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MOVEMENTS IN THE EARNINGS-

SCHOOLING RELATIONSHIP

1940-1988

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# MOVEMENTS IN THE EARNINGS-SCHOOLING RELATIONSHIP

## 1940-1988

by

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# Abstract

This study estimates the earnings differential between college and high school graduates, denoted as the college earnings premium, from 1940 to 1988. The average measured premium exhibits a decline in the 1940s, gradual increases in the 1950s and 1960s, a decline in the 1970s and a rise in the 1980s for younger male workers and most female workers. Overall the results indicate that this differential has remained relatively high during this period, even given the concurrent increase in the supply of college graduates. As a result, estimates in the expected trend in the college earnings premium based on relatively short time periods are likely to be misleading. Although the data is not well suited to explaining the observed fluctuations in the college earnings premium, some support is given to the hypotheses that cohort size and the business cycle can influence it.

# I. Introduction

Soon after Schultz (1961), Becker (1962), and Mincer (1958) developed a foundation for the earnings-schooling relationship that was well integrated into conventional economic analysis, it was found that the monetary returns to additional schooling were declining over time. The college earnings premium paid to new entrants into the work force in the 1970s appeared to be considerably lower than that paid in the 1960s and this led to talk of a problem of "overeducation". The implicit concern was that, at long last, the increasing supply of educated labor in the United States was leading to a decline in the returns to schooling and that the 1970s represented the beginning of along downward trend. My analysis shows this concern to be unfounded.

In fact, during the 1980s a dramatic reversal of this decline in the college premium has occurred. What once had the appearance of a downward trend now looks more like a cycle. The natural questions prompted by these developments over the past twenty years are whether such fluctuations have occurred in previous decades and, if so, why. The simple problem in answering these questions is that, at present, the facts on the returns to schooling are not know with confidence over a sufficiently long time period. Some work by Becker (1964) and Miller (1960) studied the earnings-schooling relationship in the 1940s and 1950s. However, only grouped data were available so that comparing these results with later results based on individuals is difficult.

The primary goal of this study is to supply the basic facts on the earnings-schooling relationship over a relatively long time period, namely 1940 to 1988. The analysis confirms the previous results for the 1970s and 1980s, as discussed above, and also shows that fluctuations have occurred in earlier periods. Namely, the college premium exhibits a large decline during the 1940s and subsequently recovers during the 1950s and 1960s. Overall, no downward

trend in the premium exists even with the large increases in the numbers of individuals receiving college degrees in the past 50 years. This largely dispels the notion that the United States has become overeducated.

Although the data is not well suited to explain the observed movements in the relationship between schooling and earnings, various hypotheses which have been suggested previously in the literature are tested to determine if they can explain the observed fluctuations. Some support is lent to the hypotheses that cohort size and business cycles play a role in determining the fluctuations in the return to a college degree.

## II. Data and Methods

### A. Data

Measures of the earnings-schooling relationship are estimated using the 1940-1980 public-use microdata files from the decennial census.[1] This data set provides large samples for each year as well as fairly consistent collecting and reporting techniques across years.[2] The major limitation of this data set is that time observations occur every ten years. Therefore, only broad trends can be analyzed In addition, the March 1988 Current Population Survey (CPS) is used in order to provide some sense of what has occurred during the 1980s. Because census and CPS data are not strictly comparable, estimates from the 1980 CPS

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[1] The 1/1000 samples for the 1960, 1970 and 1980 censuses are used. For blacks and for certain occupational and industrial measures, I use the 1/100 sample. The 1940 and 1950 1/100 sample is broken up into 20 random subsamples, for 1940 I use 3 subsamples for whites and 9 for blacks and for 1950 I use seven for the all subgroups.

[2] Some important variations do occur. Certain information in 1950 is only reported for randomly selected "sample line" individuals and only households with a "sample line" person in them are reported in the microdata files. Therefore, it is difficult to know if in fact the samples are random. Other major changes include difference in imputation methods for income when it is not known, changes if the codings of hours, weeks and industrial and occupational classifications and in 1950 a different top coding for years of schooling completed so that it is impossible to distinguish between 16 and 17 or more years of schooling.

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are also included in order to calculate changes during the 1980s.[3] The sample used in this study is restricted to individuals in the civilian work force with positive earnings, between 16 and 64 years old and not currently attending school.[4]

The mean of earnings for white men, white women, black men and black women and their schooling distributions are presented in Appendix A.[5] Generally, years of schooling have increased demonstrated both from the decreasing percentage of high school dropouts (0-11 years of schooling) and the increasing percentage of college graduates (16 or more years of schooling).[6] These results show increases in the real earnings of all groups from 1940 to 1970, a decline in real income in the 1970s, especially for lower educated individuals, and little change during the 1980s.[7] These results also confirm that individuals with greater levels of schooling earn more.

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[3] Although in theory, CPS and census data from the same year should be random samples from the same population, in fact the sample means can be quite different. This is due in large part to differences in collection techniques and ability to check data.

[4] Some other restrictions from census data may also effect the estimation. Earnings above a certain level are not reported specifically. Therefore, it is necessary to assign earnings for these individuals. The earnings bound is assigned as the earnings value for individuals in the truncated class. The earnings bounds are: (1) 1940 = 5,000, (2) 1950 = 10,000, (3) 1960 = 25,000, (4) 1970 = 50,000, (5) 1980 = 85,000 and (6) 1980 and 1988 CPS = 99,999. In the 1940 census, only wage and salary earnings are reported without indicating if any self-employment income exists as well. For consistency, earnings are included in the same manner for the other censuses.

[5] Earnings refers to wage and salary income excluding self-employment income. Earnings are reported in the year previous to the census or CPS, i.e. 1939 for the 1940 census, but I report everything in the census or CPS year for ease of presentation.

[6] I also estimate the schooling distributions within experience classes to determine if the trends vary by the age of the workers. For whites, newer entrants into the labor market have increasing years of schooling until 1970 and then the distribution remains fairly constant. The years of schooling continue to increase for older workers. This implies that the increases in years of schooling for the overall sample result from older less educated workers leaving the market rather than increases in educational attainment by new workers.

[7] Earnings are deflated by the CPI where 1985 is the base year.

*B. Methods*

The means reported above clearly show that more schooling is associated with higher earnings and that this relationship varies by "experience" class.[8] To analyze the relationship between earnings and schooling more formally, earnings equations are estimated which control for schooling. The "experience" factor is controlled for by separately estimating these equations within eight five-year experience classes.[9] This analysis is conducted separately for white men, white women, black men and black women. The basic equation estimated is as follows:

(1) $\ln W = c + a_1{}^*HSDO + a_2{}^*SC + a_3{}^*CG + b_1{}^*E2 + b_2{}^*E3 + b_3{}^*E4 + b_4{}^*E5 + e$

where:
$\ln W$ = natural log of weekly earnings where, weekly earnings is defined as annual earnings divided by weeks worked last year,

$c$ = constant term,

$a, b$ = parameters to be estimated,

HSDO = dummy variable which takes value 1 if years of schooling = 0-11 years,

SC = dummy variable which takes value 1 if years of schooling = 13-15 years,

CG = dummy variable which takes value 1 if years of schooling = 16 or more years,[10]

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[8] Experience refers to estimated years since leaving formal schooling, defined as Age - Years of Schooling - 6. For those who have periods outside the work force or discontinuous schooling ,this will overestimate labor market experience at the individual's reported schooling level. For white men, whose attachment to the labor force has been high historically, this should be a fairly tight approximation. However, for black men, who face high unemployment rates, and for women, whose labor force attachment has been more sporadic until recently, this measure of experience will be subject to greater error. However, no information is available on actual experience and this is the standard approximation used in the literature.

[9] These are: 1-5, 6-10, 11-15, 16-20, 21-25, 26-30, 31-35 and 36+ years.

[10] The schooling dummy variables are meant to reflect important levels of schooling: 0-11 years-- not high school graduate, 12 years--high school graduate, 13-15 years--some college or vocational and 16 or more years -- at least a bachelor's degree. The omitted class is 12 years of schooling.

$E_i$ = dummy variable which takes value 1 if in the ith year of the experience group, i=2, 3, 4, or 5,

e = error term.

The constant reflects on average the natural logarithm of earnings of a high school graduate in the first year of the experience group. The equation is estimated separately for the eight experience groups by the four race-gender classes for each calendar year (the census years 1940, 1950, 1960, 1970 and 1980 and the CPS for 1980 and 1988), a total of 224 regression equations. The coefficient on CG, $a_3$, is the college earnings premium.

The limitations of census data causes some difficulties in estimation. The results are somewhat sensitive to the values given to the earnings of individuals in the truncated earnings class. However, this problem exists in each census year and unless the distribution of schooling in the truncated class or the sensitivity to the given value changes from year to year, the qualitative trends reported should not be affected. The results show little sensitivity to the inclusion of self-employment income or exclusion of individuals for whom some variables were imputed. Conditioning the sample on being employed may also effect the results if the relative non-employment of college versus high school graduates has changed over time. Employment rates for each of the race-sex subgroups were calculated by schooling and experience class. These results indicate that little change in the relative employment of college graduates to high school graduates occurs for men. However, for women, the employment rates become much more similar; in the early part of the sample women with college degrees were much more likely to be employed then women with high school degrees.

### III. Estimates of the College Earnings Premium

Table I presents the estimates of the college earnings premium by race-sex classes for selected experience groups, presented in antilog form in order to show the implied ratio of earnings. These ratios represent (when multiplied

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## TABLE I

Estimated College Earnings Premium[a]
By Race-Sex Classes and Selected Experience Groups
1940 - 1988

| Race-Sex Group | 1940 Census | 1950 Census | 1960 Census | 1970 Census | 1980 Census | 1980 CPS | 1988 CPS |
|---|---|---|---|---|---|---|---|
| | | | All Experience Groups[b] | | | | |
| White Men | 1.560 (.023) | 1.298 (.017) | 1.449 (.013) | 1.520 (.011) | 1.493 (.012) | 1.481 (.015) | 1.639 (.016) |
| White Women | 1.808 (.034) | 1.416 (.022) | 1.654 (.025) | 1.747 (.020) | 1.623 (.014) | 1.542 (.023) | 1.752 (.021) |
| Black Men | 1.594 (.094) | 1.495 (.091) | 1.412 (.026) | 1.490 (.020) | 1.554 (.018) | 1.657 (.065) | 1.842 (.058) |
| Black Women | 2.143 (.114) | 1.536 (.085) | 2.184 (.038) | 2.026 (.026) | 1.833 (.018) | 1.974 (.059) | 1.970 (.054) |
| | | | 1-5 Years Experience | | | | |
| White Men | 1.768 (.051) | 1.401 (.050) | 1.495 (.036) | 1.636 (.032) | 1.384 (.032) | 1.420 (.025) | 1.804 (.040) |
| White Women | 1.984 (.075) | 1.363 (.049) | 1.594 (.054) | 1.738 (.040) | 1.579 (.027) | 1.639 (.035) | 1.881 (.043) |
| Black Men | 2.136 (.284)# | 1.081[++] (.354)# | 1.662 (.074) | 1.754 (.058) | 1.637 (.043) | 1.772 (.174)# | 2.125 (.161) |
| Black Women | 1.990 (.255)# | 1.728[++] (.327)# | 2.190 (.090) | 1.929 (.058) | 1.876 (.036) | 2.136 (.123) | 1.866 (.136) |
| | | | 11-15 Years Experience | | | | |
| White Men | 1.595 (.054) | 1.372 (.042) | 1.438 (.030) | 1.511 (.027) | 1.508 (.027) | 1.476 (.032) | 1.575 (.030) |
| White Women | 1.694 (.078) | 1.379 (.073) | 1.330 (.0563 | 1.716 (.072) | 1.559 (.040) | 1.446 (.057) | 1.650 (.047) |
| Black Men | 1.682 (.226)# | 1.937[+] (.447)# | 1.454 (.055) | 1.442 (.044) | 1.568 (.039) | 1.878 (.144)# | 1.664 (.127) |
| Black Women | 2.363 (.274)# | 1.510[++] (.313)# | 2.239 (.089) | 2.067 (.064) | 1.765 (.039) | 1.793 (.118) | 1.645 (.088) |

(Table I continued next page)

**TABLE I** (continued)

Estimated College Earnings Premium[a]
By Race-Sex Classes and Selected Experience Groups
1940 - 1988

| Race-Sex Group | 1940 Census | 1950 Census | 1960 Census | 1970 Census | 1980 Census | 1980 CPS | 1988 CPS |
|---|---|---|---|---|---|---|---|
| *21-25 Years Experience* | | | | | | | |
| White Men | 1.537 (.074) | 1.194 (.057) | 1.473 (.037) | 1.531 (.034) | 1.495 (.034) | 1.547 (.046) | 1.545 (.040) |
| White Women | 1.536 (.099) | 1.562 (.086) | 1.896 (.069) | 1.813 (.064) | 1.692 (.053) | 1.445 (.076) | 1.723 (.065) |
| Black Men | $1.539^{+}$ (.258)# | $0.687^{++}$ (.342)# | 1.207 (.067) | 1.435 (.052) | 1.459 (.052) | 1.795 (.192)# | 2.014 (.194)# |
| Black Women | $1.906^{+}$ (.451)# | $1.895^{+}$ (.350)# | 2.217 (.107) | 2.168 (.081) | 1.941 (.057) | 2.050 (.225)# | 2.081 (.186)# |
| *31-35 Years Experience* | | | | | | | |
| White Men | 1.365 (.097) | 1.267 (.084) | 1.490 (.059) | 1.413 (.047) | 1.433 (.041) | 1.575 (.054) | 1.420 (.054) |
| White Women | 2.036 (.179) | 1.424 (.099) | 1.766 (.074) | 1.804 (.063) | 1.654 (.061) | 1.314 (.101) | 1.401 (.095) |
| Black Men | $1.752^{++}$ (.436)# | $1.075^{++}$ (.482)# | 1.313 (.116) | 1.231 (.073) | 1.443 (.074) | 1.395 (.270)# | $1.401^{+}$ (.209)# |
| Black Women | $3.180^{+}$ (.978)# | $2.280^{++}$ (1.188)# | 2.275 (.164) | 2.030 (.106) | 1.754 (.072) | $2.349^{++}$ (.318)# | $1.622^{+}$ (.269)# |

Notes:  Standard errors in parentheses

All values significantly different from one with at the 1% level unless otherwise noted:
$^{++}$: Not significant at at least the 5% level
$^{+}$: Significant at the 5% level but not at the 1% level

#: value based on cell size of high school or college graduates less than fifty observations

[a] College Earnings Premium is the antilog of the estimated value of $a_3$ in equation (1).

[b] For this regression, rather than using dummies for each year of the experience group, I have dummy variables for each of the eight 5-year experience groups with 1-5 years of experience as the omitted class.

by 100) the percent difference in earnings between college and high school graduates. The estimates of the college earnings premium for the other experience groups can be found in Appendix B.

Several patterns emerge from these results. The most striking feature is the nearly universal drop in the premium from 1940 to 1950 and subsequent recovery from 1950 to 1960. In general, the increase during the 1950s is not as large as the decline in the 1940s. In most cases, these differences are found to be statistically significant.[11] This change dwarfs any other movements in the premium and shows that the premium has exhibited movements prior to 1970. This contrasts with the work done by Miller (1960) and Becker (1964) which do not find such dramatic movement in the premium during the 1940s and find little change in the 1950s as well.[12]

The changes in the premium during the 1960s, 1970s and 1980s are less homogenous by race-sex class and experience levels. Little change is observed during the 1960s, although any movement is generally positive. The expected decline in the premium during the 1970s is observed most strongly for younger men, both black and white. The premium generally declines slightly for all white men but actually increases slightly for some black male experience groups.

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[11] In order to determine if the difference in the premiums between two adjoining years is statistically significant, I combine the two data sets, for instance 1940 and 1950, and estimate equation with the following additions:

$$(2) \ln W = eq(1) + d_1*d50 + d_2*d50*HSDO + d_3*d50*SC + d_4*d50*CG + f1*d50*E2 + f_2*d50*E3 + f_3*d50*E4 + f_4*d50*E5$$

where: d50=dummy variable which takes value 1 if the observation occurs in 1950. Therefore, the estimated coefficient on d50*CG, $d_4$, is the difference between the college earnings premium in 1940 and 1950 and a simple t-test can be run to test for statistical significance.

[12] As noted previously, these results were based on grouped data. One would not necessarily expect such differences between individual and grouped data from the same data set. One reason for the difference is that my data set undersamples college educated individuals in the truncated income class for 1950 and I use a different value for earnings in this class then did Miller. Therefore, the observed decline in the premium from 1940 to 1950 may be overstated. See Coleman (1990) for a more detailed analysis of the differences in Miller's and my work.

The decline is nearly universal for women and occurs in similar degrees across experience groups. An increase in the premium during the 1980s also is observed for less experienced white men and white women. The changes for blacks in the 1980s are more difficult to ascertain given the small cell sizes and, therefore, relatively large standard errors. Also apparent from these results is that even given the large increases in the percent of the population which is college-educated from 1940 to 1988, no decline in the earnings premium for obtaining a college education occurs.

Some interesting comparisons also exist across race-sex groups. In general, the experience of whites and blacks are similar; however, it varies for men and women. The premium is consistently higher for women and the variation of the premium both over time and within a cross section is greater for women then for men. Some of the comparisons of whites versus blacks are not as easy to discern due to the small sample sizes for blacks in the early census years and for the CPS.

Another way to examine these results is to organize them by estimated year of entry into the labor market and to follow these year-of-entry cohorts throughout the sample. Table II presents the results from Table I by estimated year of labor market entry.[13] In order to actually follow a cohort through time, only results for cohorts who are observed at least three times in the sample are reported. The path which the premium for a cohort takes can be found by reading across the year of entry row.[14]

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[13] The estimated year of labor market entry is the median year that the experience group could have entered. For instance, individuals with 1-5 years of experience in 1940 would have entered the labor market between 1935 and 1939, therefore the median year is 1937.

[14] 1988 is assumed to be ten years after the 1980 census. The premium for the 36 or more years of experience group will be the appropriate premium for both the 26-30 and 31-35 group from the previous census, therefore the last figures for some cohorts will actually be an average with the adjacent cohort.

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**TABLE II**
Estimated College Earnings Premium
By Estimated Year of Labor Market Entry
By Race-Sex Classes: 1940 - 1988

| Year of Entry | 1940 Census | 1950 Census | 1960 Census | 1970 Census | 1980 Census | 1988 CPS |
|---|---|---|---|---|---|---|
| White Men | | | | | | |
| 1922 | 1.548 | 1.100 | 1.303 | | | |
| 1927 | 1.595 | 1.194 | 1.490 | 1.467 | | |
| 1932 | 1.559 | 1.439 | 1.455 | 1.467 | | |
| 1937 | 1.768 | 1.372 | 1.473 | 1.413 | 1.332 | |
| 1942 | | 1.301 | 1.439 | 1.530 | 1.332 | |
| 1947 | | 1.401 | 1.438 | 1.531 | 1.433 | 1.390 |
| 1952 | | | 1.475 | 1.571 | 1.565 | 1.390 |
| 1957 | | | 1.636 | 1.508 | 1.547 | 1.420 |
| 1962 | | | | 1.459 | 1.467 | 1.480 |
| 1967 | | | | 1.384 | 1.476 | 1.545 |
| White Women | | | | | | |
| 1922 | 1.644 | 1.405 | 1.740 | | | |
| 1927 | 1.694 | 1.562 | 1.766 | 1.822 | | |
| 1932 | 1.679 | 1.310 | 1.813 | 1.822 | | |
| 1937 | 1.984 | 1.379 | 1.896 | 1.804 | 1.613 | |
| 1942 | | 1.307 | 1.682 | 1.839 | 1.613 | |
| 1947 | | 1.363 | 1.330 | 1.813 | 1.654 | 1.570 |
| 1952 | | | 1.474 | 1.733 | 1.590 | 1.570 |
| 1957 | | | 1.594 | 1.716 | 1.692 | 1.401 |
| 1962 | | | | 1.679 | 1.559 | 1.400 |
| 1967 | | | | 1.738 | 1.559 | 1.723 |
| Black Men | | | | | | |
| 1922 | 1.274 | 1.015 | 1.185 | | | |
| 1927 | 1.682 | 0.687 | 1.313 | 1.257 | | |
| 1932 | 1.576 | 1.102 | 1.285 | 1.257 | | |
| 1937 | 2.136 | 1.937 | 1.207 | 1.231 | 1.232 | |
| 1942 | | 1.001 | 1.244 | 1.368 | 1.232 | |
| 1947 | | 1.081 | 1.454 | 1.435 | 1.443 | 1.372 |
| 1952 | | | 1.505 | 1.426 | 1.483 | 1.372 |
| 1957 | | | 1.662 | 1.442 | 1.459 | 1.401 |
| 1962 | | | | 1.548 | 1.455 | 1.840 |
| 1967 | | | | 1.754 | 1.568 | 2.014 |
| Black Women | | | | | | |
| 1922 | 2.504 | 2.514 | 2.604 | | | |
| 1927 | 2.363 | 1.895 | 2.275 | 2.282 | | |
| 1932 | 1.894 | 1.745 | 2.117 | 2.282 | | |
| 1937 | 1.990 | 1.510 | 2.217 | 2.030 | 1.972 | |
| 1942 | | 1.374 | 2.230 | 2.151 | 1.972 | |
| 1947 | | 1.728 | 2.239 | 2.168 | 1.754 | 1.455 |
| 1952 | | | 2.028 | 2.100 | 1.878 | 1.455 |
| 1962 | | | | 1.881 | 1.800 | 1.853 |
| 1967 | | | | 1.929 | 1.765 | 2.081 |

The results indicate that year of entry is very important for determining the path the college earnings premium path for a cohort. For white men, premiums upon entry vary greatly, but the premiums for more experienced workers tend to be very similar over time and within cross section. Therefore year of entry determines initial position and to some extent the path to the average premium. Generally, the two cohorts which first appear in a year follow a similar path, however that path can be very different from those just entering ten years previously. For instance, for white men, the 1942 and 1947 cohorts have very similar experiences with a slight upward trend over time until 1980, however the 1937 and 1947 cohort follow very different paths with the 1937 cohort's experience being more volatile. This sort of phenomena also occurs for white women and blacks, although the premium for older workers in these subgroups varies as well.

## IV. Alternative Measures of the Earnings-Schooling Relationship

As noted earlier, other measures of the earnings-schooling relationship are used primarily to determine whether the movements observed for the college/high school graduate relationship are indicative of more general movements in the earnings-schooling relationship or whether they are unique to the college-high school comparison. The two measures employed are: (1) the high school earnings premium and (2) the graduate school premium. The high school earnings premium is the premium for graduating high school, that is, 12 years versus less than 12 years of schooling.[15] The graduate school premium is the earnings premium for going on for more schooling after obtaining a bachelor's degree, that is, 17 or more years versus 16 years.[16] Two problems

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[15] This premium is the antilog of the coefficient on HSDO in equation (1).

[16] This premium is obtained by changing the definition of CG in equation (1) and adding another dummy variable. CG now refers to 16 years of schooling and an added dummy is included for 17 or more years of schooling. The difference in the coefficients on these variables is the graduate school premium.

arise with the estimation of this premium. First, in 1950, no distinction is made between 16 and 17 or more years of schooling so the premium cannot be estimated for that year. Second, because these levels refer to years of schooling rather than degrees obtained, it is possible that individuals with 17 or more years of schooling only have a bachelor's degree but took longer to obtain it. Individuals with 17 or more years of schooling also encompass many different kinds of degrees from masters to doctorates and professional degrees for whom the monetary return might vary greatly. However, these figures are only used for comparison rather than as the subject of intensive analysis so these concerns are not that important. This division also provides insight into whether the reported movements in the college earnings premium are driven by the 16 years of schooling group or the 17 or more years of schooling group.

Table III reports the high school and graduate school premia for white men. The premia for white women, black men and black women can be found in Appendix C. The movements in high school earnings premia are similar to those of the college earnings premium in the 1940s and the 1980s but otherwise differ. The relative position of lower skilled workers has declined during the 1980s both for this comparison and the comparison of college to high school graduates. The high school premium tends to be higher for men then for women, but the opposite is true for the college earnings premium.

The graduate earnings premium has not followed as consistent a path. In the early part of the sample, the differential was quite small and generally insignificant. However, in recent years, the differential generally has become positive although no particular increase is observed during the 1980s, unlike what occurred for the other premia.

These results lend some support to the earlier finding that the earnings premium to increased levels of schooling declined during the 1940s and rose during the 1980s. However, movements during the interim do not appear to be

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## TABLE III

Alternative Earnings Premia
White Men; By Experience Group, 1940-1988

| Experience Group | 1940 Census | 1950 Census | 1960 Census | 1970 Census | 1980 Census | 1988 CPS |
|---|---|---|---|---|---|---|
| High School Graduate/DropOut Premium | | | | | | |
| 1-5 Yrs | 1.608 | 1.473 | 1.462 | 1.412 | 1.775 | 1.939 |
| 6-10 Yrs | 1.586 | 1.317 | 1.434 | 1.416 | 1.392 | 1.545 |
| 11-15 Yrs | 1.514 | 1.266 | 1.288 | 1.376 | 1.407 | 1.499 |
| 16-20 Yrs | 1.443 | 1.204 | 1.278 | 1.350 | 1.363 | 1.522 |
| 21-25 Yrs | 1.465 | 1.171 | 1.313 | 1.326 | 1.309 | 1.613 |
| 26-30 Yrs | 1.465 | 1.294 | 1.221 | 1.237 | 1.271 | 1.546 |
| 31-35 Yrs | 1.470 | 1.256 | 1.288 | 1.298 | 1.228 | 1.217 |
| 36+ Yrs | 1.608 | 1.178 | 1.249 | 1.202 | 1.156 | 1.219 |
| Graduate/Bachelor's Earnings Premium | | | | | | |
| 1-5 Yrs | $0.946^{++}$ | - | $1.005^{++}$ | 1.171 | $1.053^{++}$ | 1.196 |
| 6-10 Yrs | $1.014^{++}$ | - | $1.033^{++}$ | $1.066^{++}$ | 1.175 | 1.116 |
| 11-15 Yrs | $0.998^{++}$ | - | $0.990^{++}$ | $1.037^{++}$ | 1.099 | 1.191 |
| 16-20 Yrs | $1.025^{++}$ | - | $1.020^{++}$ | $1.020^{++}$ | 1.117 | 1.234 |
| 21-25 Yrs | $0.973^{++}$ | - | $1.088^{++}$ | $1.009^{++}$ | $1.100^{+}$ | $1.070^{++}$ |
| 26-30 Yrs | $0.928^{++}$ | - | $1.084^{++}$ | $1.094^{++}$ | $1.049^{++}$ | $1.157^{+}$ |
| 31-35 Yrs | $0.865^{++}$ | - | $1.091^{++}$ | $1.085^{++}$ | $0.966^{++}$ | $1.052^{++}$ |
| 36+ Yrs | $1.092^{++}$ | - | $0.850^{++}$ | $1.197^{+}$ | $0.995^{++}$ | $0.931^{++}$ |

Note:   All values significantly different from one at the 1% level unless
otherwise noted:
++: Not significant at 5% level
+: Significant at 5% level but not at 1% level

universal and relate more to changes in the specific schooling levels rather than overall changes in the impact of schooling on earnings.

### V. Explaining Movements in the College Earnings Premium

Many hypotheses concerning the causes of changes in the schooling premia have been proposed. Most studies which attempt to test these hypotheses are limited to a relatively short period of time. The purpose of this section is to present these hypotheses and to examine them against the facts presented in the previous section. At this point, the analysis is restricted to white men because their employment to population ratio has remained relatively stable during the time frame of the analysis.

*A. The Effect of Cohort Size*

When the college earnings premium declined in the 1970s, the most common explanation was that the increasing supply of college graduates had finally overtaken the demand for such workers. This was in part due to increases in college attendance throughout the population and in part to the entrance into the labor force of the large even more well-educated baby boom generation. As both of these trends increase the supply of college graduates relative to the supply of high school graduates, one would expect, ceteris paribus, relative price, i.e., the college earnings premium, to fall.[17]

The question then arises as to whether changes in cohort sizes can explain other movements in the college earnings premium or whether this is an isolated relationship, perhaps due to the unusually large size of the baby boom cohort. Therefore, the first explanatory variable used in the analysis of

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[17] This spawned a literature investigating the effect of cohort sizes on earnings. Papers by Welch (1979) and Berger (1983, 1984) show that during this period the size of the cohort with which one entered the labor market had large effects on wages relative to other cohorts and across educational groups. Welch's estimated elasticities of weekly earnings with respect to cohort size for high school graduates was -0.369 and for college graduates was -0.907.

movements in the college earnings premium over time is relative cohort size. The relative size of a cohort is measured by the following ratio (CSR):

$$(2) \quad CSR_{jt} = ( X_{Cjt} / X_{Ct} ) / ( X_{Hjt} / X_{Ht} )$$

where $j$ = experience group in question

$X_{Cjt}$ = number of college graduates in experience group $j$ in year $t$

$X_{Ct}$ = number of college graduates in the sample in year $t$

$X_{Hjt}$ = number of high school graduates in experience group $j$ in year $t$

$X_{Ht}$ = number of high school graduates in the sample in year $t$

The numerator represents the fraction of college graduates who have $j$ years of experience and the denominator represents the fraction of high school graduates who have $j$ years of experience.[18] The ratio of these two fractions is used in order to observe movements in the relative cohort sizes which should be the value which affects the relative wage. As this ratio increases, ceteris paribus, the relative wages of college graduates should fall.

*B. Business Cycle Effects*

The possible effect of the business cycle on the college earnings premium is also considered. The six calendar years in the sample represent different points in the business cycle. If the wages of college and high school graduates are affected differently by booms and contractions in the economy, then this could explain movements in the college earnings premium. Specifically, one generally assumes that more skilled workers will be more insulated from contractions in the economy because firms face higher replacement costs if they are laid off. Since they are often salaried workers, it is also more difficult to

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[18] These are the measures usually used in testing the effect of cohort size on earnings. In some cases, moving averages across adjoining experience groups are used to allow for the possibility of substitution. For instance instead of just the number of college graduates in experience group $j$ in the numerator, the numbers of college graduates in experience groups $j-1$ and $j+1$ could be added to the numerator with lower weights. Given the already limited number of time observations, I do employ this method here because it would tend to decrease variation in the independent variables and make estimation even more difficult.

cut back on hours or overtime. Since the analysis uses weekly earnings, cut backs in hours worked could affect the earnings of lower skilled workers. Therefore one would expect the college earnings premium to be countercyclical. The unemployment rate for white men aged 35-44 (UR) and deviations in trend for GNP (DGNP)[19] are alternatively used as business cycle indicators. If the college earnings premium is countercyclical, then it should have a negative relationship with deviations in trend for GNP and a positive relationship with the unemployment rate.

*C. Analysis of the Hypotheses*

Determining whether the facts support the hypotheses outlined above is frustrated by the small number of time observations. Although the time frame of the analysis covers almost fifty years, observations exist only for every ten years. In effect, only six time effects are distinguished which limits the ability to consider several explanatory variables at the same time. This problem can be alleviated to some extent by assuming that effect of the explanatory variables on the college earnings premium are the same for all experience groups, or at least several adjoining groups. Appendix D describes process used to determine which experience groups to combine for the analysis. As a result of that process, I conduct the tests separately for white men in the 1-25 experience groups and the 26+ experience groups.

The following general equation is estimated separately for each of the five explanatory variables to determine its simple association with the college earnings premium.

$$(4) \; CEP_{it} = c + a^*EXPVAR_{it} + e_{it}$$

where $CEP_{it}$ = college earnings premium for white men in experience group i in year t from Table III and Appendix A,

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[19] Deviations in trend for GNP is calculated by estimating time trends for GNP for the following periods: (1) 1929-1939, (2) 1946-1975 and (3) 1965-1987. The deviation is the difference between the actual value of GNP and the predicted value from appropriate time period for the year in question.

EXPVAR = explanatory variable (CSR, UR, or DGNP) for experience group i in year $t$[20],

i = 1-25, 26+,

t = 1940, 1950, 1960, 1970, 1980 census and 1988 CPS.

The results from this estimation are reported in Table IVa. Similar regressions are estimated which include both of the explanatory variables in order to determine the effect of one variable while holding the other variables constant. In other words the following equation is estimated for the two sets of experience groups:

$$CEP = c + a_1 {}^*CSR + a_2 {}^*DGNP + e$$

where the variables are defined as before.

DGNP is used in this regression as opposed to unemployment because the 1940 unemployment rate is an outlier when compared to the other years and this rate does not capture changes over time as well as deviations in trend in GNP. These results are also found in Table IVa.

The results indicate some support for the above hypotheses although the significance levels are generally quite low. However, the fact that the dependent variable is itself an estimate is not considered so the reported standard errors are not valid. Correction for this would likely increase the standard errors which would only decrease the levels of significance. The more important problem is lack of observations. However, the proposed signs on each of the variables holds for older workers, especially when all variables are included. In general, the results for newer workers are quite poor.

Specifically, the coefficient on the cohort size ratio is negative and larger in absolute terms for older workers than that for younger workers. The premium for older workers is also negatively correlated with the business cycle while the opposite is true for younger workers. This is not surprising since the

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[20] The values for these variables can be found in Table IVb.

**TABLE IVa**
Regression Results for College Earnings Premium, White Men

| Explanatory Variable | Variables Included Individually | | All Variables Included | |
|---|---|---|---|---|
| | 1-25 Yrs Exper. | 26+ Yrs Exper. | 1-25 Yrs Exper. | 26+ Yrs Exper. |
| Cohort Size Ratio | .040[++] (.108) | -.170[+] (.080) | .036[++] (.097) | -.169[++] (.084) |
| Deviations in GNP Trend | .071 (.026) | -.016[++] (.037) | .071[+] (.026) | -.003[++] (.034) |
| Unemployment Rate | .032[++] (.016) | -.031[++] (.020) | - | - |

Notes: Standard errors in parentheses
All values significantly different from zero at the 1% level unless otherwise noted:

[++]: Not significant at the 5% level
[+]: Significant at 5% level but not at 1% level

**TABLE IVb**
Values for the Explanatory Variables, White Men

| Experience Group | 1940 Census | 1950 Census | 1960 Census | 1970 Census | 1980 Census | 1988 CPS |
|---|---|---|---|---|---|---|
| | | | Cohort Size Ratio | | | |
| 1-5 Years | 0.746 | 0.982 | 1.400 | 1.712 | 1.017 | 1.029 |
| 6-10 Years | 0.966 | 0.967 | 1.445 | 1.129 | 1.441 | 1.080 |
| 11-15 Years | 1.157 | 0.902 | 1.276 | 1.153 | 1.295 | 1.094 |
| 16-20 Years | 1.248 | 0.963 | 0.862 | 1.091 | 0.971 | 1.381 |
| 21-25 Years | 1.110 | 1.125 | 0.697 | 1.117 | 0.951 | 1.113 |
| 26-30 Years | 1.071 | 1.574 | 0.736 | 0.742 | 0.930 | 0.882 |
| 31-35 Years | 1.163 | 0.747 | 0.529 | 0.421 | 0.366 | 0.453 |
| 36+ Years | 1.007 | 0.746 | 0.523 | 0.422 | 0.350 | 0.452 |
| | | | Unemployment Rate | | | |
| All Groups | 6.70 | 3.33 | 3.37 | 2.33 | 3.74 | 3.90 |
| | | Deviations in Trend for GNP (billions of constant dollars) | | | | |
| All Groups | 80.92 | 33.74 | -127.83 | 40.24 | 12.13 | 126.66 |

reason why the hypothesized reason why college graduates would face less
fluctuation in their earnings over the business cycle is that they have more
valuable specific human capital. However, younger workers, even college
graduates, are less likely to have gained the necessary specific human capital.
In fact, these results indicate that less experienced college graduates are more
vulnerable to changes in the business cycle then are high school graduates.

*D. Changes in Demand for Skilled versus Unskilled Workers*

Another hypothesis is that the college earnings premium is affected by
changes in the demand for skilled versus unskilled workers. Two factors, either
alone or together, would tend to increase the wages of college graduates, or high
skill workers, versus the wages of high school graduates, or low skill workers.
First, all industries (occupations) could increase their relative demand for
college graduates, that is, a shift in overall demand for skilled workers. Second,
those industries which traditionally have had a high percentage of workers as
college graduates could be the high growth industries (occupations), that is, a
shift in the industrial (occupational) mix. Census data does not allow for actual
estimation of demand for skilled workers in industries or the actual growth in
these industries. Instead, employment in industries (occupations) by schooling
level is estimated. Of course, this measure reflects both supply and demand
factors. These estimates can show if the observed employment trends are
consistent with the hypothesis and if any of the movements in employment
correspond to movements in the premia.

Table V reports the percent of total employment in industries or
occupations which is college educated. Table VI reports the percent of total
employment in these industries or occupations. Employees in all industries and
most occupations have become more likely to have a college education. These
trends must reflect increases in demand for skilled workers higher than the
increases in supply given the continued large college earnings premium. The

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## TABLE V

### Percent of Employment in Industry or Occupation
### Which is College Educated

| Industry/ Occupation | 1940 Census | 1950 Census | 1960 Census | 1970 Census | 1980 Census | 1988 CPS |
|---|---|---|---|---|---|---|
| | | | Industries | | | |
| Ag-Min-Co | 1.38 | 3.12 | 4.07 | 6.49 | 11.50 | 10.08 |
| Durable | 2.80 | 3.79 | 7.57 | 10.63 | 12.21 | 21.50 |
| NonDurable | 2.90 | 4.68 | 7.84 | 9.02 | 10.38 | 15.26 |
| Tr-Comm-PU | 2.92 | 3.57 | 6.51 | 8.33 | 12.12 | 20.27 |
| Wholesale Trade | 4.96 | 6.34 | 10.59 | 14.19 | 14.83 | 18.71 |
| Retail Trade | 2.60 | 3.52 | 5.43 | 6.26 | 9.33 | 10.92 |
| FIRE | 7.36 | 11.50 | 16.49 | 20.32 | 26.52 | 33.38 |
| Business/ Repair | 3.20 | 2.68 | 111.02 | 15.79 | 16.21 | 29.25 |
| Personal/ Entertain | 1.30 | 2.73 | 2.31 | 3.65 | 9.33 | 12.55 |
| Professl Services | 34.06 | 36.91 | 40.86 | 50.26 | 41.72 | 45.55 |
| Public Adminis | 12.37 | 10.60 | 15.74 | 17.51 | 27.88 | 40.79 |
| | | | Occupations | | | |
| Managers | 15.77 | 15.45 | 27.07 | 33.95 | 37.64 | 47.11 |
| Profess- ionals | 47.00 | 53.11 | 64.84 | 68.54 | 72.16 | 84.58 |
| Technicians | - | - | 17.28 | 26.68 | 25.84 | 43.76 |
| Sales Workers | 7.12 | 6.87 | 13.41 | 16.79 | 18.50 | 25.87 |
| Administ. Support | 5.64 | 5.37 | 7.36 | 8.26 | 9.54 | 14.08 |
| Service Workers | 0.73 | 1.22 | 1.70 | 3.16 | 4.95 | 6.27 |
| Farm Workers | 0.04 | 2.06 | 15.15 | 7.52 | 7.64 | 5.50 |
| Craftsmen | 1.40 | 2.03 | 3.64 | 3.54 | 5.46 | 5.19 |
| Operators/ Laborers | 0.43 | 0.77 | 1.11 | 1.66 | 2.29 | 0.57 |

where: ag-min-co = agriculture, mining and construction
     durable = durable manufacturing
     nondurable = non durable manufacturing
     tr-comm-pu = transportation, communication and public utilities
     FIRE = finance, insurance and real estate
     Business/Repair = business and repair services
     personal/entertain = personal and entertainment services
     professl services = professional services
     public adminst. = public administration
     administ. support = administrative support (clerical workers)

## TABLE VI

### Percent of Employment in Industry or Occupation

| Industry/ Occupation | 1940 Census | 1950 Census | 1960 Census | 1970 Census | 1980 Census | 1988 CPS |
|---|---|---|---|---|---|---|
| | | | **Industries** | | | |
| Ag-Min-Co | 14.86 | 13.66 | 4.01 | 8.87 | 2.70 | 3.52 |
| Durable | 14.14 | 18.58 | 25.54 | 18.42 | 15.94 | 13.23 |
| Nondurable | 17.27 | 14.67 | 14.39 | 12.24 | 15.77 | 16.04 |
| Tr-Comm-PU | 8.18 | 9.81 | 8.79 | 7.67 | 8.11 | 8.23 |
| Wholesale Trade | 2.59 | 4.52 | 4.19 | 4.08 | 4.60 | 5.36 |
| Retail Trade | 13.36 | 13.99 | 13.23 | 13.24 | 13.65 | 19.10 |
| FIRE | 3.98 | 3.16 | 4.66 | 4.90 | 5.53 | 8.04 |
| Business/ Repair | 1.89 | 0.88 | 1.34 | 2.01 | 2.89 | 3.41 |
| Personal/ Entertain | 10.81 | 7.30 | 5.71 | 4.52 | 4.13 | 5.13 |
| Professl Services | 7.54 | 7.82 | 11.84 | 17.15 | 2.049 | 15.46 |
| Public Adminis | 5.38 | 5.61 | 6.30 | 6.90 | 6.19 | 2.48 |
| | | | **Occupations** | | | |
| Managers | 1.56 | 5.75 | 7.94 | 8.69 | 13.49 | 15.49 |
| Profess- ionals | 7.10 | 7.54 | 9.09 | 11.94 | 12.33 | 9.06 |
| Technician | 0.00 | 0.00 | 0.90 | 1.56 | 3.00 | 2.96 |
| Sales Workers | 5.43 | 7.55 | 6.67 | 6.49 | 7.44 | 9.10 |
| Administ. Support | 18.60 | 14.21 | 16.86 | 18.59 | 16.30 | 16.11 |
| Service Workers | 30.09 | 10.20 | 11.05 | 12.14 | 12.22 | 12.46 |
| Farm Workers | 4.76 | 3.71 | 2.67 | 1.40 | 1.58 | 2.56 |
| Craftsmen | 11.92 | 17.55 | 16.20 | 15.69 | 12.77 | 12.44 |
| Operators/ Laborers | 20.30 | 34.04 | 28.62 | 24.47 | 20.49 | 19.34 |

where: ag-min-co = agriculture, mining and construction
durable = durable manufacturing
nondurable = non durable manufacturing
tr-comm-pu = transportation, communication and public utilities
FIRE = finance, insurance and real estate
Business/Repair = business and repair services
personal/entertain = personal and entertainment services
professl services = professional services
public adminst. = public administration
administ. support = administrative support (clerical workers)

story for growth in traditionally high skill occupations and industries is not as clear although professional services and financial industries have grown fairly rapidly in recent years. In fact, changes in the industrial and occupational mix as well as changes in the relative demands for workers within a particular industry or occupation seem better suited to explaining reasons why the earnings premium has remained at a high level rather than for explaining particular movements over time in that premium.

*E. Conclusion*

Overall, the results show some support for the hypotheses described in the early part of this section. However, given the amount of variance left unexplained by these equations and the imprecise estimates, it appears that the process which describes the movements in the college earnings premium is more complex then can be accounted for with this data set.

## VI. Conclusion

This study tracks movements in the earnings differential between high school and college graduates from 1940 to 1988. These movements are largely similar across race and sex groups. Specifically, the premium declines almost universally in 1940s, rises in the 1950s and 1960s, especially for white women and blacks, declines in the 1970s for younger men and most women, and increases during the 1980s for most workers. Overall, no downward trend is observed in the premium which is remarkable given the large overall increases in the percent of workers who obtain college degrees.

These results indicate that previous work using relatively short time periods to estimate schooling premia should not be used to predict long term trends. In fact, no trend in the college earnings premium is found between 1940 and 1988; rather the premium exhibits short term fluctuations. The remaining question is what causes these short term fluctuations and why has the premium remained high over this time period given the large increases in

the supply of college educated individuals. The results from this study, although they are limited, indicate that cohort size, business cycle effects and changes in the industrial or occupational mix may influence the college earnings premium. Future research should focus on whether tests using data better suited to analyzing hypotheses confirm these findings and whether other hypotheses may better explain the facts.

## APPENDIX A

### Years of Schooling Distribution: % in Four Classes
### For Working Individuals: Aged 16-64
### By Race-Sex Classes: 1940 - 1988

| Schooling Group | 1940 Census | 1950 Census | 1960 Census | 1970 Census | 1980 Census | 1980 CPS | 1988 CPS |
|---|---|---|---|---|---|---|---|
| White Men | | | | | | | |
| 0-11 Yrs | 70.4 | 60.2 | 42.0 | 30.2 | 21.5 | 25.1 | 16.7 |
| 12 Yrs | 18.1 | 24.6 | 29.9 | 35.3 | 36.7 | 36.7 | 38.3 |
| 13-15 Yrs | 5.9 | 7.9 | 14.5 | 15.8 | 19.3 | 17.9 | 18.8 |
| 16+ Yrs | 5.6 | 7.3 | 13.5 | 18.6 | 22.4 | 20.3 | 26.1 |
| White Women | | | | | | | |
| 0-11 Yrs | 53.9 | 46.4 | 34.2 | 25.3 | 17.4 | 19.8 | 12.3 |
| 12 Yrs | 30.5 | 35.1 | 39.8 | 45.8 | 45.2 | 45.9 | 43.6 |
| 13-15 Yrs | 8.6 | 10.5 | 15.1 | 15.9 | 20.1 | 18.5 | 22.1 |
| 16+ Yrs | 7.0 | 7.9 | 10.9 | 13.0 | 17.3 | 15.9 | 22.1 |
| Black Men | | | | | | | |
| 0-11 Yrs | 92.3 | 86.3 | 69.0 | 53.5 | 37.1 | 40.9 | 24.7 |
| 12 Yrs | 4.6 | 9.3 | 17.7 | 28.4 | 35.6 | 35.7 | 41.5 |
| 13-15 Yrs | 1.7 | 2.4 | 8.8 | 11.4 | 17.4 | 15.4 | 19.7 |
| 16+ Yrs | 1.5 | 2.0 | 4.4 | 6.7 | 9.9 | 8.0 | 14.0 |
| Black Women | | | | | | | |
| 0-11 Yrs | 86.9 | 79.5 | 60.4 | 42.7 | 29.1 | 33.0 | 18.2 |
| 12 Yrs | 7.5 | 12.3 | 22.5 | 34.3 | 38.7 | 40.6 | 44.4 |
| 13-15 Yrs | 3.4 | 3.9 | 9.9 | 13.7 | 20.3 | 15.6 | 21.6 |
| 16+ Yrs | 2.2 | 4.4 | 7.2 | 9.3 | 12.0 | 10.8 | 15.9 |

### Average Annual Earnings For Selected Schooling Groups
### By Race-Sex Classes: 1940 - 1988
### (1985 dollars)

| Race-Sex Group | 1940 Census | 1950 Census | 1960 Census | 1970 Census | 1980 Census | 1980 CPS | 1988 CPS |
|---|---|---|---|---|---|---|---|
| All Schooling Groups | | | | | | | |
| White Men | 10,617 | 14,716 | 21,945 | 29,123 | 26,583 | 24,227 | 24,582 |
| White Women | 6,648 | 8,805 | 11,166 | 13,745 | 13,087 | 10,821 | 13,784 |
| Black Men | 4,618 | 8,022 | 12,076 | 18,090 | 18,632 | 16,463 | 17,557 |
| Black Women | 2,509 | 4,888 | 6,541 | 11,161 | 12,870 | 10,891 | 15,752 |
| 12 Years Schooling | | | | | | | |
| White Men | 11,417 | 14,856 | 21,792 | 27,555 | 24,416 | 23,334 | 21,481 |
| White Women | 6,957 | 9,191 | 11,106 | 13,139 | 12,301 | 10,427 | 12,386 |
| Black Men | 6,579 | 10,013 | 13,245 | 19,056 | 18,517 | 17,364 | 15,788 |
| Black Women | 3,318 | 6,607 | 7,555 | 11,533 | 12,327 | 10,848 | 14,498 |
| 16+ Years Schooling | | | | | | | |
| White Men | 19,142 | 20,653 | 31,367 | 41,108 | 36,826 | 36,173 | 35,352 |
| White Women | 12,297 | 12,780 | 16,840 | 21,119 | 18,203 | 16,431 | 20,218 |
| Black Men | 10,539 | 13,133 | 18,364 | 27,454 | 27,254 | 19,568 | 28,499 |
| Black Women | 7,514 | 11,433 | 14,022 | 21,500 | 20,504 | 20,647 | 20,891 |

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## APPENDIX B
### Other Estimates of College Earnings Premium

Estimated College Earnings Premium[a]
By Race-Sex Classes and Selected Experience Groups
1940 - 1988

| Race-Sex Group | 1940 Census | 1950 Census | 1960 Census | 1970 Census | 1980 Census | 1980 CPS | 1988 CPS |
|---|---|---|---|---|---|---|---|
| | | | 6-10 Years Experience | | | | |
| White Men | 1.559 (.047) | 1.301 (.038) | 1.419 (.029) | 1.475 (.026) | 1.459 (.024) | 1.355 (.026) | 1.669 (.031) |
| White Women | 1.679 (.067) | 1.307 (.053) | 1.474 (.075) | 1.679 (.056) | 1.584 (.032) | 1.501 (.042) | 1.725 (.040) |
| Black Men | 1.576 (.205)# | 1.001[++] (.244)# | 1.505 (.061) | 1.548 (.044) | 1.614 (.033) | 1.514 (.095) | 1.674 (.124) |
| Black Women | 1.894 (.242)# | 1.374[++] (.313) | 2.028 (.077) | 1.881 (.059) | 1.800 (.030) | 1.906 (.101) | 1.980 (.131) |
| | | | 16-20 Years Experience | | | | |
| White Men | 1.548 (.066) | 1.439 (.049) | 1.439 (.032) | 1.525 (.032) | 1.571 (.032) | 1.467 (.044) | 1.613 (.037) |
| White Women | 1.644 (.084) | 1.310 (.070) | 1.682 (.071) | 1.733 (.063) | 1.559 (.047) | 1.629 (.082) | 1.650 (.052) |
| Black Men | 1.274[++] (.232)# | 1.102[++] (.268)# | 1.244 (.062) | 1.426 (.048) | 1.455 (.047) | 1.287[++] (.166)# | 1.921 (.122) |
| Black Women | 2.504 (.352)# | 1.745[+] (.305)# | 2.230 (.101) | 2.100 (.067) | 1.800 (.050) | 1.811 (.152)# | 1.878 (.118) |

Estimated College Earnings Premium[a]
By Race-Sex Classes and Selected Experience Groups
1940 - 1988

| Race-Sex Group | 1940 Census | 1950 Census | 1960 Census | 1970 Census | 1980 Census | 1980 CPS | 1988 CPS |
|---|---|---|---|---|---|---|---|
| | | | 26-30 Years Experience | | | | |
| White Men | 1.331 (.083) | 1.100[++] (.064) | 1.455 (.042) | 1.530 (.036) | 1.581 (.041) | 1.565 (.054) | 1.480 (.050) |
| White Women | 1.982 (.148) | 1.405 (.077) | 1.813 (.067) | 1.839 (.059) | 1.590 (.052) | 1.507 (.099) | 1.400 (.073) |
| Black Men | 1.121[++] (.329)# | 1.015[++] (.551)# | 1.285 (.085) | 1.368 (.063) | 1.483 (.060) | 1.808 (.190)# | 1.840 (.157)# |
| Black Women | 1.831[++] (.562)# | 2.514[++] (1.489)# | 2.117 (.128) | 2.151 (.093) | 1.878 (.064) | 2.309 (.239)# | 1.853 (.160)# |
| | | | 36 or more Years Experience | | | | |
| White Men | 1.182[++] (.093) | 1.388 (.095) | 1.303 (.062) | 1.467 (.048) | 1.332 (.044) | 1.484 (.064) | 1.390 (.062) |
| White Women | 2.140 (.235) | 1.232[++] (.107) | 1.740 (.091) | 1.822 (.070) | 1.613 (.063) | 1.244 (.090) | 1.570 (.110) |
| Black Men | 1.478[++] (.369)# | 3.187[+] (.881)# | 1.185[++] (.135)# | 1.257 (.096) | 1.232 (.084) | 1.943[++] (.494)# | 1.372[++] (.274)# |
| Black Women | 1.416[++] (.966)# | 1.137[++] (.917)# | 2.604 (.218) | 2.282 (.129) | 1.972 (.107) | 1.545[++] (.309)# | 1.455[++] (.340)# |

Notes:
All values significantly different from one at the 1% level unless otherwise noted:
   ++: Not significant at the 5% level
   +: Significant at 5% level but not at 1% level

   #: value based on cell size of high school or college graduates less than fifty observations

Standard errors in parentheses

[a] College Earnings Premium is the antilog of the estimated value of $a_3$ in equation (1).

# APPENDIX C

Alternative Earnings Premia
By Race-Sex Class and Experience Group
1940 - 1988

| Experience Group | 1940 Census | 1950 Census | 1960 Census | 1970 Census | 1980 Census | 1988 CPS |
|---|---|---|---|---|---|---|
| **High School Graduate/DropOut Premium** | | | | | | |
| **White Women** | | | | | | |
| 1-5 Yrs | 1.559 | 1.358 | 1.564 | 1.328 | 1.685 | 2.018 |
| 6-10 Yrs | 1.472 | 1.271 | 1.298 | 1.306 | 1.332 | 1.520 |
| 11-15 Yrs | 1.376 | 1.175 | 1.315 | 1.242 | 1.125 | 1.349 |
| 16-20 Yrs | 1.338 | 1.220 | 1.252 | 1.181 | 1.138 | 1.464 |
| 21-25 Yrs | 1.330 | 1.160 | 1.142 | 1.140 | 1.145 | 1.309 |
| 26-30 Yrs | 1.408 | 1.212 | 1.212 | 1.179 | 1.201 | 1.476 |
| 31-35 Yrs | 1.400 | 1.264 | 1.288 | 1.182 | 1.188 | 1.235 |
| 36+ Yrs | 1.629 | 1.235 | 1.228 | 1.204 | 1.122 | 1.198 |
| **Black Men** | | | | | | |
| 1-5 Yrs | 1.844 | 1.984 | 1.730 | 1.495 | 1.445 | 1.702 |
| 6-10 Yrs | 2.024 | 1.802 | 1.567 | 1.418 | 1.432 | 1.754 |
| 11-15 Yrs | 1.863 | 1.322 | 1.397 | 1.406 | 1.340 | 1.274[++] |
| 16-20 Yrs | 1.828 | 1.536 | 1.416 | 1.368 | 1.355 | 1.517 |
| 21-25 Yrs | 1.554 | 1.262 | 1.380 | 1.297 | 1.281 | 1.298 |
| 26-30 Yrs | 1.655 | 1.388 | 1.390 | 1.340 | 1.276 | 1.130[++] |
| 31-35 Yrs | 1.220[++] | 1.406[++] | 1.267 | 1.251 | 1.254 | 1.270[++] |
| 36+ Yrs | 1.194[++] | 0.950[++] | 1.276 | 1.240 | 1.202 | 1.296[++] |
| **Black Women** | | | | | | |
| 1-5 Yrs | 1.702 | 1.784 | 1.557 | 1.408 | 1.319 | 1.655 |
| 6-10 Yrs | 1.623 | 1.866 | 1.523 | 1.436 | 1.255 | 1.047[++] |
| 11-15 Yrs | 1.689 | 1.665 | 1.514 | 1.357 | 1.305 | 1.443 |
| 16-20 Yrs | 1.855 | 1.701 | 1.496 | 1.499 | 1.323 | 1.163[++] |
| 21-25 Yrs | 1.822 | 1.817 | 1.483 | 1.385 | 1.298 | 1.465 |
| 26-30 Yrs | 1.707[+] | 1.346[++] | 1.567 | 1.507 | 1.285 | 1.665 |
| 31-35 Yrs | 1.420[++] | 1.811[++] | 1.409 | 1.525 | 1.357 | 1.318[++] |
| 36+ Yrs | 1.878[++] | 1.887[+] | 1.443 | 1.508 | 1.313 | 1.490 |

## Graduate Earnings Premium, White Women[a]

| Experience Group | 1940 Census | 1950 Census | 1960 Census | 1970 Census | 1980 Census | 1988 CPS |
|---|---|---|---|---|---|---|
| 1-5 Yrs | 1.355[+] | - | 1.019[++] | 1.058[++] | 1.157 | 1.124[+] |
| 6-10 Yrs | 1.139[++] | - | 1.228[++] | 1.197[++] | 1.221 | 1.247 |
| 11-15 Yrs | 1.198[++] | - | 1.215[+] | 1.370 | 1.386 | 1.287 |
| 16-20 Yrs | 1.214[++] | - | 1.278[+] | 1.278 | 1.297 | 1.603 |
| 21-25 Yrs | 1.032[++] | - | 1.323 | 1.343 | 1.374 | 1.430 |
| 26-30 Yrs | 1.301[++] | - | 1.217[+] | 1.276 | 1.401 | 1.486 |
| 31-35 Yrs | 1.582[+] | - | 1.177[++] | 1.206[+] | 1.391 | 1.752 |
| 36+ Yrs | 0.776[++] | - | 1.140[++] | 1.458 | 1.166[++] | 1.484[+] |

Notes:
All values significantly different from one at the 1% level unless otherwise noted:
    ++: Not significant at the 5% level
    +: Significant at 5% level but not at 1% level

[a] The results are reported for whites only because the number of blacks in each of the experience groups who have 17 or more years of education is very small.

## APPENDIX D

### Determination of Group Experience Classes

I will show how I conducted the analysis for cohort size ratios. The same analysis is done for the other variables simply by subsitituting that variable wherever cohort size ratio appears in the following discussion.

(1) Estimate equation with assuming same slope and constantfor all experience groups. The equation estimated is:

(a) $CEP_{it} = c + a^*CSR_{it} + e_{it}$

where $CEP_{it}$ = college earnings premium for experience group i in year t

$CSR_{it}$ = cohort size ratio for exp. grp i in year t

i = 1-5, 6-10, 11-15, 16-20, 21-25, 26-30, 31-35, 36+

c = constant

a = slope

e = error term

The results are in the first row of Table D.

(2) Estimate equation (a) but allow constant to vary by experience group, i.e., estimate the following equation

(b) $CEP_{it} = c + c1^*D6\_10 + c2^*D11\_15 + c3D16\_20 +$

$c4^*D21\_25 + c5^*D26\_30 + c6^*D31\_35 + c7^*D36$

$a^*CSR_{it} + e_{it}$

where $D6\_10$ = dummy variable which takes value (1) for 6-10 years of experience group

$D11\_15$ = dummy variable which takes value 1 for 11-15 years of experience group

$D16\_20$ - D36 defined similarly

all other variables defined as in eq(a).

In this case, c is the constant for the 1-5 yrs of experience group, c + c1 is the constant for the 6-10 yrs of experience group, etc. These results are in the last eight rows of Table D.

(3) Estimate equation (a) but allow slope to vary, i.e., estimate:

(c) $CEP_{it} = c + CSR_{it}^* (a + a1^*D6\_10 + a2^*D11\_15 + a3^*D16\_20 +$

$a4^*D21\_25 + a5^*D26\_30 + a6^*D31\_35 + a7^*D36) + e_{it}$

where variables defined as above.

In this case, a is the slope for 1-5 years, a+a1 is the slope for 6-10 years, etc.

I conduct the analysis in this fashion because including all the dummy variables to interact with both the slope and the constant at once causes many problems with the estimation. Because the number of observations is so low, I cannot precisely test to see if the effects vary, but rather I look for clear breaks in the effects. In this case the 1-25 years of experience group appears much different from those with 26 or more years of experience. This break also seems natural

when I do the same analysis with the other explanatory variables. The last two rows of Table 3 show the slope and constant when this division is made.

## TABLE D

### Differences in the Effect of Cohort Size on the College Earnings Premium by Experience Group
### White Men

| Experience Group | Constant | Slope |
|---|---|---|
| All Exp Groups | 1.42 | 0.05 |
| 1-5 Years | 1.77 | -0.03 |
| 6-10 Years | 1.68 | -0.10 |
| 11-15 Years | 1.70 | -0.08 |
| 16-20 Years | 1.71 | -0.07 |
| 21-25 Years | 1.65 | -0.13 |
| 26-30 Years | 1.57 | -0.23 |
| 31-35 Years | 1.54 | -0.25 |
| 36+ Years | 1.47 | -0.41 |
| 1-25 years (N=30) | 1.46 | 0.04 |
| 26+ Years (N=18) | 1.54 | -0.19 |

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