis, much of it discussed in earlier sections of this paper and in papers by Jensen, Thorndike, and Hunter (all 1986). The next six propositions are more speculative, but together they explain the otherwise puzzling pattern of results which sustains mistaken arguments that *g* is of little practical importance. They do so in large part by providing a more realistic perspective on two phenomena ignored almost totally in economic and sociological research—personnel practices and the nature of work itself.

Personnel Practices

A key assumption running through the arguments reviewed above is that the attributes enabling people to get good jobs must be the same as

TABLE 1
Ten Propositions from a New Theory of Occupational Inequalities

1. Occupations differ in the general intellectual difficulty of the tasks they require workers to perform on the job.
2. The occupational prestige hierarchy primarily reflects an ordering of occupations according to intellectual difficulty level.
3. Occupations that are higher in intellectual difficulty level tend to be more critical to the employing organization.
4. Large differences in intelligence in the population are evident by the early school years and this distribution is not substantially changed, at this time in history, by either later school or work environments.
5. The occupational hierarchy has evolved and is sustained over time because enduring differences in intelligence within populations create pressure for segregating work tasks into different occupations by intellectual difficulty level.
6. The degree of differentiation (i.e., mean differences in intellectual difficulty among occupations) in a hierarchy is affected by the efficiency (i.e., validity) with which people are sorted by intelligence to occupations.
7. Only moderate levels of efficiency in sorting by intelligence are necessary to sustain a highly differentiated intelligence-based occupational hierarchy.
8. Education (primarily years of education) influences allocation processes (i.e., the status attainment of workers) to the extent that employers use education as a signal of worker quality.
9. However, employers will rely on educational credentials only to the extent that education actually is a useful signal of worker competence (*useful* meaning not only valid but also having a favorable cost–benefit ratio compared to other possible signals).
10. Educational level has been the most useful (but not the most valid) indicator of worker intelligence in recent history, but its value to employers can wax and wane as social policies and practices change its relative costs and benefits as a signal of worker quality.

Note. From Gottfredson (1985).

those enabling workers to perform them better and earn more. This assumption is wrong, because considerable error must be expected in real social systems. Even in highly rational systems, employers typically have to hire and compensate workers in the absence of good information about workers' current capacities or their eventual performance levels.

It is unrealistic, if not impossible in most cases, for employers to fine tune compensation according to the level of a worker's own performance, as many economists seem to assume, and thereby insulate themselves from differences in worker performance. The difficulty in evaluating job performance is only one among diverse obstacles preventing employers from tying individual workers' wages or salaries to their performance levels. At the same time, it is foolhardy for employers to assume that all workers will at least do more good than harm on the job, particularly in critical jobs. Thus, employers must exercise some care when hiring workers. Employers seldom know, however, which job applicants will best fit their needs and justify the sometimes considerable costs of on-the-job training. Largely through trial-and-error efforts to obtain better workers, employers have discovered valid but fallible *signals* of the underlying worker traits that do contribute to job performance. Employers may be entirely mistaken about why their signals work, but as long as they continue to profit from using those signals, they are likely to continue relying on them.

In view of the moderately high (.6) correlation between intelligence and educational level, it is not surprising that employers have used educational credentials so extensively in screening job applicants and have often paid scant attention to the specific nature of the education workers have obtained. Employers rely heavily on educational credentials—often unknowingly—as a crude, cheap, socially acceptable, but nevertheless effective device for screening job applicants by broad intelligence level. This use of educational level as a valid but fallible signal of worker quality is quite sufficient to explain why education is more useful than intelligence for getting a good job even though intelligence is more useful for performing it well. Screening job applicants on the basis of signals of intelligence, rather than intelligence itself, also explains why intelligence is not necessarily the prime determinant of an individual's occupational fate in a *g*-based occupational hierarchy.

However, the *continued* use of signals of worker quality depends on the relative *value* of those signals to employers (i.e., on their validity and cost effectiveness). If, over time, commonly used signals become less valid indicators of the underlying worker traits from which employers profit, then their use also can be expected to wane. For example, if the link between intelligence and education were to be weakened or broken, educational credentials would lose their previous value for getting good jobs because they would lose their value to employers as signals of overall worker quality. Other signals could be expected to develop in their stead.

The Nature of Occupations

Other apparent paradoxes are resolved and the evolution of the occupational hierarchy is better understood by taking a less reified view of occupations themselves. Social scientists have tended to conceptualize occupations as standardized pigeonholes that people compete to enter in order to obtain the rewards dispensed therein. However, "occupations" are merely labels for *distinctive configurations of work tasks often assigned to workers*. The specific configurations within any one occupation are diverse and typically overlap those of other occupations to some extent. It is largely the typical or *modal* configuration, however, that defines an occupation and that determines its aptitude demands and pay scales. Thus, all occupations can routinely absorb a certain proportion of workers whose interests and abilities deviate markedly from the mode and yet still retain their characteristic requirements and rewards.

The modal configuration of tasks defining an occupation can gradually evolve or shift over time in response to net changes in the capabilities of the workers who are typically recruited to and retained in that occupation. Specifically, sustained increases (or decreases) in the average intelligence levels of the workers filling an occupation can lead in time to increases (or decreases) in the average intellectual difficulty of the tasks assigned to that occupation, and shifts in *average* intelligence levels are all that is required for occupations to shift gradually in difficulty level. These gradual shifts in average occupational content can occur because there is always some flexibility in the assignment of tasks to individual workers in light of their particular strengths and weaknesses. Tasks that become more frequently delegated to (or taken away from) individual *workers* may eventually be assigned to (or eliminated from) the occupational *positions* themselves.

When differences in intelligence within a society's work force are large and stable, the recruitment of intelligent workers to occupations becomes a zero-sum game, and net increases in worker intelligence within one occupation come at the expense of other occupations. As the mean intelligence levels within two occupations diverge, so, too, can the average difficulty levels of the tasks typically assigned to those occupations. From this perspective, it is possible to see how the gradual reconfiguration of work content to accommodate shifts in the intelligence levels of workers can cause occupations to drift apart slowly and naturally in intellectual difficulty and thereby create the occupational hierarchy we now observe.

Occupational hierarchies are generally viewed as stable social structures, which they certainly seem to be for long periods of time, but they can expand or contract depending on the validity of the signals employers use in hiring and promoting workers. The more efficiently people are sorted to jobs by intelligence, the more differentiated occupations can become and thus the steeper the occupational hierarchy will be. The less efficiently workers are sorted, the more contracted the hierarchy will be and the more overlap there will be in the distributions of intelligence within different occupations. Hierarchical differences among occupations can be maintained despite considerable inefficiency or error in matching individual people to individual jobs; those hierarchical distinctions simply remain smaller than they would be if there were more valid sorting of workers to jobs.

From this perspective it is apparent that the emergence and maintenance of a *g*-based occupational hierarchy does not require that intelligence be either the only determinant of job performance or the major determinant of who gets higher status jobs. It is necessary only that intelligence be the most stable substrate of human differences which themselves lead to differences in job performance.

The Trade-off between Productivity and Equality

Functional theory and revisionist theory both assume that social policies can be readily devised that simultaneously increase both equality and productivity. The modified functional theory leads to a more pessimistic conclusion, because it suggests that the classic moral and economic trade-off between equality and efficiency (Okun, 1975) exists in no small part because of the *g* factor among individuals on the one hand and the consequent *g* factor or hierarchy among occupations themselves on the other hand. Equalizing the average *g* loadings of work tasks across jobs or more randomly assigning workers to differentially *g*-loaded jobs, as revisionists have often suggested, would reduce inequality at least in the short run. However, it could also be expected to drastically reduce productivity and cause general havoc as more workers made blunders on critical tasks. Conversely, increasing the match between task complexity and worker intelligence, say, through more valid selection society wide, would increase aggregate economic productivity, perhaps quite substantially (Hunter & Schmidt, 1983). Increases in the validity of personnel selection practices would also accord with common notions of fairness or equity. Nonetheless, it is unclear that societies will tolerate the steepening of the occupational hierarchy, beyond some point, that I have already speculated is fostered in the long run by increasingly valid selection within a society at large. Certainly, many constraints against high performance already exist to mitigate invidious comparisons among workers (Gardner, 1961). And more valid selection practices that also increase adverse impact on socially visible subgroups in the population will certainly generate a lot of countervailing social pressures.

The theory thus suggests that personnel selection is at the fulcrum of the balance on which society tries to weigh the competing goals of equality and productivity. As such, personnel selection can be expected periodically to be a focal point of social tensions as the balance shifts

back and forth. The theory also suggests that to be successful in the long run, any policy that seeks to change *either* the level of productivity or inequality in a society via changing personnel practices or the nature of work must anticipate the probable impact of that policy on *both* productivity and inequality.

A CONCRETE EXAMPLE OF THE SOCIETAL CONSEQUENCES OF g IN EMPLOYMENT

Group differences in intelligence illustrate both the processes outlined by the theory and the surprising scope and magnitude of the consequences of *g* in employment. The black–white difference in intelligence provides a concrete and especially important example.

Any psychometrician who is familiar with the black and white IQ distributions knows that, if cognitive tests are used in selecting workers, proportionately fewer blacks than whites will be selected for jobs requiring above average intelligence. Those psychometricians can also readily estimate the ratio of blacks to whites at any given IQ level. However, what IQ levels are required by different occupations? What proportion of blacks to whites should we expect among physicians with racially blind but appropriately *g*-loaded selection: 1 to 20, 1 to 4, 1 to 2? And how different would this ratio be for other occupations, for example, police officers or truck drivers? Also, what are the monetary and nonmonetary ramifications of increasing minority employment levels to specific levels in specific jobs, say, through the use of quotas? It is these sorts of unanswered questions that bedevil employers, judges, and unions. The fear of treading near these touchy issues, however, impedes the conduct of more general research on the impact of *g* in social life. Our collective reluctance to tackle them head-on blocks more constructive dialog about our alternatives for dealing wisely with group differences in intelligence. Instead, that reluctance tacitly supports the continuation of social policies that chronically generate as much social tension as they were intended to alleviate.

Patterns of Occupational Inequality Expected from the Mean Black–White Differences in Intelligence

There is no clear way to determine what the distribution of occupations among blacks and whites would be in a fair and just social system, because fairness is a sociopolitical and not a scientific issue. But it is possible to estimate what occupational patterns by race might look like if blacks and whites were both recruited to jobs from the same ranges of IQ that the general population appears to have been drawn from in the past, which, as discussed above, are consistent with valid but fallible

selection for a *g*-based occupational hierarchy. Such estimates are provided in Table 2.

The first step in creating this table was to estimate the IQ ranges from which workers are most often recruited to different occupations. Recruitment ranges spanning approximately the 15th to the 85th IQ percentiles were estimated for each of nine diverse occupations that employ large numbers of males and for which there were data available for incumbents from the GATB general intelligence scale. The nine occupations are grouped into four IQ ranges which, although overlapping, are clearly ordered in terms of both intelligence requirements and prestige level—as is shown in the first two columns. For example, IQs above 114 in the Stanford–Binet metric are generally required for physician and engineer, whereas IQs between 91 and 117 are typical among fire fighters, police officers, and electricians. There is no implication here that attributes other than intelligence are unimportant for getting or performing jobs. The recruitment ranges are used only to estimate the proportions of people likely to be considered eligible or available in terms of intelligence alone.

The second step was to estimate the proportions of both the black and white populations that, according to nationally representative test data, fall within each of the four different recruitment ranges. These results are presented in columns 5 and 6 and show that progressively smaller proportions of both populations fall within the estimated recruitment ranges for the higher level occupations.

The third step was to compute the ratio of the proportion of blacks to the proportion of whites that fall within these IQ recruitment ranges and that would thus be eligible for each of the nine occupations in terms of intelligence alone. A ratio of 0.5, for example, would mean that proportionately half as many blacks as whites would be eligible. Racial parity, which is a common goal among both blacks and whites, is represented by a ratio of 1.0.

For purposes of comparison, ratios were also estimated for recruitment ranges that are either half a standard deviation higher for blacks than for whites, as might occur because of unfair discrimination against blacks, or half a standard deviation lower for blacks. Columns 7–9 show the estimated black–white ratios for these three different recruitment ranges. These three sets of ratios differ considerably, but in all cases they are far from parity in the more intellectually demanding occupations, and they approach parity only among the lowest level jobs listed in the table. For example, a ratio of only 0.05, or 1 to 20, is found for physician and engineer under the condition of same IQ recruitment ranges for both races; the ratio rises to 0.24, or about 1 to 5, when the recruitment range is half a standard deviation lower for blacks than for whites. The analogous ratios for police officers, fire fighters, and electricians are higher but still

TABLE 2
Actual Black–White Ratios of Male Employment in Nine Occupations vs Employment Ratios Expected on the Basis of Black–White Differences in Intelligence

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
			% of population above minimum IQ required[d]		% of population in IQ range[d]		B/W ratio in range			B/W ratio for % of male workers employed in each occupation[e]	
z scores for IQ range from which most workers are recruited[a]	Prestige level[b]	Major IQ range of recruitment (in SB metric)[c]	B	W	B	W	Range for blacks is 0.5 *SD* higher	Same range	Range for blacks is 0.5 *SD* lower	1970[f]	1980[g]
0.8+		114+	1.1	23.0	1.1	23.0	0.01	0.05	0.22		
Physician	88									0.23	0.30
Engineer	66									0.12	0.25
0.5 to 2.0		108–134	3.3	35.2	3.3	32.7	0.02	0.10	0.35		
Secondary teacher	63									0.59	0.59
Real estate sales	48									0.18	0.23
−0.5 to 1.0		91–117	28.4	74.5	27.8	56.9	0.20	0.49	0.87		
Fire fighter	41									0.27	0.65
Police officer	37									0.69	0.87
Electrician	44									0.33	0.50
−0.8 to 0.7		86–112	42.5	83.1	40.8	56.4	0.36	0.72	1.07		
Truck driver	29									1.59	1.48
Meat cutter	32									0.98	0.98

[a] Range extends roughly from minimum intelligence level (GATB aptitude G) required as determined in GATB studies of job performance (U.S. Department of Labor, 1970, Table 9-1, job titles 131, 142, 155, 179, 246, 297, 356, 404, and 413) to 1.5 *SD*s above that minimum. G cutting points are not available for fire fighter and meat cutter, but $\bar{X}_G$ and SD_G are the same as for police officer and truck driver, respectively, so the former were grouped with the latter. A full-sample *SD* of 1.5 above the minimum was chosen to define the major range of recruitment because it generally represents within-occupation ranges of at least 2.0 *SD*s. The range for physicians and engineers was adjusted downward to be consistent with studies reviewed by Matarazzo (1972, chap. 7) for physicians and other professionals.

[b] Source: Gottfredson & Brown (1978).

[c] IQ ranges in the Stanford–Binet metric were estimated by assuming that $\bar{X}_G = 100$, $SD_G = 20$, $\bar{X}_{IQ} = 100$, and $SD_{IQ} = 17$. The latter two parameters were estimated from data in Footnote *d* and assume that the total population is 88% white and 12% black.

[d] Calculated assuming that $\bar{X}_{IQ}$ and SD_{IQ} are 83.4 and 13.4 for blacks and 101.8 and 16.4 for whites. These parameters were calculated by transforming WISC data for a nationally representative sample of 12- to 17-year-olds (Hitchcock, 1976, Tables 1 & 2) into the Stanford–Binet metric. Percentages of the population within any specific IQ range were then estimated from the cumulative normal distribution (Dixon & Massey, 1969, Table A-4).

[e] Data are for the experienced civilian labor force and so include the experienced unemployed as well as the employed. Occupational categories for 1970 and 1980 are not perfectly comparable with each other or with the GATB job titles. More Spanish origin persons were included in the white category in 1970 than 1980 (U.S. Bureau of the Census, 1983a, pp. 3–4).

[f] Calculated from data in U.S. Bureau of the Census (1973, Table 2) for occupational categories 006-023, 065, 144, 270, 430, 631, 633, 715, 961, and 964 (public police only, U.S. Bureau of the Census, 1971).

[g] Calculated from data in U.S. Bureau of the Census (1983a, Table 2) for occupational categories 044-059, 084, 157, 254, 416-418, 575, 686, and 804 (U.S. Bureau of the Census, 1982).

do not reach parity: 0.49 for equal recruitment ranges and 0.87 for the ranges more favorable to blacks than to whites.

Different assumptions about the distribution of intelligence in the black and white populations and about the intelligence requirements of jobs would produce somewhat different estimated black–white ratios for individual occupations, but the overall *pattern* of ratios would probably be the same under any set of reasonable assumptions. That pattern suggests that if blacks are recruited to jobs according to intelligence in the same manner as the general population seems to have been in the past, then deviations from black–white parity in employment can be expected to be especially striking in high-level jobs.

Finally, data on actual employment ratios in 1970 and 1980 provide some perspective on the estimated ratios. These data, which are shown in the last two columns, reveal the same pattern as do the estimated ratios. More intellectually demanding jobs tend to employ relatively fewer blacks, and parity is found only in the lowest level jobs. It is also the case that actual employment ratios are most similar to ratios estimated for lower recruitment ranges for blacks. This is true for all occupations in both years with but three exceptions. For 1980, the mean absolute differences between the expected and the actual black–white ratios are 0.50, 0.29, and 0.17, respectively, for recruitment ranges that are higher, equal, or lower for blacks. If anything, then, black–white differences in employment seem to be *smaller* than those which would be expected on the basis of how the general population appears to have been selected into occupations on the basis of intelligence. It should be noted that this pattern favoring blacks does not necessarily imply any employment bias in favor of blacks, because it could result from diverse factors including unreliability in valid personnel selection procedures.

This pattern of unexpectedly high actual black–white ratios is consistent, however, with data showing that mean IQs are *lower* for blacks than for whites in the same occupational category (Stewart, 1947) and for black versus white applicants for the same jobs (Jensen, 1977). The fact that blacks may obtain higher level jobs than predicted on the basis of their IQ scores does not provide evidence that intelligence tests underestimate their job performance, because research has repeatedly shown that any bias in prediction *favors* blacks by overpredicting their actual performance in school or on the job (Hunter, 1983b; Hunter et al., 1984; Linn, 1982; Manning & Jackson, 1984).

If black–white differences in *g* remain large and *if* jobs remain *g* loaded, then black–white parity in employment may be possible only by lower intelligence recruitment standards for blacks. Unless blacks possess compensatory non-*g* traits in greater measure than do whites for any particular job, then lower intelligence standards for blacks than for whites will also result in lower mean performance levels for blacks than for whites in those jobs. Such a trade-off between minority hiring ratios and work force productivity, although both are desirable goals, has been clearly documented by utility analyses in selection research (Hunter et al., 1984). Jensen (1985) has provided indirect evidence that blacks exceed whites on the average on the non-*g* components of motor coordination, which illustrates that job performance among blacks cannot necessarily be expected to be lower than that of whites even when the blacks may have lower average IQs (see also Hunter, 1983b, for relevant evidence). However, this particular black advantage probably does little overall to decrease black occupational disadvantages due to lower intelligence because, as reviewed above, psychomotor ability is useful for predicting performance primarily in low-level jobs.

The Wider Ramifications of g-Based Racial Inequalities

During the War on Poverty in the 1960s, reducing black–white differences in cognitive abilities was commonly viewed as a promising way of decreasing black–white differences in education and employment, and the school was the central battleground in this war. Massive changes in the funding and delivery of educational services have occurred in the last two decades, and black–white differences in educational level have continued to decrease, with the difference in median years of education completed by young people dropping to 0.3 years in 1980 from 3.4 years in 1950 (U.S. Bureau of the Census, 1981, Table 229, 1983b, Table 18). Despite such changes and despite concerted efforts to reduce the black–white difference in intelligence, that difference in intelligence has been resistant to change (Hurn, 1978; Jensen, 1983), and it remains as large today as it has been for at least the last 60 years (Gordon, 1980). Preschool interventions, remedial education, and the search for new pedagogical techniques continue unabated, as do indictments of the educational system for failing to diminish the black–white difference in intelligence, but evidence mounts that current differences in schooling resources and practices have much less effect on academic aptitude and performance than was long assumed (Ashline, Pezzullo, & Norris, 1976), thus further dimming hopes for a workable educational solution to the black–white difference in intelligence.

As evidence accumulates that the black–white difference is not only real but also very stubborn, whatever its origin, there has been a clear shift in arguments about the importance of *g* and in the strategies suggested for decreasing black–white differences in life outcomes. This shift has taken the form primarily of minimizing the importance of intelligence both in school and at work. Whereas it was usually argued in the past that intelligence is important because it enables people to get the educational credentials necessary for a good job, now it is increasingly argued that intelligence is important *only* for getting educational credentials and that

it need not be if educational practices were changed in order to break the link between intelligence and either achievement in school or years of education attained.

A critical but mistaken assumption of this strategy is that differences in *g* create no noticeable or significant differences in job performance among equally highly educated individuals, all of whom are presumed to have learned approximately the same skills in school (M. King, 1984; U.S. Commission on Civil Rights, 1982). Being so widely accepted, however, this misconception about the value of schooling versus intelligence has been particularly mischievous in public life, because it turns well-intentioned but failing educational remedies for a difficult social problem into additional sources of rancor, with educators and employers often receiving much of the blame for those failures.

Blacks already enter college and obtain more years of education than whites of the same intelligence level (Eckland, 1980a; Manning & Jackson, 1984; Thomas, Alexander, & Eckland, 1979) which means, conversely, that blacks have lower mean IQs than do whites with the same amount of education (Dearman & Plisko, 1981, Table 2.7; Hennessy & Merrifield, 1978). The large mean black–white differences in Scholastic Aptitude Test (SAT) and Graduate Record Examination (GRE) scores in different years and in all college majors (Berryman, 1983, Tables 48–51) are consistent with this pattern, as too is evidence that blacks fail professional licensing exams at a much higher rate than do whites (Humphreys, 1980; "Race Bias," 1986).

The foregoing black–white differences in intelligence at equivalent educational levels suggest that if employers rely heavily and equally on educational credentials when selecting black and white workers, then the blacks they select can be expected to be less productive on the average than the whites they select. The policy of pursuing black–white occupational parity through educational parity, without also decreasing the black–white difference in intelligence, and of expecting employers to continue to hire according to those credentials, is tantamount, taking the employer's point of view, to making educational credentials an even more biased indicator of intelligence favoring blacks. The more biased educational level becomes as a signal of intelligence, favoring blacks, the more obvious black–white differences in performance between equally highly educated blacks and whites can be expected to become, and the more likely employers will be eventually to discount black educational credentials or to try to replace educational credentials with more valid selection criteria. Although such employer reactions could be justified from the point of view of worker productivity, they would have the effect of defeating the purpose of equalizing educational credentials by race in the first place.

Whether or not employers find the educational credentials of blacks or whites useful in hiring, outside observers often use them in assessing whether employers have unfairly discriminated against blacks. Specifically, when it is observed that blacks with the same educational credentials as whites have higher unemployment rates, lower level jobs, lower performance ratings, or lower promotion rates, those data are frequently taken as prima facie evidence of discrimination against blacks, not only by the public press (E. King, 1984a, 1984b) but also by social scientists (Smith, 1983, pp. 168–169) and by government agencies charged with fighting racial discrimination (U.S. Commission on Civil Rights, 1982, pp. 58–59). Discrimination may indeed account for some of these black–white differences in employment, but some differences are to be expected, even in the absence of discrimination, if blacks go further in school than do whites at the same intelligence levels and if employers do in fact respond to IQ-generated differences in performance.

Not all social policies recommended for reducing racial inequalities focus on formal schooling. For example, one suggestion has been to make job training less *g* loaded in order to reduce the adverse impact of lower intelligence. But if work tasks themselves remain *g* loaded, as argued earlier, then adverse impact would only be delayed until after job entry. This is essentially the same delayed adverse impact that occurs when entry but not promotion requirements are lowered for one group but not another, as has been painfully learned in some organizations such as the New York City police department (M. Cohen, 1984).

One of the job restructuring strategies that has been proposed for easing adverse impact is that of reducing the *g* loadings of the work actually performed in individual jobs. However, it is hard to imagine reducing *g* loadings sufficiently in enough jobs to significantly reduce the adverse impact created by a 1-standard-deviation black–white difference in intelligence, particularly in the more desirable higher level jobs in which there seems to be no substitute for human judgment and analytical thinking.

The closer this society approaches black–white parity in occupational patterns without also approaching black–white parity in intelligence, the more social tensions we can expect the black–white difference in *g* to generate, especially if personnel selection criteria–at least for nonblacks—simultaneously become more *g* loaded. Articles in the public press are beginning to make public the growing private sentiment that blacks do not perform as well as whites in the same positions, a sentiment that has grown, perhaps not coincidentally, with the dramatic narrowing of black–white differences in educational levels during the last few decades and with more widespread implementation of quota-oriented affirmative action policies (Murray, 1984). This sentiment in turn is polarizing blacks and whites further, with members of each race accusing the other of racial discrimination—blacks often being accused of promoting affirmative,

compensatory, or reverse discrimination, and whites being accused either of a more subtle and insidious institutional racism or of the "old racism of the 1950s" disguised as a new realism (R. Cohen, 1984). We also see anger, frustration, and confusion on all sides when painstaking efforts to develop racially fair certification, hiring, and promotion procedures are rejected by former proponents whenever those procedures turn out to produce "racially discriminatory results" (i.e., to have continued adverse impact on minorities: M. Cohen, 1984; "Race Bias," 1986).

CONCLUSION

Nothing in this article should be construed as promulgating the view that the social or moral worth of individuals or groups is a function primarily of their intelligence levels. Obviously, many traits are valued highly and contribute to the welfare of society—integrity, compassion, and courage, to name but a few. Rather, this article has concerned the role of intelligence in accounting for differences in one important sphere of human conduct, namely, performance at work. Evidence was reviewed that strongly suggests that differences in intelligence among workers inevitably lead to nontrivial differences in job performance, certainly in the division of labor as we know it today. More intelligent workers are more valuable workers, all else being equal. This article has also concerned the role of intellectual differences in structuring the very nature of the work we perform and the societies we live in. For instance, it appears that the occupational status hierarchy may have arisen as a natural accommodation by societies to the wide and stable dispersions in intelligence within their populations. Although the status and income of individual workers are only weakly to moderately dependent on their own intelligence levels, the hierarchy of occupational positions for which workers compete is itself ultimately an outgrowth of individual differences in *g*.

Intelligence has its profound effect on the structure of society, not necessarily because it is the most highly valued of individual differences—although conceivably it is—but rather because it may have the widest and most stable distribution among all the traits that are valuable in industrialized nations. That is, differences in intelligence probably constitute a bigger and more consistent constraint on the performance of individuals and societies than do more manipulable attributes, so they are the most likely substrate from which differentially valued occupational positions will arise.

One objective of this article has been to illustrate that the societal consequences of the *g* factor in employment are much larger than most of us had ever imagined. The wide ramifications of the large mean black–white difference in *g* simply provide an additional, especially poignant, example. A second objective has been to stress the need for unfettered inquiry into the societal consequences of *g*. Scientific inquiry into the

actual, as distinct from the presumed, costs and benefits of alternative social policies is essential if our nation is to make better informed decisions regarding economic productivity and socioeconomic inequality. Clinging to the unfounded hope that the societal consequences of *g* are minor, even nonexistent, does nothing to halt the inexorable impact that differences in intelligence have on human performance and social life. That their investigation is socially sensitive is only further testimony to their importance.

REFERENCES

Anastasi, A. (1982). *Psychological testing* (5th ed.). New York: Macmillan Co.

Ashline, N. F., Pezzullo, T. R., & Norris, C. I. (Eds.). (1976). *Education, inequality, and national policy*. Lexington, MA: Heath.

Berg, I. (1970). *Education and jobs: The great training robbery*. New York: Beacon.

Berryman, S. E. (1983). *Who will do science? Minority and female attainment of science and mathematics degrees: Trends and causes*. New York: The Rockefeller Foundation.

Bowles, S., & Gintis, H. (1976). *Schooling in capitalist America*. New York: Basic Books.

Campbell, R. T. (1983). Status attainment research: End of the beginning or beginning of the end? *Sociology of Education*, **56**, 47–62.

Christal, R. E. (1974). *The United States Air Force occupational research project*. Lackland AFB, TX: Air Force Human Resources Laboratory (AFSC) (NTIS No. AD 774574).

Cohen, M. T. (1984, October 16). Is it right to fight racial bias by fudging city police exams? *New York Tribune*, pp. 1B, 4B.

Cohen, R. (1984, December 19). Racism is back. *Washington Post*, p. A25.

Collins, R. (1979). *The credential society: An historical sociology of education and stratification*. New York: Academic Press.

Davis, K., & Moore, W. E. (1945). Some principles of stratification. *American Sociological Review*, **10**, 242–249.

Dearman, N. B., & Plisko, V. W. (1981). *The condition of education, 1981 ed.* Washington, DC: National Center for Education Statistics.

Dixon, W. J., & Massey, J., Jr. (1969). *Introduction to statistical analysis*. New York: McGraw-Hill.

Duncan, O. D., Featherman, D. L., & Duncan, B. (1972). *Socioeconomic background and achievement*. New York: Seminar.

Eckland, B. K. (1980a). Competent teachers and competent students. *Behavioral and Brain Sciences*, **3**, 341–342.

Eckland, B. K. (1980b). Education in the meritocracy. (Review of *Who gets ahead? The determinants of economic success in America*). *American Journal of Education*, **89**(1), 76–85.

Fox, W. L., Taylor, J. E., & Caylor, J. S. (1969). *Aptitude levels and the acquisition of skills and knowledges in a variety of military training tasks*. Alexandria, VA: Human Resources Research Organization (NTIS No. AD 688263).

Gardner, J. W. (1961). *Excellence: Can we be equal and excellent too?* New York: Harper.

Gordon, R. A. (1980). Implications of valid (and stubborn) IQ differences: An unstatesmanlike view. *Behavioral and Brain Sciences*, **3**(3), 343–344.

Gordon, R. A. (in press). SES versus IQ in the race–IQ–delinquency model. *International Journal of Sociology and Social Policy*.

Gottfredson, L. S. (1984). *The role of intelligence and education in the division of labor* (Rep. No. 355). Baltimore, MD: The Johns Hopkins University, Center for Social Organization of Schools.

Gottfredson, L. S. (1985). Education as a valid but fallible signal of worker quality: Reorienting an old debate about the functional basis of the occupational hierarchy. In A. C. Kerckhoff (Ed.), *Research in sociology of education and socialization* (Vol. 5, pp. 123–169). Greenwich, CT: JAI Press.

Gottfredson, L. S. (1986). Occupational Aptitude Patterns (OAP) Map: Development and implications for a theory of job aptitude requirements (Monograph). *Journal of Vocational Behavior,* **29,** 254–291.

Gottfredson, L. S. (in press). Intelligence versus training: Job performance and black-white occupational inequality. *Personality and Individual Differences.*

Gottfredson, L. S., & Brown, V. C. (1978). Holland codes for the 1960 and 1970 censuses: Detailed occupational titles. *JSAS Catalog of Selected Documents in Psychology,* **8,** 22 (Ms. No. 1660).

Gottfredson, L. S., & Crouse, J. (1986). Validity versus utility of mental tests: Example of the SAT. *Journal of Vocational Behavior,* **29,** 363–378.

Hawk, J. A. (1970). Linearity of criterion–GATB aptitude relationships. *Measurement & Evaluation in Guidance,* **2**(4), 249–251.

Hennessy, J. J., & Merrifield, P. R. (1978). Ethnicity and sex distinctions in patterns of aptitude factor scores in a sample of urban high school seniors. *American Educational Research Journal,* **15**(3), 385–389.

Hitchcock, D. C. (1976). *Intellectual development and school achievement of youths 12–17 years: Demographic and socioeconomic factors* (Vital and Health Statistics: Series 11, No. 158) (DHEW Publication No. (HRA) 77-1640). Washington, DC: U.S. Govt. Printing Office.

Humphreys, L. G. (1980). Race differences in tested intelligence: Important socially, obscure causally (A review of *Bias in Mental Testing*). *Proceedings of the National Academy of Education,* **7.**

Hunter, J. E. (1983a). A causal analysis of cognitive ability, job knowledge, job performance, and supervisor ratings. In F. Landy, S. Zedeck, & J. Cleveland (Eds.), *Performance measurement and theory* (pp. 257–275). Hillsdale, NJ: Erlbaum.

Hunter, J. E. (1983b). *Fairness of the General Aptitude Test Battery: Ability differences and their impact on minority hiring rates.* Washington, DC: Division of Counseling and Test Development, Employment and Training Administration, U.S. Department of Labor.

Hunter, J. E. (1983c). *Test validation for 12,000 jobs: An application of job classification and validity generalization analysis to the General Aptitude Test Battery (GATB).* Washington, DC: Division of Counseling and Test Development, Employment and Training Administration, U.S. Department of Labor.

Hunter, J. E. (1986). Cognitive ability, cognitive aptitudes, job knowledge, and job performance. *Journal of Vocational Behavior,* **29,** 340–362.

Hunter, J. E., & Hunter, R. F. (1984). Validity and utility of alternative predictors of job performance. *Psychological Bulletin,* **96,** 72–98.

Hunter, J. E., & Schmidt, F. L. (1983). Quantifying the effects of psychological interventions on employee job performance and work-force productivity. *American Psychologist,* **38,** 473–478.

Hunter, J. E., Schmidt, F. L., & Rauschenberger J. (1984). Methodological, statistical, and ethical issues in the study of bias in psychological tests. In C. R. Reynolds & R. T. Brown (Eds.), *Perspectives on bias in mental testing* (pp. 41–99). New York: Plenum.

Hurn, C. J. (1978). *The limits and possibilities of schooling.* Boston: Allyn & Bacon.

Jensen, A. R. (1977). An examination of culture bias in the Wonderlic Personnel Test. *Intelligence,* **1,** 51–64.

Jensen, A. R. (1980). *Bias in mental testing.* New York: Free Press.

Jensen, A. R. (1983). The nonmanipulable and effectively manipulable variables of education. *Education and Society,* **1,** 51–62.

Jensen, A. R. (1984). Test validity: *g* versus the specificity doctrine. *Journal of Social and Biological Structures,* **7,** 93–118.

Jensen, A. R. (1985). The nature of the black–white difference on various psychometric tests: Spearman's hypothesis. *Behavioral and Brain Sciences,* **8,** 193–219.

Jensen, A. R. (1986). *g*: Artifact or reality? *Journal of Vocational Behavior,* **29,** 301–331.

King, E. (1984a, September 22). MTA employee suit charges bias in promotions. *Baltimore Afro-American,* p. 2.

King, E. (1984b, October 6). Bias charges continue at SSA. *Baltimore Afro-American,* pp. 1–2.

King, M. L. (1984, June 27). Affirmative action makes for shared experience. *Wall Street Journal,* p. 34.

Linn, R. L. (1982). Ability testing: Individual differences, prediction, and differential prediction. In A. K. Wigdor & W. R. Garner (Eds.), *Ability testing: Uses, consequences, and controversies: Pt. II. Documentation section* (pp. 335–388). Washington, DC: National Academy Press.

Loehlin, J. C., Lindzey, G., & Spuhler, J. N. (1975). *Race differences in intelligence.* San Francisco: Freeman.

Manning, W. H., & Jackson, R. (1984). College entrance examinations: Objective selection or gatekeeping for the economically privileged. In C. R. Reynolds & R. T. Brown (Eds.), *Perspectives on bias in mental testing* (pp. 189–220). New York: Plenum.

Matarazzo, J. D. (1972). *Wechsler's measurement and appraisal of adult intelligence* (5th ed.). Baltimore: Williams & Wilkins.

McCormick, E. J., Jeanneret, P. R., & Mecham, R. C. (1972). A study of job characteristics and job dimensions as based on the Position Analysis Questionnaire (PAQ). *Journal of Applied Psychology,* **56,** 347–368.

McDaniel, M. A. (1986). *The evaluation of a causal model of job performance: The interrelationships of general mental ability, job experience, and job performance.* Doctoral dissertation. Washington, DC: George Washington University.

McDaniel, M. A., & Schmidt, F. L. (1985). *A meta-analysis of the validity of training and experience ratings in personnel selection* (Rep. No. OSP-85-1). Washington, DC: U.S. Office of Personnel Management, Office of Staffing Policy.

Murray, C. (1984, December 31). Affirmative racism: How preferential treatment works against blacks. *The New Republic,* Issue 3650, pp. 18–23.

Okun, A. M. (1975). *Equality and efficiency: The big tradeoff.* Washington, DC: The Brookings Institution.

Race bias cited in Texas teacher tests (1986, May 20). *Baltimore Afro-American,* pp. 1, 10.

Schmidt, F. L., & Hunter, J. E. (1981). Employment testing: Old theories and new research findings. *American Psychologist,* **36,** 1128–1137.

Schmidt, F. L., Hunter, J. E., & Outerbridge, A. N. (1986). The impact of job experience and ability on job knowledge, work sample performance, and supervisory ratings of job performance. *Journal of Applied Psychology,* **71,** 432–439.

Smith, E. J. (1983). Issues in racial minorities' career behavior. In W. B. Walsh & S. H. Osipow (Eds.), *Handbook of vocational psychology: Vol. 1. Foundations* (pp. 161–222). Hillsdale, NJ: Erlbaum.

Spaeth, J. L. (1979). Vertical differentiation among occupations. *American Sociological Review,* **44,** 746–762.

Stewart, N. (1947). Relationship between military occupational specialty and Army General

Classification Test standard score. *Educational and Psychological Measurement,* **7,** 677–693.

Sticht, T. (Ed.). (1975). *Reading for working: A functional literacy anthology*. Alexandria, VA: Human Resources Research Organization.

Terman, L. M. (1916). *The measurement of intelligence*. Boston: Houghton-Mifflin.

Terman, L. M., & Merrill, M. A. (1937). *Measuring intelligence*. Boston: Houghton-Mifflin.

Terman, L. M., & Merrill, M. A. (1972). *Stanford Binet Intelligence Scale: Manual for the Third Revision Form L-M*. Boston: Houghton Mifflin.

Thomas, G. E., Alexander, K. L., & Eckland, B. K. (1979). Access to higher education: The importance of race, sex, social class, and academic credentials. *School Review,* **87,** 133–156.

Thorndike, R. L. (1986). The role of general ability in prediction. *Journal of Vocational Behavior,* **29,** 332–339.

U. S. Bureau of the Census (1971). *1970 census of the population: Classified index of occupations and industries*. Washington, DC: U. S. Govt. Printing Office.

U. S. Bureau of the Census (1973). *Census of population 1970: Subject reports. Occupational characteristics* (Final rep. PC(2)-7A). Washington, DC: U. S. Govt. Printing Office.

U. S. Bureau of the Census (1981). *Statistical abstract of the United States: 1981* (102nd ed.). Washington, DC: U. S. Govt. Printing Office.

U. S. Bureau of the Census (1982). *1980 census of population: Classified index of industries and occupations*. Washington, DC: U. S. Govt. Printing Office.

U. S. Bureau of the Census (1983a). *Detailed occupation and years of school completed by age, for the civilian labor force by sex, race, and Spanish origin: 1980* (Suppl. Rep. PC80-S1-8). Washington, DC: U. S. Govt. Printing Office.

U. S. Bureau of the Census (1983b). *Population profile of the United States: 1982* (Current Population Reps., P-23, No. 130). Washington, DC: U. S. Govt. Printing Office.

U. S. Commission on Civil Rights (1982). *Unemployment and underemployment among blacks, Hispanics, and women* (Clearinghouse Publication 74). Washington, DC: U.S. Govt. Printing Office.

U. S. Department of Labor (1970). *Manual for the USTES General Aptitude Test Battery*. Washington, DC: U.S. Govt. Printing Office.

U. S. Department of Labor (1977). *Dictionary of occupational titles* (4th ed.). Washington, DC: U. S. Govt. Printing Office.

Wechsler, D. (1949). *Wechsler intelligence scale for children: Manual*. New York: The Psychological Corporation.

Wechsler, D. (1974). *Manual for the Wechsler intelligence scale for children*. New York: The Psychological Corporation.

Wigdor, A. K., & Garner, W. R. (1982). *Ability testing: Uses, consequences and controversies: Pt. 1. Report of the committee*. Washington, DC: National Academy Press.

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