The Great Equalizer: Does Education Pay Off for Members of Minority Groups?

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Introduction

Does going to school pay off? Most people think so. Currently, almost 90 percent of young adults[1] graduate from high school and about 60 percent of high school seniors continue on to college the following year. People decide to go to college for many reasons. One of the most obvious is the expectation of future economic success based on educational attainment.

However, despite rising educational attainment across social and demographic lines, income surveys show persistent disparities in earnings between men and women, and among members of difference races and ethnic groups. Yet much of the same research confirms the strong relationship between earnings and education. At least some of the earnings differences between members of difference groups arise from residual differences in educational attainment by members of those groups. Educational differences do not fully explain earnings disparities in the United States. In light of the persistent differences in earnings among people of different social groups, does education really matter?

Education and Earnings

It is well documented that earnings increase with educational level.[2] For example, adults ages 25 to 64 who worked full-time, year-round at some point during 1997 to 1999[3] earned a mean $40,800 per year. Average earnings ranged from $23,400 for high school dropouts to $30,400 for high school graduates, $52,200 for college graduates, and $109,600 for workers with professional degrees (M.D., J.D., D.D.S., or D.V.M.). As shown in Figure 1, with the exception of workers with professional degree who have the highest average earnings, each successively higher education level is associated with an increase in earnings.

Figure 1 also demonstrates how work experience influences earnings. Average earnings for people who worked full-time, year-round were somewhat higher than those for all workers (which includes people who work part-time or for part of the year). Most workers worked full-

[1] Ages 25 to 29.

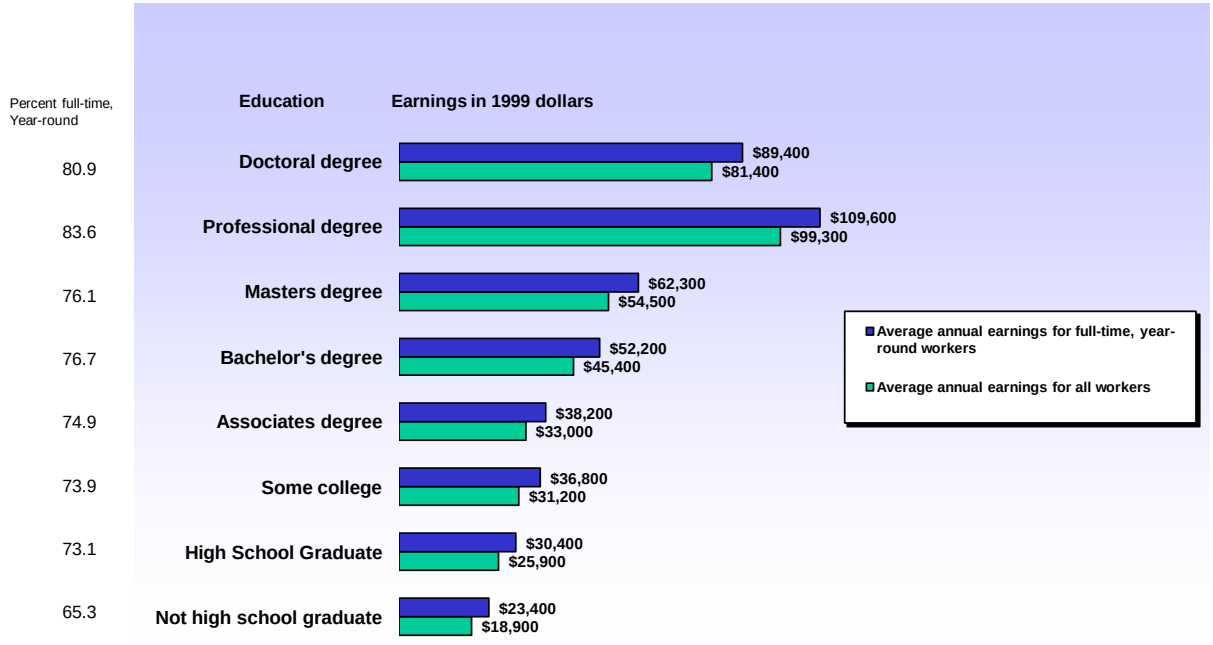
[2] The following description of education and earnings derive from our analysis of Current Population Survey data for the years 1975 to 2000.

[3] The study period covers earnings from three years -- 1997, 1998, and 1999. Earnings are represented in 1999 dollars.

time and year-round (74 percent). However, the commitment to work full-time, year-round varies with demographic factors, such as educational attainment, sex, and age. For instance, high school dropouts (65 percent) are less likely than those with bachelor=s degrees (77 percent) to work full-time and year-round. Historically, women=s attachment to the labor force has been more irregular than men=s due mostly to competing family responsibilities. Earnings estimates based on all workers (which includes part-time workers) includes some of this variability. Yet, regardless of work experience, the education advantage remains.

Earnings estimates based on full-time, year-round workers provide a more straight-forward view of potential earnings, and remove some biases for demographic group comparisons.

Figure 1: Work Experience and Average Annual Earnings of Workers 25 to 64 Years Old, by Educational Attainment, Based on 1997-1999 Experience



•**Source: U.S. Census Bureau, Current Population Surveys, March 1998, 1999, 2000.**

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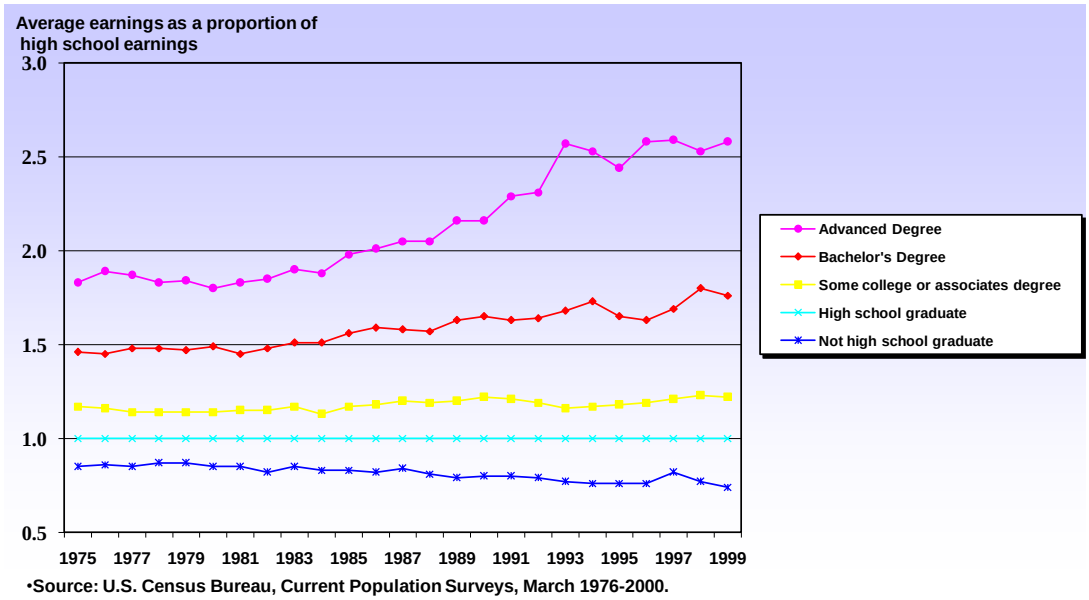
Historically, education has paid off.

Over the past 25 years, earnings differences have grown dramatically among workers with different levels of educational attainment. As Figure 2 shows, in 1975, full-time, year-round workers with a bachelor=s degree had 1.5 times the annual earnings of workers with only a high school diploma. By 1999, this ratio had risen to 1.8. Workers with an advanced degree, who earned 1.8 times the earnings of high school graduates in 1975, averaged 2.6 times the earnings of workers with a high school diploma in 1999. During the same period, the relative earnings of the least educated workers fell dramatically. While in 1975, full-time, year-round workers without a high school diploma earned 0.9 times the earnings of workers with a high school diploma, by 1999, they were earning only 0.7 times the average earnings of high school graduates.

Figure 2: Average Earnings of Full-time, Year-round Workers as a Proportion of the Average Earnings of High School Graduates by Educational Attainment: 1975 to 1999



•Source: U.S. Census Bureau, Current Population Surveys, March 1976-2000.

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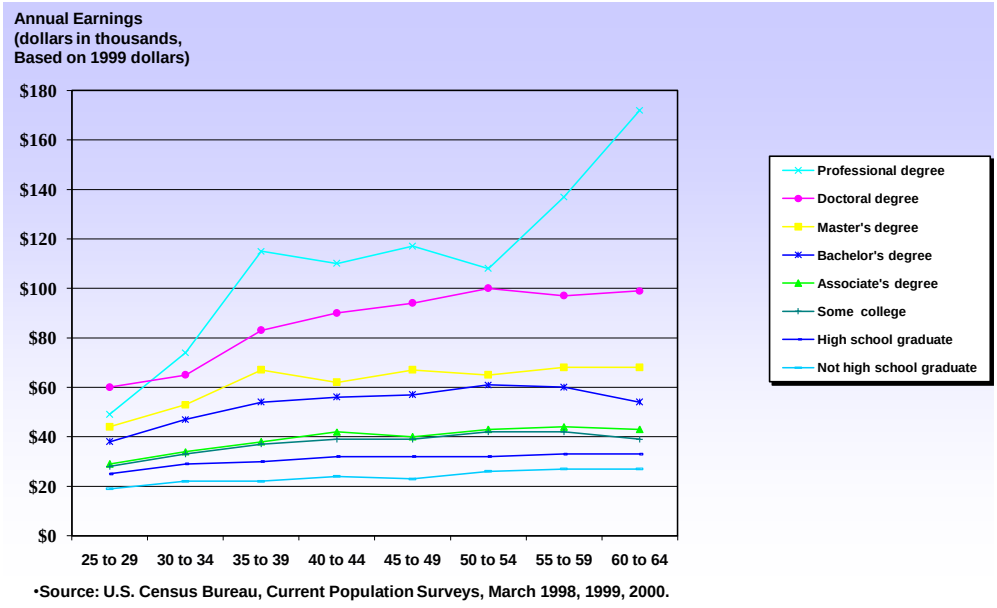
The historical change in relative earnings by educational attainment may be explained by both the supply of labor and the demand for skilled workers. In the 1970s, the premiums paid to college graduates dropped because of an increase in their numbers, which kept the relative earnings range among the educational attainment levels rather narrow. Recently, however, technological changes favoring more skilled (and educated) workers have tended to increase earnings among working adults with higher educational attainment, while, simultaneously, the decline of labor unions and a decline in the minimum wage in constant dollars have contributed to a relative drop in the wages of less ed ucated workers.[4]

Earnings differences by educational attainment compound over one=s lifetime.

The large differences in average earnings among the educational levels reflect both differential starting salaries and also disparate earnings trajectories B that is, the path of earnings over one=s life. As Figure 3 shows, the earnings paths of those with doctoral and professional degrees look very different from those of workers at other levels of education.

Figure 3: Earnings Trajectories for Full-Time, Year-round Workers by Educational Attainment, Based on 1997-1999 Work Experience



•Source: U.S. Census Bureau, Current Population Surveys, March 1998, 1999, 2000.

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[4]Boesel, David, *College for All? Is There Too Much Emphasis on Getting a 4-year College Degree?* National Library of Education, Department of Education NLE 1999-2024, 1999.

At most ages, however, more education equates to higher earnings.[5] Indeed, the educational payoff is most notable at the highest educational levels

Within the same level of education, earnings disparities exist among social groups.

Among those ages 25 and older, the percentage of men and women with a bachelor=s degree has increased sharply over the past 25 years, with women markedly narrowing the gap. In 1975, 18 percent of men and 11 percent of women had attained a bachelor=s degree. By 2000, 28 percent of men and 24 percent women had a bachelor=s degree. In fact, in each year since 1982 more American women than men have received bachelor=s degrees.[6] Additionally, 84 percent of both men and women had completed high school in 2000, up from 63 percent for men and 62 percent for women in 1975.

Even so, men have higher average earnings than women with similar educational attainment. Among full-time, year-round workers ages 25 to 64, the female-to-male earnings ratio was 0.67 for the 1997-1999 period. This wage gap occurred with very little variation at every level of educational attainment.

Across the ages, however, the female-to-male earnings ratio was higher among younger full-time, year-round workers (0.84) than among older workers (0.56). Clearly, younger women begin their work-life with earnings much closer to those realized by men.[7] This pattern of male and female younger workers starting with closer earnings than those of older workers is not new. In 1975 the earnings ratio was 0.69 for younger workers compared with 0.56 for older workers. The age differences remain, although the earnings gap between men and women is closing.

Figure 4 illustrates the variation in female-to-male earnings ratios by age and education level. At both the high school and bachelor=s attainment level, the earnings of younger women

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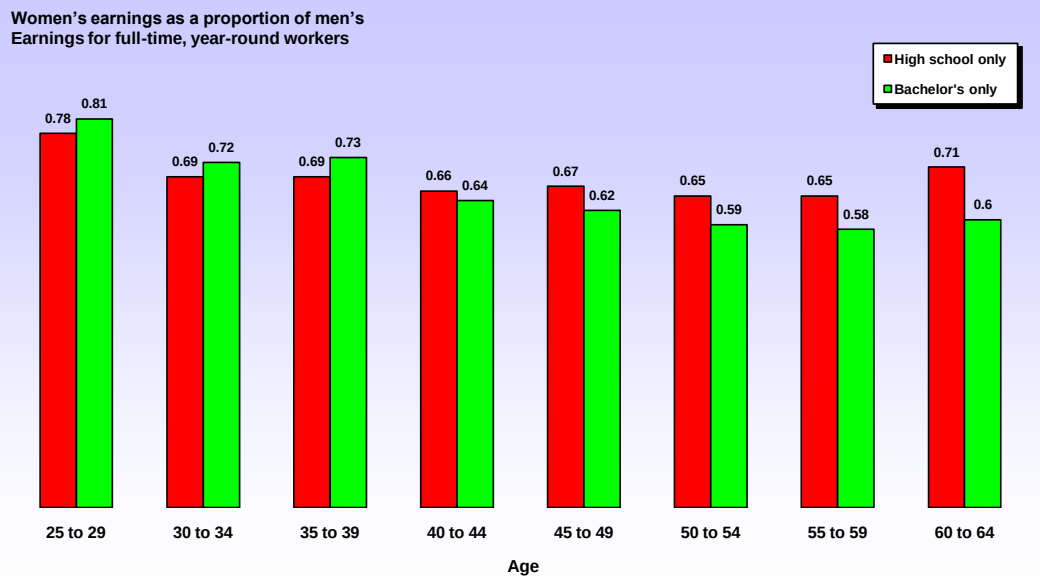
[5]With the exception of workers with professional degrees who have the highest average earnings. At some ages average earnings for people with some college and for people with an associates degree are not significantly different.

[6]National Center for Education Statistics, *ADigest of Education Statistics 1999@*, U.S. Department of Education, NCES 2000-031, Table 249.

[7]Some of the persistent, though shrinking, differences in earnings may be related to field of study. Women have historically tended to major in fields with lower economic rewards than have men. While this remains the case, a growing proportion of female college graduates now receive bachelor=s degree in more highly paid fields, such as business or computers (National Center for Education Statistics, *A1999 Digest of Education Statistics@*, U.S. Department of Education, NCES 2000-031).

and men are relatively close with women earning about four-fifths of men=s earnings. However, for workers with a bachelor=s attainment, the earnings difference between men and women becomes more pronounced as workers age (from 0.81 for ages 25 to 29 years compared with 0.60 for ages 60 to 64), compared with a relatively flat earnings difference for workers at the high school level.

Figure 4: Women's Earnings Relative to Men's by Age and Educational Attainment: 1997-1999



•Source: U.S. Census Bureau, Current Population Surveys, March 1998, 1999, 2000.

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Numerous events over one=s work-life may account for the expanding wage gap with age, such as continuous participation in the labor force, commitment to career goals, competing events, discrimination, and promotions. These and other factors, may lower the earnings of women relative to men, and these differences play out dramatically with total work-life earnings.[8] Educational attainment also differs significantly by race and Hispanic origin.[9]

[8]See Suzanne M. Bianchi and Daphne Spain. American Women in Transition. Russell Sage Foundation, New York, 1986. pp. 139-168.

[9]Because Hispanics may be of any race, data in this report for Hispanics overlap slightly with data

Among adults 25 years old and over in 2000, 88 percent of White non-Hispanics, 86 percent of Asians and Pacific Islanders, and 79 percent of Blacks had attained at least a high school diploma. Similarly, 28 percent of White non-Hispanics, 44 percent of Asians and Pacific Islanders, and 17 percent of Blacks had received a bachelor=s degree. For Hispanics (who may be of any race), only 57 percent had a high school diploma and 11 percent a bachelor=s degree. Even accounting for these large differences in educational attainment by looking at earnings within each education category, earnings differences persist.

On average, earnings are lower for Blacks and Hispanics than for White non-Hispanics with the same educational attainment level. Yet educational investment still pays off. Black workers with less than a high school education earned $20,000, increasing to $26,000 for workers with a high school education, $40,000 for a bachelor=s degree, and $51,000 for an advanced degree. Likewise, Hispanic earnings also reflects this ascending outcome. Thus, regardless of race or ethnicity, higher educational attainment equates to higher earnings.

A simple cross tabulation of the mean earnings by educational attainment for members of different groups shows that the economic reward for each succeeding level of educational attainment differs by group (Table A). The average earnings differences between a high school drop out and a high school graduate are fairly uniform for the three race groups and Hispanics, at about $5,000 each. However, the earnings for workers with a bachelor=s degree compared with

Table A. Annual Average Earnings by Race and Hispanic Origin and Educational Attainment: 1997-1999

(Earnings for full-time, year-round workers ages 25 to 64 years old, in 1999 dollars)

	Total	White, non-Hispanic	Black	Asian and Pacific Islander	Hispanic (of any race)
Not high school graduate	23,420	27,086	20,362	22,056	20,041
High school graduate	30,436	31,969	25,655	26,659	26,026
Some college	36,758	38,925	30,194	31,995	30,867
Associate	38,216	39,507	32,077	36,568	33,600
Bachelors	52,231	54,562	40,251	46,006	40,940
Advanced	75,006	77,475	51,154	74,054	65,805

Source: U.S. Census Bureau, Current Population Survey, March 1998, 1999, and 2000.

for the Black population and for the Asian and Pacific Islander population. Based on the March 1998, 1999, and 2000 Current Population Survey samples, 3 percent of Black adults 25 to 64 years old and 2 percent of Asian and Pacific Islanders 25 to 64 years old are also of Hispanic origin. Data for the American Indian and Alaska Native population are not shown in this report because of their small sample size in the March 1998, 1999, and 2000 Current Population Surveys.

workers with just a high school diploma increased differently for different ethnic groups; about $23,000 for White non-Hispanics, $19,000 for Asians and Pacific Islanders, and $15,000 for Blacks and Hispanics. More dramatic differences appear between the average earnings for people with advanced degrees and bachelor=s degrees. Continuing college beyond the bachelor=s level pays about an extra $25,000 for White non-Hispanics, Asians and Pacific Islanders, and Hispanics, compared with $11,000 for Blacks.

More than one underlying cause could produce these earnings differences. Previous researchers have offered explanations which fall, roughly, into three different categories. The first, exemplified by Siegel in his classic 1965 paper, AOn the Cost of Being a Negro,@ attributes earnings differences to outright discrimination.[10] Siegel postulated that institutions value similarly educated workers differently according to their race, and, essentially, imposed an economic Arent@ on Black individuals who achieve greater education. A second category, more often applied to differences in earnings between the sexes, includes strictly functional hypotheses, for example, postulating that women=s commitment to family makes them a greater risk to businesses, discouraging investment in women employees.[11] A third category includes hypotheses which suggest past discrimination has lingering effects on current members of formerly discriminated-against groups.[12] This last category is a sort of middle ground between the first two, assuming that, while discrimination may no longer actively work against minority groups, historical disadvantages may yield functional impediments to current achievement by present minority group members. For example, people with less educated parents may find, upon their own graduation, that they lack their peers= parental social connections in the job world.

A common thread among these three areas of research has been the fairly complex statistical models which testing these theories required. Various models have included, for example, controls for continuity of work, seniority on the job, socio-economic status of parents, quality measures of the degree, or mastery of English. Even Siegel, who eschewed regression in

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[10]Siegel, Paul M., AOn the Cost of Being a Negro@, *Sociological Inquiry*, Number 35, Winter 1965,pp. 41-57. See also Johnson, Michael P.; Sell, Ralph R.; AThe Cost of Being Black: A 1970 Update@, *AJS* Volume 82, Number 1, 1975,pp. 183-190. See also Baldwin, Marjorie L.; Butler, Richard J.,; Johnson, William G.; AA Hierarchical Theory of Occupational Segregation and Wage Discrimination@, *Economic Inquiry*, Vol. 39, No. 1, January 2001, pp. 94-110.

[11]For an excellent review, see Bianchi and Spain, pp. 169-197.

[12]Similar to the Theory of Cumulative advantage, as described by Robert Merton in AThe Matthew Effect in Science@, *Science*, 1968, pp. 56-63.

favor of a strictly descriptive method, included controls for occupation. In short, other researchers have attempted to create an overall model of earnings in which education was only one predictor among many.

In this paper, we take a different approach. We do not attempt to account for all the factors which impact earnings, but rather, focus strictly on the returns to education for members of different social groups. This approach should require much simpler models than previous research, yet, if successful, will hopefully yield insights into important basic questions.

Questions:

In this research, we explore the relationship between education and earnings for members of different social groups. Specifically, we consider whether Blacks, Hispanics, and women receive similar dollar benefits from education as do White males. Toward that end, we attempt to specify statistical models with sufficient predictive power to answer the following questions:

1. Do members of minority groups begin at a lower level in the payoff curve (that is, for example, a simple Acost of being Black@)?

2. Or, do members of minority groups actually accrue different proportional benefits at each level of education, that is to say, have a different payoff curve altogether?

3. If the answers to either questions 1 or 2 are yes, does education make a significant impact compared to a social group=s historical disadvantages?

Data

The analysis in this paper is based on data from the March 1998, 1999, and 2000 Current Population Surveys (CPS) conducted by the U.S. Census Bureau for the Bureau of Labor Statistics. The March CPS is a nationally representative household survey of the civilian noninstitutionalized population of the United States based on a complex sample design. In each year (1998, 1999, and 2000) approximately 50,000 households were sampled nationwide, including about 100,000 people ages 15 and older.

The main purpose of the CPS is to collect labor force information to estimate the monthly national unemployment rate and other employment statistics. The CPS collects additional information on other social, demographic, and economic characteristics of people such as age, sex, race, and Hispanic origin, and educational attainment.

During the March CPS, the Census Bureau collects supplemental information to the main survey, including personal earnings and other demographic variables. Because the March CPS

asks about earnings during the previous year, the earnings data in the remainder of this paper are 1997, 1998, and 1999 earnings -- all adjusted to represent 1999 earnings.

To simplify our analysis, we include only those people 25 to 64 years old. This captures the vast majority of working adults who have completed their education. The arbitrary start age biases the data by artificially inflating the earnings of the least educated among the youngest people in the sample. Presumably, young people who were not in school could have accumulated work experience and seniority in the job market compared with those of the same age who attended more school. However, the direction of the bias, that is, in affording somewhat higher salaries to those with less education, should not negatively impact the analysis in this paper. To control for the different rates of part-time employment among people of different educational levels, this paper restricts results to people employed full-time, year round.[13] We consider only individuals with positive earnings.

Missing CPS data are regularly imputed via an allocation process. Blank cases are filled in by duplicating the answers of similar households with the same key characteristics, such as race or age of the householder. To avoid covariance within the dependent variable, we used only non-allocated cases in this analysis.

Each year, one-half of the CPS sample overlaps with the previous year=s sample. To avoid duplicate cases using consecutive years of data, we included only those people who were in rotations 1 through 4 in each year (in their first year of CPS). The resulting sample includes 51,404 sample individuals.

Several times in the text we refer to "earnings trajectories" based on age. While this gives the appearance of following individuals across time, these data are cross sectional. All references to trajectories are based on the assumption that a person entering the workforce today will experience earnings similar to older individuals like themselves at each age during their working life.

Methods:

We begin by exploring the relationship between education and earnings, controlling for social group within a consolidated model. Next, we explore the earnings/education relationship for each subgroup with a three way model (earnings, age, education) applied to members of each subgroup separately. Finally, we build a logistic model using the same independent variables as the consolidated Ordinary Least Squared (OLS) regression to determine whether education can increase the probability of achieving stellar[14] income status more than social group membership can decrease it.

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[13]CPS is a cross sectional survey, and does not provide sufficiently detailed work-history data to account for hours worked in all jobs during the year for which it collects earnings data. Limiting our regression analysis to full-time year round workers roughly controls for these unavailable variables.

[14]In this paper, we define "stellar" incomes as any dollar amount of $100,000 or higher (about 4%

Overall, we specify 11 OLS regression models and 1 logistic regression model. Model 1, chosen because it is the simplest possible conceptual model, focuses on the relationship between the natural log of earnings and education for members of minority social groups. We began with the log of earnings to control for the right-skewed distribution of earnings. In addition to the earnings and education variables, we included only age, sex, and race/ethnicity. Thus we begin with...

Model 1. Log(Earnings) = intercept + [A][educational attainment] + [B]*[age] + [C]*[social group]*

Model 2 attempts to estimate the actual dollar cost of membership within each social group by applying the same conceptual model to actual earnings. Model 2 differs from Model 1 only in that it controls for right-skewed cases by excluding the highest earners ($100,000 and over). Thus...

Model 2. [Earnings up to $100,000] = intercept + [A][educational attainment] + [B]*[age] + [C]*[social group]*

Model 3 applies the same conceptual model to the remainder of the population, those earning $100,000 or more.

Model 3 . [Earnings of $100,000 or more] = intercept + [A][educational attainment] + [B]*[age] + [C]*[social group]*

Models 4 through 11 apply the basic model shown in Model 2 (earnings predicted by age and education) to members of each social group separately (we specify the social groups in the next section). Thus, for each group, we tested the model....

Models 4 - 11. [Earnings up to $100,000] = intercept + [A][educational attainment] + [B]*[age]*

Finally, Model 12 employs the same independent variables to predict the log odds likelihood of people achieving $100,000 earnings. Thus....

Model 12. Log(Q/(1-Q)) = intercept + [A][educational attainment] + [B]*[age] + [C]*[social group]*

...where "Q" is the probability of earning $100,000 or more.

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of full-time, year-round earners). This is an arbitrary cutoff. However, the model produces similar results with other cutoff figures (we tested figures as low as $80,000 and as high as $250,000).

INDEPENDENT VARIABLES

Educational attainment is a vector of dichotomous variables representing discrete education levels. We chose to represent educational attainment as a series of discrete education levels to allow us to explore the different values of each education level. By way of contrast, using a continuous education variable forces the model to assign the same marginal value to the step between, for example, a bachelor's degree and an advanced degree as that between a high school diploma and completing the first year of college. Our categories are less than high school, high school graduate, some college, bachelor=s degree, advanced degree; high school graduate is the omitted category in all models, and thus our comparison group.

Age is a vector of age and age-squared. To account for the nonlinear relationship between age and earnings, we include both age and age-squared as independent variables.[15] The universe of our models includes those people 25 to 64 years old. We subtract 24 from age before squaring it.

Social group is a vector of dichotomous variables on race and ethnicity crossed with sex, and [A], [B], and [C] are parameter vectors. Including race and ethnicity (Hispanic origin) crossed with sex as a set of dichotomous variables assumes that race, ethnicity, and sex have independent linear effects upon earnings (moving the intercept). In addition, including these variables forces our first two models to assume that education and earnings exhibit the same underlying relationship (the same slope) for members of different social groups.

We included the following social groups in our analysis:

Male White non-Hispanic
Male Black
Male Asian and Pacific Islander
Male Hispanic
Female White non-Hispanic
Female Black
Female Asian and Pacific Islander
Female Hispanic

Note that using the above matrix of social groups in the models below assumes not just that race, ethnicity, and sex have independent linear effects upon earnings, but also implies that they have *equivalent* effects, that is, that they impact earnings in a similar way. This is a large assumption we make for the sake of simplicity. However, because we input this matrix into our models as a

[15]Lorence, Jon; Mortimer, Jeylan T.; AJob Involvement Through the Life Course: A Panel Study of Three Age Groups@, *American Sociological Review*, Vol. 50, October 1985, pp. 618-638.

series of separate dichotomous variables whose coefficients have the freedom to vary, if this assumption fails, it will not damage our models. In addition, the resulting coefficients inform us about whether this was a good assumption or not.

Results

Selecting a model to investigate earnings and education.

We began by specifying an OLS regression model on logged earnings (Table B). The overall model (Model 1) shows the general relationship between earnings and education, controlling for age and social group membership. The model is statistically significant at the .0001 level, as are all estimated coefficients. With an R-squared of .19, much of the variance in earnings (about 81 percent) is unaccounted for by this model. However, the intention of this model is only to determine the relationship between earnings, education, and social group.

As expected, we find that age has a significant and positive relationship with earnings. We also see that age squared has a negative relationship, so the monetary return due to age decreases with time.

Table B. Parameter Estimates and standard Errors for Log of Earnings, Earnings Below $100,000, and Earnings $100,000 or More

(Earnings for Full-time, Year-Round Workers Ages 25 to 64)

	Model 1 Log of earnings n= 51,404 Adj R squared 0.19		Model 2 Earnings $1 to $100,000 n= 49,260 Adj R squared 0.28		Model 3 Earnings $100,000 or more n= 2,134 Adj R squared 0.01	
Independent variables	Parameter	Standard error	Parameter	Standard error	Parameter	Standard error
Intercept	10.078 ***	0.013	26,668 ***	266	180,041 ****	18,927
Age	0.029 ***	0.001	938 ***	27	-899	1,615
Age squared	-0.001 ***	0.000	-18 ***	1	42	37
Less than high school	-0.294 ***	0.013	-6,815 ***	278	104,357 ****	33,989
Some college	0.171 ***	0.010	4,840 ***	208	-10,604	15,917
Associate	0.230 ***	0.013	6,475 ***	269	-2,590	19,812
Bachelors	0.508 ***	0.010	14,375 ***	205	-1,350	12,964
Advanced	0.755 ***	0.012	20,341 ***	273	6,629	12,906
Black male	-0.209 ***	0.016	-6,453 ***	327	-31,318	22,016
Black female	-0.444 ***	0.015	-12,457 ***	315	-46,796	40,577
API male	-0.211 ***	0.023	-4,970 ***	498	-26,766	15,387
API female	-0.373 ***	0.027	-10,745 ***	564	-40,771	31,539
Hispanic male	-0.233 ***	0.015	-6,440 ***	316	-14,661	21,888
Hispanic female	-0.485 ***	0.019	-13,381 ***	390	59,238	43,501
White female	-0.367 ***	0.008	-10,918 ***	169	-14,365	9,991

*p < .10, **p<.05, ***p<.01

Note: Numbers in parentheses are negative.

Source: U.S. Census Bureau, Current Population Survey, March 1998, 1999, and 2000.

Educational attainment has a strong influence on earnings. Interpreting a dollar amount is difficult in a semi-log model. However, we can use these coefficients to determine the relative value of different education levels. So, for example, we see that, all other things being equal, the positive payoff for getting an associates degree after high school (0.230) is nearly as large as the negative effect of not finishing high school (-0.294). In turn, the difference between a high school diploma and associates degree is about half the difference between a high school diploma and a bachelor's degree (0.508), and about a third the difference between a high school diploma and an advanced degree (0.755).

This model assumes that the earnings realized by members of different social groups will all reflect the same underlying education/earnings relationship. Provided we accept this assumption, we can use this model to make comparisons of the relative value of more education compared to the Acost@ of not being a White non-Hispanic male.

All other thing being equal, the earnings of Black, Hispanic, and Asian and Pacific Islander men are all lower than those of White non-Hispanic men by similar amounts (-0.209, -0.233, -0.211, respectively). The magnitude of this negative "cost" of not being a White non-Hispanic is something less than the positive payoff for attaining an associates degree compared with only finishing high school (about 0.230), and more than the benefit of finishing some college compared to only finishing high school (about 0.171).

Women suffer a relatively higher Acost@ for not being a White non-Hispanic than men. Black women (-0.444), Hispanic women (-0.485), and Asian Pacific Islander women (-0.373) each suffer a loss of a magnitude between the benefit gained from achieving an associates degree over high school attainment (0.230), and gaining a bachelor's degree over high school attainment (0.508). White non-Hispanic women (-0.367) suffer a Acost@ of not being a White non-Hispanic male somewhat similar to the Acost@ suffered by Asian and Pacific Islander women.

The coefficients in Model 1 based on logged earnings are difficult to translate into actual dollar figures. In Model 2, we regress the same independent variables on earnings, but use earnings directly. However, we also have truncated the sample by removing those with highest earnings ($100,000 or more), in an attempt to prevent this small proportion (4 percent) of super-high income cases from skewing our results. We are left with the vast majority of individuals (49,260 cases).

Model 2 is significant at the .0001 level, as are all coefficients. The R-squared is somewhat higher, .28. All coefficients are in the same direction as in Model 1, and of similar relative magnitudes. This means that, holding age and education constant, Black, Hispanic, and Asian and Pacific Islander women earning less than $100,000 per year and working full time, year round, earn between about $10,700 and $13,400 less than similar White non-Hispanic men. White non-Hispanic women earn about $10,900 less than White non-Hispanic men. These costs approach the benefit of earning a bachelor's degree compared to only a high school diploma, about $14,400. They are considerably less than the benefit of gaining an advanced degree compared to only completing high school, about $20,300.

Black, Hispanic, or Asian and Pacific Islander men fare somewhat better. Among those earning less than $100,000, controlling for education and age, these men earn about $5,000 to $6,500 a year less than White non-Hispanic men. To make up for this deficit through education, Asian and Pacific Islander males (-$5,000) need to complete some college over and above high school ($4,900). Hispanic males (-$6,400) and Black males (-$6,500) would need to complete an associates degree over and above a high school diploma.

These costs are averages and do not factor in the downward bias exerted by limiting the sample to only those individuals earning less than $100,000. However, because of the small size of the excluded population (about 4% of cases), and because these averages do not suffer the upward drag of the super high earnings individuals, we believe that this model produces good

estimates for the vast majority of working individuals. In addition, the somewhat higher R-squared term in the earnings limited model suggests that at least some of the unexplained variance in logged earnings from Model 1 occurs in the small group of high earners. To investigate this suggestion, we produced Model 3 of people earning $100,000 or more.

Model 3 does not work. The model yields statistically insignificant, or barely significant results for all coefficients apart from the intercept, and has an R-squared of .01, leaving more than 99 percent of the observed variance in earnings unexplained. This indicates that the same cluster of independent variables which can somewhat predict earnings below $100,000 fails to predict marginal earnings above this level. One interpretation of this result is that once earnings have exceeded a certain threshold, in this case $100,000, education, age, and social group no longer predict the specific level of earnings an individual might reach. In other words, among stellar earners, education, social group membership, and age do not predict who will earn $100,001 and who earn $1,000,001. We return to this result in a later section of this paper.

We conclude that Model 2 had the best predictive power among the vast majority of the sample.

1. Do members of minority groups begin at a lower level in the payoff curve?

Models 1 and 2 give some support to the hypothesis that people in certain social groups enter the job market with a drag on their earnings potential, and furthermore, that this drag is of a magnitude to overcome at least some gains from education. However, the models include the implicit assumption that this drag was a simple linear effect, in essence, a yearly Arent@ for not being a White non-Hispanic male. To investigate whether members of different social groups experience fundamentally different earnings returns from education, we divide the sample by social group, and apply the remaining elements of the model to each group individually. Table C shows our results. Once again, we use earnings as our dependent variable, and limit the population to those with earnings below $100,000.

All eight models (Models 4-11) are statistically significant at the .0001 level, with R-squares between about .16 (Black males) and .28 (Hispanic females). As we would expect based on the previous results, nearly all variables in all models are statistically significant.

Table C. Parameter Estimates and Standard Errorrs for each Social Group in Comparison to High School Graduates

(Earnings of $1 to $100,000 for full-time, year-round workers ages 25 to 64 years)

	Model 4 White Non-Hispanic Male n= 21,418 Adj R squared 0.19		Model 5 Black Male n= 2,707 Adj R squared 0.16		Model 6 API Male n= 1,092 Adj R squared 0.23		Model 7 Hispanic Male n= 3,190 Adj R squared 0.24	
Independent variables	Parameter	Standard error	Parameter	Standard error	Parameter	Standard error	Parameter	Standard error
Intercept	23,918 ***	440	20,118 ***	1,178	21,389 ***	2,123	22,041 ***	679
Age	1,266 ***	48	962 ***	134	703 ***	229	684 ***	80
Age squared	-24 ***	1	-19 ***	4	-13 **	6	-13 ***	2
Less than high school	-7,584 ***	528	-5,766 ***	1,159	-7,490 ***	2,581	-7,132 ***	534
Some college	4,765 ***	360	4,953 ***	904	5,673 ***	2,169	5,291 ***	680
Associate	5,552 ***	464	6,822 ***	1,427	12,354 ***	2,621	10,084 ***	1,043
Bachelors	14,577 ***	345	12,879 ***	1,070	18,071 ***	1,713	13,622 ***	844
Advanced	19,246 ***	458	16,742 ***	1,679	25,172 ***	1,932	21,176 ***	1,270

	Model 8 White Non-Hispanic Female n= 15,381 Adj R squared 0.23		Model 9 Black Female n= 2,945 Adj R squared 0.27		Model 10 API Female n= 840 Adj R squared 0.27		Model 11 Hispanic Female n= 1,866 Adj R squared 0.28	
Independent variables	Parameter	Standard error	Parameter	Standard error	Parameter	Standard error	Parameter	Standard error
Intercept	17,737 ***	421	14,935 ***	923	14,970 ***	2,151	17,957 ***	732
Age	740 ***	45	711 ***	102	707 ***	208	356 ***	84
Age squared	-15 ***	1	-13 ***	3	-16 ***	6	-6 ***	2
Less than high school	-6,030 ***	599	-5,212 ***	968	-928	2,194	-6,629 ***	590
Some college	4,771 ***	336	5,545 ***	710	10,297 ***	1,942	4,349 ***	667
Associate	6,506 ***	415	7,908 ***	982	10,715 ***	2,256	6,976 ***	905
Bachelors	14,685 ***	327	15,257 ***	800	17,723 ***	1,553	12,253 ***	759
Advanced	21,401 ***	422	23,347 ***	1,115	27,594 ***	1,936	21,133 ***	1,165

**p < .05, *** p<.01

Source: U.S. Census Bureau, Current Population Survey, March 1998, 1999, and 2000.

As expected, the intercepts vary from group to group. If the null hypothesis were true, namely that members of each social group experienced fundamentally the same earnings payoff for each level of education and merely began at a different earnings level, then we would expect the intercepts of each model to match, roughly, the dollar coefficients from Model 2. However, we find this is not the case. Rather, for all groups except female Asian and Pacific Islanders, we find that the difference between the intercepts of the separate models are smaller than the corresponding coefficients in Model 2. This is what we would expect if there were some underlying relational difference in the earnings payoff with education among the different social groups which a simple dummy variable in a consolidated model could not fully account for. These data suggest that it is possible members of different social groups do not simply begin

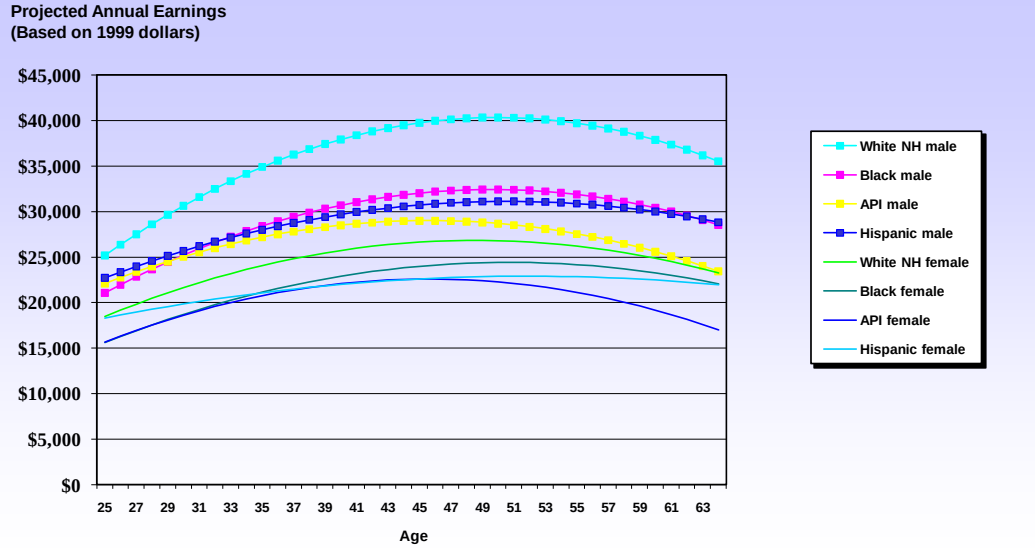
their working life with different entry-level earnings, but might realize fundamentally different earnings payoffs for similar educational attainments throughout their working lives.

2. Do members of minority groups actually accrue different proportional benefits at each level of education, that is to say, have a different payoff curve altogether?

Turning to the age control, we see that age explains at least some of this difference (Figure 5). In almost every case, White non-Hispanic males have higher coefficients for both age and the age-squared term. All other things being equal, the two figures translate, roughly, into beginning at age 25 with earnings of an additional $1,242 per year, growing each year to a peak in the early 50s age bracket of about $16,500, followed by a slow decline in earnings based on age. All other social groups experience a lower initial bump up in earnings based on age, and a lower peak, with most coefficients on age between $400 and $900, and on age squared of about -$13 to -$19. Black males, for example, begin at age 25 with about $943 more than they would have without considering age, building to a peak in their mid-fifties of about $12,310, followed by a decline. Female Asian and Pacific Islander begin with an earning bump more similar to that of White non-Hispanic males, but never experience as high a peak, and experience the decline in their earning earlier. Hispanic females experience a steady, if small, rise in earnings with age, but in any case, do not accrue the sort of dollars with age which White non-Hispanic males accrue.

Using Table C to examine the regression coefficients on the levels of educational attainment across Models 4-11, we find some variation, but also surprising consistency. The figures, with some exceptions (mostly in the Asian and Pacific Islander groups), tend toward the corresponding coefficients from Model 2. The match is certainly not precise, but neither is it different enough to make strong arguments about fundamental differences in the monetary returns on education for members of most of these social groups.

Figure 5: Projected Earnings Trajectories for Full-Time, Year-round Workers by Social Group, Based on 1997-1999 Work Experience



•Source: U.S. Census Bureau, Current Population Surveys, March 1998, 1999, 2000.

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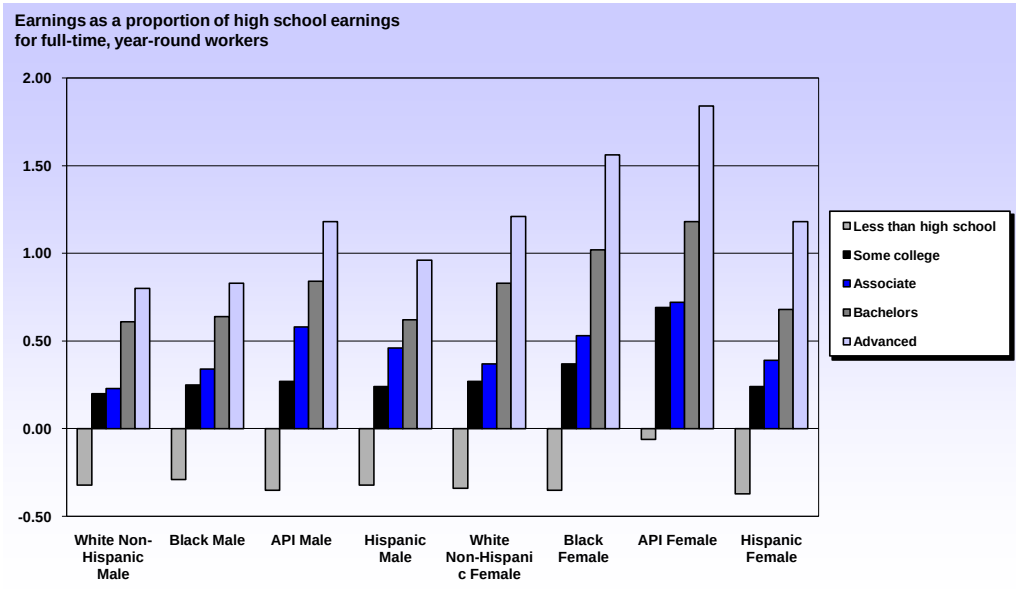
Next, for each group, we compare education coefficients to their intercept. In this way, we can see how education pays off relative to their group starting point (in this case, a high school education). Displaying these proportion beside one another in Figure 6, we find surprising consistency among the three large male groups (White non-Hispanic, Black, Hispanic). In other words, for males, the payoff for each level of education beyond the high school level is proportionately similar among these social groups. Note that because White non-Hispanic male earnings begin at a higher level, they receive higher absolute dollar returns on each level of education compared with the other groups.

For women, however, because of their lower high school starting earnings (intercepts), educational attainment in proportionately more important than for men. The payoff on education seems higher for female groups. There is also variability among the different female social groups.

Figure 6: Proportional Payoff for Education



•Source: U.S. Census Bureau, Current Population Surveys, March 1998, 1999, 2000.

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3. If the answers to either questions 1 or 2 are yes, does education make a significant impact compared to a social group=s historical disadvantages?

Models 4 through 11 failed to give strong support to a hypothesized complex picture of the relationship between education and earnings for members of different social groups. The models suggest instead that the underlying relationship between earnings and education is fundamentally similar for all workers. Therefore, we return to the observations derived from models 1 and 2 about the relative magnitudes of the costs of social group membership and the benefits of education. Specifically, we found sufficient educational attainment could provide benefits greater than the cost of any social group membership. Though both models 1 and 2 supported this conclusion, the model with the better predictive power, Model 2, had a bias because of the universe restriction to those with earnings under $100,000. Model 3 suggested different underlying causes than education or social group membership drive the specific earnings level of those with stellar earnings. However, while education does not predict the earnings an individual will receive above $100,000, it might still be the key to reaching that high level to begin with. In other words, does education predict who will become a stellar earner, and

can education overcome the barriers to entry to this upper earnings level attached to social group membership? These questions suggested a logistic model.

In Model 12 we apply the same independent variables to a log-linear model on the odds likelihood of earning more than $100,000, and we see a familiar pattern (Table D). The coefficients are mostly statistically significant and in the same directions as in both Models 1 and 2. Turning to the odds ratios, we see a remarkable pattern of rising likelihood of the effect of each additional level of education. While those with some college education or an associates degree are about twice as likely as someone with only a high school diploma to earn $100,000 or more, those who earn a bachelor=s degree are about eight times more likely. Those who stay in school to earn an advanced degree are more than 18 times more likely than high school graduates to achieve $100,000 or higher salary.

Table D. Probability of Earning $100,000 or more

	Model 12 Earnings of 100,000 or more n= 51,404		
Independent variables	Estimate	Standard error	Odds Ratio
Intercept	-5.357 ***	0.127	
Age	0.119 ***	0.011	1.13
Age squared	-0.002 ***	0.000	1.00
Less than high school	-0.641 ***	0.224	0.53
Some college	0.751 ***	0.106	2.12
Associate	0.676 ***	0.132	1.97
Bachelors	2.063 ***	0.087	7.87
Advanced	2.911 ***	0.087	18.37
Black male	-1.091 ***	0.149	0.34
Black female	-2.561 ***	0.269	0.08
API male	-0.104	0.110	0.90
API female	-1.302 ***	0.214	0.27
Hispanic male	-0.828 ***	0.150	0.44
Hispanic female	-1.837 ***	0.288	0.16
White female	-1.545 ***	0.068	0.21

*p < .10, **p<.05, ***p<.01

Source: U.S. Census Bureau, Current Population Survey, March 1998, 1999, and 2000.

Comparing the above odds ratios to those on social group membership gives us some insight into whether education can make the difference in overcoming barriers to entry to high earnings positions for members of different social groups. We see that Black males (0.34) are only about one-third as likely as White non-Hispanic males of similar age and educational attainment to achieve $100,000 or higher earnings. Hispanic males (0.44) are somewhat less than half as likely. Women fare worse. Black women (0.08) are about one-twelfth as likely as White non-Hispanic males to make it to the highest earnings levels. Asian and Pacific Islander women are a bit over one-fourth as likely. Hispanic women are only about one-sixth as likely, and White non-Hispanic females are about one-fifth as likely as White non-Hispanic males to achieve the highest earnings levels.

Though this model does not account for many factors which presumably influence entry to high earnings positions, if we assume that none of them would substantially alter the odds ratios we have, we can postulate that most individuals who are not White non-Hispanic males can increase their odds of receiving the highest earnings through education, and that the increase in their odds can be larger than the lower odds they experience because of their social group membership.

Discussion

The primary limitation of the above models lies in our deliberate exclusion of potential explanatory variables, some available in one form or another in our data set, but many not. For example, the quality of an education presumably relates to the return on it, with graduates of top level schools realizing premium earnings over graduates from lower level schools. Social connections may yield earnings advantages for people from wealthy families. Effort on the job may distinguish one individual from another with a similar background and education. However, in order to focus entirely on the relationship between education and earnings for members of different social groups, we have accepted a simplifying assumption, namely that these excluded variables do not co-vary with age, race, sex, or educational attainment among full-time, year-round workers. To the extent that they do not, we can take our results at face value. That is to say, we can make comparisons of the coefficients we have, and assume that the excluded variables would have merely lowered the amount of unexplained variance (raised our R-squared terms) had we included them.

However, it seems more likely that at least some important predictors of earnings co-vary to at least some degree with our included variables. Where they do, the variables that we have included will express not only their own individual influences on earnings, but will also exert influences as a proxy for the missing variables, in direct proportion with the degree of covariation. This proxy-effect would artificially increase the magnitudes of the coefficients of our included variables where both the direct and proxy-effects have the same sign, and would

tend to artificially lower the magnitude of our coefficients where the relationship with earnings is in different directions.

Whether or not the assumption of zero covariation between included and excluded variables damages our analysis depends upon four factors:

A) Obviously, if the covariation is small, then the proxy effects will be small, and thus not damaging to the analysis.

B) If the excluded variables have only small effects on earnings, then regardless of the degree of covariation, the impact on these analysis will be small;

C) If all proxy effects had different directions but similar magnitudes, they would cancel one another—though this seems very unlikely;

D) Finally, if we assume that the distinction between a particular pair of included and excluded variables is of low importance, then the impact on these analysis of any covariation will be low, even in the case where there is both high covariation, and where the excluded variable has a significant impact upon earnings. For example, race may be a strong proxy for social connections, and social connections may be a strong predictor of earnings. However, depending upon our hypothesis of how race impacts earnings, we may not ascribe significant importance to the difference between race and social connection. We might simply accept that differences in social connections may be one of the ways that race itself influences earnings. This would be in line with, for example, the Theory of Cumulative advantage.

A full accounting of all potentially excluded explanatory variables, including an analysis of the degree to which they co-vary with our included variables, the magnitudes of their independent impacts on earnings, and the specific form of their hypothetical relationship to earnings, is beyond the scope of this paper. However, at least one set of excluded and potentially explanatory variables—those associated with sex—warrants mentioning

The regression models in this paper treat sex as a simple dimension of a social group matrix, essentially equivalent to race. The model considers Hispanic men, for instance, to be a social group in the same way that it considers Hispanic women or Black men to be groups. However, the consistently lower earnings of all women than all men, and the relatively higher importance of education to all women=s earnings compared with men=s suggests that race and sex have different systematic impacts on earnings. In other words, it may be that race and sex more properly belong in models of earnings as separate independent variables, rather than as a series of discrete crosses.

One plausible explanation for these differences is that sex stands in as a proxy for important excluded variables. For example, women=s role in child rearing may result in a systematic difference in the work histories of women and men, with more women accumulating

more and longer interruptions to their career paths.[16] Or perhaps women and men have different priorities which result in males demanding and receiving higher salaries, and women seeking greater flexibility in work hours. We can forward many hypotheses such as these, however, testing the possibilities belongs in the providence of other research.

Conclusions

In this paper, we have found support for the hypothesis that individuals from minority groups experience lower initial earnings than White non-Hispanic males. We failed to find evidence supporting the hypothesis that members of different social groups experience fundamentally different earnings payoffs for different levels of educational attainment. In examining the vast majority of earners, we found that members of all social groups accrued similar earnings benefits with greater education, and that these benefits could amount to dollar sums larger than the "cost" of not being a White non-Hispanic male.

However, while the earnings realized by members of all social groups increased with education in roughly the same pattern, among most women the increases were proportionately larger compared with their groups= intercepts. This implies that education is relatively more important to achieving higher lifelong earnings for most women than for most men. This is to say, since women=s earnings trajectories are, on the whole, flatter than most men=s, women must begin with higher earnings to keep up with less educated men, who=s earnings rise more steeply with age.

In addition, we discovered that the predictors of earnings below $100,000 fail to predict marginal earnings above $100,000. However, those same independent variables do predict the probability of reaching the highest earnings levels. We find that the benefits of sufficient education can overcome some of the measurable cost of historical discrimination. Education matters.

[16]See Hundley, Greg, AMale/Female Earnings Differences in Self Employment: The Effects of Marriage, Children, And the Household Division of Labor@, *Industrial and Labor Relations Review*, Vol. 54, No. 1, (October 2000), pp. 95-113. See also, Lombard, Karen V., AFemale Self-Employment and Demand for Flexible, Nonstandard Work Schedules@, *Economic Inquiry*, Vol. 39, No. 2, April 2001, pp. 214-237.