

This PDF is a selection from an out-of-print volume from the National Bureau of Economic Research

Volume Title: Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education, 2nd ed.

Volume Author/Editor: Gary S. Becker

Volume Publisher: NBER

Volume ISBN: 0-226-04109-3

Volume URL: <http://www.nber.org/books/beck75-1>

Publication Date: 1975

Chapter Title: Rates of Return from High School Education and Trends over Time

Chapter Author: Gary S. Becker

Chapter URL: <http://www.nber.org/chapters/c3737>

Chapter pages in book: (p. 201 - 213)

## CHAPTER VI

### *Rates of Return from High School Education and Trends over Time*

The first section of this chapter investigates the effect of high-school education on earnings and productivity; the second investigates changes over time in the economic effects of higher education. The first considers the effect of differential ability on the apparently large rate of return from high school and thus on the apparently "decreasing returns" to additional years of schooling; the second considers whether the rapid secular increase in the number of high-school and college graduates in the United States has been accompanied by a secular decline in their rates of return.

#### **1. The Rate of Return from High School Education**

Rates of return were computed for the 1939 cohort of urban, native white, male high-school graduates and the 1949 cohort of all white male graduates using Census data and adjustments similar to those made for college graduates.<sup>1</sup> The best single private estimates, unadjusted for differential ability, average about 18 per cent, being 16 and

<sup>1</sup> See section 1 of Chapter IV and Appendix A.

20 per cent for the 1939 and 1949 cohorts, respectively. These are several percentage points greater than the corresponding estimates for college graduates.

TABLE 13

## Average IQ at Several Educational Levels

<i>Educational Level</i>	<i>Average IQ</i>
High-school graduates	112.0
High-school dropouts	98.0
7-8 years of schooling	84.9

Source: Estimated from President's Commission on Higher Education, *Higher Education for American Democracy*, Washington, 1947, Volume VI, Table 11, p. 11. The data compiled by V. Benson give very similar results (see her "The Intelligence and Later Scholastic Success of Sixth Grade Pupils," *School and Society*, February 1942, p. 165, Table 1). Her data are especially interesting because the subsequent education of children given IQ tests in the sixth grade was determined. Therefore, the positive relation between IQ and education in her study cannot be considered a consequence of the education itself.

Table 13 suggests that the ability of high-school and elementary-school graduates differs considerably: the average IQ of high-school graduates is more than 30 per cent higher than that of persons with seven or eight years of schooling. A correction for differential ability might well have a larger effect on the estimated rate of return to high-school than to college graduates since the average IQ of the latter is only about 12 per cent higher (see Table 5). Unfortunately, adjusted high-school rates cannot be estimated very easily. For example, the unadjusted rate of return to high-school dropouts cannot be used because Table 13 indicates that their IQ is also much greater than that of elementary-school graduates; some confirmation is given by the fact that their unadjusted rate is only slightly below that to graduates.

Two estimates are available. Morgan and David have adjusted crude earnings differentials for father's education, personality, and

several other variables.<sup>2</sup> The adjusted differential between high-school and elementary-school graduates is 64 per cent of the unadjusted differentials at ages 18 to 34 and 40 per cent at ages 35 to 74, while these ratios were 60 and 88 per cent between college and high-school graduates.<sup>3</sup> Thus their adjustments generally reduce the apparent gain from a high-school education by more than that from a college education.

A similar conclusion emerges from the study cited earlier of differentials between brothers.<sup>4</sup> Brothers averaging 11.8 years of schooling earned about \$111 more (in 1939 prices) for each additional year of schooling than those averaging 8.9 years. This was about 73 per cent of the crude and 62 per cent of the corrected gains for high-school graduates of the same age in 1939.<sup>5</sup> Corresponding percentages for college graduates were 81 and 67.

The unadjusted rate of return to white male high-school graduates is greater than that to college graduates,<sup>6</sup> and the unadjusted rate to elementary-school graduates would be still greater. Such evidence might well suggest "diminishing returns" or "diminishing marginal product" from additional years of schooling. Adjustments for differential ability, however, seem to reduce the apparent rate more to high-school than to college graduates, and, I may add, probably still more to elementary-school graduates. So the appearance of diminish-

<sup>2</sup> See the full description in section 2 of Chapter IV.

<sup>3</sup> In line with the above expectation, the crude differential between high-school dropouts and elementary-school persons was not unaffected but was reduced by more than 60 per cent at ages 35 to 74 (computed from their Table III in "Education and Income," *Quarterly Journal of Economics*, August 1963; it was, however, increased slightly at the younger ages). One should point out, however, that the crude differentials between high-school graduates, dropouts, and elementary-school graduates are probably significantly understated in their survey. For example, they find that the present values of the earnings of white male nonfarmer high-school graduates and dropouts are about equal when only a 4 per cent interest rate is used, and dropouts actually earn more than graduates at ages 18 to 35 (see *ibid.*, Table IV). Yet not only the Census data but also other quantitative evidence (see, e.g., *School and Early Employment Experience of Youth*, Department of Labor, Bulletin 1277, Washington, 1960, pp. 32-33) and general observations suggest that the relative earnings of graduates are much larger than that.

<sup>4</sup> Donald E. Gorseline, *The Effects of Schooling upon Income*, Bloomington, 1932. See section 2 of Chapter IV for a discussion of this study.

<sup>5</sup> The brothers with higher and lower educations averaged about 43 and 44 years old, respectively (*ibid.*). Earning differentials between them were compared to differentials in 1939 between persons aged 35 to 44 and 45 to 54, and a simple average taken.

<sup>6</sup> However, as indicated in the discussion in Chapter IV, section 3, the results are different for nonwhites: for example, the unadjusted rate of return to southern, male, nonwhite high-school graduates in 1939 is a few percentage points lower than that to college graduates.

ing returns results at least in part from the nature of the correlation between ability and education. Fully adjusted rates, therefore, might show no diminishing returns and might even show "increasing returns" to additional years of schooling.

The very rapid secular growth in high-school education in the United States (see Table 14) may in the first place be mostly due to

TABLE 14

Investment in High School Education, College Education,  
and Physical Capital, 1900-1956  
(current prices)

	<i>Per Cent of 17-Year-Olds with 12 Years of Schooling (1)</i>	<i>Rate of Total Investment in High School to Gross Physical Investment (2)</i>	<i>Ratio of Fore- gone Earnings in High School to Gross Physi- cal Investment (3)</i>	<i>Ratio of Investment in High School to Investment in College (4)</i>
1900	6.4	.021	.015	.900
1920	16.8	.041	.030	1.575
1930	29.0	.124	.071	1.625
1940	50.8	.146	.084	1.789
1950	59.0	.107	.066	1.033
1956	62.3	.133	.080	1.105

Source: Column 1: *Historical Statistics of the United States, Colonial Times to 1957*, Washington, 1960, Series H223-233, p. 207; numerators in other columns from T. W. Schultz, "Capital Formation by Education," *Journal of Political Economy*, December 1960, Table 5; denominators from sources given in Table 12.

compulsory school laws but is probably ultimately more directly related to anticipated private and social real rates of return. Evidence has already been presented indicating that the unadjusted private money rate of return to high-school education is very large, and although the adjusted rate may be much lower, it too is probably considerable. A first approximation to the unadjusted social money rate can be found by relating before-tax earning differentials to total costs: it is only slightly lower than the private rate for white males because differential tax payments almost offset public costs. The true social rate, moreover, would be much larger still if high-school education made an important contribution to the residual advance in knowledge (see the discussion in section 2 of Chapter V). So both the

private and social rates of return seem sufficient to justify the large expansion of high-school education.

## 2. Trends in Rates of Return

Many issues of current importance depend on the secular trends in rates of return from education. For example, youngsters are now being exhorted to finish high school and even college partly because of a belief that relatively unskilled and uneducated persons are becoming increasingly obsolete in the American economy. This belief presumes that advances in technology have raised the gains from high-school and college education, especially since World War II, and perhaps even for a much longer period. On the other hand, economists have frequently alleged that the secular increase in the relative supply of more educated persons in the United States and elsewhere has reduced and will continue to reduce the gains from education.<sup>7</sup> In this section I try to provide some very preliminary answers to such questions by bringing together readily available evidence on secular trends.

### *After 1939*

Column 1 of Table 15 provides estimated private rates of return, unadjusted for differential ability, to college graduates in 1939, 1949, 1956, 1958, 1959, and 1961. The estimates for 1939 and 1949 were computed from data in the 1940 and 1950 Census and presented in Chapter IV. Although from a common source, they are not strictly comparable since the 1940 Census gave the earnings of urban native white males, whereas the 1950 Census gave the incomes of all white males. The estimates for 1956 and 1958 are based on the incomes of all males rather than whites alone as in 1949; more importantly, they were collected in surveys that often give considerably different results from those obtained in the Census. The entries for 1959 are rough estimates based simply on comparisons between mean income differentials computed from the 1960 Census and from the 1958 survey for all males over age 25. The entries for 1961 are based on similar comparisons between median differentials at different age classes. A fuller treatment of the 1960 Census materials and the 1961 survey is cer-

<sup>7</sup> A forceful argument along these lines even in the context of the early postwar period can be found in S. Harris, *How Shall We Pay for Education?*, New York, 1948, pp. 61-72. For an earlier statement, see A. G. B. Fisher, "Education and Relative Wage Rates," *International Labour Review*, June 1932.

TABLE 15

Private Rates of Return from College  
and High School Education  
for Selected Years since 1939  
(per cent)

Year of Cohort	College Graduates (1)	High School Graduates (2)
1939	14.5	16
1949	13+	20
1956	12.4	25
1958	14.8	28
1959	} slightly higher than in 1958	
1961		

Source: For 1939, 1949, 1956, and 1958, see Appendix A. For 1959, see *U.S. Summary Detailed Characteristics*, U.S. Census of Population, Table 223; for 1961, see *Income of Families and Persons in the United States, 1961*, Current Population Reports, p. 60, No. 39, Table 28.

The 1959 estimates were based simply on a comparison of the differences between the mean incomes of all males of 25 and over in 1958 and 1959. Differentials between college and high-school graduates were higher in 1959 by 7 per cent and between the latter and elementary-school graduates by 11 per cent. Costs apparently rose by a slightly smaller amount during the same period. The 1961 estimates were based on comparisons of median income differentials at various ages in 1958 and 1961. They were generally higher in 1961, again by amounts probably slightly in excess of the rise in costs during the same three years. More precise comparisons may change these estimates somewhat, probably not much.

tainly warranted as more information on costs and incomes becomes available.

The rate of return apparently declined about 1.5 percentage points from 1939 to 1949 and then rose again in the late 1950s. Although these variations can hardly be considered statistically significant given the differences and errors in the basic data, the decline from 1939 to 1949 is consistent with extensive evidence of a general narrowing of

skill differentials during the 1940s, and the rise from 1949 is consistent with the slight general widening during the 1950s. There apparently has been little net change in the private rate of return to male college graduates during the twenty-three years as a whole.

Private rates of return to high-school graduates for the same years are shown in column 2.<sup>8</sup> In contrast with the rates for college graduates, these rose throughout the period, by 4 points from 1939 to 1949, and by a whopping 8 points after 1949, so there was about a 12 point increase during the twenty-three years as a whole. Apparently, the economic position of high-school graduates remained about the same relative to college graduates and increased substantially relative to elementary-school graduates. Note, however, that since the rates in Table 15 are unadjusted for differential ability, the true rates would have moved differently since 1939 if the correlation between ability and education changed. One might well believe that the differential ability of high-school graduates rose over time because now only the physically handicapped, dullards, or least motivated persons fail to go to high school. Although this might explain the large rise in the unadjusted gain from high school, note that Morgan and David actually find a larger ratio of adjusted to unadjusted earnings differentials between high-school and elementary-school graduates at younger than at older ages. The ratios between college and high-school graduates, on the other hand, are smaller at younger ages.<sup>9</sup>

The movements in rates since 1939 were the net result of several changes with different effects. The substantial advance in technology and knowledge would tend to increase rates of return on education, even if the advance was "neutral" and did not change percentage differentials (see my argument in Chapter III, section 2), and even if the advance was itself an effect of education. Demand for well-educated persons has also risen since 1939 because of a shift in government and business toward complicated military hardware and systematic research.

On the other hand, a growth in the relative number of highly educated persons would, by itself, reduce rates of return on education. Table 16 indicates that the number of college and high-school graduates has increased at about the same rate since 1939, so there is apparently little reason from the supply side to expect much decline

<sup>8</sup> Since nonwhites are concentrated at lower educational levels, the last four estimates would be biased more when comparing rates of return from high school than from college. Comparisons made with the 1950 Census data indicate, however, that only a small upward bias could have resulted from including nonwhites.

<sup>9</sup> Computed from *Quarterly Journal of Economics*, August 1963, Table III.

TABLE 16

Percentage of Population  
with High School and College Education  
in 1940, 1950, and 1957

<i>Year</i>	<i>High School Graduates</i>	<i>College Graduates</i>
1940	12	5
1950	18	7
1957	22	9

Source: H. Miller, "Annual and Lifetime Income in Relation to Education, 1939-1959," *American Economic Review*, December 1960, Table 2.

in percentage earning differentials between them. Yet these changes in supply would produce a decline in the rate of return from college education. For the earnings of college and high-school graduates would decline relative to less-educated persons, and thus absolute earning differentials between college and high-school graduates would decline even if percentage differentials were unchanged. And a decline in absolute differentials would lower the rate of return from college unless costs declined by an equal amount. Once again a change in percentage differentials gives a wrong picture even of the direction of change in rates of return.

A decrease in mortality would by itself—the earnings of survivors taken as given—increase rates of return (see Chapter III, section 2). Mortality among white adults was already so low in 1939, however, that subsequent decreases could only increase rates by a minor amount. To illustrate, suppose that no member of the 1939 cohorts ever died, and that earnings beyond age 64 rose at a rate of 2 per cent per year. The rate of return to white males in 1939 would have been less than one-half of a percentage point above the rate computed with 1940 mortality conditions.

If adjusted rates behaved similarly to unadjusted ones, the rate of return from college did not change on balance and that from high school increased substantially after 1939. Therefore, advances in technology and other forces increasing the demand for educated persons must have offset the increase in college graduates and more than offset the increase in high-school graduates. Consequently, technological

advance and other changes apparently increased the demand for high-school graduates more than that for college graduates.

*Before 1939*

The growth in technology, shifts in demand, decline in mortality, growth in education, etc., clearly may not have occurred at the same rate in the early part of the century as they did subsequently. About technology and demand shifts, little can be said.<sup>10</sup> Mortality, however, definitely declined more rapidly in the early part of the century. For example, if the mortality of white males in 1901 had prevailed in 1939, rates of return to college and high-school education would have been about three-fifths of a percentage point lower than they were with 1939 mortality.

Although the relative number of both high-school and college graduates increased substantially before 1939, the former probably increased more rapidly. Supply changes alone, therefore, would produce a greater decline in the rate of return to high-school than to college graduates. Indeed, they would have *increased* the rate to college graduates if a widening percentage differential between college and high-school earnings more than offset a decline in the earnings of both relative to less-educated persons.<sup>11</sup>

Quantitative information before 1939 is extremely scanty and unreliable, and Tables 17 and 18 summarize the little information available. Table 17 presents absolute income differentials in both current and 1958 dollars between college and high-school graduates at scattered dates, while Table 18 presents similar differentials between high-school and elementary-school graduates. According to the 1926 survey,<sup>12</sup> real absolute differentials between college and high-school graduates declined substantially from the 1920s to the 1950s. Since real costs rose during this period, rates of return to college would have declined even more.<sup>13</sup> According to the same survey, however, real

<sup>10</sup> Denison's calculations suggest greater technological progress since the late 1920s only if Department of Commerce rather than Kendrick-Kuznets estimates of national product are used (see his *Sources of Economic Growth in the United States*, New York, 1962, p. 269).

<sup>11</sup> Note that once again a widening percentage differential may be consistent with a declining rate of return even if costs were unchanged.

<sup>12</sup> Everett W. Lord, *The Relation of Education to Income*, Indianapolis, 1928.

<sup>13</sup> These data constitute Renshaw's principal evidence of secular decline in rates of return from college education (see "Estimating the Returns to Education," *Review of Economics and Statistics*, August 1960, p. 322).

TABLE 17

Income Differentials between College and High School Graduates  
at Various Ages and for Scattered Years since 1904  
in Current and 1958 Dollars

Age	1904 Mean Earnings		1926 Median Incomes		1927 Mean Incomes		1956-1958 (current dollars)	
	Current Dollars (1)	1958 Dollars (2)	Current Dollars (3)	1958 Dollars (4)	Current Dollars (5)	1958 Dollars (6)	Mean Incomes (7)	Median Incomes (8)
25-34	—	—	1146	1870	834	1361	1915	1127
32	936	3019	—	—	—	—	—	—
30-34	—	—	1465	2390	—	—	1438	—
35-44	—	—	2821	4602	—	—	4068	2478

Source: Column 1: J. M. Dodge, "The Money Value of Technical Training," *Transactions of the American Society of Mechanical Engineers*, Vol. 25, 1904. Column 3: Lord, *Relation of Education and Income*. Column 5: Gorseline, *Effect of Schooling*. Column 7: Miller in *American Economic Review*, December 1960, Table 1, p. 965.

differentials between high-school and elementary-school graduates<sup>14</sup> widened greatly during the same period. These data do not necessarily imply, therefore, that rates of return to high-school graduates declined during the last thirty years.

While rates of return from college education may have greatly declined at the same time that rates from high school declined much less, if at all, the accuracy and comparability with later data of the 1926 survey are subject to doubt. For one thing, questionnaires were sent out through a single fraternity, and the response rate was low (about 50 per cent). Only 1750 persons in the final sample were college graduates, and many were business majors. Moreover, the differentials between high-school and elementary-school graduates seem unbelievably small compared to those between college and high-school graduates.

Several persons around the turn of the century studied the effect of education on incomes in a few cities, companies, specialties, or schools. They found much larger differentials between college, high-school, and elementary-school graduates than are found today (see Tables 17

<sup>14</sup> The survey clearly overstates these differentials because all persons with at least eight years of schooling are lumped together in the category I call "elementary-school graduates."

TABLE 18  
Income Differentials between High School and Elementary School Graduates at Various Ages  
and for Scattered Years since 1900 in Current and 1958 Dollars

Age	1900-1906 Mean Earnings		1908 Mean Earnings		1927 Mean Incomes		1956-1958 Mean Incomes, 1958 Dollars		1926 Median Incomes		1956-1958 Median Incomes, 1958 Dollars	
	Current Dollars (1)	1958 Dollars (2)	Current Dollars (3)	1958 Dollars (4)	Current Dollars (5)	1958 Dollars (6)	Mean 1958 Dollars (7)	Mean 1958 Dollars (7)	Current Dollars (8)	1958 Dollars (9)	Current Dollars (8)	1958 Dollars (9)
20	300	980	275	862	—	—	—	—	—	—	—	—
21	425	1389	—	—	—	—	—	—	—	—	—	—
22	500	1634	425	1332	—	—	—	—	—	—	—	—
23	500	1634	—	—	—	—	—	—	—	—	—	—
24	625	2042	500	1724	—	—	—	—	—	—	—	—
25	900	2941	862	2702	—	—	—	—	—	—	—	—
25-34	494	1614	—	—	—	—	1222	1222	316	515	316	1616
35-44	722	2359	—	—	—	—	1724	1724	866	1413	866	1785
45-54	—	—	—	—	403	658	—	—	—	—	—	—

Source: Columns 1, 3: A. C. Ellis, *The Money Value of Education*, U.S. Office of Education Bulletin 22, Washington, 1917.  
Column 5: Gorseline, *Effects of Schooling*, Table XXXIV, p. 113. Columns 7, 10: Miller in *American Economic Review*, December 1960,  
Table 1, p. 965. Column 8: Lord, *Relation of Education and Income*, p. 8.

and 18). Since the real costs of schooling rose rapidly over time,<sup>15</sup> this evidence suggests a large decline in rates of return to both high-school and college education.

If the data before 1940 can be considered representative, which is questionable, rates of return on both high-school and college education declined rather significantly during the first forty years of the century, and then stopped declining and even rose during the next twenty years. Since at least the relative number of college graduates increased more rapidly after 1940 and since mortality declined more rapidly before, these very different trends would probably be explained by less rapid shifts in the demand for educated persons during the earlier period: advances in knowledge and shifts in demand for final products may have been less favorable to educated persons then.<sup>16</sup> This conclusion is sufficiently important that much more attention should be paid to the historical evidence.<sup>17</sup>

One can also learn much from comparisons of different countries. A particularly good example of an "autonomous" increase in the supply of higher education is provided by the influx of well-educated European Jews into Palestine during the twenties and thirties, an influx motivated by religious and cultural considerations, not by any economic demand for well-educated persons. The influx should have lowered the return to higher education, and recent evidence indicates private rates of return in Israel during the fifties of only about 6 and 9 per cent for high-school graduates and college persons, respectively.<sup>18</sup> An equally autonomous change has been the large-scale immigration of low-educated African and Asian Jews to Israel after its birth in 1948. This

<sup>15</sup> Total costs per student in 1947-1949 dollars were as follows in 1900 and 1950:

	<i>High School</i>	<i>College</i>
1900	320	1050
1950	1035	2415

See Schultz in *Journal of Political Economy*, December 1960, Tables 5 through 7. His figures were converted from current to 1947-1949 dollars with the Consumer Price Index.

<sup>16</sup> Historians usually do assume that the technological improvements accompanying the industrial revolution reduced the relative demand for highly skilled persons.

<sup>17</sup> Albert Fishlow has, in fact, studied the historical trends in the demand for and supply of educated persons in the United States. See his "Levels of Nineteenth-Century American Investment in Education," *Journal of Economic History*, 26, December 1966, pp. 418-436, as well as his "The American Common School Revival: Fact or Fallacy?" in H. Rosovsky, ed., *Industrialization in Two Systems: Essays in Honor of Alexander Gerschenkron*, New York, 1966.

<sup>18</sup> See R. Klinov-Malul, "The Profitability of Investment in Education in Israel," unpublished Ph.D. dissertation, Hebrew University, 1964, Chapter 3.

change should have increased the return to higher education, and, notwithstanding the equalitarian tradition in Israel, there is clear evidence of a significant increase after 1948.<sup>19</sup>

<sup>19</sup> See *ibid.*, Chapter 4; also V. Bahral, *The Effect of Mass Immigration on Wages in Israel* (mimeographed), Falk Project for Economic Research in Israel, 1962.