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Appendix A: Data and Results from the Various Studies Used in This Report

The above conclusions are, of course, based on a detailed examination of as many relevant samples as we could locate. To be relevant, a sample not only had to contain information on college attendance by IQ level, but the public record also had to contain enough data points to permit statistical investigation. In this appendix we will discuss in detail the various samples we have used and the results we obtained from each.

Since many of these studies were conducted before the Second World War and only a few of them were undertaken by economists, most contemporary economists will probably be unfamiliar with them. In addition, since these studies are conducted by different people at various times and places, there are differences in the populations sampled and in the designs of the samples. For these reasons we will have to describe each sample in some detail as we present our results.

As mentioned above, the ability measure (A) in each sample has been standardized by converting it into percentile standing based on the population of high school graduates. The education measure is the fraction of high school graduates, in any ability class, continuing to college.

Yerkes Study

The first group IQ tests were developed and used by the U.S. Army in the World War I. The Alpha version of this test was similar to tests now in use; the Beta version was designed for those who were illiterate. Robert M. Yerkes has presented much of the data on scores cross-classified by schooling, occupation, and other bases.[1] In most instances separate information is available for white native-born enlisted men, white foreign-born enlisted men, Negro enlisted men, and officers. There is evidence that the data on Negroes is affected by the cultural bias in the test. Since the same problem probably exists for the foreign

[1] The basic reference to the World War I tests is Yerkes (1921). All statements and references are from this volume unless otherwise noted. In our analysis we have used data from Tables 280, 281, and 393-395.

born, we have studied only the white native-born enlisted men and the officers. Further, we have excluded M.D.'s from the analysis since they have a lower IQ and higher educational attainment than other officers;[2] in addition, because of the nature of the army, M.D.'s are represented in the sample in a much larger proportion than in the population as a whole. We believe that this composition of the population corresponds closely to the makeup of our other samples from non-Southern states in the 1920's (except that females are excluded here).

A problem with these data is that the tests were given to people with different amounts of schooling. As noted earlier, although this method yields biased estimates, we can correct for it roughly. Another difficulty is that in order to relate schooling completed at the time of the test to IQ scores, we must assume either that all individuals had completed their schooling, or that (because of the war) everyone's recorded educational attainment was the same fraction of his final amount of schooling. These assumptions would be violated if students were allowed to volunteer for the army or if they were drafted from school. For World War I, however, Congress passed a law that specifically restricted volunteer army enlistments to one division.[3] But the enlisted men who were tested were all draftees.[4] Further, since the draft itself only applied to those 21-30 years of age, it is reasonable to assume that all precollege education was completed. Consequently, it is possible to use the sample of about 50,000 white, native-born enlisted men and 12,000 officers to study ability differences between males who enter college and males who only complete twelfth grade. It is also possible to study ability differences between these two groups and those with less than twelve years of schooling. Since the testees were between the ages of 21 and 30, they would have been born between 1887 and 1896; consequently, those who finished high school would have graduated approximately between 1905 and 1914.

Finally, when these data are grouped by occupation there is evidence that—because of draft exemptions—the people with higher IQ's in some occupations have been underrepresented.[5] Although this omission would be important if one were comparing average IQ levels by occupation, it will not affect our education-IQ estimates unless the functional relation for the excluded people differs from that of the included. There appears to be no good reason to assume such a difference exists.

[2]Compare Tables 280 and 393-395 in Yerkes (1921).

[3]See, for example, Miller (1968).

[4]The test results only apply to draftees and not pre-1917 recruits.

[5]For a discussion of revised estimates by occupation, see Bingham (1937) and Fryer (1922).

Yerkes published his data cross-classified by about 35 IQ groups and. by (completed) years of schooling ranging from 0 through 12 years of college. It is possible, therefore, to determine the specific grades in which ability becomes crucial in determining future educational attainment. We will consider this particular question shortly, but first we present the results for the percentage of high school graduates who enter college:

$$(1) \qquad A = -.52 + 1.45E_{12} \qquad \bar{R}^2 = .73$$
$$(4.1) \quad (8.4)$$

In this and subsequent equations, the definitions of the variables are:

A = the midpoint of the various IQ categories available. The categories are defined as ranges of percentiles such as 0 to 10th, or 25th to 40th percentile.

E_{12} = the fraction of high school graduates in a particular percentile range who entered college (or, in some instances, completed one year).

For each sample there are as many observations as there are IQ categories. Each number in parentheses is the ratio of the absolute value of the parameter to its standard error, while $\bar{R}^2$ is the coefficient of determination corrected for degrees of freedom. This regression, and all others given below that use grouped data, are estimated by weighting each sample point by the square root of the number of people in each ability class that contains the sample point.

The coefficient on E_{12} is about 1.5 and significant at the 1 percent level. Solving the equation for E_{12}, we find that as the percentile rank increases by one unit (e.g., 20th to 21st percentile), the percentage of high school graduates entering college rises by .70 percentage points.[6] The reciprocal of the coefficient of E will be denoted the "selectivity coefficient" in the discussions to follow.

Before considering the implications of this result two points must be acknowledged. As indicated in footnote 9 on page 14, the coefficient of 1.45 is biased upward and the bias is equal to the least squares estimate of λ in $z = \lambda E_{12} + v$. On the basis of the Learned and Wood data, we calculated λ to be about .15; therefore, our corrected estimate of the slope coefficient of E_{12} is 1.3, which has a reciprocal of .77. Thus, as a result, the selectivity after correction is even greater. As will become clear from our results for other samples and cohorts, even the selectivity coefficient of .7, which is biased downwards, is quite steep as compared with the decades immediately following.

While the estimate of the coefficient of E_{12} is biased upwards in (1), we showed earlier that the bias that would occur when A was the

[6]There is a poor fit at the very low and very high ability ranges. Consequently, the results should be used cautiously in these ranges.

independent variable could be positive or negative. Thus, it is not surprising that when we computed the comparable equation to (1), the coefficient on A was .37. In the follow-up samples presented below, where we would not expect a bias, the reciprocals of the coefficients on E are much closer to the coefficients on A.

We turn next to the results for different years of schooling. Since A refers to the percentile rank of high school graduates, it is inappropriate for scaling scores for other years of schooling. Hence, in the following equations our measure of ability is the recorded Alpha score. The results will not be directly comparable with other samples, but some intrasample conclusions can be drawn.

The method of analysis is as follows. Starting with the seventh grade we relate the mean score in each Alpha category to the percentage in each such category who continue to the next grade. For example, E_7 represents the number of people in a particular Alpha category who have an education greater than or equal to eight grades, divided by the number of people in that category who attended seven or more grades. Similarly, E_8 is equal to those in a given Alpha category with nine or more years of education divided by those with eight or more years. In general, $E_k = (\sum_{k+1}^{t} a_j) / (\sum_{k}^{t} a_j)$ where a_j is the number of people with j years of education in a given Alpha category, and t is the maximum number of years of schooling.

Since those in the age group 21-30 were subject to the draft and since college attendance did not confer a deferment, some college students may have had their recorded education terminated involuntarily; thus the equations using E_{13}, E_{14}, and E_{15} may be affected. However, this qualification presumably only applies to 21- and 22-year-olds and only to some of these; thus, our equations are probably not seriously in error. The results appear in Table 3.

Several points in the table are worthy of comment. The first point is that every estimate of b is significant at the 1 percent level. The second point concerns the pattern of the reciprocals of b, or the selectivity coefficients. Relatively little selection, or weeding-out, occurred at the end of the seventh or eleventh grades—that is, the 1/b values are .39 and .34. At the end of the eighth grade, which in many areas terminated pre-high school education, the greatest selectivity occurred—with a 1/b value of .68. Judging by the t values, this estimate of 1/b differs significantly from that for the seventh or eleventh grade. During grades nine and ten, selectivity is slightly more than for the seventh grade, but substantially less than at the entrance to high school. Upon graduation from high school, selectivity increases to a high level, second only to selectivity after the eighth grade. While the big college weeding-out process is at the stage of entering, selectivity during college remains at a substantial level. Thus the average of 1/b for grades thirteen, fourteen,

TABLE 3 **World War I regressions by grades of education completed, and average IQ by grades completed**

(Alpha = a + bE_k)

k	*b*	*1/b*	*Average alpha score*	*Number of students in average*
7	2.55 (18.7)	.39	53	7765
8	1.46 (26.4)	.68	69	14966
9	2.33 (17.4)	.43	89	4054
10	2.31 (15.9)	.43	96	3309
11	2.95 (13.0)	.34	105	2082
12	1.65 (7.9)	.61	119	3698
13	2.06 (10.2)	.49	117	1782
14	2.34 (16.8)	.43	126	2100
15	1.94 (14.8)	.52	134	2143

Note: $E_k = \sum_{k+1}^{t} a_j / \sum_{k}^{t} a_j$

where k is highest school grade completed. Data are for officers and native-born, white enlisted men. The sample size is about 50,000. Medical doctors are excluded.

and fifteen of about .47 is exceeded only by the 1/b values for the eighth and twelfth grades.

It should be recalled that the above equations will be biased because the Alpha scores are partly determined by years of schooling. But it is extremely unlikely that the bias varies enough from one year to the next to explain the differences in b for the eighth and twelfth grades, as compared with these values for grades on either side of eight and twelve.

Finally, the reader should realize that this analysis of selectivity is, in general, cumulative. That is, because attrition in each grade is related to mental ability, one would expect the average Alpha score of students who complete the eighth grade to exceed that of seventh grade students. Similarly, one would expect the scores of students who complete the ninth grade to be on the average better than those who finish the eighth grade, etc. The average Alpha scores for each grade (together with the numbers of students) can, in fact, be calculated directly from the Yerkes data and are presented in the right-hand columns of Table 3. The averages increase with grades completed, except for the thirteenth year. This means that the average ability level of those who drop out of college after one year is actually lower than the average of those who end their education after completing high school. Dropouts after two years, however, have a higher average ability than those who complete just high school. Further, although not reported here, the average ability of those with one and two years of graduate schooling is slightly below the ability level of those with four years of undergraduate schooling.

A comparable analysis cannot be carried out for World War II data. It is true that during World War II a substantial cross section of the population was in the military and was subjected to IQ testing in the form of the Army General Classification Test (A.G.C.T.). But unfortunately the data are not directly usable because the draft age was 18 and volunteers were encouraged. Indeed, the occupation of many of those who were tested was high school or college student.[7]

In addition to the data derived from the published records of the military, it is possible to obtain information on ability and education from follow-up studies. A number of these have been published in sufficient detail to permit analysis of the individual samples. We present now a discussion of these samples.

Proctor Study

As far as we have been able to determine, the earliest civilian (group) IQ test in which students were subsequently followed-up was conducted by William M. Proctor. In 1917-1918, Proctor tested about 1,600 students in San Francisco Bay Area high schools with the Army Alpha and Stanford Binet tests. His sample included male and female students enrolled in grades nine to twelve. Then, in a 1923 follow-up study, Proctor compiled the educational histories from 1917 through 1923 of a sample of 130 of the original 1,600 students.[8]

[7]See Stewart (1947).

[8]Since the students were drawn from the Stanford University area, the within-sample percentiles were not representative of the nation. Thus we used the following ability conversion procedure. We calculated the frequency distribution of high school students on the Stanford Binet from the information contained in the Benson study described below. Using this curve, we have converted the Proctor scores to a nationwide percentile basis.

The results for the 130 males and females combined are:

(2) $$A = -.39 + 1.00E_{12} \qquad \bar{R}^2 = .66$$
$$(3.1) \quad (5.6)$$

where A is IQ percentile and E_{12} is percentage of high school graduates continuing their education. The slope coefficient, which is significant at the 1 percent level, implies a selectivity coefficient of 1.0. This is similar to the Yerkes estimate of .77, which of course is only for males.

For males we have:

(3) $$A = -.24 + .73E_{12} \qquad \bar{R}^2 = .27$$
$$(1.1) \quad (2.7)$$

from which the selectivity coefficient is 1.4

For females the results are:

(4) $$A = -.20 + 1.18E_{12} \qquad \bar{R}^2 = .59$$
$$(1.4) \quad (5.1)$$

The 1923 Proctor sample is quite useful, for it is the only one available for this time period and contains separate information for males and females. However, it should be recalled that only 130 students were tested and not all of these graduated from high school. In addition, all the students lived in Palo Alto and, although we used a special conversion method because we suspected this student body to be atypical, the equations may still reflect special circumstances. First, substantial evidence exists that students from urban and rural areas have different behavior. Moreover, college attendance in this period may have been crucially related to the nearness of a college. Finally, those students whose parents taught at Stanford probably had more psychological motivation to attend college. Thus, the above equations should be treated with caution, especially since the $\bar{R}^2$ for this sample is much lower than in most others.

Benson Study

The sample obtained by Viola Benson (1942), which has been extensively and ingeniously used by Becker (1964), is very unusual, since the IQ test (Haggerty Intelligence Examination) was given to approximately 2,000 students in the *sixth* grade in Minneapolis in 1923. In 1940 Miss Benson obtained information on the subsequent educational attainment of about 1,700 of these students.[9] In her thesis (Benson, 1940), the data are presented as the number of people in a given IQ range who achieved various levels of schooling from sixth grade through PhD.[10] This sample can be used to study the relationship between ability and education for pre-high school students, as well as high school entrants and high school graduates. Since the Benson data refer to students in

[9] One was still in college at the time of the study.

[10] In her article the data are condensed to five educational attainment groups.

the sixth grade, these students would have entered high school in about 1926, or nearly a decade after those in Proctor's and up to two decades after Yerkes' sample. No separate information on males and females is available.

The education for high school graduates is:

$$(5) \qquad A = -\,.31 + 2.24E_{12} \qquad \overline{R}^2 = .77$$
$$(1.6) \quad (4.4)$$

The slope coefficient is significant at the 1 percent level. Solving the equation for E_{12}, we find that the selectivity coefficient is approximately .45. This selectivity coefficient is much lower than the estimate of .77 from Yerkes' data. Therefore, it appears that ability differences were more important in differentiating the percentage continuing to college in the early part of the century than in the 1920s.

Next we examine the data by years of schooling. Following the method used with Yerkes, we estimate equations for the fraction of students in each grade (by IQ class) who enter the next grade.[11] The equations are presented in Table 4. Since the IQ tests in Yerkes and Benson are scaled differently, it is not possible to compare the coefficients; however, the pattern of results can be compared.[12]

The greatest selectivity occurs at the end of the eighth grade (end of pre-high school education). During high school the selectivity coefficient falls from 1.2 to .2 in the eleventh grade. At the end of high school IQ becomes important in determining those who enter college, but selectivity is almost as strong during college as at the end of the twelfth grade. The Yerkes data, which refer to students educated two decades earlier, yielded strikingly similar results. There, as here, the eighth and twelfth grades were the crucial points in the selectivity process, with the selectivity coefficient being slightly larger for the eighth grade. In both samples selectivity was lowest in the eleventh grade and was also low in the seventh grade. College selectivity rates, after entrance, were substantial in both cases.

It is of some interest to examine the mean IQ of the students who terminated their education at various grades. These data are included in the right-hand columns of Table 4. Except for the eleventh and fourteenth grades (which are based on small samples) they show a continuous increase. They differ from the Yerkes data in that the average IQ of college dropouts is consistently above that of high school graduates not continuing their education.

[11] The Benson and Yerkes data differ slightly: in Benson, the students are classified by the last grade they entered; in Yerkes, the data are for the last grade completed.

[12] In addition, the Yerkes results are biased, but those from Benson are not. Moreover, Benson's data combine males and females.

TABLE 4 **Benson regressions by grades of education completed, and average IQ by grades completed**

($IQ = a + bE_k$)

k	b	$\frac{1}{b}$	*Average IQ*	*Number of students in average*
7	1.84 (5.6)	.54	99.7	127
8	.85 (2.4)	1.17	101.5	202
9	1.48 (5.6)	.67	105.9	170
10	2.02 (2.0)	.50	114.0	118
11	4.10 (3.3)	.24	111.1	45
12	1.31 (4.2)	.96	116.6	581
13	1.39 (3.8)	.71	119.1	56
14	1.17 (2.8)	.81	118.9	27
15	.95 (1.1)	1.05	122.7	11

O'Brien Study

In the early 1920s the Terman Group Test of Mental Ability was administered to more than 4,000 juniors and seniors from approximately 160 Kansas high schools. These students were followed through high school graduation, and college records of those who attended college were obtained by F. P. O'Brien (1928). Unfortunately, data are not available for girls and boys separately. The basic results for students tested in their senior year, after conversion to our standard form, are:

$$(6) \qquad A = -\underset{(3.3)}{.48} + \underset{(7.2)}{2.72}E_{12} \qquad \bar{R}^2 = .86$$

This equation is similar to that of the Benson study, suggesting a stable relationship between A and E for high school graduates of the 1920s.

Barker Study

Richard W. Barker (1937) studied 3,767 students who graduated from 148 Iowa high schools in 1934. In the fall of 1935, a questionnaire was sent to the high schools of these students to determine if they were attending college. The ability measure used was a composite measure based on all the "Iowa Every-Pupil Tests" the graduate had taken during his four years in high school. (In general 13 tests were given each year.) This composite measure was transmitted into percentile scores with the total sample as base. Data for seven ability classes are available for males and females separately. The results for the combined sample, and then for males and females separately, are:

$$(8) \qquad A = \underset{(.04)}{.05} + \underset{(4.5)}{1.87}E_{12} \qquad \bar{R}^2 = .83$$

$$(9) \qquad A = -\underset{(.5)}{.06} + \underset{(4.6)}{2.03}E_{12} \qquad \bar{R}^2 = .80$$

$$(10) \qquad A = \underset{(1.4)}{.14} + \underset{(4.3)}{1.63}E_{12} \qquad \bar{R}^2 = .75$$

Wolfle and Smith Study

In the mid 1950s, as part of a study for the Commission on Human Resources and Advanced Training, Dael Wolfle and Joseph Smith collected data on income in 1953, rank in high school class, IQ, post-high school education, and many other sociodemographic factors for some high school graduates of the 1930s. The basic data for men in summary form were published in Wolfle and Smith (1956).[13] While the original data in this study are no longer extant, Dr. Wolfle has kept extensive cross-tabulations of the information and has generously supplied us with these tabulations. Our analysis will be based on these printouts; our discussion of the data will be based on Wolfle and Smith (1956).

The samples of male and female students were drawn from Minnesota, Illinois, and Rochester, New York. We analyzed the Minnesota sample but not the other two, since they contained too few ability classes.

The Minnesota population covered every high school in Minnesota and included all graduates of 1938 who ranked in the upper 60% of their classes or who scored in the upper half of the distribution of all high school students on the American Council of Education Psychological Exam (ACE). A randomly selected sample of 10% of all 1938 Minnesota graduates was also surveyed. (ibid., p. 209).

The response rate (returned as a fraction of delivered questionnaires) for the Minnesota sample was .68. Unfortunately for our purposes here, there was a tendency for high school graduates who continued their education to respond more than proportionately as compared with those who did not continue. Consequently, in a regression of ability on

[13] These data are discussed in Anderson (1950), Anderson and Berning (1941), Becker (1964), Denison (1964), and Wolfle (1960).

education both the slope coefficient and the intercept will be biased downward.

Male high school graduates of 1938 were subject to the draft in World War II and were able to claim GI education benefits after the war. Since the literature of the 1920s and 1930s indicates that financial constraints were very important in determining the demand for college education, the GI Bill could have had substantial effects on the choice between work and college.[14] Indeed, the actual educational attainment in 1939, as presented in Anderson and Berning's initial follow-up survey, indicates that only half as many people entered college then as when Wolfle and Smith compiled their data. This result can, of course, be partially attributed to the response effect noted above.

For Minnesota we have information on the percentage of high school seniors who entered college by decile rank on the ACE exam.[15] The estimated equation is:

$$(11) \qquad A = -\underset{(7.3)}{1.10} + \underset{(10.2)}{2.36}E_{12} \qquad \bar{R}^2 = .89$$

In this equation, E_{12} is significant at the 1 percent level implying a selectivity coefficient of .42, which is very close to those estimated from the O'Brien and Benson data.

Although this equation is estimated from data that included males and females, it is possible to obtain separate information for each of the sexes. The relevant equations for males and females respectively are:

$$(12) \qquad A = -\underset{(5.3)}{1.42} + \underset{(7.1)}{2.50}E_{12} \qquad \bar{R}^2 = .83$$

$$(13) \qquad A = -\underset{(5.6)}{.97} + \underset{(8.1)}{2.41}E_{12} \qquad \bar{R}^2 = .79$$

All the equations are similar, although the intercepts differ somewhat because fewer females attend college. The equations for males can be compared with those estimated from the Yerkes and Proctor data. It appears that in the Wolfle and Smith Minnesota data the selectivity coefficient is approximately one-half to one-third as large as for these earlier studies.

Phearman Study

In 1946-1947, L. T. Phearman (1948) compared Iowa high school graduates who entered college with those who did not. His sample consisted of 2,616 high school seniors from 192 Iowa schools that were selected as representative of the various sizes of schools in the state. The ability measure used was the percentile rank on the "Iowa Tests of Educa-

[14] See, for example, Goetsch (1940).

[15] Following the usual census procedure, we have excluded vocational training from college education.

tional Development" that the students took in the fall of 1946. Attendance or nonattendance at college was verified in the fall of 1947 by follow-up letters to both the students and high school principals. The results for the combined sample, and separately for males and then females, are:

$$\text{(18)}\quad A = .09 + \underset{(1.3)\quad(7.3)}{1.42E_{12}} \qquad \bar{R}^2 = .78$$

$$\text{(19)}\quad A = .14 + \underset{(2.1)\quad(6.8)}{1.26E_{12}} \qquad \bar{R}^2 = .75$$

$$\text{(20)}\quad A = .04 + \underset{(.6)\quad(7.2)}{1.55E_{12}} \qquad \bar{R}^2 = .77$$

The coefficients are considerably lower than those of the earlier studies, suggesting the possibility of a significant change in the selectivity coefficient from the prewar to the postwar period. Several studies undertaken in the 1950s, analyzed in detail below, support this view and indicate that more change occurred in the 1950s.

Berdie Studies

In 1950, R. Berdie (1954) studied the post-high school *plans* of over 90 percent of Minnesota's high school seniors in public and private schools. Test scores on the ACE (1947 form) college aptitude test and rank in class were available for all students. A follow-up study one year after these students graduated revealed the extent to which their plans were fulfilled. Berdie reports, "although many students changed their plans, the overall proportions of students actually pursuing the various plans were close to the proportions of those who had chosen these plans the year before" (ibid., p. 64). Of the students who said they were planning on attending college, 84 percent actually entered. A further follow-up study of this group in 1954 by Corcoran and Keller (1957) provided additional information. In particular, it contained a comparison of college plans and actual college attendance by ability levels. Their tables indicate that for each of the IQ classes the fraction of students planning to attend college is nearly identical with the fraction actually attending. In view of this result, we have used the percentage planning to continue at each ability level from the original 1950 study as an estimate of those actually continuing.[16]

In 1961, Berdie and A. Hood (1963) conducted another study similar to that of 1950. For most students the Minnesota Scholastic Aptitude test score was available—having been administered during the winter of the junior year in high school. Students' post-high school plans were

[16]The original study is used because it provides twice as many IQ classes as the Corcoran and Keller study.

elicited through use of a questionnaire completed in the senior year by 97 percent of all graduating seniors in Minnesota.

In the spring of 1962 a follow-up letter sent to a random sample of students revealed that approximately 92 percent of those who planned to attend college actually were doing so one year later. In view of this result, we have used the data on college plans by ability level to reflect actual attendance.

We consider first the results for students who graduated from high school in 1950. Our equation for male and female graduates combined is:[17]

(21) $A = -.14 + 1.61E_{12}$ $\bar{R}^2 = .98$
$\quad(3.7)\ (18.6)$

E_{12} is significant at the 1 percent level, yielding a selectivity coefficient of .62.[18] This estimate is substantially different from those of the O'Brien, Benson, and Wolfle and Smith Minnesota studies, but not from the Barker and Phearman studies. The separate equations for males and females respectively are:

(22) $A = -.15 + 1.49E_{12}$ $\bar{R}^2 = .98$
$\quad(4.2)\ (20.1)$

(23) $A = -.14 + 1.76E_{12}$ $\bar{R}^2 = .98$
$\quad(3.3)\ (16.2)$

The Berdie and Hood data on college plans in 1961, which we treat as comparable with our other information, yield for males and females combined:[19]

(24) $A = -.03 + 1.29E_{12}$ $\bar{R}^2 = .98$
$\quad(.89)\ (20.8)$

E_{12} is significant at the 1 percent level, and the selectivity coefficient is higher than the one estimated from the earlier Berdie study. The separate equations for males and females respectively are:

(25) $A = -.05 + 1.23E_{12}$ $\bar{R}^2 = .98$
$\quad(1.7)\ (21.7)$

(26) $A = -.00 + 1.37E_{12}$ $\bar{R}^2 = .98$
$\quad(.05)\ (19.8)$

[17] The nonlinear form of this equation with E_{12} as the dependent variable, which was used in the "loss of talent" discussion above (Figure 2), is:

$E_{12} = .16 + .21A + .38A^2$ $\bar{R}^2 = .99$
$\quad(8.8)\ (2.4)\ (4.6)$

[18] The results using the Corcoran and Keller follow-up are almost identical—the coefficient of E_{12} is 1.66.

[19] The nonlinear form is:

$E_{12} = .09 + .36A + .40A^2$ $\bar{R}^2 = .99$
$\quad(12.7)\ (10.5)\ (12.0)$

This pattern of results is the same as for the 1950 study in that the slope coefficient is higher for females than males, with the combined result in between.

Assuming for the moment that Minnesota is typical of the 1950-1960 era, we can draw the following conclusions. First, selectivity coefficients are greater in this era than in the 1920s or 1930s. Second, it appears that between 1950 and 1961 the coefficient increased by a statistically significant amount.

The extent to which Minnesota is typical of the nation can be gauged on the basis of results for other states, or for the country as a whole. The results we will present shortly strongly resemble the Minnesota equations. It is also useful to note that the Benson study was drawn from Minneapolis, and the Wolfle and Smith data were from Minnesota. While the relevant factors that affect the ability-education relation in one state vis-a-vis another state could change over time, a comparison of the various Minnesota studies is probably meaningful.

Little Study

J. Kenneth Little (1958) has analyzed the students at Wisconsin high schools who were seniors during the academic year 1956-1957. In the spring of 1957 approximately 95 percent of Wisconsin's high school seniors filled out questionnaires that included information on their plans beyond high school. The class rank and percentile scores on the Henmon-Nelson Tests of Mental Ability were obtained for most graduates. In the fall of 1957 a questionnaire was sent to the parents of approximately one-sixth of the graduates from each school. This sample indicated that 90 percent of the seniors who planned to attend college were actually enrolled. We have used these data on educational plans to obtain the following results for the IQ deciles for males and females combined:[20]

(29) $A = .04 + 1.55E_{12}$ $\bar{R}^2 = .95$
$(.9)\ (13.1)$

The coefficient of E_{12} lies between the Berdie estimates for 1950 and 1961, as we would have expected. The results, respectively, for males and females are:

(30) $A = .02 + 1.44E_{12}$ $\bar{R}^2 = .96$
$(.6)\ (15.3)$

(31) $A = .05 + 1.74E_{12}$ $\bar{R}^2 = .94$
$(1.1)\ (12.3)$

[20] The nonlinear form is:

$E_{12} = .06 + .19A + .42A^2$ $\bar{R}^2 = .98$
$(2.3)\ (1.6)\ (3.6)$

This pattern of results agrees with those of the Phearman and the Berdie studies in that the slope coefficient is smallest for males and largest for females.

Project Talent Study

In 1959 a massive attempt to collect and analyze nationwide educational and mental ability data on students was begun. A great deal of socioeconomic and mental ability data on students in different grades has been collected by Project Talent (1964). Of particular interest to us are those students who graduated from high school in 1960. Approximately 88,000 were sent questionnaires one year later in an attempt to determine, among other things, whether they were or had been in college. About 70 percent of the students responded. To eliminate nonresponse bias, a random sample of 5 percent of those who did not reply were located by other means, and this group was used to represent the nonresponders.

The results for the combined sample, and then for males and females separately, are:[21]

(33) $A = -.03 + 1.17E_{12}$ $\quad \bar{R}^2 = .95$
$\qquad (1.1)\ (20.0)$

(34) $A = -.11 + 1.18E_{12}$ $\quad \bar{R}^2 = .99$
$\qquad (7.2)\ (44.9)$

(35) $A = -.02 + 1.17E_{12}$ $\quad \bar{R}^2 = .90$
$\qquad (.6)\ (14.4)$

These results are very similar to those of the 1961 Berdie study.

[21] The nonlinear form is:

$E_{12} = .14 + .26A + .57A^2$ $\quad \bar{R}^2 = .99$
$\qquad (20.9)\ (8.3)\ (19.4)$