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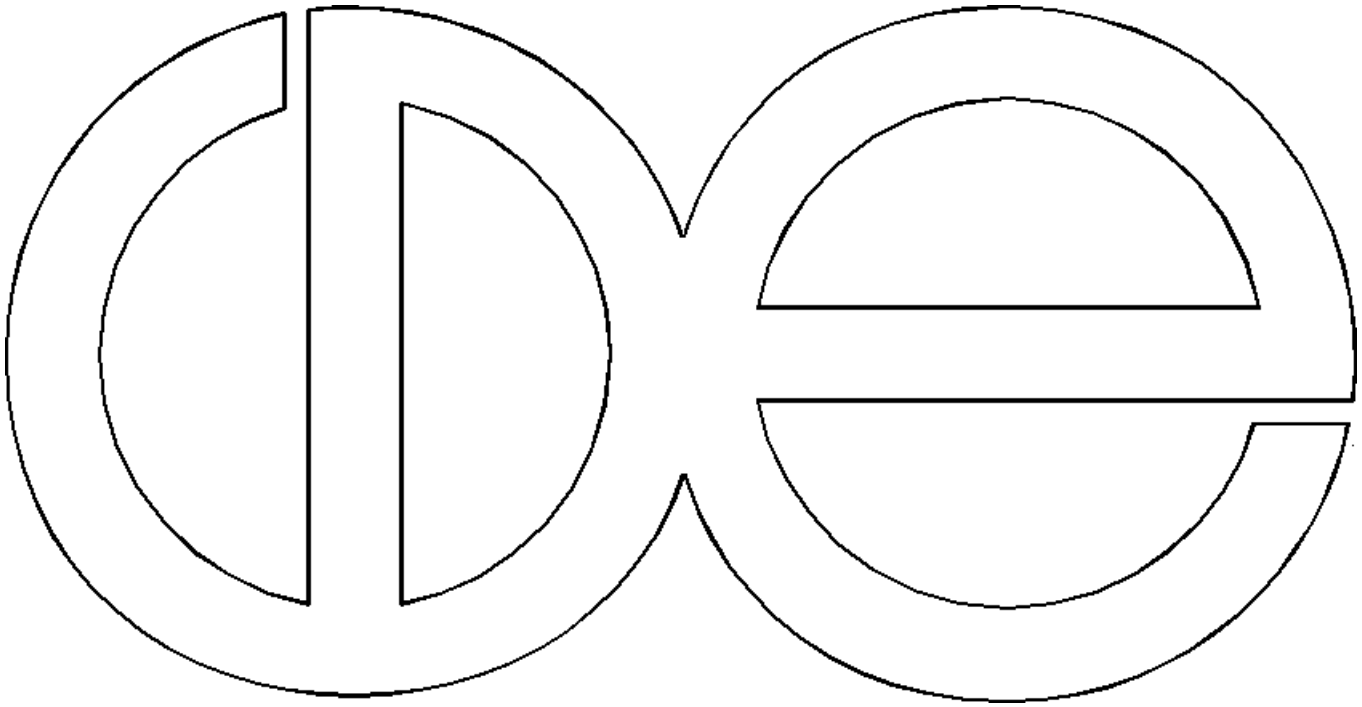

Verbal Ability and Socioeconomic Success: A Trend Analysis[1]

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ABSTRACT

Along with other recent analyses of American social structure, Herrnstein and Murray's *The Bell Curve* offers several hypotheses about the increasing centrality of cognitive ability in social stratification during the 20th century. These include growing cognitive sorting in education, occupational standing, and income and -- by implication -- increasing stratification of children's cognitive ability by their social and economic background. However, Herrnstein and Murray provide scant evidence of growth in cognitive sorting. Using data from the General Social Survey, we test each of these hypotheses using a short verbal ability test which was administered to about 12,500 American adults between 1974 and 1994. While weaknesses of the verbal ability test preclude definitive conclusions, the GSS data provide no support whatever for any of the trend hypotheses advanced by Herrnstein and Murray.

Standardized psychological tests have been given on a massive scale in the United States since World War I -- more than three-quarters of a century. Research and speculation has periodically highlighted growth in the importance of cognitive ability for adult success. Recent examples of this theme include Richard Herrnstein and Charles Murray's (1994) *The Bell Curve* and Nicholas Lemann's (1995a; 1995b) social history of college admissions testing. One can find similar themes -- focusing more on cognitive and job skills than on intelligence *per se* -- running across the political spectrum in the work of Robert Reich (1991), Mickey Kaus (1995), Barbara Ehrenreich (1989), and Earl Hunt (1995). However, we actually know very little about trends in the relationships between cognitive skills and success in schooling, jobs, or earnings, possibly excepting very recent growth in the effects of ability on the earnings of young workers.[2]

Lemann presents a fascinating *prima facie* case for growth in the role of mental testing in college admissions -- and there would appear to be visible and significant effects of testing on the chances of able students for admission to elite colleges and universities (Frank and Cook, 1995). Herrnstein and Murray (1994:25) argue more broadly that, in the course of this century, cognitive ability has become the key factor in socioeconomic success:

> "The twentieth century dawned on a world segregated into social classes defined in terms of money, power, and status. The ancient lines of separation based on hereditary rank were being erased, replaced by a more complicated set of overlapping lines. Social standing still played a major role, ... but so did out-and-out wealth, educational credentials, and, increasingly, talent. Our thesis is that the

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

twentieth century has continued the transformation, so that the twenty-first will open on a world in which cognitive ability is the decisive dividing force. ... Social class remains the vehicle of social life, but intelligence now pulls the train."

Herrnstein and Murray provide a great deal of evidence -- much of which is flawed -- about social and economic differentials that are associated with cognitive ability (Fischer, et al., 1996), but they offer very little direct evidence to support the thesis that ability has become more central in the stratification system.

In the following review, we examine Herrnstein and Murray's evidence of trends in the relationship between ability and college attendance, entrance into elite colleges, and entrance into elite occupations. Then we summarize new evidence of trend in relationships between ability and the stratification system. The new evidence is drawn from the General Social Survey (GSS) of the National Opinion Research Center, a series of national cross-sectional surveys carried out between 1974 and 1994.[3] While the GSS includes only a brief test of verbal ability, it provides repeated, standardized measurements of ability, schooling, occupation, and income for a national household sample of American adults. Using the GSS, it is possible to estimate trends over the two decades of the surveys and, in some cases, across the longer period covered by the lives of sample members.

Trends in College Attendance and Cognitive Ability

Herrnstein and Murray argue that, between the 1920s and the 1960s, college attendance became more tightly linked with IQ. For example, they write "... the students going to college

[3] Most of those data would have been available to Herrnstein and Murray. In a September 1994 conversation with the senior author, Charles Murray said that he had never heard of the General Social Survey.

were being selected ever more efficiently for their high IQ. The crucial decade was the 1950s, when the percentage of top students who went to college rose by more than it had in the preceding three decades." (p. 29) ... "At the same time that many more young people were going to college, they were also being selected ever more efficiently by cognitive ability." (p. 33) ... "At every level of cognitive ability, the links between IQ and the probability of going to college became tighter and more regular." (p. 34). To support this argument, Herrnstein and Murray rely heavily on estimates from fragmentary state and local data by Taubman and Wales (1972),[4] combined with data from the National Longitudinal Study of Youth (NLSY), a large survey of 14 to 21 year olds that began in 1979.

Herrnstein and Murray's graph, "At mid-century America abruptly becomes more efficient in getting the top students to college" (p. 34), is reproduced here as Figure 1. The graph shows Taubman and Wales' estimates of trend at just one point of the ability distribution -- the 75th percentile -- together with Herrnstein and Murray's extension of the series to 1980.[5] It certainly shows a dramatic shift toward greater college attendance among students of moderately high ability. In our opinion, the data provide less support for Herrnstein and Murray's conclusion when one combines the Taubman-Wales estimates at the 75th percentile with their estimates at other percentile points of the ability distribution. The original display by Taubman and Wales (1972:20) is reproduced in Figure 2. In our eyes, it shows that the college-going chances of

[4] Herrnstein and Murray (1994:33-37) omit the cautions voiced by Taubman and Wales (Taubman and Wales 1972), for example, that the pre-1960 data are from diverse states and local areas, mainly in the upper Midwest, and that their estimates are in some cases based on college plans rather than college attendance.

[5] One can only wonder at the creative extension of the post-1950 trend-line beyond the range of the data.

American high school graduates grew rapidly at every level of ability in the years following World War II.[6]

Herrnstein and Murray also argue that the difference in cognitive ability between the college and non-college populations has grown. After estimating the mean IQ of "23-year-olds" in 1930 who were without a college degree, had graduated from college, and had graduated from the "Ivy League and Seven Sisters," they report, "College graduates and the noncollege population did not differ much in IQ. And even the graduates of the top universities ... had IQs well within the ordinary range of ability" (p. 45). These estimates were based on a study of Pennsylvania high school students of the late 1920s who were followed through the college years (Learned and Wood, 1938) and on the first cohort to take the Scholastic Aptitude Test (SAT) in 1926 (Brigham, 1932). Even if these data were as described by Herrnstein and Murray -- and they are not -- one might ask how they could be generalized to American 23-year-olds in 1930.

Herrnstein and Murray (1994:46) go on to contrast their estimates from 1930 with estimates of mean IQ in the same three subpopulations around 1990:

> "By 1990, the noncollege population, drained of many bright youngsters, had shifted downward in IQ. While the college population grew, the gap between

[6] There also may be a difference between the definition of the base populations in the data from Taubman and Wales and those displayed for 1970 and 1980 by Herrnstein and Murray. Taubman and Wales estimated the percentage of high school graduates attending college at the 75th percentile of ability, while Herrnstein and Murray describe the display as the percentage of "high school graduates in the top IQ quartile who went directly to college." There is an obvious difference between location at the 75th percentile and in the top quarter of the distribution; the latter group includes everyone at or above the 75th percentile. Herrnstein and Murray's data point for 1980 appears to be above 80 percent (p. 34), while -- on the very next page -- Herrnstein and Murray show that, at the 75th percentile, about 60 percent of NLSY graduates of 1980-82 went directly to college (p. 35).

> college and noncollege populations therefore also grew. The largest change, however, has been the huge increase in the intelligence of the average student in the top dozen universities, up a standard deviation and a half from where the Ivies and the Seven Sisters were in 1930."

The more recent estimates are based on Armed Forces Qualification Test (AFQT) scores for non-college graduates and all college graduates in the National Longitudinal Survey of Youth and on an extrapolation from published SAT verbal test scores of entering freshman in elite undergraduate schools (pp. 46, 670).[7] Even in a generous reading, it is not clear why one should regard the AFQT and SAT scores as comparable to one another or to the scores from the 1930s. Herrnstein and Murray might better have drawn on Taubman and Wales' (1972: 5) estimates of the time series of ability percentiles of high school graduates who did or did not continue to college. As shown in Figure 3, these estimates suggest a divergence between ability levels of continuing and non-continuing graduates between 1925 and the early 1960s. However, we shall see that it would be dangerous to extrapolate that series beyond 1960.

Herrnstein and Murray's observation of a "huge increase in the intelligence of the average student in the top dozen universities" rests heavily on their estimate that people who attended elite Eastern colleges early in this century had low IQs. They cite two studies using the Otis Self-Administering Test of Mental Ability, Higher Form A, *ca* 1922-27 (pp. 38-39). The Otis

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[7] The SAT verbal scores were drawn from a survey of colleges by *U.S. News & World Report*. Those data have been criticized because colleges often exclude data from low-scoring groups in their entering classes. Herrnstein and Murray report a weighted average score of 633 among entering students, which they raise to 650 for graduates on the argument that "dropout rates for these schools are comparatively low but highly concentrated among those with the lowest entering scores" (p. 670).

Test had a set of age norms, and the Otis "IQ" was obtained by adding the deviation of each person's score from the age norm to 100 (regardless of age). This "IQ" could not possibly correspond exactly to IQs as measured with modern tests -- if for no other reason than that 1 item equals 1 IQ point at every age, but we have been unable to find any conversion between it and later versions of Otis tests or other modern tests whose properties are documented. That is, the correspondence between the Otis “IQ” and any modern IQ score is no more than a psychometric pun.

Herrnstein and Murray report that there is, in Carl Brigham's *Study of Error* (1932), "a table for converting the SAT of that era to IQ scores" (p. 38).[8] In 1926 Brigham administered the Otis test to a random subsample of 1080 high school students (among the initial 8,040 candidates who took the SAT) with a half-hour limit during the "experimental" segment of the SAT administration. However, Brigham's table maps SAT scores into raw Otis scores and reports, "The Otis I.Q. conversions were not used, and this table applies only to total raw scores" (p. 336). However, if one uses Otis' mapping, an SAT of 500 corresponds to an Otis raw score of 58.7. This would map into an Otis IQ of about 117, since the Otis norm for 18-year olds was 42 (Main, 1928:739).

Herrnstein and Murray report this finding as pertaining to "entering students" in the Ivy League and the Seven Sisters (p. 38), but the data from 1926 pertain to every “candidate” who took the SAT, regardless of the schools to which they had applied. They do not pertain to entrants, who were screened by high school grades, the traditional tests of the College Entrance

[8] We thank Nicholas Lemann (1996:112) for drawing our attention to Herrnstein and Murray’s use of the Brigham report.

Examination Board, and whatever else may have intervened between application and entry. Moreover, while the list of schools to which candidates said they were applying is dominated by the Ivy League and the Seven Sisters, it is not strictly limited to those schools (Brigham, 1932:331).

We have not found scores for all entering student in the Ivy League and Seven Sisters colleges in 1926 -- or any other year -- in Brigham's reports.[9] We have found scores of Freshmen in four women's colleges in the 1927 report on the SAT administration (Brigham, 1932:345). We have inferred from the frequencies that these must include four of Smith, Wellesley, Vassar, Mt. Holyoke, and Radcliffe, for no other colleges contributed enough female applicant test-takers to have yielded the observations reported. In these 1315 cases, the mean SAT is 535.25, which would correspond to a raw Otis score of 62.7 and an Otis IQ of 121. Again, we do not know how this "IQ" corresponds to any modern IQ, nor the share of entrants that is represented by this score, nor the relationship between SAT scores in these four schools and those throughout "the Ivy League and the Seven Sisters." Moreover, according to the report, "It is not believed that the scholastic aptitude test was used very widely as a criterion for admission in 1926, so that selection in this variable would come about only indirectly from selection in the other two measures --

[9] However, the annual reports of 1928 to 1930 include brief reports of college attrition in relation to high school test scores in "a certain [male] college in which all students take the same course in freshman year and the same course in sophomore year" and in which 333 of 365 students took the SAT in 1926 (p. 361). From the number of test scores obtained (p. 331), the college probably was Yale University, Princeton University, Harvard University, or the Massachusetts Institute of Technology. The average test score of the students admitted was 487 (s = 107), and at the end of two years, it was 523 (s = 79) among 226 remaining students. At the end of three years, the mean test score was 518 (s = 99) among 218 remaining students (p. 370), and the mean test score was 520 (s = 100) among 212 graduates of 1930 (p. 377). These data are more suggestive of low initial test scores than the data on candidates for admission, but we do not know whether they can be generalized to elite schools of the late 1920s.

principally by the examinations of the College Entrance Examination Board" (p. 345). Thus, because of the imperfect correlation between SAT scores and the two selection criteria, we would expect the SAT scores among entrants to be somewhat lower than if selection had taken place explicitly on SAT scores.

Another relevant fact is that, in the Pennsylvania study, the mean Otis IQ of high school graduates in 1928 was 105 with a standard deviation of 10.4 (Learned and Wood, 1938:135). That would place women entrants to the four colleges about two standard deviations above their age norm, where the standard deviation pertains to youth who completed high school in Pennsylvania in the late 1920s.

Given the confusion of test-takers with college entrants, the lack of contemporary norms for the Otis IQ test, and the fact that the SAT scores were not used directly in college admissions, we are quite certain that Herrnstein and Murray underestimated the cognitive ability of elite college students in the late 1920s, but we cannot say by how much. Neither can we say by how much the near-universal use of test-taking in college admission altered the ability distributions of students at elite colleges between the 1930s and the 1990s.

Trends in Occupation and Cognitive Ability

With respect to the trends in the relationship between ability and occupations, Herrnstein and Murray write:

> "... the main point seems beyond dispute: Even as recently as midcentury, America was still a society in which most bright people were scattered throughout the wide range of jobs. As the century draws to a close, a very high proportion of that same

group is now concentrated within a few occupations that are highly screened for IQ." To support this hypothesis, Herrnstein and Murray (1994:54-61) provide no data on ability by occupation, but base their argument on growth in professional and technical occupations, which presumably require high ability levels, and on changes in the educational credentials of business leaders. For example, the graph, "The top IQ decile becomes rapidly more concentrated in high-IQ professions from 1940 onward," is reproduced here as Figure 4. It shows three time series of the number of persons in select occupations from 1900 to 1990, where in each series the same numerator is expressed relative to another denominator: the top IQ decile in the labor force, the top IQ decile in the adult population, or the total labor force. The display is based on the assumption that, throughout the century, 50 percent of persons in high-IQ occupations have had IQs of 120 or higher.[10] Thus, since the number of high-IQ individuals is limited, growth in high-IQ occupations is presumed to demonstrate increasing concentration of highly intelligent individuals in such occupations and, by implication, increasing concentration of less intelligent individuals in other occupations. Our reading of the graph is that, in the absence of data on the

[10] The "high-IQ" occupations are accountants, architects, chemists, college teachers, computer scientists, dentists, engineers, lawyers, mathematicians, natural scientists, physicians, and social scientists. We have not been able to reproduce this display from the sources given by Herrnstein and Murray. Our estimate of the series in the total labor force is close to that of Herrnstein and Murray, as is that for the top IQ decile in the adult population (persons 25 years old or older). However, the numerator in the former series is apparently all persons in "high-IQ" occupations, while the numerator in the latter series is restricted to half the persons in "high-IQ" occupations, presumably those with IQs above 120. Our success in reproducing those two series leaves us confident that we have identified both the numerator and denominator of the third series, presumably, "people in the high IQ occupations, expressed as a percentage of the top IQ decile in the labor force." However, our estimates appear to fall well below those of Herrnstein and Murray, ranging from 6.4 percent in 1900 to 31.0 percent in 1990, while our reading of their graph shows just below 10 percent in 1900 and, they report (p. 55), "by 1990, more than one out of three." One might argue that these details do not matter much because the series do not tell us anything except that selected, highly educated occupation groups have grown rapidly since 1940.

temporal stability of ability within occupations, it shows nothing more than the growth of selected, highly educated occupations.

Since the publication of *The Bell Curve*, several researchers have looked for evidence of trend in the cognitive ability of occupational groups, but there was little evidence before the 1970s. From the 1970s to the 1990s, data from the General Social Survey (GSS) suggest that, if anything, cognitive differences among occupation groups have declined, rather than increased (Hauser, 1995; Hauser and Carter, 1995; Weakliem, et al., 1995; Hauser, et al., 1996).

Ability and Social Standing in the General Social Survey

In this chapter, we have tried to exhaust the usefulness of the General Social Survey for inferences about trends in the antecedents, correlates, and effects of verbal ability.[11] Specifically, we address three questions: (1) Have the effects of social background on verbal ability increased across time? (2) Has the relationship between schooling and verbal ability changed across time? (3) Have the effects of verbal ability on occupational and economic success changed across time?[12] Throughout our analyses, we have attempted to address these questions separately for Black and White women and men.[13] The design and scope of the GSS provide analytic opportunities and limitations, and for that reason, we turn next to a description of the GSS data.

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[11] As described below, the design of the GSS necessarily limits our analysis to verbal ability, and we offer no evidence about other abilities.

[12] Note that the last two of these questions were addressed in the previously cited passages from *The Bell Curve*. As described below, we believe that the argument of *The Bell Curve* also implies a growing relationship between social background and cognitive ability.

[13] Thus, we have followed Herrnstein and Murray in reporting separate analyses for Blacks and Whites. Elsewhere, we have used the GSS data to investigate trends in Black-White test score differentials for cohorts born from 1910 to 1970 (Huang and Hauser, 1996).

WORDSUM and the General Social Survey

The General Social Survey (GSS) of the National Opinion Research Center has regularly administered a 10-item verbal ability test (WORDSUM) to cross-section samples of adults in U.S. households since the early 1970s (Davis and Smith, 1994). Because there are repeated, usually annual, administrations of WORDSUM to cross-section samples of about 1000, it is possible to identify age and cohort effects on test performance by assuming that there are no period effects (Huang and Hauser, 1996). However, since the test scores and socioeconomic outcomes have been observed only in cross-section, there are serious problems of specification in analyses of the relationships between WORDSUM and educational attainment, occupational status, or earnings. While the GSS data provide clues about changes in verbal ability and its relationship with social background and schooling over much of this century, they provide a narrower temporal window of observation on relationships between ability and occupational status and earnings, the two decades from 1974 to 1994.

The ten GSS vocabulary items were chosen from "Form A," one of two parallel, twenty-item vocabulary tests selected by Thorndike. Each form contained two vocabulary test items from each of the levels of the vocabulary section of the Institute for Educational Research Intelligence Scale: Completion, Arithmetic Problems, Vocabulary, and Directions (Thorndike, 1942). Form A was developed by Thorndike in response to the need for a very brief test of intelligence in a social survey (Thorndike and Gallup, 1944), and it was also used in an attempt to study the feasibility of an aptitude census (Thorndike and Hagen, 1952). Form A was later used

by Miner (1957) in his monograph, *Intelligence in the United States,* which attempted to assess the intellectual ability of the U.S. population using a national household sample.[14]

For each of ten WORDSUM items, GSS respondents are asked to choose the one word out of five possible matches that comes closest in meaning to the word in capital letters. Figure 5 gives a set of sample items that are similar to those in WORDSUM.[15] The GSS obtains personal interviews, and each item is handed to the respondent on a preprinted card. Before 1988, WORDSUM was administered to the full GSS sample, but only every other year. Since 1988 it has been administered to two-thirds of the sample, using an alternate forms design. From 1974 to 1994, WORDSUM was completed by 11,160 Whites and 1,418 Blacks who were ages 20 to 65 at the survey date and who also provided valid data on years of schooling, number of adults in the household, number of siblings, and structure of the family of orientation.

Miner (1957:28-30) argued that vocabulary tests are highly correlated with tests of general intelligence. He assembled some thirty-six studies in which a vocabulary measure had been correlated with a measure of general intelligence, and he found a median correlation of 0.83. Miner also noted that, whereas Wechsler had originally excluded a vocabulary test from the Wechsler-Bellevue scales because "he felt it might be unfair to illiterates and those with a foreign language background," he later decided that it was an excellent measure of general intelligence. Finally, Miner noted that the median correlation of verbal tests with full-scale IQ tests is larger

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

[15] We have selected these items at random from the list in Miner (1957:53). The National Opinion Research Center prefers that the WORDSUM test remains unpublished.

than the median correlation Wechsler reported between the Wechsler-Bellevue Full Scale and fifteen other measures of general intelligence (Wechsler, 1944).

More recently, Wolfle (1980:110) reported that the correlation between the GSS vocabulary test and the Army General Classification Test (AGCT) was 0.71. His account is worth quoting in full:

> The correlation between adult intelligence and the vocabulary score was calculated from information kindly provided by Robert L. Thorndike (1967). He reported on two normative studies by Irving Lorge conducted among Army enlisted men who were administered the AGCT and the Vocabulary-GT. Correlations of 0.70 and 0.77 were reported for Forms 1 and 2, respectively. These two values were averaged (0.74), and to this value the Spearman-Brown correction of test length was applied (because NORC used only half the items) using Thorndike's revised estimate of the test's reliability (Miner, 1957:50). These computations resulted in a revised correlation of 0.71 between adult intelligence and the NORC vocabulary score.

Despite these indications of validity, we would urge caution in the use of WORDSUM. First, the test is very short, so its reliability is low. The internal consistency reliabilities are 0.712 among Whites and 0.628 among Blacks. In the 1994 GSS, in addition to WORDSUM, half the sample was administered 8 of the 14 similarity (abstract reasoning) items from the Wechsler Adult Intelligence Scale-Revised (Wechsler, 1981).[16] The correlations between WORDSUM and the

[16] Hauser and Mare (1993) added the similarity items in order to calibrate them against WORDSUM for use in supplementary telephone interviews with brothers and sisters of the GSS respondents.

WAIS-R similarity scores were 0.394 for Whites and 0.409 for Blacks, without correction for unreliability. After correction for internal consistency reliability, the correlations were 0.589 among Whites and 0.608 among Blacks. Second, despite the common use of vocabulary tests in IQ instruments and the high correlations between tests of vocabulary and of general intelligence, there is evidence of divergent trends between IQ and verbal ability in the past several decades. For example, even if verbal ability is a valid indicator of general intelligence, neither the overall trend in WORDSUM nor the specific trends in WORDSUM among Blacks and Whites need follow those in more general tests of ability (Huang and Hauser, 1996). Third, contrary to the stylized facts of psychometrics (Jensen, 1986:311), there is substantial evidence that various cognitive tests are differentially predictive of social and economic success (Goldberger, 1995; Heckman, 1995; Corcoran, 1996). Thus, our failure to find trends in the effects or correlates of WORDSUM cannot be definitive with respect to trends in the effects or correlates of other types or measures of ability.

Figure 6 shows the vocabulary test score distributions of Blacks and Whites in the GSS from 1974 to 1994. The mean numbers of correct items are $\bar{x}_w = 6.23$ ($s_w = 2.09$) for Whites and $\bar{x}_b = 4.78$ ($s_b = 1.93$) for Blacks. From the display of relative frequencies, it is obvious that there is a ceiling effect on the scores for Whites in the general population. Similarly, there are ceiling or floor effects on the number of correct answers in other subpopulations, e.g., persons with many or few years of schooling. Where WORDSUM appears as a dependent variable, our analyses are based on a two-sided tobit specification, which compensates for censoring at both ends of the distribution on the assumption that the true distribution of test scores is Gaussian (Maddala, 1983).

Methodological issues

Before attempting a trend analysis of the GSS data, we carried out several methodological analyses. Only 460 GSS respondents (3.7 percent) refused to answer any of the WORDSUM items, and we ignored them throughout the analysis. The refusals had completed slightly fewer years of schooling ($\bar{x}$ = 10.5 vs. 12.9 years), but were also more variable in schooling (s = 3.6 vs. 2.8 years). We considered whether item nonresponses -- other than complete refusal -- should be treated as incorrect answers, or whether total scores should be adjusted for the number of items answered. We compared the internal consistency reliabilities among complete responses and among incomplete responses, treating nonresponses in the latter group as errors. These were virtually the same, 0.62 and 0.64. Further, the correlations between educational attainment and WORDSUM among the complete and incomplete responses were identical. Thus, we assumed that item-specific nonresponses were erroneous responses. We experimented with a range of corrections for guessing and examined the correlations of WORDSUM with educational attainment, occupational status (Stevens and Featherman, 1981; Stevens and Cho, 1985), and -- for 1994 GSS respondents only -- the WAIS-R similarities for each correction scheme. We found that the correlations with external criteria were lowered by corrections for guessing, so we did not introduce such a correction.

Finally, we carried out logistic regression analyses of each item, by race and by birth cohort, in order to look for differential item functioning (DIF). We carried out each analysis with and without adjustment of total test scores for unreliability, and in each case we controlled age at test administration. In the absence of differential item functioning, the odds of a correct response to an item would be the same for two groups at every ability level, as indicated by the total test

score. Uniform differential item functioning occurs when the odds of answering an item are equally greater or equally lower at every ability level. Nonuniform differential item functioning occurs when the difference between groups in the odds of a correct answer are not the same across ability levels (Swaminathan and Rogers, 1990).

In looking for differential item functioning, we modified the usual model for differential item functioning by including dummy variables for age at testing as covariates. For Whites, we based the intercohort comparisons on 10-year birth cohorts from 1910-19 to 1960-69. Among Blacks, we collapsed the 1910-29 birth cohort in order to increase sample size. The usual logistic regression model for predicting the probability of a correct response to an item is:

$$P(u = 1) = e^z / (1 + e^z), \quad (1)$$

where

$$z = \tau_0 + \tau_1 \theta + \tau_{2j} w_j + \tau_{3j} (\theta \times w_j). \quad (2)$$

The variable w_j indicates membership in the *j*th group, and θ is the observed ability of an individual. In this case, θ is the respondent's total WORDSUM score, w_j is the respondent's birth cohort, and $\theta \times w_j$ is the product of the two independent variables, w_j and θ. An item shows uniform DIF if $\tau_{2j} \neq 0$ for some *j* and $\tau_{3j} = 0$ for all *j*, and it shows nonuniform DIF if $\tau_{3j} \neq 0$ for any *j*, whether or not $\tau_{2j} = 0$. Since WORDSUM varies with age at testing, we also included dummy variables for respondent's age in the regression. Thus, the model becomes:

$$z = \tau_0 + \tau_1 \theta + \tau_{2j} w_j + \tau_{3j} (\theta \times w_j) + \tau_{4i} x_i, \quad (3)$$

where x_i is a dummy variable for membership in the *i*th 10-year age group. We estimated this model separately for Whites and Blacks, and we looked for evidence that items had become easier or harder for successive cohorts. We used conventional statistical tests with p = 0.01,

supplemented by BIC, the Bayesian information criterion (Raftery, 1995), and we also looked for systematic variation across cohorts in the parameters for differential item functioning (DIF). By all standards, we found little evidence of nonuniform DIF, and in only one case, a relatively difficult item among Whites, did the Bayesian criterion indicate there was reliable evidence of uniform differential item functioning. However, there were four items among Whites and two items among Blacks in which there was nominally significant uniform DIF. Among Blacks, both items had become successively more difficult, and among Whites, two items had become more difficult, and two had become less difficult.

We also estimated a model similar to equation 3, in which we pooled the data for Blacks and Whites and specified effects of racial-ethnic group, corresponding to those of cohorts in equation 3. In comparing Blacks and Whites, when total WORDSUM scores are controlled, a few items are slightly easier for Whites than for Blacks with the same WORDSUM score. After adjustment for internal consistency reliability, those effects are reversed: Five items are significantly easier for Blacks than for Whites with the same estimated true scores. One other item is then significantly easier for low-scoring Blacks and significantly harder for high-scoring Blacks. There does not appear to be any relationship between item difficulty and differential item functioning. Given these equivocal findings, it would probably be a good idea to test the sensitivity of our regression analyses to the elimination of selected items. Because of the small number of items in WORDSUM, we have not done so here. However, these findings provide yet more reason for caution in the interpretation of WORDSUM trends.

Finally, we looked for external evidence that the difficulty of the WORDSUM items may have changed across time. Between 1921 and 1967, four studies have reported frequency counts

and ranks for English words (Thorndike, 1921; Thorndike, 1931; Thorndike and Lorge, 1944; Kučera and Francis, 1967). Unfortunately, the several sets of rankings are of uncertain comparability. Thorndike (1921) is a list of the 10,000 most frequent words "in a count of about 625,000 words from literature for children; about 3,000,000 words from the Bible and English classics; about 300,000 words from elementary-school text books; about 50,000 words from books about cooking, sewing, farming, the trades, and the like; about 90,000 words from the daily newspapers; and about 500,000 words from correspondence" (p. iii). Thorndike (1931) reports the addition of "extensive additional counts from over 200 other sources including about 5,000,000 words" (p. iii), and he extended the list to 20,000 words. Thorndike and Lorge (1944) added information from counts of an additional 4.5 million words. Kučera and Francis (1967) did not build on the work of Thorndike and Lorge, but analyzed "a collection of statistical information obtained from analysis of The Standard Corpus of Present-Day Edited American English, a computer processible corpus of language texts assembled at Brown University during 1963-64" (p. xvii). The corpus of more than 1,000,000 words was selected from the press (reportage, editorial, and reviews), religion, skills and hobbies, popular lore, belles lettres and biography, learned and scientific writings, humor, and several categories of fiction writings. It would appear that the Thorndike-Lorge series was cumulative, beginning with a focus on children's reading material and later extending to more general collections of text. For that reason, that series is not entirely appropriate for an assessment of trend. On the other hand, the Kučera-Nelson corpus is almost entirely made up of adult-oriented text, and it is thus not strictly comparable to the Thorndike-Lorge series.

For each WORDSUM item, we looked up or estimated the approximate rank of each stimulus word, of its synonym, and -- in most cases -- of a plausible distractor. We had no basis for interpreting changes in the relative frequency of key words within a given item. Kučera and Francis (1967) identified the 50,000 most common words, and in many cases, words that had appeared in the earlier lists were much less common in the 1967 list. We do not know whether differences between rankings in that list and the earlier lists are due to true temporal change or to other differences in the selection of text. In any event, we find that the ranks of WORDSUM items have been either stable or decreasing. That is, if frequency of usage in written text is an indicator of difficulty, WORDSUM has become somewhat more difficult across time, independent of any other change in verbal ability in the general population. That tendency occurs to some degree across the lists of 1921, 1931, and 1944, and it appears strongly when we include the 1967 list in the comparison. However, we do not believe that changes in item difficulty, if they are real, could account for decreasing differences between the test scores of Blacks and Whites.

We would add that the GSS data yield plausible estimates of correlations of verbal ability with educational attainment, occupational status, and earnings, and these give us confidence that the quality of the data justify our more demanding trend analyses (Huang, 1996).

Omitted Variables and Model Specification

Figure 7 shows an idealized, block-recursive path model of the process of stratification. In this scheme, childhood ability (x_1) and socioeconomic status (x_2) are presumably related, with correlation ρ_{12}. Childhood ability may also affect successive adult outcomes: schooling (y_1), adult ability (y_2), occupational status (y_3), and earnings (y_4). The GSS data include measures of childhood socioeconomic status, verbal ability in adulthood, schooling, occupational status, and

earnings. However, as indicated by the dotted outlines and arrows, they do not include a measure of childhood ability.[17] Without loss of generality, we ignore intercepts and express all variables in standard deviation units. With these conventions, the full model is

$$
\begin{aligned}
y_1 &= \gamma_{11}\, x_1 + \gamma_{12}\, x_2 + \epsilon_1 \\
y_2 &= \gamma_{21}\, x_1 + \gamma_{22}\, x_2 + \beta_{21}\, y_1 + \epsilon_2 \\
y_3 &= \gamma_{31}\, x_1 + \gamma_{32}\, x_2 + \beta_{31}\, y_1 + \beta_{32}\, y_2 + \epsilon_3 \qquad (4) \\
\text{and} \quad y_4 &= \gamma_{41}\, x_1 + \gamma_{42}\, x_2 + \beta_{41}\, y_1 + \beta_{42}\, y_2 + \beta_{43}\, y_3 + \epsilon_4.
\end{aligned}
$$

Consider the relationship between socioeconomic background (SES) and ability in adulthood. We should like to estimate either γ_{22}, or, perhaps, the reduced form effect, $\gamma_{22} + \beta_{21}\gamma_{12}$. However, in the former case, given the data at hand, we can only estimate $\gamma_{22} + \gamma_{21}\rho_{12}$, and in the case of the reduced form, we can only estimate $\gamma_{22} + \beta_{21}\gamma_{12} + \gamma_{21}\rho_{12} + \beta_{21}\gamma_{11}\rho_{12}$. That is, when we estimate the regression of adult ability on childhood SES and schooling, the coefficient of SES includes a component due to the regression of adult ability on childhood ability and the correlation of the latter with SES. If we simply regress adult ability on childhood SES, the estimate includes components due to the regressions of both schooling and adult ability on childhood ability, along with the correlation of the latter with SES. Thus, in the GSS data, we can only make inferences about change in the relationship between childhood SES and adult ability that are inclusive of effects by way of childhood ability.

Given the theoretical context of our analysis, this may not be an entirely bad situation. Herrnstein and Murray (1994:108-15) argue that ability has become more important in

[17] Moreover, the temporal lag between childhood or school completion and adult IQ, occupation, and earnings varies with the age of the respondent at the survey date. We addressed this problem by carrying out age-specific analyses of those outcomes.

socioeconomic achievement and that assortative mating by education and, consequently, by IQ, has increased. Given the presumed high heritability of IQ, childhood ability must become more highly correlated with parental social standing, so ρ_{12} increases.[18] Moreover, they regard the effect of SES on schooling (γ_{12}) as declining, the effect of childhood ability on schooling (γ_{11}) as increasing, and the effect of childhood SES on adult ability (γ_{22}) as negligible. Let's suppose that β_{21} and γ_{21} are constant over time. If we merely regress adult ability (y_2) on childhood SES (x_2), the coefficient of SES is a mixture of effects that are predicted to increase ($\gamma_{21}\rho_{12}$, $\beta_{21}\gamma_{11}\rho_{12}$) and an effect that is predicted to decrease ($\beta_{21}\gamma_{12}$). However, if we regress adult ability on schooling (y_1) as well as childhood SES (x_2), then the coefficient of SES includes only one component ($\gamma_{21}\rho_{12}$) that would be expected to increase through time.

We can make a similar argument with respect to the relationship between schooling and adult ability. Suppose we make the same assumptions as before about the constancy and change of coefficients across birth cohorts. In that case, if we merely regress adult ability (y_2) on schooling (y_1), the schooling coefficient is $\beta_{21} + \gamma_{22}(\gamma_{12} + \gamma_{11}\rho_{12}) + \gamma_{21}(\gamma_{11} + \gamma_{12}\rho_{12})$. Again, there is no clear prediction about the growth or decline of this estimate. However, if we estimate the regression of adult ability (y_2) on childhood SES (x_2) and schooling (y_1) , then the schooling coefficient is upwardly biased by dint of the common effect of childhood ability on schooling and adult ability, $\gamma_{21}\gamma_{11}$, which would presumably increase across time. Thus, we shall look at intercohort trends in mean levels of adult verbal ability by levels of completed schooling. In addition, we have also taken a completely descriptive view of the relationship between schooling

[18] Flynn (1996) recapitulates Herrnstein and Murray's argument elegantly, and his investigation of periodic norming samples for the Stanford-Binet and Wechsler IQ tests in the U.S. shows no tendency for socioeconomic differentials in childhood IQ to increase over time.

and ability in adulthood by estimating the conditional means of verbal ability within levels of completed schooling; these correspond to the analyses of Taubman and Wales (1972) that were reproduced in part by Herrnstein and Murray.

Finally, consider the effects of adult ability (y_2) on occupational status (y_3) and earnings (y_4). In this case, we are willing to assume that the lagged effects of childhood ability, γ_{31} and γ_{41} are negligible. That is, the effects of childhood ability are realized completely through schooling and ability in adulthood. In this case, there is no omitted variable bias in our estimates of the effects of adult ability, once we have controlled schooling and childhood socioeconomic status. In the context of the model in Figure 7, we have greater confidence in inferring trend in the effects of ability on adult occupational status and earnings than in inferring trend in the effects of childhood socioeconomic status on ability or about trend in components of the relationship between schooling and ability in adulthood.

Trends in the Effects of Social Background on Verbal Ability

There are two broad classes of explanation for the relationships between social and economic background and verbal ability. The first is that high social and economic standing of the family of orientation leads to more stimulating, demanding, and supportive resources, environments, and socialization practices that produce superior child outcomes. The second, suggested both by Herrnstein and Murray and by contemporary behavior geneticists, is that high social and economic standing of the family is an indicator of genetic advantage that can be passed on to children by genetic as well as by social or psychological processes.[19] Herrnstein and Murray

[19] Of course, neither social nor genetic modes of intergenerational status transmission need be limited to the production of cognitive ability.

(1994:93-115) offer several hypotheses that would lead to greater relationships between measured ability and socioeconomic standing among parents: cognitive sorting in the educational system, in the economy (by occupation, workplace, and income), and increased assortative mating by ability. For example, drawing on Mare's studies of trend in assortative marriage by educational attainment, Herrnstein and Murray conclude: "Intermarriage among people in the top few percentiles of intelligence may be increasing far more rapidly than suspected." (p. 113). Moreover, they argue that the heritability of intelligence is high and, probably increasing, insofar as environments have become generally more favorable to cognitive development (pp. 108-110): "The fact that family members resemble each other in intelligence in adulthood as much as they do is very largely explained by the genes they share rather than the family environment they shared as children. ... High cognitive ability as of the 1990s means, more than even before, that the chances of success in life are good and getting better all the time, and these are *decreasingly* affected by the social environment, which by extension indicates that they must be *increasingly* affected by genes." Even if there were no genetic component to cognitive ability, increases in assortative mating alone would lead to a growth in the contribution of social background to inequalities in ability. Herrnstein and Murray's argument has much stronger implications. Not only is there an increase of assortative mating, but to the degree that cognitive sorting in the parental generation has increased, parental status is increasingly valid as an indicator of the genetic propensity for high (or low) cognitive ability. Thus, we should expect to find an increasing association between socioeconomic background and the cognitive ability of children.[20]

[20] Again, see Flynn (1996) for a similar interpretation of Herrnstein and Murray's argument.

We examine inter-cohort changes in the effects of social background on vocabulary test scores based on a two-sided tobit specification (Maddala, 1983), which takes into account the censored distribution of WORDSUM. Because of the small number of Black cases and the large number of coefficients to be estimate, this analysis is restricted to Whites.[21] Father's education and mother's education are two sets of dummy variables with 12 years of education as the reference group. Dummy variables have been created for the following categories: 0-7 years, 8 years, 9-11 years, 12 years, 13-15 years, 16-20 years, and years of education missing. Father's occupation is based on the 1970 Census major occupational categories in the GSS from 1974 to 1989. Fathers' occupations are based on 1980 Census occupation codes in the GSS from 1990 to 1994, and these have been recoded into major occupation categories in the 1970 Census classification using a scheme developed by Kubitschek (1986). Father's occupation is a set of dummy variables with "craftsmen and kindred workers" as the reference group. Dummy variables for occupation include: (1) professional, technical, and kindred workers; managers and administrators, except farm; (2) sales workers; clerical and kindred workers; (3) craftsmen and kindred workers; (4) operatives, except transport; transport equipment operatives; (5) laborers, except farm; service workers; (6) farmers, farm managers, farm laborers and farm foremen; (7) father's occupation missing.[22] In addition to these parental SES variables, other social

[21] In the appendix, Table A1 reports the number of GSS observations in each category of social background for each birth cohort of Whites. Tables A3 to A6 report the means and standard deviations of social background, verbal ability, and socioeconomic outcomes among White and Black women and men.

[22] We have also carried out similar analyses using more detailed occupational and educational categories and using continuous measures of occupational status and of years of schooling. The findings are essentially the same as those reported herein (Huang, 1996).

background variables used in this analysis are the number of siblings, non-intact family, Southern origin, and farm background.

Because the GSS covers repeated cross-sections of different birth cohorts during adulthood, older and younger cohorts differ in their composition by age at testing. For example, individuals born in 1954 were 20 years old in 1974, and they might have appeared in the GSS at ages between 20 and 40; however, individuals born in 1934 were 40 years old in 1974, and they might have appeared in the GSS at ages between 40 and 60.[23] Since we wanted to estimate the effects of social background on test scores separately for each cohort, that analysis uses age adjusted test scores as the dependent variable. We used the following model to obtain age-adjustments for test scores net of birth cohort effects:

$$y_2 = \beta_0 + \beta_1 X_{20} + \beta_2 X_{30} + \beta_3 X_{40} + \beta_4 X_{50} + \beta_5 X_{60} + \beta_6 Z_{25} + \beta_7 Z_{35} + \beta_8 Z_{45} + \varepsilon_2 \qquad (5)$$

where, $X_{20} = 1$ in the 1920-1929 birth cohort;[24] $X_{30} = 1$ in the 1930-1939 birth cohort; $X_{40} = 1$ in the 1940-1949 birth cohort; $X_{50} = 1$ in the 1950-1959 birth cohort; $X_{60} = 1$ in the 1960-1969 birth cohort; $Z_{25} = 1$ for respondents aged 25-34; $Z_{35} = 1$ for respondents aged 35-44; and $Z_{45} = 1$ for respondents aged 45-54. Thus, the 1910-1919 birth cohort is the reference group for the birth cohort dummy variables, and the 55-65 age group is the reference group for the age group dummy variables. The estimates from this model are:

$$y_2 = 6.37 - 0.12 X_{20} - 0.14 X_{30} + 0.13 X_{40} - 0.001 X_{50} - 0.9 X_{60} - 0.14 Z_{25} + 0.20 Z_{35} + 0.10 Z_{45} \qquad (6)$$

[23] Age at testing ranges from 55 to 64 in the 1910-1919 birth cohort, 45 to 64 in the 1920-1929 birth cohort, 35 to 64 in the 1930-1939 birth cohort, 25 to 54 in the 1940-1949 cohort, 25 to 44 in the 1950-1959 birth cohort, and 25 to 34 in the 1960-1969 birth cohort.

[24] The value of each dummy variable is zero for all cases that do not meet the definition specified in the text. For example, $X_{20} = 1$ in the 1920-1929 birth cohort, and $X_{20} = 0$ for all cases that are not in the 1920-1929 birth cohort.

Thus, for respondents aged 55 to 64, the age-adjusted scores are their raw test scores; for respondents aged 45 to 54, the age-adjusted scores are their raw test scores minus 0.10; and so on.

Because the GSS vocabulary test was, in the vast majority of cases, administered after respondents had completed their schooling, it is best to examine inter-cohort changes in the effects of social background on vocabulary test scores after controlling respondents' years of education.[25] However, as a matter of possible interest, we have also estimated trends in the effects of each social background variable without any statistical controls (other than age at testing).

Figure 8 shows intercohort trends in verbal ability differentials by father's education among white GSS respondents. There are clear differentials in verbal ability between the adult children of highly educated and poorly educated fathers, but we see no indication that those differentials have widened between people born at about the time of World War I and those born during the Vietnam era.[26] Figure 9 shows intercohort trends in verbal ability differentials by mother's education; again, we see no evidence of growing differentials in verbal ability. The only possible sign of such growth is a slight decrease in the scores of persons whose mothers had 8 or 9 to 11 years of schooling, relative to high school graduates. However, there is no sign at all that

[25] Huang (1996:130-58) has estimated regressions of WORDSUM on the social background variables, individually and collectively, with and without controlling educational attainment, and the findings with respect to trend are similar to those reported here.

[26] The estimates used in Figure 8 to Figure 11 and their standard errors are reported in the appendix, Table A7. Here and in the following analyses, we have no interest in global changes in verbal ability, and we have expressed all effects relative to ability levels in a convenient and relatively large reference group, e.g., high school graduates or skilled workers.

the adult children of highly educated mothers are diverging in verbal ability relative to those of high school graduates.[27] Figure 10 shows trends in verbal ability among adults whose fathers were in different major occupation groups, relative to the ability of children whose fathers were skilled workers. Again, there are clear differentials in verbal ability. Through most of the 20th century, the adult children of white collar workers had higher verbal ability than those of skilled workers, who in turn had higher verbal ability than other blue collar workers. However, there appears to have been a gradual convergence between the ability levels of all categories of blue collar workers, leading to a reduction in overall differentials by father's occupation.

Figure 11 shows trend lines in the effects of four more social background variables: broken family, Southern origin, farm origin, and number of siblings. The first three of these are dummy variables and, thus, their effects are strictly comparable. The fourth, number of siblings, is a continuous variable, and the importance of its effects are somewhat understated on the scale of Figure 11. There are clear trends in the effects of Southern origin and farm origin: Early in this century, it was a great disadvantage to have been raised in the South or on a farm, and both of those handicaps have largely disappeared among Whites.[28] Likewise, there has been a substantial reduction in the negative effect of coming from a large family. In the birth cohort of 1910 to 1919, each additional brother or sister was associated with a decline of 0.23 WORDSUM items,

[27] We have suppressed one outlying observation, an exceptionally high value for verbal ability among the 26 children of mothers with 0 to 7 years of schooling in the cohort of 1960 to 1969 (See appendix, Table A7).

[28] Similarly, across these same cohorts, Huang and Hauser (1996) have found a major reduction in the Black-White differential in verbal ability.

and the corresponding effect was only 0.12 items in the cohort of 1960 to 1969. Only in the case of non-intact family do the effects appear to be stable.[29]

In short, across a large number of social background characteristics, there is no evidence of a trend towards greater inequality in verbal ability among American adults born between 1910 and 1970. However, in light of our analysis of Figure 7, we have also looked in detail at a parallel set of differentials in verbal ability by social background, this time based on a multiple regression in which educational attainment has been controlled, along with all of the social background variables. These differentials are displayed in Figure 12 to Figure 15.[30] These graphs provide almost no suggestion of increasing differentials in verbal ability by social background. One minor exception is the low value of ability among the adult children of fathers with 0 to 7 years of schooling in the cohort of 1950 to 1959. Otherwise, the predominant impression is that no change has taken place, other than the absolutely declining effects of Southern birth and farm background. To conclude, we find little evidence in the GSS data that the effects of parental socioeconomic status on verbal ability have increased over time among Whites in the United States.

Trends in the Effects of Educational Attainment on Verbal Ability

We argued earlier that, if ability levels were increasingly differentiated by levels of completed schooling, we should observe increasing mean differences in ability among levels of

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[29] However, there is an anomalous, non-significant positive effect of being raised in a non-intact family in the oldest cohort. This pertains to a small number of persons raised in non-intact families.

[30] The estimates used in Figure 12 to Figure 15 and their standard errors are reported in the appendix, Table A8.

schooling, after social background has been controlled.[31] Thus, such effects might appear in educational coefficients of the tobit model used to estimate the trends in Figures 12 to 15. Figure 10 shows trends in estimated effects of single years of completed schooling, expressed as deviations from the verbal ability of Whites who completed exactly 12 years of schooling.[32] While there are clear and strong differences in ability among levels of completed schooling, we see very little evidence of trend at this level of disaggregation of the schooling variable. If we disregard the observations for the youngest cohort, which may not have completed its schooling, there is perhaps some indication that ability levels have increased at 18 to 20 years of schooling, but there is no corresponding increase at the more prevalent levels of 14 to 16 years of schooling. Moreover, there is no indication that the verbal ability of Whites with relatively low levels of schooling has declined relative to that of high school graduates, excepting a slight downward trend in the verbal ability of persons with exactly 11 years of completed schooling.

Recall from Figure 3 that, in their analysis of state and local data, Taubman and Wales (1972:5) found increasing differences between the ability levels of high school graduates who did and did not attend college between the 1920s and the 1960s. Figure 17 shows a similarly aggregated series of differentials in verbal ability among levels of schooling, estimated from the GSS. In this case, following Taubman and Wales, we have not controlled social background, and we have estimated the tobit regression across the GSS sample of Whites, controlling age at testing, but not social background. Rather than Taubman and Wales' comparison between high

[31] Also, recall Herrnstein and Murray's argument that mean ability differences between high school and college graduates have increased (1994:33-50).

[32] The estimates used in Figure 16 and their standard errors are reported in the appendix, Table A8.

school graduates and college attenders, we show differences between high school graduation and three other levels of completed schooling: less than high school, some college, and completion of a bachelor's degree or more.[33] Again, there are large differences in verbal ability by level of completed schooling. There is no consistent trend in the difference between ability levels of high school graduates and those with less than a high school diploma. There is a steady, but very modest decline in the difference between ability levels of Whites with some college and those who only completed high school. The difference was 0.92 WORDSUM items in the cohort of 1910-19 and 0.67 items in the cohort of 1960-69. There were large changes in the contrast between college and high school graduates. As in Taubman and Wales' series, this difference increased in the cohorts born from 1910 to 1940 -- that is, for high school graduates between 1930 and 1960 in the Taubman-Wales series -- but the difference has decreased steadily thereafter, so it was about the same for cohorts born in the 1960s as among those born in the 1920s. Thus, for people born since the Great Depression -- during whose young adulthood higher education expanded dramatically -- we find steadily declining differences between the verbal ability levels of college and high school graduates. This may be good or bad news, depending on how one looks at it. On the one hand, it fails to support claims about the formation of a cognitive elite, but on the other hand it provides little comfort to those who might hope for increasing cognitive effects of college education. In our opinion, assuming the GSS series are valid, the findings suggest that the

[33] Unlike Table A8 and Figure 16, this analysis is based on reports of educational credentials, as well as years of completed schooling. Thus, 16 or more years of schooling do not place a respondent in the highest category unless he or she reported earning at least a bachelor's degree.

changing differential between college and high school graduates has been dominated by the combination of larger enrollments and the decreasing selectivity of post-secondary education.

Trends in the Effects of Verbal Ability on Occupational Status

There is a long tradition of sociological analysis of occupational stratification, in which the status of jobs is characterized by a socioeconomic index, a weighted average of occupational earnings and occupational education.[34] In this analysis, we have used Stevens and Featherman's MSEI2, an index in which the weights of men's occupational characteristics in the 1970 Census have been determined by a regression of occupational prestige ratings in the 1960s (Stevens and Featherman, 1981). The index was updated for use with occupations in the 1980 Census classification by Stevens and Cho (1985).

Table 1 shows selected regressions of occupational status on verbal ability among Black and White GSS respondents. In these analyses, we have grouped the GSS observations into three periods: 1974 to 1982, 1984 to 1989, and 1990 to 1994. Note that, unlike our analyses of verbal ability in relation to social background and schooling, this trend analysis pertains only to the two decades between 1974 and 1994, and we are unable to use the GSS data to address the longer range hypothesis advanced by Herrnstein and Murray (1994:54-61). Among Whites, we have sufficient sample cases to analyze the data separately for three age groups of men and women: 25 to 34, 35 to 44, and 55 to 64. Among Blacks, because of the smaller sample size, we have been unable to disaggregate the data by age. The estimated effects of verbal ability are based on

[34] These indices have recently been reviewed by Hauser and Warren (1997).

models in which social background or schooling has been controlled, and WORDSUM has been corrected for internal consistency reliability.[35]

Taking the estimates in the upper panel of Table 1 at face value, there is a mixed picture. When social background and educational attainment are both controlled, the effect of verbal ability appears to have declined among Black men and increased among Black women. It appears to have increased among the youngest White men and decreased in the next older age group. Finally, the net effect of ability appears to have increased dramatically among older White women in the most recent period.[36] It is not clear how such varied changes would fit global theories of the increasing effects of ability. In any event, we have contrasted the effects of ability across periods within each age and racial group, comparing each period with each other period and running global chi-square tests. None of these contrasts is statistically significant. That is, we find no reliable evidence that the net effect of verbal ability on occupational status rose between the 1970s and the 1990s. In fact, the net effects of verbal ability in the upper panel of Table 1 are generally small and often statistically insignificant, thus suggesting that verbal ability affects occupational standing mainly by way of years of completed schooling.

The estimates in the upper panel of Table 1 are based strictly on the model of Figure 7. We also relaxed that specification and asked what the effects of verbal ability would look like if

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[35] Huang (1996:158-67, 171-88) reports exhaustive trend analyses of the correlations and regressions of occupational status with verbal ability in the GSS. The correlations were estimated with and without correction for unreliability and restriction of range, and the regressions were estimated with and without the inclusion of schooling and with and without reliability corrections. He found no evidence of trend in the effect of ability on occupational status.

[36] Interestingly, Hauser et al. (1997) have found a striking increase in the effect of measured cognitive ability on the occupational status of female Wisconsin high school graduates who reached their 50s in the early 1990s.

we did not presume that adult ability was the product of schooling; that is, we regressed occupational status only on WORDSUM and social background. In these regressions, the estimated ability coefficients are much larger, but again, there is no evidence that effects of ability have increased throughout the population. Indeed, taken at face value, it would appear that the effects of verbal ability on occupational status have decreased among Black men, among White men under the age of 45, and among middle-aged White women. On the other hand, the coefficient does appear to increase with time among older White women, and this is the only statistically significant contrast (Huang, 1996:177).

Trends in the Effects of Verbal Ability on Earnings

Herrnstein and Murray believe that economic stratification by IQ is increasing, along with that by educational attainment and occupational standing:

> "The overriding dynamic that will shape the effects of cognitive stratification is the increasing value of intelligence in the marketplace. The smart ones are not only being recruited to college more efficiently, they are not only (on average) more productive in the workplace, their dollar value to employers is increasing and there is every reason to believe that this trend will continue. As it does so, the economic gap separating the upper cognitive classes from the rest of society will increase." (p. 93).

Here again, rhetoric outpaces fact. The first piece of evidence that cognitive differences lead to increasing economic differences is a comparison of wage trends among engineers with those of wage trends among manufacturing employees from the 1930s to the 1980s (pp. 93-4), a contrast that could plausibly have several other explanations, among which are increases in the demand for

engineers relative to workers, increases in the schooling of engineers relative to workers, decreases in the domestic demand for manufacturing workers, and decreases in the strength of unions. Second, economic returns to schooling have increased, but they do not explain all of the growth of wage inequality. Herrnstein and Murray attribute part of the residual increase in wage inequality to the growing importance of intelligence (pp. 96-98). Finally, Herrnstein and Murray cite one study of young White men in the NLSY, and they conclude "the smart men earned most of the extra wage benefit of education in the past decade" (p. 98). As noted above, there is no consensus among economic analysts that the NLSY data show increasing effects of cognitive ability -- or even that the design of the NLSY permits such an inference.

Our analyses of earnings are based on items in which GSS respondents checked off categories on a card, and the earnings categories have varied across surveys.[37] We have analyzed a constructed variable (REALRINC) which reconciles these diverse reports in terms of 1986 dollars, and our earnings regressions use the natural log of this variable.[38] Before the log transform, the earnings distribution was highly skewed to the right. After the log transform, it was skewed to the left. For that reason, we carried out three related analyses of the effects of ability on earnings. First, we estimated a logit equation to predict whether or not a GSS respondent had any earnings. Second, we estimated a logit equation that predicted very low levels of earnings ($3,000 or less in 1986 dollars) vs. higher levels of earnings. Third, we estimated a tobit regression of the log of earnings, in which observed earnings were left-censored at $3,000. Each of these analyses was carried out for subgroups defined by race, gender, and

[37] The numbers of cases used in our analyses of earnings are in the appendix, Table A2.

[38] We carried out our own adjustment of 1994 earnings into 1986 dollars.

survey year, as in the case of our analyses of occupational status.[39] Each equation was estimated with controls for work experience and childhood socioeconomic status or educational attainment.

The upper panel of Table 2 reports estimates of the effects of verbal ability on whether or not the respondent earned any income from employment in the year preceding the General Social Survey. Net of schooling, work experience, and social background, these effects are negligible in most cells of the design.[40] The effects are statistically significant only among Blacks in 1984 to 1989 and among the oldest White men in 1974 to 1982. There is no evidence of an increasing trend in the effects of verbal ability on the occurrence of non-zero earnings.

The upper panel of Table 3 reports estimates of the effects of verbal ability on moderate or high earnings (greater than $3,000) relative to very low earnings (less than $3,000) among persons with some earnings in the General Social Survey. Again, net of social background, work experience, and schooling, these effects are small and statistically insignificant, and they vary irregularly across survey years. We find no evidence that the effects of verbal ability on low earnings have changed for any age or racial group.

Finally, the upper panel of Table 4 shows estimates of the effects of verbal ability on the log of earnings among persons with earnings, based on a tobit model with left censoring at $3,000. Each model controls social background, work experience, and years of completed

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[39] Huang (1996:158-67, 171-88) reports exhaustive trend analyses of the correlations and regressions of earnings with verbal ability in the GSS. The correlations were estimated with and without correction for unreliability and restriction of range, and the regressions were estimated with and without the inclusion of schooling and with and without reliability corrections. He found no evidence of trend in the effect of ability on earnings.

[40] Throughout the analyses of Tables 2 to 4, we have specified potential work experience with linear and quadratic terms in years not spent in school.

schooling. Here, several of the ability effects are statistically significant, notably, all three effects for White women in the most recent period. However, we again find no evidence of systematic increase in the effects of verbal ability on earnings.

This parade of non-effects and non-changes in effects might lead one to worry whether the GSS data are valid, but we think that such a concern would be misplaced. In fact, the GSS data yield plausible estimates of correlations between verbal ability and socioeconomic outcomes, and they yield plausible estimates of regressions of socioeconomic outcomes on verbal ability -- provided we do not control years of completed schooling. Throughout these analyses, verbal ability appears to affect earnings primarily through its relationship with educational attainment. As a cautionary measure, though it is not suggested by the model in Figure 7, we also estimated regressions like those in the upper panels of Tables 2 to 4 in which social background and work experience have been controlled, but schooling has not been controlled. These estimates are shown in the lower panels of Tables 2 to 4. In these models, again, we find no evidence that the effects of verbal ability on socioeconomic achievement have increased from the 1970s to the 1990s.

Summary and Conclusions

The General Social Survey provides valuable clues about the evolving role of cognitive ability in American society. The strength of the GSS is that it has regularly administered a short verbal ability test to adult Americans over a 20-year period, during which it has also obtained standardized measurements of social background and socioeconomic outcomes. Its weakness lies in the brevity and narrow content of the WORDSUM test, the fact that the GSS contains no childhood measure of ability, and the fact that the GSS cannot be said to represent either elite or

underclass elements of the American population in substantial numbers. Because the GSS has surveyed repeated cross-sections of the adult household population since the middle 1970s, it provides -- with appropriate allowance for age at testing, a 60-year retrospective of relationships between verbal ability and schooling and between verbal ability and socioeconomic background. In the case of socioeconomic outcomes, the temporal span is shorter, covering only the survey years from 1974 to 1994.

In analyzing the GSS data, we have tried to be mindful of their strengths and weaknesses, as well as of the sweeping speculations and predictions about the changing role of cognitive ability that have spurred present interest in its antecedents, correlates, and effects. We have sought to find changes in the effects of social origins on verbal ability, changes in the relationship between completed schooling and verbal ability, and changes in the effects of verbal ability on occupational status and earnings. In each of these analyses, we have found nothing that would justify either radical predictions about the dominant role of cognitive ability in the stratification process or even moderate concern about its future role. Verbal ability has not become more differentiated by socioeconomic origins. While college graduates became brighter relative to high school graduates in cohorts born from the 1920s to the 1930s, in more recent cohorts, differences in verbal ability between college graduates and high school graduates have declined.

We would not for a moment deny cognitive ability an important place in the stratification process, but that place appears to be limited mainly to its role in determining how far people go in school, and that role appears to have been pretty much the same throughout this century. Even with rather crude controls for levels of completed schooling, verbal ability has modest and, in many cases, variable effects on occupational status and earnings. Our findings suggest that, if

there is a key variable in the American class system, it is educational attainment, not cognitive ability. There is no consistent or reliable evidence in the General Social Survey that effects of verbal ability on socioeconomic outcomes have increased over the past two decades. Of course, we do not know how the effects of verbal ability or of other abilities have changed in earlier periods.

What of elegant and powerful stories about the growing role of cognitive ability in the stratification process, like that spun by Herrnstein and Murray and quoted at the beginning of this essay? In our opinion, while such tales are appealing and provocative, our interest in them remains purely academic. Herrnstein and Murray have offered precious little evidence to support their story line, and we find equally little support in the trend data from the General Social Survey.

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Table 1. Effects of Test Scores on Occupational Status after Correction for Test Unreliability: General Social Survey, 1974 to 1994

	1974-1982		1984-1989		1990-1994	
Population	B	S. E.	B	S. E.	B	S. E.
Estimates controlling social background and schooling:						
Black men						
Age 25-64	1.64	1.03	1.45	2.03	0.03	1.08
Black women						
Age 25-64	1.07	0.69	0.71	1.00	2.42	1.27
White men						
Age 25-34	1.26	0.89	1.06	1.03	2.27	0.86
Age 35-44	2.17	1.03	1.86	0.74	0.68	1.13
Age 45-64	1.09	0.53	1.98	0.71	1.14	0.89
White women						
Age 25-34	2.11	0.61	2.61	0.86	2.14	0.91
Age 35-44	2.68	0.89	1.61	0.85	1.93	0.87
Age 45-64	1.89	0.42	1.57	0.58	3.07	0.75
Estimates controlling social background:						
Black men						
Age 25-64	5.09	1.11	4.98	1.57	3.48	1.04
Black women						
Age 25-64	4.97	0.91	3.75	1.04	4.95	1.34
White men						
Age 25-34	5.73	0.74	5.36	0.90	4.94	0.92
Age 35-44	7.41	0.80	6.04	0.72	5.44	0.95
Age 45-64	4.56	0.51	5.10	0.64	5.11	0.83
White women						
Age 25-34	4.57	0.56	4.70	0.80	4.28	0.88
Age 35-44	6.02	0.81	4.29	0.87	4.73	0.78
Age 45-64	3.75	0.47	4.04	0.55	5.73	0.63

Table 2. Cohort Changes in the Effects of Test Scores on Non-Zero Earnings: General Social Survey, 1974 to 1994

	1974-1982		1984-1989		1990-1994	
Population	B	S. E.	B	S. E.	B	S. E.
Estimates controlling social background, schooling, and work experience:						
Black men						
Age 25-64	0.16	0.12	0.46	0.19	0.03	0.26
Black women						
Age 25-64	0.06	0.08	0.21	0.09	0.10	0.13
White men						
Age 25-34	0.03	0.13	-0.31	0.18	-0.19	0.21
Age 35-44	0.25	0.22	-0.24	0.19	0.12	0.16
Age 45-64	0.17	0.07	0.01	0.10	0.12	0.09
White women						
Age 25-34	0.05	0.06	-0.04	0.08	0.00	0.09
Age 35-44	0.04	0.07	-0.13	0.09	-0.10	0.09
Age 45-64	0.03	0.05	0.00	0.06	-0.03	0.07
Estimates controlling social background and work experience:						
Black men						
Age 25-64	0.16	0.11	0.31	0.15	-0.06	0.18
Black women						
Age 25-64	0.17	0.07	0.29	0.08	0.15	0.11
White men						
Age 25-34	0.12	0.12	-0.16	0.15	-0.10	0.19
Age 35-44	0.46	0.17	0.00	0.15	0.06	0.14
Age 45-64	0.15	0.07	0.03	0.08	0.11	0.08
White women						
Age 25-34	0.10	0.05	0.03	0.08	0.09	0.08
Age 35-44	0.09	0.07	-0.13	0.08	0.00	0.08
Age 45-64	0.07	0.04	0.00	0.05	-0.02	0.07

Note: Estimates are based on a logistic regression model. The dependent variable is earnings status; earners are coded as 1 and non-earners are coded as 0.

Table 3. Cohort Changes in the Effects of Test Scores on High vs. Low Earnings: General Social Survey, 1974 to 1994

	1974-1982		1984-1989		1990-1994	
Population	B	S. E.	B	S. E.	B	S. E.
Estimates controlling social background, schooling, and work experience:						
Black men						
Age 25-64	0.13	0.35	0.43	0.68	*	*
Black women						
Age 25-64	-0.15	0.16	0.15	0.16	0.03	0.18
White men						
Age 25-34	0.03	0.19	0.29	0.23	0.18	0.23
Age 35-44	*	*	-0.35	0.20	0.26	0.24
Age 45-64	-0.43	0.26	0.54	0.35	0.07	0.29
White women						
Age 25-34	0.20	0.10	-0.19	0.11	0.03	0.13
Age 35-44	0.25	0.15	-0.11	0.12	-0.02	0.12
Age 45-64	-0.07	0.11	-0.11	0.12	0.20	0.11
Estimates controlling social background and work experience:						
Black men						
Age 25-64	0.31	0.24	0.28	0.36	*	*
Black women						
Age 25-64	0.11	0.13	0.21	0.14	0.19	0.16
White men						
Age 25-34	0.13	0.16	0.42	0.20	0.09	0.20
Age 35-44	*	*	-0.19	0.19	0.36	0.21
Age 45-64	-0.40	0.24	0.11	0.21	0.08	0.23
White women						
Age 25-34	0.28	0.08	-0.08	0.09	0.20	0.11
Age 35-44	0.23	0.13	-0.01	0.11	0.01	0.11
Age 45-64	-0.01	0.09	-0.01	0.10	0.19	0.09

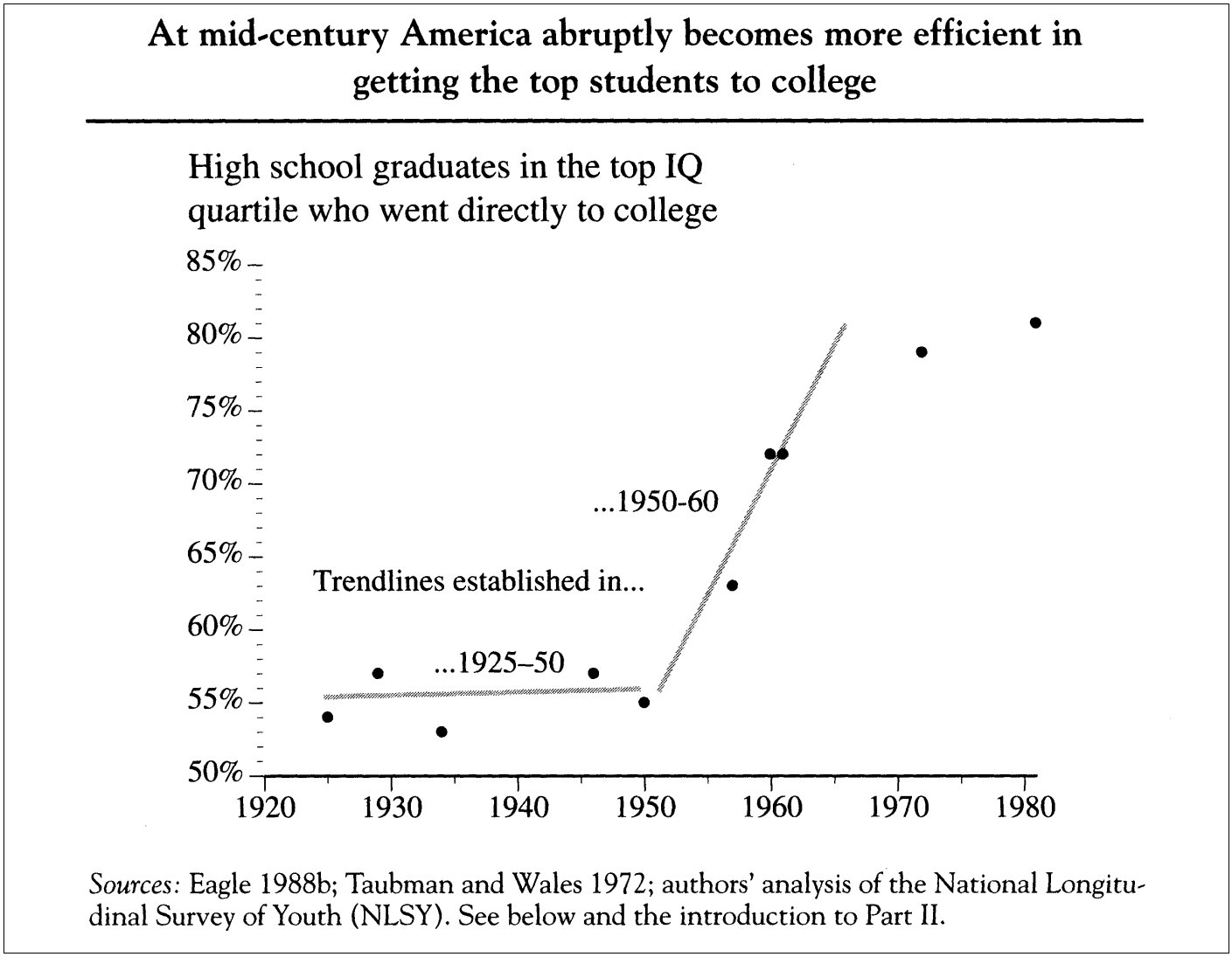
Note: Estimates are based on a logistic regression model. The dependent variable is earnings status: Earners who earned more than $3,000 are coded as 1, while earners who earned less than $3,000 are coded as 0. Two cohorts have only one respondent who earned less than $3,000 and these cells are marked with “*.”

Table 4. Cohort Changes in the Effects of Test scores on Log Earnings (1986 dollars): General Social Survey, 1974 to 1994

	1974-1982		1984-1989		1990-1994	
Population	B	S. E.	B	S. E.	B	S. E.
Estimates controlling social background, schooling, and work experience:						
Black men						
Age 25-64	0.13	0.03	0.05	0.03	0.06	0.03
Black women						
Age 25-64	0.02	0.03	0.08	0.03	0.05	0.03
White men						
Age 25-34	0.05	0.03	0.01	0.03	0.08	0.03
Age 35-44	0.03	0.03	0.05	0.02	0.01	0.03
Age 45-64	0.06	0.02	0.04	0.02	0.03	0.02
White women						
Age 25-34	0.00	0.03	0.08	0.02	0.05	0.02
Age 35-44	0.06	0.03	0.03	0.03	0.07	0.03
Age 45-64	0.00	0.04	0.11	0.03	0.07	0.03
Estimates controlling social background and work experience:						
Black men						
Age 25-64	0.09	0.02	0.06	0.02	0.01	0.02
Black women						
Age 25-64	-0.03	0.02	0.07	0.03	0.01	0.03
White men						
Age 25-34	0.05	0.02	0.03	0.02	0.07	0.02
Age 35-44	0.04	0.02	0.03	0.02	0.00	0.02
Age 45-64	0.09	0.02	0.03	0.02	0.03	0.02
White women						
Age 25-34	-0.02	0.02	0.09	0.02	0.03	0.03
Age 35-44	0.06	0.02	0.02	0.02	0.06	0.02
Age 45-64	0.04	0.02	0.05	0.02	-0.01	0.02

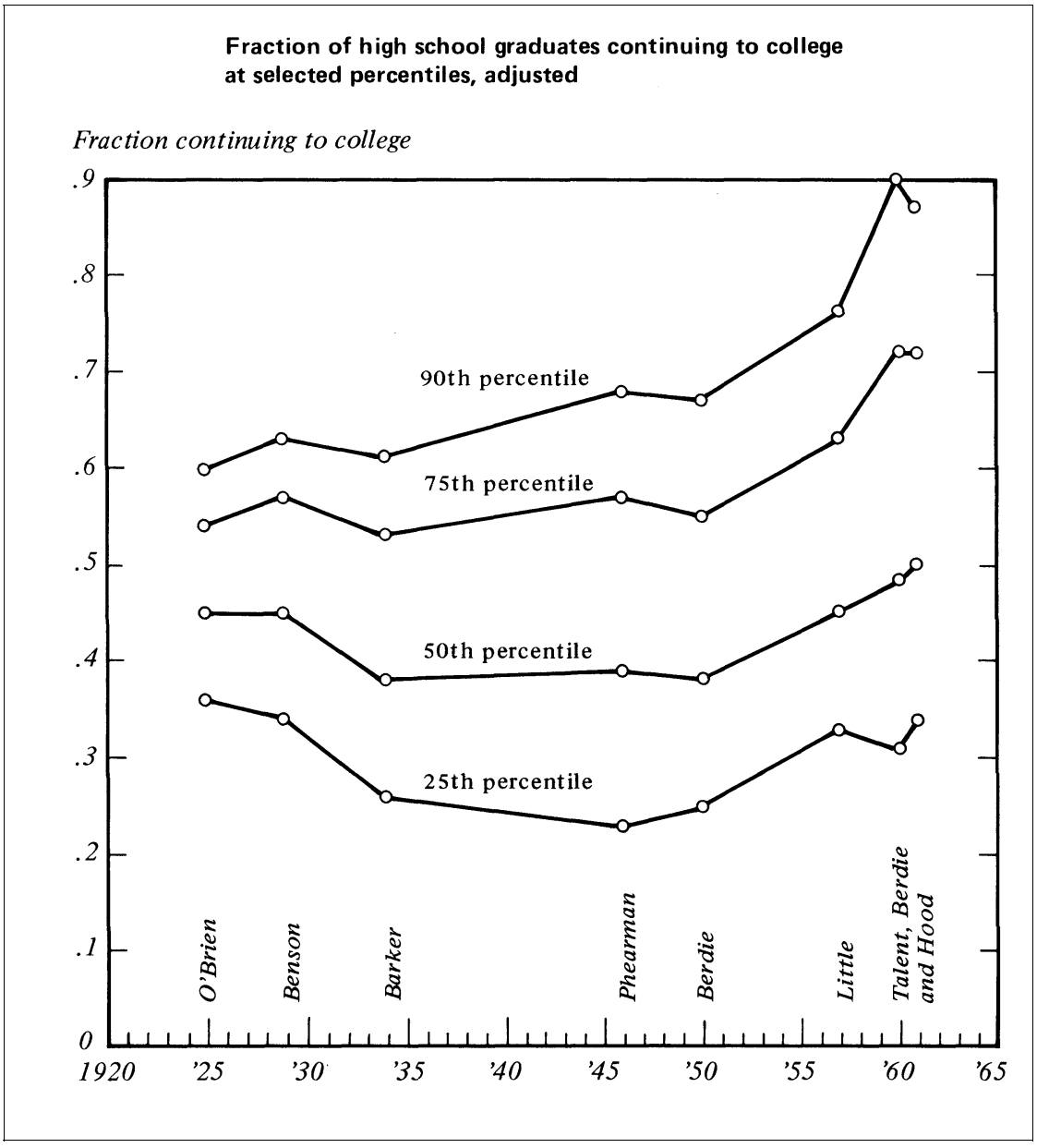
Note: Estimates are based on a tobit model of the log of earnings in 1986 dollars with left censoring at $3,000.

Figure 1. Trends in College Entry by Ability According to Herrnstein and Murray



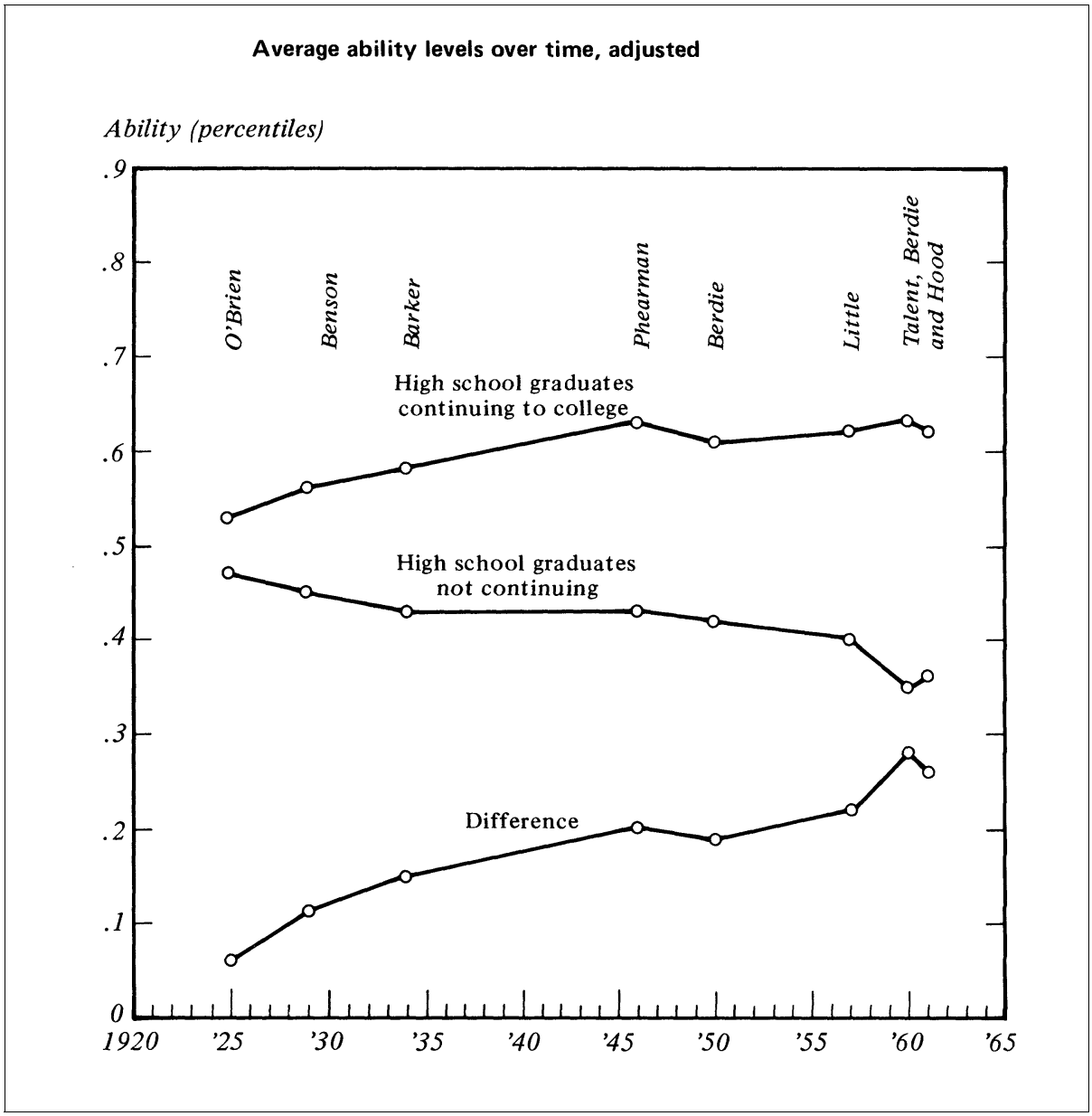
Source: Herrnstein and Murray (1994: 34).

Figure 2. Trends in College Entry by Ability According to Taubman and Wales



Source: Taubman and Wales (1972: 20).

Figure 3. Trends in Ability Percentile by College Entry According to Taubman and Wales

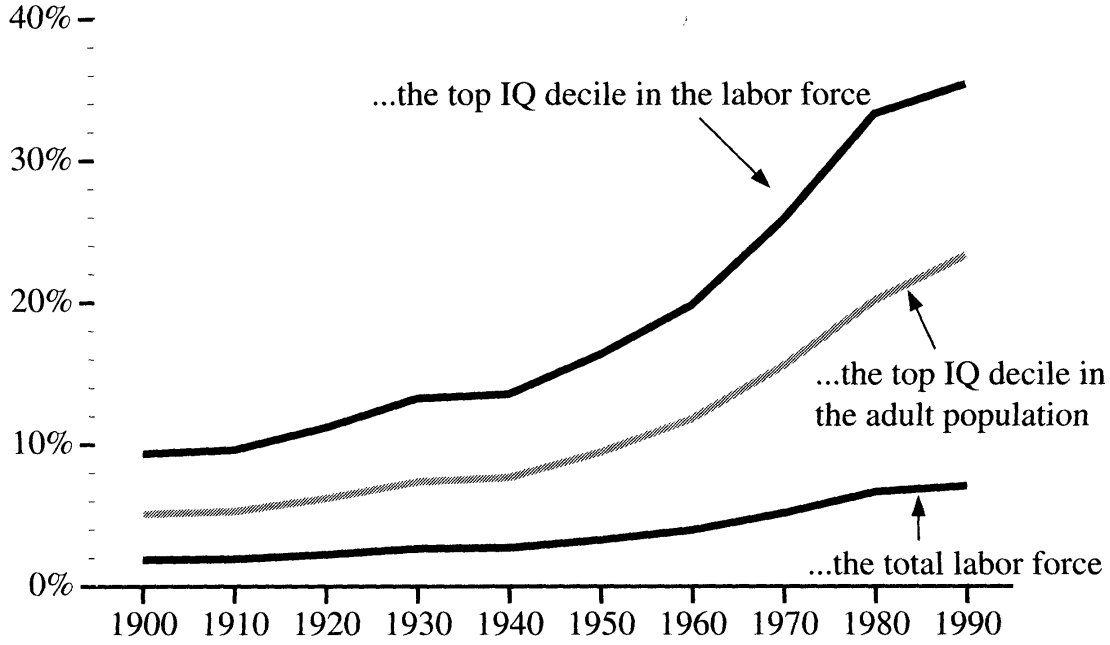


Source: Taubman and Wales (1972: 5).

Figure 4. Growing Concentration of the Cognitive Elite in High-IQ Professions According to Herrnstein and Murray

The top IQ decile becomes rapidly more concentrated in high-IQ professions from 1940 onward

People in the high-IQ occupations, expressed as a percentage of...



Source: U.S. Bureau of the Census 1975, Table D233–682; *SAVS* 1981, Table 675; U.S. Department of Labor, 1991, Table 22.

Note: Included are accountants, architects, chemists, college teachers, computer scientists, dentists, engineers, lawyers, mathematicians, natural scientists, physicians, and social scientists. Assumes 50 percent of persons in these professions have IQs of 120 or higher.

Source: Herrnstein and Murray (1994: 56).

Figure 5. Illustrative Vocabulary Test Items

a. LIFT	1. sort out	2. raise	3. value	4. enjoy	5. fancy
b. CONCERN	1. see clearly	2. engage	3. furnish	4. disturb	5. have to do with
c. BROADEN	1. efface	2. make level	3. elapse	4. embroider	5. widen
d. BLUNT	1. dull	2. drowsy	3. deaf	4. doubtful	5. ugly
e. ACCUSTOM	1. disappoint	2. customary	3. encounter	4. get used	5. business
f. CHIRRUP	1. aspen	2. joyful	3. capsize	4. chirp	5. incite
g. EDIBLE	1. auspicious	2. eligible	3. fit to eat	4. sagacious	5. able to speak
h. CLOISTERED	1. miniature	2. bunched	3. arched	4. malady	5. secluded
i. TACTILITY	1. tangibility	2. grace	3. subtlety	4. extensibility	5. manageableness
j. SEDULOUS	1. muddled	2. sluggish	3. stupid	4. assiduous	5. corrupting

Source: Miner (1957: 53).

Figure 6. WORDSUM Distributions of Blacks and Whites: General Social Survey, 1974-94

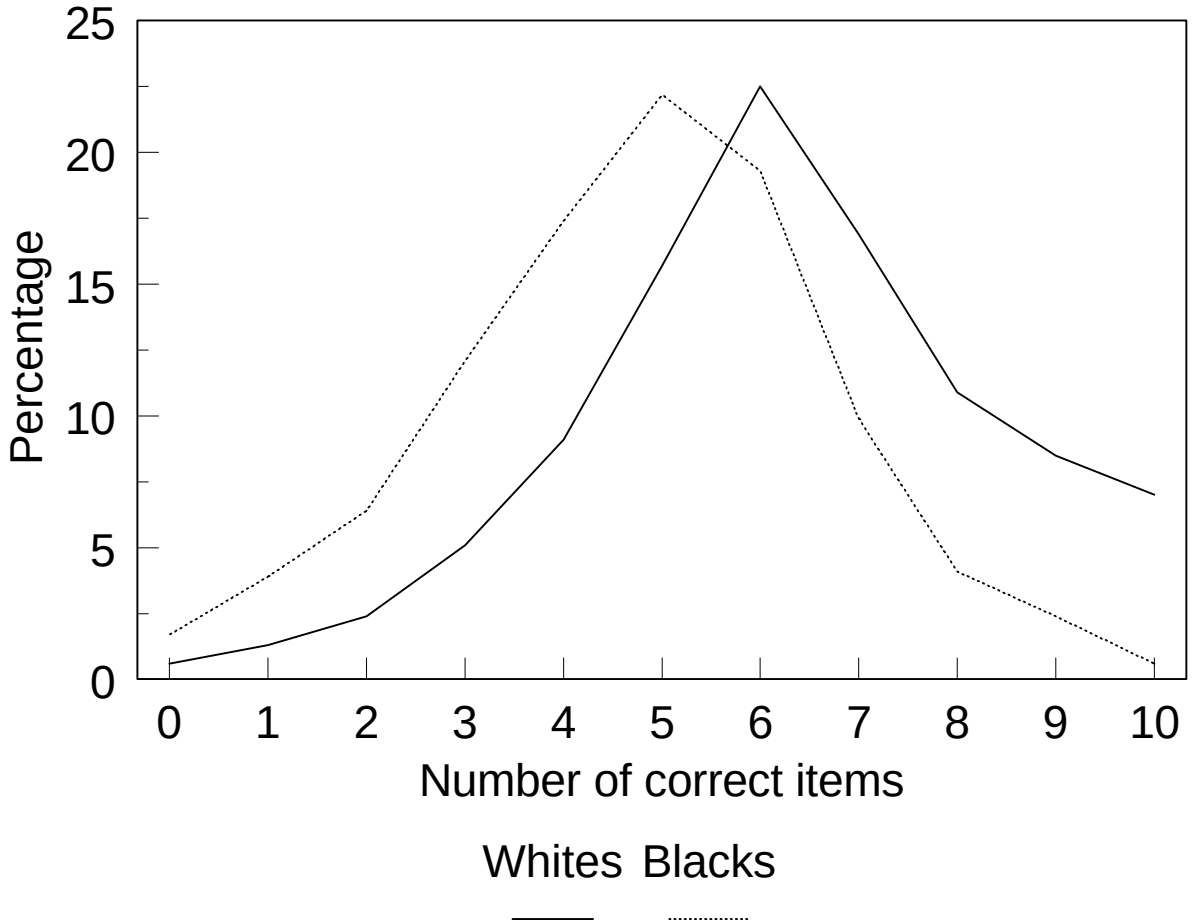


Figure 7. A Simple Model of the Stratification Process

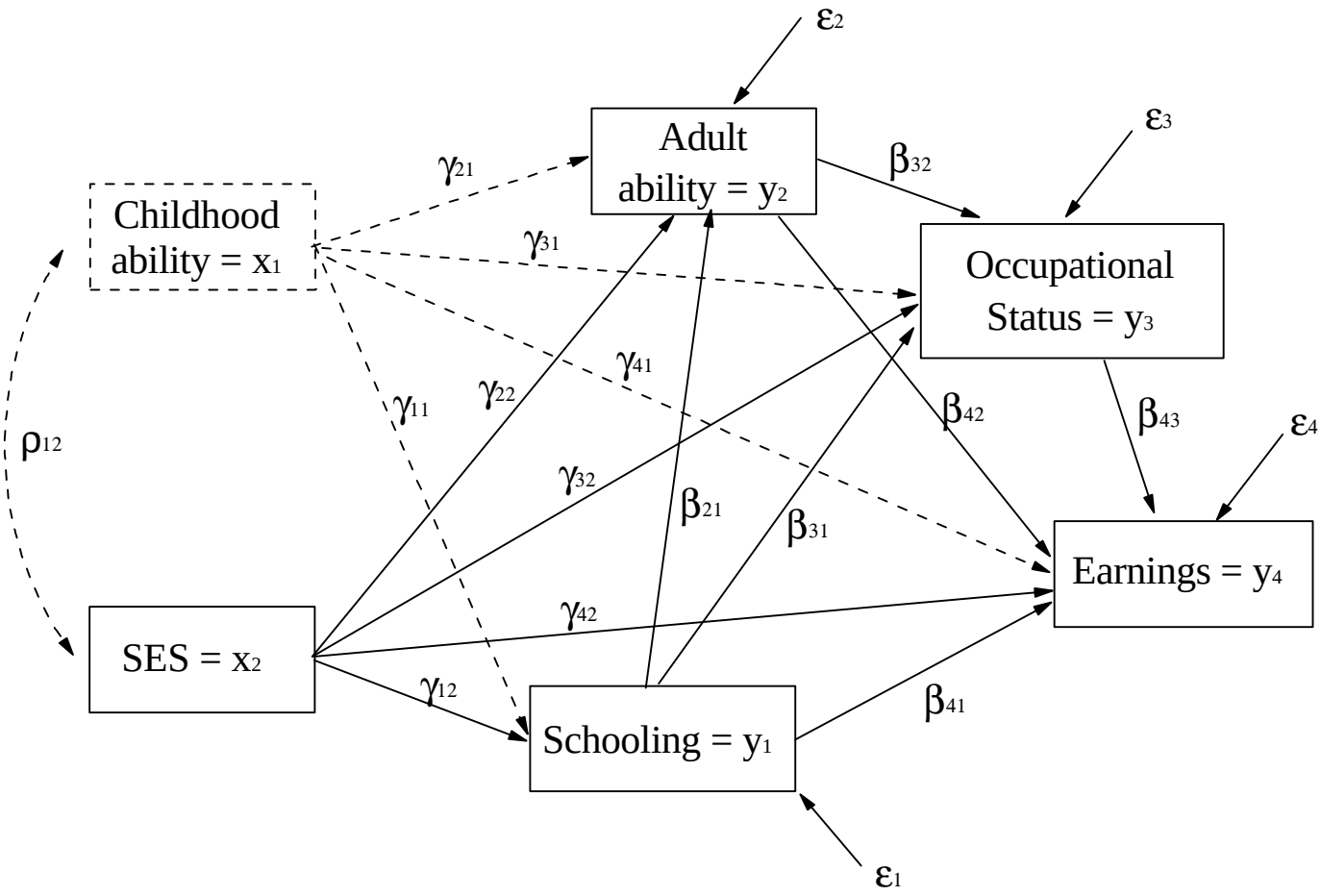
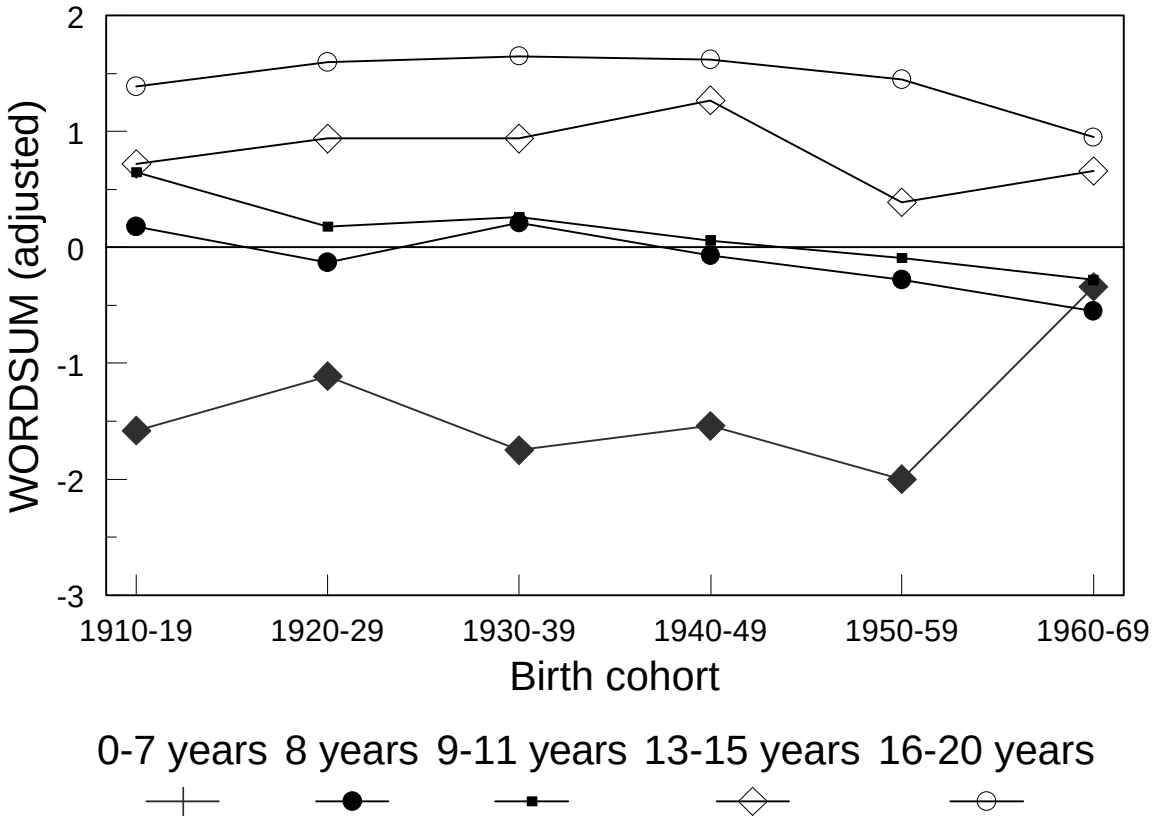
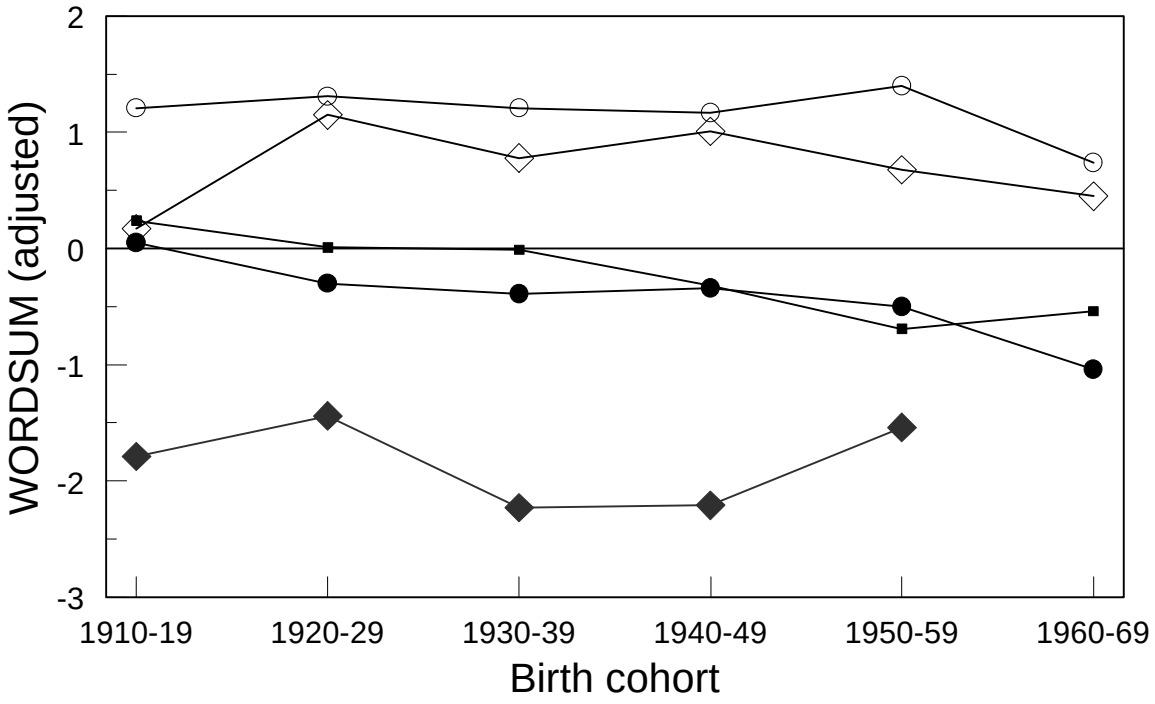


Figure 8. Trends in Verbal Ability Differentials by Father's Education: Whites in General Social Survey, 1974-1994



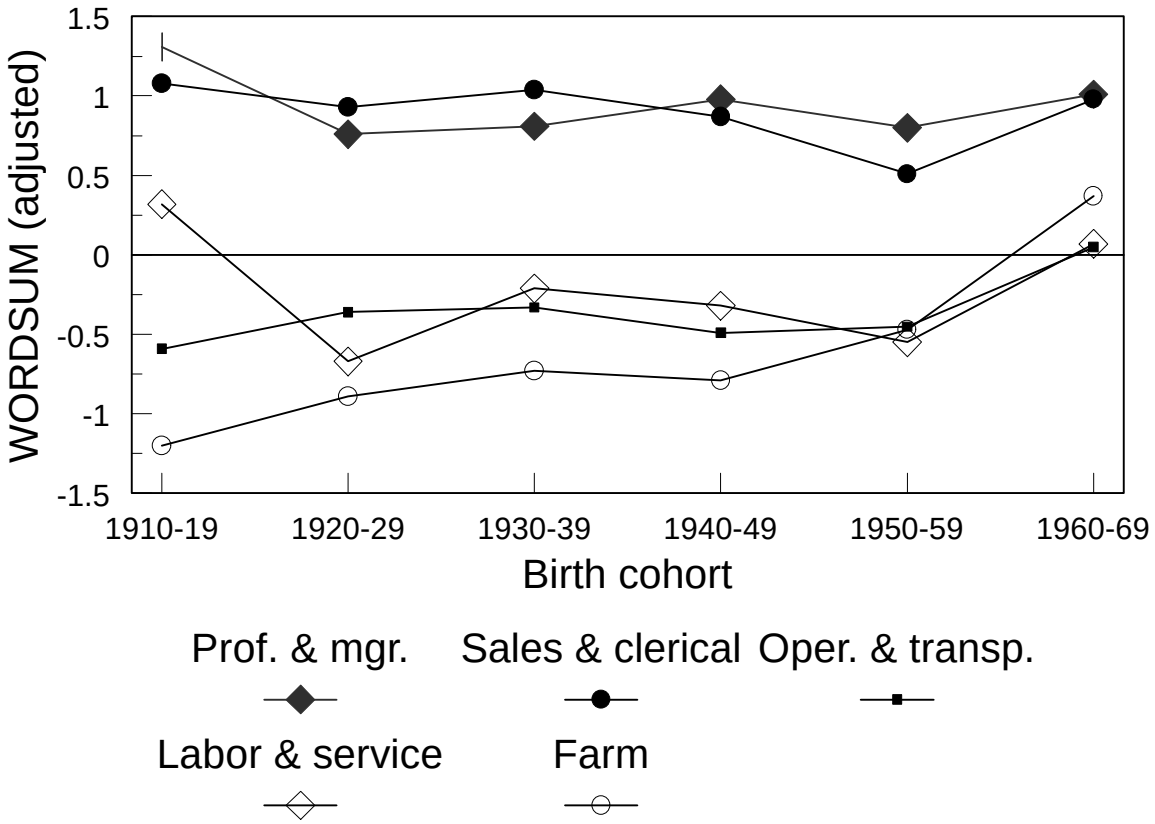
Notes: Estimates are relative to high school graduate fathers, based on a tobit regression of age-adjusted WORDSUM scores.

Figure 9. Trends in Verbal Ability Differentials by Mother's Education: Whites in General Social Survey, 1974-1994



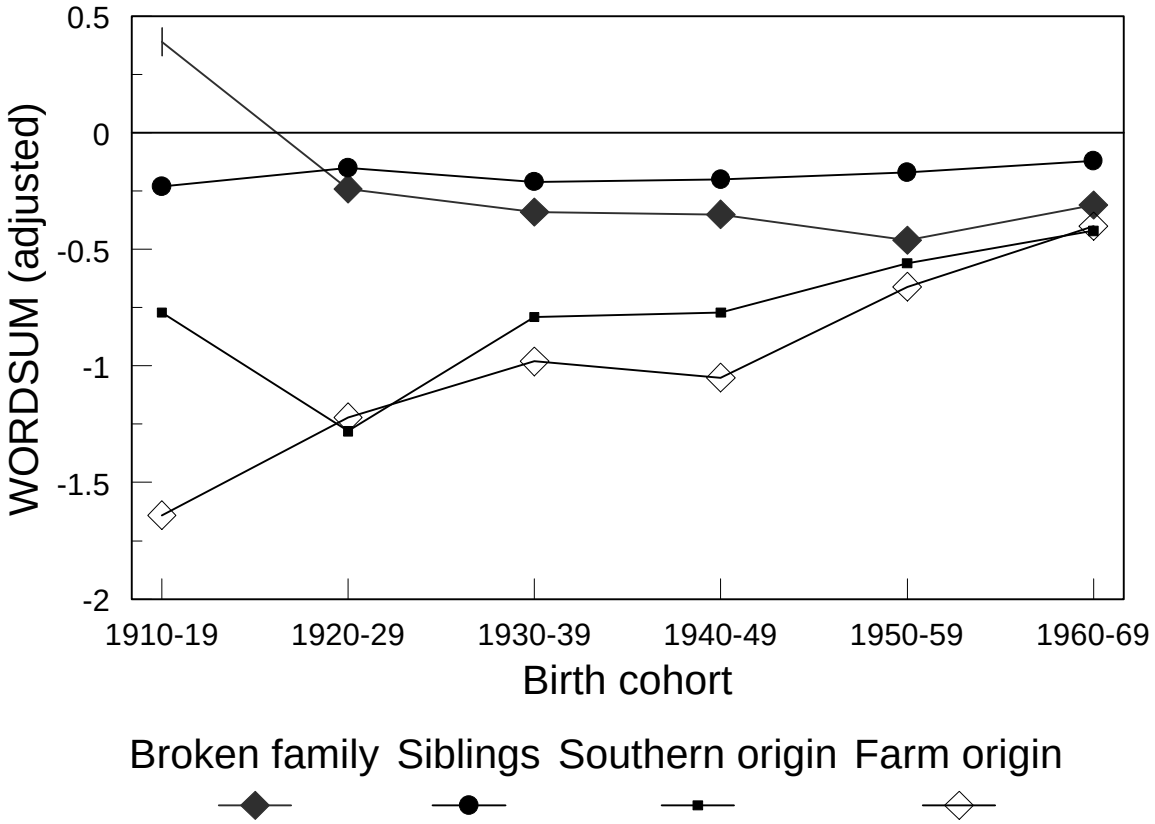
Notes: Estimates are relative to high school graduate mothers, based on a tobit regression of age-adjusted WORDSUM scores.

Figure 10. Trends in Verbal Ability Differentials by Father's Occupation: Whites in General Social Survey, 1974-1994



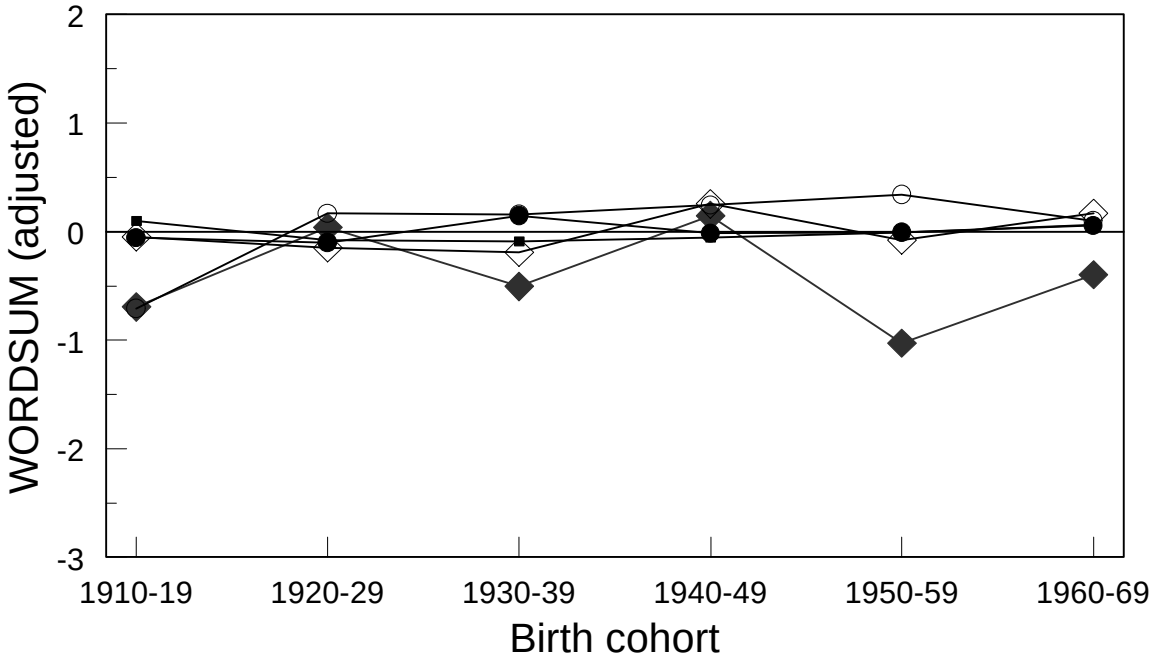
Notes: Estimates are relative to craftsman fathers, based on a tobit regression of age-adjusted WORDSUM scores.

Figure 11. Trends in Verbal Ability Differentials by Family Background: Whites in General Social Survey, 1974-1994



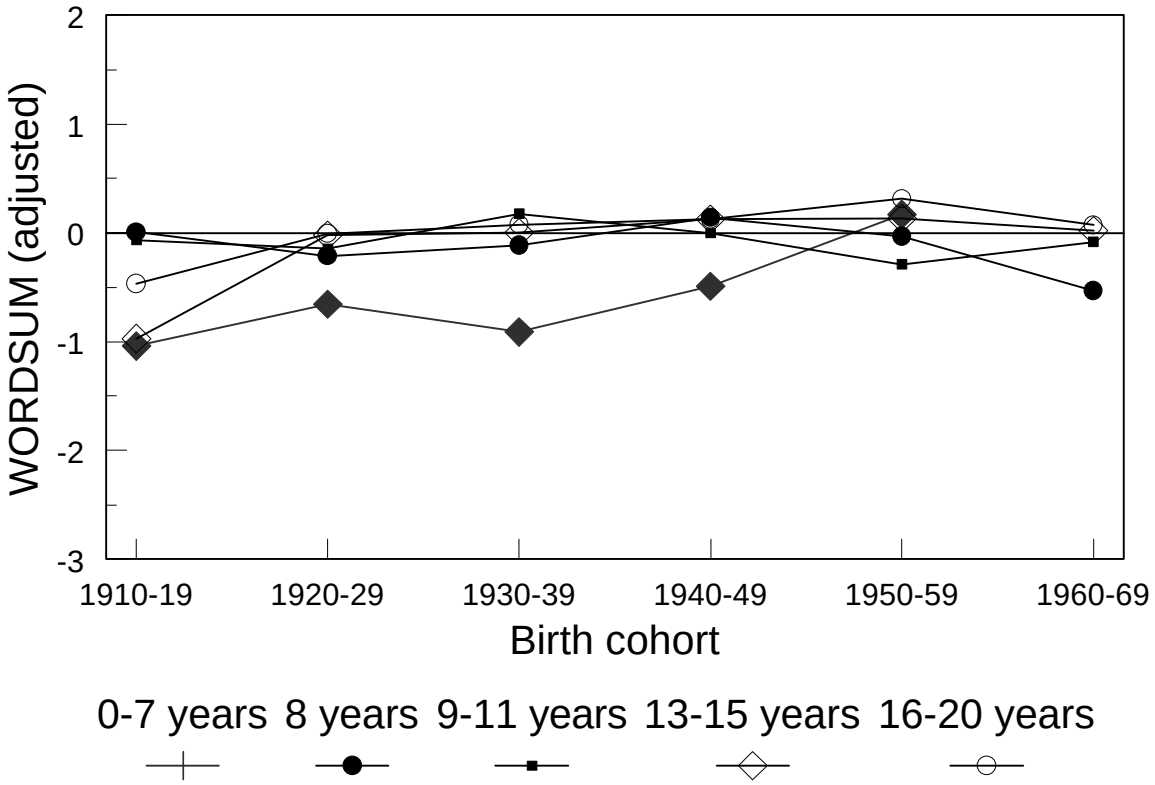
Notes: Estimates are based on a tobit regression of age-adjusted WORDSUM scores.

Figure 12. Trends in the Effects of Father's Education on Verbal Ability: Whites in General Social Survey, 1974-1994



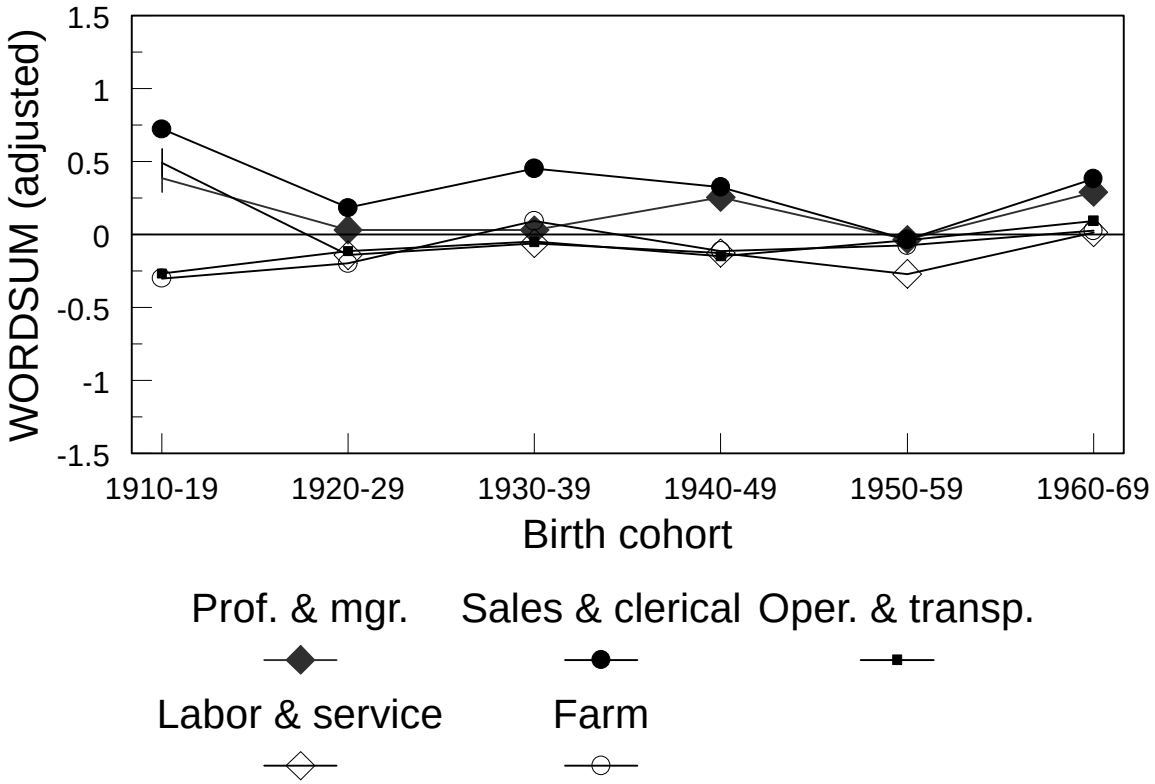
Notes: Estimates are relative to high school graduate fathers, based on a tobit regression of age-adjusted WORDSUM scores in which schooling and social background are controlled.

Figure 13. Trends in the Effects of Mother's Education on Verbal Ability: Whites in General Social Survey, 1974-1994



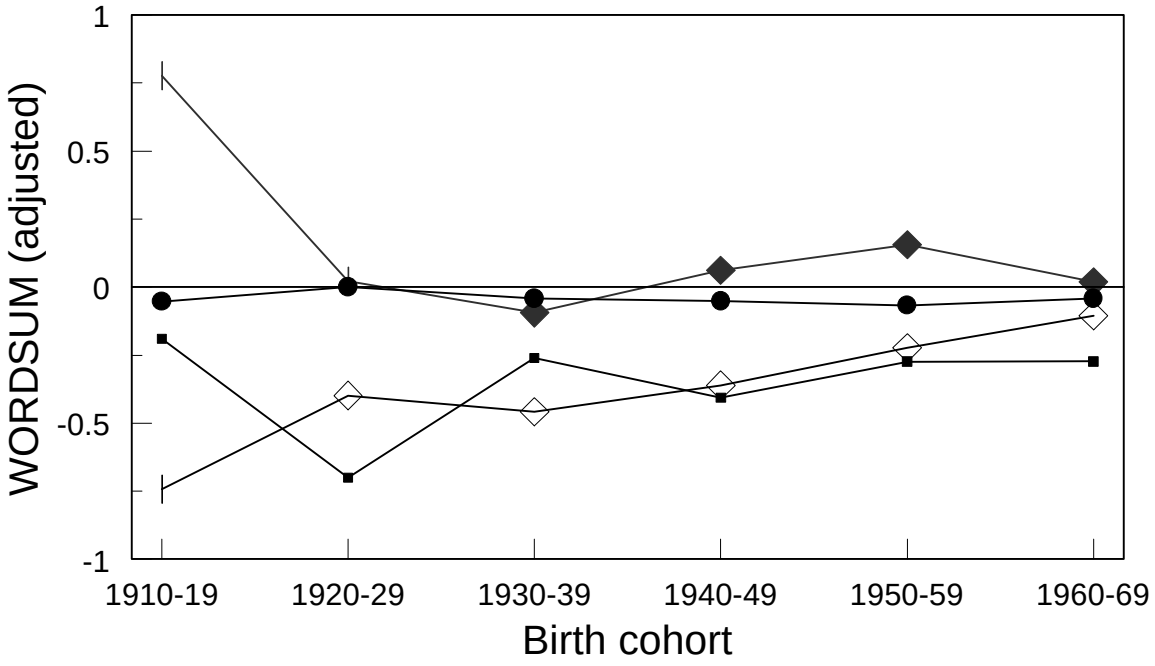
Notes: Estimates are relative to high school graduate mothers, based on a tobit regression of age-adjusted WORDSUM scores in which schooling and social background are controlled.

Figure 14. Trends in the Effects of Father's Occupation on Verbal Ability: Whites in General Social Survey, 1974-1994



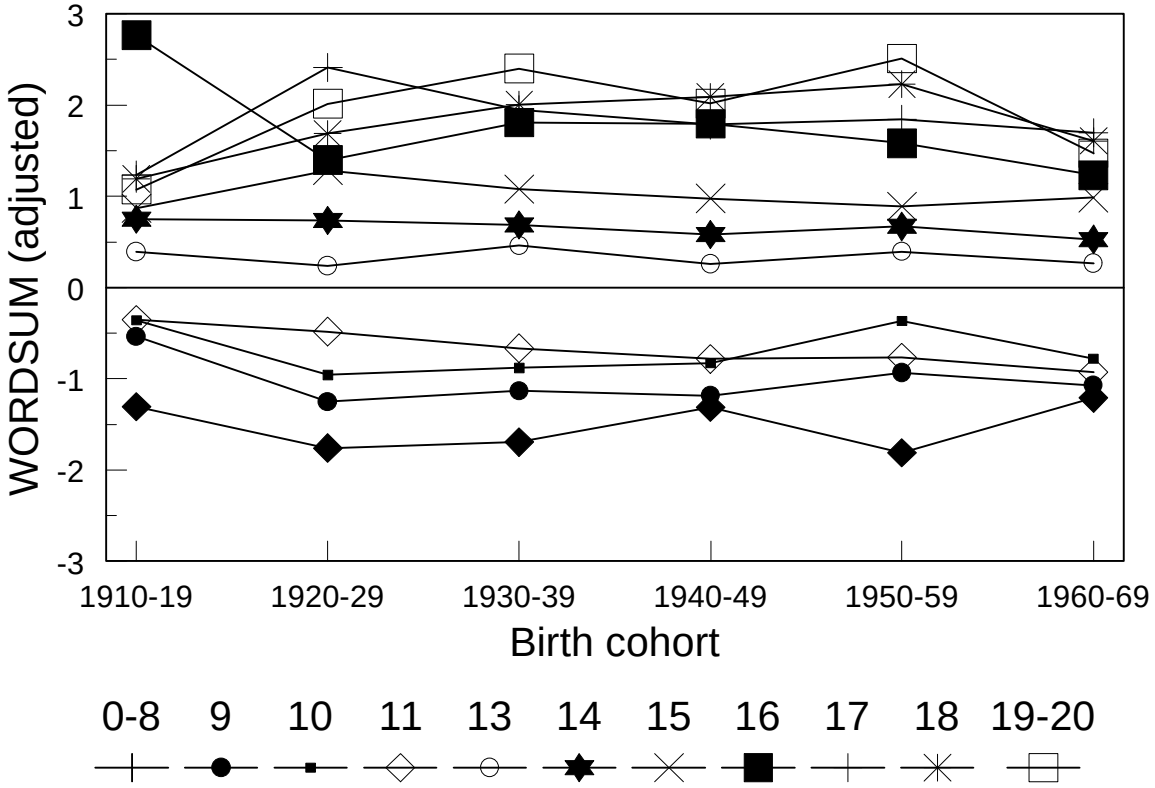
Notes: Estimates are relative to craftsman fathers, based on a tobit regression of age-adjusted WORDSUM scores in which schooling and social background are controlled.

Figure 15. Trends in the Effects of Family Background on Verbal Ability: Whites in General Social Survey, 1974-1994



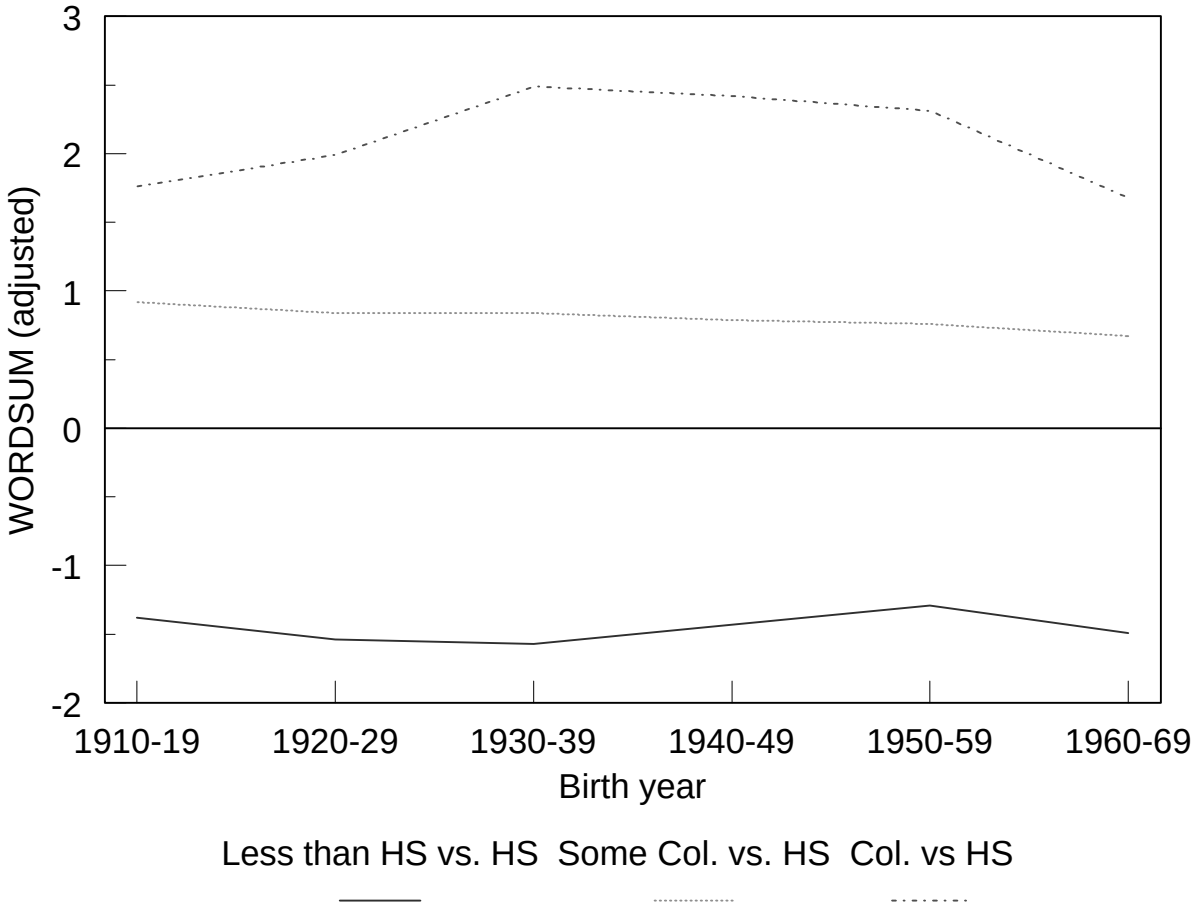
Notes: Estimates are based on a tobit regression of age-adjusted WORDSUM scores in which schooling and social background are controlled.

Figure 16. Trends in Verbal Ability Differentials by Educational Attainment: Whites in General Social Survey, 1974-1994



Notes: Estimates are relative to high school graduates, based on a tobit regression of age-adjusted WORDSUM scores in which schooling and social background are controlled.

Figure 17. Differences in Verbal Ability (WORDSUM) between Levels of Schooling
Whites Aged 25 to 64 in the General Social Survey, 1974-94



Note: Estimates are based on a 2-sided tobit regression
in which age at testing has been controlled.

APPENDIX

Table A1. Numbers of Cases for Analysis of Social Background, Educational Attainment, and Verbal Ability (WORDSUM): Whites in General Social Survey, 1974-1994

	Birth Cohort					
	1910-'19	1920-'29	1930-'39	1940-'49	1950-'59	1960-'69
Father's education						
0-7 years	122	272	340	358	189	57
8 years	97	253	274	367	221	44
9-11 years	22	86	170	272	227	84
12 years	46	120	229	636	641	275
13-15 years	14	49	68	190	222	103
16-20 years	14	51	84	233	390	203
Missing	137	351	406	408	402	181
Total cases	452	1182	1571	2464	2292	947
Mother's education						
0-7 years	117	231	228	236	118	26
8 years	115	280	310	314	149	30
9-11 years	24	121	236	349	274	113
12 years	65	208	417	984	1011	432
13-15 years	13	68	92	226	319	158
16-20 years	10	29	77	157	247	130
Missing	108	245	211	198	174	58
Total cases	452	1182	1571	2464	2292	947
Father's occupation						
Prof. & mgr.	66	174	292	553	662	291
Sales & clerical	32	77	94	230	218	85
Craftsmen	96	252	304	523	470	184
Oper. & transp.	65	185	265	403	294	103
Labor & service	36	102	151	220	189	77
Farm	116	252	249	276	168	53
Missing	41	140	216	259	291	154
Total	452	1182	1571	2464	2292	947
Broken family	93	252	361	462	479	279
Southern origin	127	328	460	731	627	254
Farm origin	176	418	523	648	549	226

Table A1. continued.

	Birth Cohort					
	1910-’19	1920-’29	1930-’39	1940-’49	1950-’59	1960-’69
Respondent’s education						
0-8 years	119	166	133	88	44	13
9 years	20	64	73	70	34	25
10 years	36	95	97	113	73	31
11 years	26	87	90	87	69	46
12 years	142	479	680	885	749	269
13 years	21	61	105	228	200	85
14 years	38	93	110	241	271	124
15 years	16	21	47	98	115	40
16 years	20	103	160	348	364	152
17 years	11	32	50	95	78	52
18 years	12	24	61	92	80	37
19-20 years	7	30	62	104	87	27

Table A2. Sample Size in Analyses of Non-Zero Earnings. High vs. Low Earnings, and Log of Earnings: Respondents in the General Social Survey by Race, Sex, and Age, 1974-1994

	1974 - 1982	1984 - 1989	1990 - 1994
Zero vs. Non-Zero Earnings			
Black men			
Age 25-64	224	170	172
Black women			
Age 25-64	267	282	260
White men			
Age 25-34	533	365	328
Age 35-44	341	366	336
Age 45-64	668	423	387
White women			
Age 25-34	594	453	384
Age 35-44	430	398	410
Age 45-64	744	531	469
High vs. Low Earnings and Log of Earnings			
Black men			
Age 25-64	189	144	149
Black women			
Age 25-64	160	216	206
White men			
Age 25-34	503	347	318
Age 35-44	328	351	319
Age 45-64	595	359	337
White women			
Age 25-34	399	364	306
Age 35-44	274	326	343
Age 45-64	384	346	363

Table A3. Means and Standard Deviations of Variables for White Men: General Social Survey, 1974-1994

	Mean	Std. Dev.	N
Father's years of education	10.26	3.72	3923
Mother's years of education	10.79	3.13	3923
Father's occupational status	33.27	17.36	3923
Number of siblings	3.55	2.81	3923
Non-intact family	.21	.40	3923
Southern origin	.27	.45	3923
Farm background	.31	.46	3923
Respondent's years of education	13.24	3.08	3923
Respondent's occupational status	39.15	20.40	3923
Percentage of non-zero earners	.92	.27	3746
Percentage of earners who earn $3000 or more	.98	.16	3456
Log (Earnings in 1986 dollars + $3000)	10.21	.65	3456

Table A4. Means and Standard Deviations of Variables for White Women: General Social Survey, 1974-1994

	Mean	Std. Dev.	N
Father's years of education	10.52	3.57	4616
Mother's years of education	10.73	3.10	4616
Father's occupational status	33.92	17.49	4616
Number of siblings	3.64	2.85	4616
Non-intact family	.21	.41	4616
Southern origin	.28	.45	4616
Farm background	.26	.44	4616
Respondent's years of education	12.96	2.6	4616
Respondent's occupational status	40.05	17.7	4616
Percentage of non-zero earners	.70	.46	4414
Percentage of earners who earn $3000 or more	.88	.33	3104
Log (Earnings in 1986 dollars + $3000)	9.55	.67	3104

Table A5. Means and Standard Deviations of Variables for Black Men: General Social Survey, 1974-1994

	Mean	Std. Dev.	N
Father's years of education	8.62	3.22	593
Mother's years of education	9.7	3.42	593
Father's occupational status	24.29	10.59	593
Number of siblings	5.37	4.07	593
Non-intact family	.44	.50	593
Southern origin	.64	.48	593
Farm background	.29	.45	593
Respondent's years of education	12.09	3.15	593
Respondent's occupational status	28.13	16.1	593
Percentage of non-zero earners	.85	.36	566
Percentage of earners who earn $3000 or more	.97	.17	483
Log (Earnings in 1986 dollars + $3000)	9.90	.58	483

Table A6. Means and Standard Deviations of Variables for Black Women: General Social Survey, 1974-1994

	Mean	Std. Dev.	N
Father's years of education	8.57	3.02	864
Mother's years of education	9.5	3.44	864
Father's occupational status	24.23	10.88	864
Number of siblings	5.6	3.86	864
Non-intact family	.47	.50	864
Southern origin	.64	.48	864
Farm background	.27	.45	864
Respondent's years of education	12.35	2.65	864
Respondent's occupational status	32.35	18.39	864
Percentage of non-zero earners	.71	.45	809
Percentage of earners who earn $3000 or more	.91	.29	582
Log (Earnings in 1986 dollars + $3000)	9.57	.63	582

Table A7. Trends in Verbal Ability Differentials by Social Background Variables: Whites in the General Social Survey, 1974-1994

		Birth Cohort					
		1910-'19	1920-'29	1930-'39	1940-'49	1950-'59	1960-'69
Father's education							
0-7 years	B	-1.58	-1.11	-1.75	-1.54	-2.00	-0.34
	S.E.	0.52	0.33	0.42	0.46	0.45	0.70
8 years	B	0.18	-0.13	0.21	-0.07	-0.28	-0.55
	S.E.	0.31	0.17	0.15	0.12	0.14	0.30
9-11 years	B	0.65	0.18	0.26	0.06	-0.09	-0.28
	S.E.	0.55	0.26	0.18	0.13	0.14	0.22
13-15 years	B	0.72	0.94	0.94	1.27	0.39	0.66
	S.E.	0.66	0.33	0.27	0.16	0.15	0.20
16-20 years	B	1.39	1.60	1.65	1.62	1.45	0.95
	S.E.	0.65	0.32	0.24	0.15	0.12	0.16
Missing	B	-0.09	-0.53	-0.63	-0.49	-0.36	-0.06
	S.E.	0.28	0.16	0.13	0.12	0.12	0.17
Mother's education							
0-7 years	B	-1.79	-1.44	-2.23	-2.21	-1.54	0.67
	S.E.	0.56	0.36	0.35	0.46	0.50	0.79
8 years	B	0.05	-0.30	-0.39	-0.34	-0.50	-1.04
	S.E.	0.29	0.16	0.14	0.12	0.16	0.35
9-11 years	B	0.24	0.01	-0.01	-0.32	-0.69	-0.54
	S.E.	0.53	0.22	0.15	0.12	0.13	0.19
13-15 years	B	0.17	1.15	0.78	1.01	0.68	0.45
	S.E.	0.63	0.27	0.23	0.15	0.12	0.17
16-20 years	B	1.21	1.31	1.21	1.17	1.40	0.74
	S.E.	0.77	0.41	0.25	0.18	0.14	0.18
Missing	B	-0.88	-1.10	-1.16	-0.98	-0.89	-0.83
	S.E.	0.29	0.17	0.16	0.15	0.16	0.25

Table A7, continued.

		Birth Cohort					
		1910-’19	1920-’29	1930-’39	1940-’49	1950-’59	1960-’69
Father’s occupation							
Prof. & mgr.	B	1.31	0.76	0.81	0.98	0.80	1.01
	S.E.	0.37	0.21	0.17	0.12	0.12	0.17
Sales &	B	1.08	0.93	1.04	0.87	0.51	0.98
clerical	*S.E.*	0.47	0.27	0.25	0.16	0.16	0.24
Oper. &	B	-0.59	-0.36	-0.33	-0.49	-0.45	0.05
transp.	*S.E.*	0.36	0.20	0.17	0.13	0.14	0.22
Labor &	B	0.32	-0.67	-0.21	-0.32	-0.55	0.07
service	*S.E.*	0.43	0.25	0.20	0.16	0.17	0.25
Farm	B	-1.20	-0.89	-0.73	-0.79	-0.47	0.37
	S.E.	0.31	0.19	0.17	0.14	0.18	0.28
Missing	B	0.01	-0.38	-0.21	-0.14	-0.21	0.51
	S.E.	0.42	0.22	0.18	0.15	0.14	0.20
Non-intact family							
	B	0.39	-0.24	-0.34	-0.35	-0.46	-0.31
	S.E.	0.28	0.16	0.13	0.11	0.10	0.13
Number of siblings							
	B	-0.23	-0.15	-0.21	-0.20	-0.17	-0.12
	S.E.	0.04	0.02	0.02	0.01	0.02	0.03
Southern origin							
	B	-0.77	-1.28	-0.79	-0.77	-0.56	-0.42
	S.E.	0.25	0.14	0.12	0.09	0.09	0.14
Farm background							
	B	-1.64	-1.22	-0.98	-1.05	-0.66	-0.40
	S.E.	0.22	0.13	0.11	0.09	0.10	0.14

Table A8. Trends in the Effects of Social Background and Educational Attainment on Verbal Ability: Whites in the General Social Survey, 1974-1994

		Birth Cohort					
		1910-'19	1920-'29	1930-'39	1940-'49	1950-'59	1960-'69
Father's education							
0-7 years	B	-0.69	0.04	-0.50	0.15	-1.03	-0.40
	S.E.	0.49	0.33	0.37	0.40	0.43	0.90
8 years	B	-0.06	-0.10	0.15	-0.01	-0.01	0.05
	S.E.	0.29	0.15	0.13	0.10	0.13	0.28
9-11 years	B	0.10	-0.08	-0.09	-0.05	-0.01	0.06
	S.E.	0.49	0.22	0.15	0.11	0.12	0.20
13-15 years	B	-0.05	-0.15	-0.19	0.26	-0.08	0.17
	S.E.	0.58	0.28	0.23	0.14	0.13	0.19
16-20 years	B	-0.71	0.17	0.16	0.24	0.34	0.10
	S.E.	0.61	0.29	0.23	0.14	0.13	0.19
Missing	B	0.48	-0.03	-0.27	-0.20	-0.05	-0.04
	S.E.	0.29	0.17	0.15	0.14	0.15	0.26
Mother's education							
0-7 years	B	-1.04	-0.66	-0.91	-0.49	0.17	1.55
	S.E.	0.52	0.36	0.32	0.40	0.47	1.01
8 years	B	0.01	-0.21	-0.12	0.14	-0.03	-0.53
	S.E.	0.27	0.15	0.12	0.11	0.15	0.32
9-11 years	B	-0.07	-0.14	0.18	0.00	-0.29	-0.08
	S.E.	0.48	0.19	0.13	0.10	0.11	0.18
13-15 years	B	-0.97	-0.02	0.00	0.13	0.13	0.02
	S.E.	0.58	0.24	0.20	0.13	0.11	0.16
16-20 years	B	-0.47	-0.01	0.08	0.13	0.31	0.07
	S.E.	0.68	0.35	0.22	0.15	0.13	0.18
Missing	B	-0.79	-0.41	-0.05	-0.20	-0.26	-0.29
	S.E.	0.30	0.16	0.15	0.13	0.15	0.24

Table A8, continued.

		Birth Cohort					
		1910-’19	1920-’29	1930-’39	1940-’49	1950-’59	1960-’69
Father’s occupation							
Prof. & mgr.	B	0.39	0.03	0.03	0.26	-0.03	0.29
	S.E.	0.35	0.18	0.15	0.11	0.11	0.18
Sales &	B	0.72	0.18	0.45	0.32	-0.03	0.38
clerical	*S.E.*	0.43	0.24	0.20	0.13	0.14	0.22
Oper. &	B	-0.27	-0.11	-0.05	-0.15	-0.04	0.09
transp.	*S.E.*	0.32	0.17	0.14	0.11	0.12	0.20
Labor &	B	0.49	-0.14	-0.06	-0.13	-0.27	0.01
service	*S.E.*	0.38	0.21	0.17	0.13	0.14	0.23
Farm	B	-0.30	-0.20	0.09	-0.11	-0.07	0.03
	S.E.	0.34	0.18	0.15	0.13	0.16	0.27
Missing	B	-0.63	-0.02	0.31	0.22	-0.05	0.39
	S.E.	0.50	0.26	0.22	0.19	0.19	0.29
Non-intact family							
	B	0.78	0.02	-0.09	0.06	0.16	0.02
	S.E.	0.31	0.18	0.15	0.12	0.12	0.16
Number of siblings							
	B	-0.05	0.00	-0.04	-0.05	-0.07	-0.04
	S.E.	0.03	0.02	0.01	0.01	0.01	0.03
Southern origin							
	B	-0.19	-0.70	-0.26	-0.41	-0.27	-0.27
	S.E.	0.23	0.12	0.10	0.08	0.08	0.12
Farm background							
	B	-0.74	-0.40	-0.46	-0.36	-0.22	-0.11
	S.E.	0.27	0.14	0.10	0.09	0.09	0.14

Table A8, continued.

		Birth Cohort					
		1910-’19	1920-’29	1930-’39	1940-’49	1950-’59	1960-’69
Respondent’s education							
0-8 years	B	-1.31	-1.76	-1.69	-1.31	-1.81	-1.21
	S.E.	0.28	0.18	0.17	0.19	0.25	0.46
9 years	B	-0.54	-1.25	-1.13	-1.18	-0.93	-1.07
	S.E.	0.48	0.25	0.22	0.21	0.29	0.35
10 years	B	-0.36	-0.96	-0.88	-0.83	-0.36	-0.78
	S.E.	0.38	0.20	0.19	0.17	0.20	0.31
11 years	B	-0.35	-0.48	-0.66	-0.78	-0.77	-0.92
	S.E.	0.44	0.21	0.19	0.19	0.20	0.26
13 years	B	0.39	0.24	0.46	0.26	0.40	0.27
	S.E.	0.47	0.25	0.18	0.12	0.13	0.20
14 years	B	0.75	0.73	0.68	0.58	0.67	0.53
	S.E.	0.38	0.21	0.18	0.12	0.12	0.18
15 years	B	0.87	1.28	1.08	0.98	0.89	0.99
	S.E.	0.54	0.41	0.26	0.18	0.16	0.27
16 years	B	2.77	1.40	1.81	1.79	1.58	1.23
	S.E.	0.55	0.21	0.16	0.11	0.11	0.18
17 years	B	1.23	2.41	1.95	1.79	1.85	1.70
	S.E.	0.65	0.35	0.26	0.18	0.20	0.25
18 years	B	1.19	1.69	2.01	2.09	2.23	1.61
	S.E.	0.67	0.39	0.23	0.19	0.20	0.29
19-20 years	B	1.08	2.01	2.40	2.02	2.51	1.47
	S.E.	0.81	0.35	0.23	0.17	0.19	0.33

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