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This study assesses the relative importance of several factors on the earnings of men with college degrees. More specifically, it examines the relationship between earnings of college men and eight other factors. They were; age, their college's rank as measured by the index of freshmen aptitude, field of specialization, color (white-nonwhite), father's occupation, father's education, current region of residence, and type of residence at high school graduation (metropolitan-nonmetropolitan). Age was included as a control variable and proved to be important, whereas, current region of residence was also intended as a control but was not shown to be important. Additional variables relating to the college attended and the student's background were eliminated either on an <u>a priori</u> basis or by trying them in regression equations and finding that they added little to the model's explanatory powers. The study shows how much of the variance in earnings can be explained with these variables, as well as the average earnings levels for individuals with various combinations of these characteristics.

The data were investigated by multiple regression techniques using a quantitative dependent variable (average weekly earnings) and sets of dummy values for the independent variables. Both additive and interaction models were used.

# Source of the Data and Method of Analysis

The data were derived from a special supplement to the Current Population Survey of the Bureau of the Census conducted in March and April of 1967. The supplement sample consisted of males who had completed four or more years of college, and included information on each person's college major, number and level of degrees. his background, and the names of all colleges where he received a degree. Using an Office of Educa-tion code for colleges, it was possible to obtain several characteristics of the colleges attended simply by knowing their names. The information gathered in the supplement on college attendance was matched to the Current Population Survey record giving the general demographic and economic characteristics of each individual in the sample. The total sample size for men with college degrees who worked full-time was 2,559. The included 1,759 with bachelor degrees as their highest degree, with the remainder having a higher degree. Out of those with degrees, there were 115 nonwhite persons, and 2,444 whites.

The dependent variable used in this study is average weekly earnings during 1966 for full-time workers. Earnings, as defined here, included money received from wages or salaries, or from operation of a farm, business or professional practice. It does not include interest, dividends, rents or sources of income other than earnings. Since earnings are not distributed according to the normal curve, the classical regression assumptions have not been met. This factor does not bias the regression coefficients, but it does make the standard errors larger than they would be otherwise. As a result, the relationships derived will appear to be less significant than they really are.<sup>1</sup>

The most important independent variables were age, the college's rank as measured by the index of freshman aptitude, field of specialization, and color. Four categories were used for age, six for college rank, ll for field of specialization, and two for color. Variables were also added for whether the father was a whitecollar worker, whether the father had completed 4 years of college or more, whether the person lived in the South or not, and whether the person lived in a metropolitan area when he graduated from high school. These four characteristics proved to be relatively unimportant as explanatory variables. For each characteristic, one category was excluded to make the solution of the regression equation determinant.

The index of freshmen aptitude, or what will be referred to as college rank, is of particular interest. In the simplest terms, this index measures the average aptitude, verbal and mathematical, of entering freshmen at a given college. The data were gathered in connection with the "Project Talent" survey of high school students conducted by the University of Pittsburgh. Four cohorts of these high school students were followed up one year after graduating from high school, and the name of their college was recorded along with their measured "aptitude". The aptitude score itself is a combination of three aptitude scores -- reading comprehension, abstract reasoning, and mathematics. Each school with at least 10 students in the "Project Talent" survey was given the average score of those in the survey entering that institution. These scores were then standardized to a distribution with a mean of 50 and standard deviation of 10. The measure can be interpreted as a rough indicator of the rank of a college in terms of the "ability" of the student body at a given point in time. If it is assumed that, on the average, the better students select the bet-ter colleges, this index can also be interpreted as a rough measure of the quality of a school.

The remaining independent variables are largely self-explanatory. A white-nonwhite dichotomy was used for color. The field of specialization was gathered in response to the question. "In what field did you receive this degree?" In order to study interaction effects, the sample was divided into three levels of degrees, I, II, and III. Level I is composed of men with bachelor's degrees as the highest degree, as well as a few who stated they had a degree but did not give the level. Level II is composed of those with master's degrees, or a first degree in law, theology, or denistry. The Level III sample contained only 100 observations and contained those with the Ph.D. degree, medical and other doctors, and second degrees in law and theology. This sample was too small for our regression model, and only results for Levels I and II are presented here.

### The Results

Initially the dependent variable (weekly earnings) was regressed on each characteristic separately. The results are given in table 1 for

the two levels of degrees. In both cases, age, college rank, and field of specialization are the most important explanatory variables. This is shown by the relatively high values of the coefficients of determination, which measure the percent of variation in earnings that is explained by a given independent variable. Color is also relatively important. Age is the most important variable for Level I whereas college rank and color are the most important explanatory variables for Level II. On the basis of these regressions, the multivariate model was designed to include age, college rank, and field of specialization, with the remaining variables added in order of importance by a step-wise regression Father's occupation, region of resiprocedure. dence, father's education, and type of high school residence added very little to the explanatory power of the models. In all cases, the step-wise regression added them in the order listed in table 1.

Table 1 MEASURES	OF (	CORRELATION	ANI	O SIGNIFI	CANCE	FOR	AVERA	GE.	WEEKIN	EARNINGS	OF	MEN
WITH C	)ILE(	GE DEGREES	AND	SELECTED	VARI	ABLES	, BY	DEG	REE G	ROUP		

	Lev	el I	Leve:	L II
Item	Coefficient of determination R <sup>2</sup>	F	Coefficient of determination R <sup>2</sup>	F
Age College rank. Field of specialization. Color Age, rank, specialization, and race combined Father's occupation. Current region of residence. Father's education High school residence.	.079 .042 .040 .008 .134 .004 .003 .002 .002	37.53* 12.69* 7.25* 14.25* 12.73* 7.29* 5.81** 2.69 3.94	.039 .048 .072 .012 .180 .007 .003 .001 .001	6.99* 5.85** 5.38** 8.24* 6.76* 4.67** 2.08 .40 .82
All variables combined	.135	10.83*	.184	5.85*

\* Significant at .01 level.

\*\* Significant at .05 level.

#### College Rank

The regression results for college rank, are given in table 2. The data labeled "Gross Effect" are the results of regressing the dependent variable on college rank alone. The (b) coefficients measure the average increment to earnings due to being in a given aptitude group rather than in the lowest group, which is the excluded variable. The mean earnings levels for the excluded group is measured by the intercept. For instance, people who received bachelor's degrees from schools in group 6 had average weekly earnings of \$105 more than those who attended the poorest schools, whose average earnings level was \$169. The mean weekly earnings column shows the mean weekly earnings for those in the different groups. The data labeled "Net Effect" measure the effects of college rank, after the effects of age, field of specialization, and color have been accounted for. The net mean incomes are calculated under the assumption that age, college rank, field of specialization, and color are additive variables, or in other words, that the effect of each is independent of the value of the other variables.<sup>2</sup>

The results show that there are differences in earnings due to college rank for both degree levels. Going to a better school is more of an advantage for those with higher degrees. It is also apparent that taking account of other factors than college rank significantly affects the apparent role of the college rank variable. In general, the additional variables tend to decrease the increments in earnings associated with college rank, and to increase the intercept. The data suggest that, on the average, going to the best schools rather than the poorest adds about \$4,200 per year for the holder of a bachelor degree (Level I). This difference is greater for holders of Level II degrees--approximately \$5,900. One possible explanation for the difference is that the quality of education is more important at the higher degree levels where performance on the job is more directly related to technical skills acquired at the University.

Although account has been taken of interaction between college rank and the level of degree, the regressions for each level assume additivity and this may not be a realistic representation of the data. The effect of the college's rank may be different for whites and nonwhites, or for education majors and engineering majors. Testing for these differences would have required a much larger sample.

The increments to earnings due to college rank are greater for the higher rank colleges than the lower ones, in the Level I sample. However, the college rank measure should be interpreted as having only ordinal properties and therefore nothing can be concluded about the marginal returns to attending better colleges. That is, the regression coefficients do not apply to equal intervals on the rank scale, because distance between rankings has no meaning in an absolute sense.<sup>3</sup>

Table 2 THE EFFECTS	OF	COLLEGE	RANK	ON	AVERAGE	WEEKIY	EARNINGS	OF	MEN	WITH	COLLEGE	DEGREES,
			1	BY :	LEVEL OF	DEGREE						

College rank as		Gross effect <sup>1</sup>			Net effect <sup>2</sup>	
measured by index of freshmen aptitude group	Ъ	b $\sigma_b$ Mean weekly earnings b in dollars		Ъ	<b>6</b> b	Mean weekly earnings in dollars
Level I						
0 1 2 3 4 5 6	-5 15 39 54 84 105	Intercept 23.5 23.1 22.1 22.4 23.8 24.8	169 164 184 208 223 253 274	Adjusted 13 25 35 43 65 84	Intercept 23.2 23.0 22.0 22.3 23.6 24.7	173 186 198 208 216 238 257
Level II						·
0 1 2 3 4 5 6	-7 58 63 78 75 115	Intercept 38.3 39.2 37.2 37.0 39.0 39.4	167 160 225 230 245 242 282	Adjusted 21 85 75 79 58 118	Intercept 38.0 37.8 35.6 35.4 37.2 37.6	159 180 244 234 238 217 277

<sup>1</sup>Regression of earnings on college rank.

<sup>2</sup>Regression of earnings on college rank with color, age, and field of specialization as control variables.

## Field of Specialization

Table 3 shows the differences in average weekly earnings accounted for by the field of specialization. For Level I degrees--engineering, the physical sciences, and business and commerce offer the greatest monetary rewards. Those majoring in religion did the poorest. The pattern changes somewhat for those in the Level II sample. Health fields and law offer the greatest returns to persons in this sample with business and commerce and education improving relative to other majors. Those in the health fields are primarily dentists, as there are no MD's in the Level II sample.

Persons majoring in technical fields for a bachelor's degree appear to have an income advan-

tage that is lost for holders of higher degrees. In the Level I sample for example, men who majored in engineering and the physical sciences received the highest returns, but for those with their highest degree in the Level II sample, business and commerce overtakes both. This may be somewhat misleading, for many people with a master's degree in business have bachelor's degrees in technical fields. In a sense, this earnings differential may be due to a difference in occupations. An individual with a second degree in engineering is very likely to be a research worker whereas an individual with a graduate degree in business is more likely to be in the higher paid levels of management. Thus, we have not entirely separated the effects of college major and current occupation.<sup>4</sup>

		Gross effect	1		Net effect <sup>2</sup>		
Field of specialization	Ъ	σ <sub>b</sub>	Mean weekly earnings in dollars	Ъ	σ <sub>b</sub>	Mean weekly earnings in dollars	
Level I							
Education Biological sciences Business and commerce Engineering Health Humanities Physical sciences Religion Social sciences Other	-7 52 87 31 32 70 -21 37 60	Intercept 18.4 11.8 12.3 23.7 17.2 15.1 47.5 13.8 21.7	164 157 216 251 195 196 234 143 201 224	Adjusted -22 38 58 15 16 43 -31 18 27	Intercept 17.6 11.5 12.3 22.7 16.6 14.8 45.6 13.5 21.2	182 160 220 240 197 198 225 151 200 209	
Level II							
Education Biological sciences Business and commerce Engineering Health Humanities Law Physical sciences Religion Social sciences Other				Adjusted 5 74 58 107 -7 100 20 -14 -22 -5	Intercept 39.5 21.8 22.5 25.8 29.3 16.9 24.6 27.1 24.7 49.7	190 195 264 248 297 183 290 210 176 168 185	

Table 3.--THE EFFECTS OF FIELD OF SPECIALIZATION ON AVERAGE WEEKLY EARNINGS OF MEN WITH COLLEGE DEGREES, BY DEGREE GROUP

<sup>1</sup>Regression of earnings on field of specialization.

<sup>2</sup>Regression of earnings on field of specialization with color, age, and college rank as control variables.

# Color

The regressions show that nonwhites have significantly lower earning levels than whites (table 4). According to the "Gross Effects" of color, there is a greater difference in earnings due to color at the higher degree level. However, this difference disappears when color is used in a multivariate model. For both levels, the "Gross Effect" attributes some factors to color that should be attributed to college rank and field of specialization. Color of the student and the rank of his institution are related as well as color and certain fields of specialization. This can be seen in table 5. Thus when these variables are added, the earnings differential due to color is decreased. But, the net effect still represents over \$2,400 per year difference in earnings, even after taking account of college rank, field of specialization, age, and level of degree. The nonwhite category includes Japanese and Chinese who usually have significantly higher incomes than Negroes. Therefore

the earnings differences between whites and Negroes would be greater than those shown here for whites and nonwhites.

Table 6 illustrates how adding color as a variable affects the regression coefficients for college rank. The first column gives the regression coefficients for college rank, controlling for field of specialization and age. The addition of color to the regression changed the regression coefficients to those in the third column. For both degree levels, the introduction of color increases the intercept value and decreases each regression coefficient by a relatively uniform amount.

The size of the change in the regression coefficients indicates that there is substantial correlation between color and college rank. Without color, the regression attributed earnings effects to college rank which are more properly attributed to color. The pattern of the changes in the college rank regression coefficients indicate that being nonwhite and in a low ranking college are likely concurrences. What originally appeared as earning increments associated with attending schools above the lowest rank is actually due to being white as opposed to nonwhite.

It is important to see how different variables may reinforce the effects of color for Negroes. After accounting for age, college rank, and field of specialization, nonwhites have significantly lower earnings than whites. As can be seen from table 5, Negroes are more likely to choose a field of specialization that is less rewarding financially, (education) and less likely to be engineers, the most rewarding for bachelor degree holders. Add to this the fact that such a large proportion of Negroes attend the lowest rank colleges. And, the Negro age structure is such that Negroes are more likely to be young if they have a college degree. By each factor, the Negro has a disadvantage and none of the factors offset others, but rather they reinforce each other. Even though \$49 of the difference in white and nonwhite weekly earnings is due to color, the actual difference in mean weekly earnings was \$67. The difference between \$67 and \$49 is due to other factors than color. Being nonwhite, and the attributes, choices and opportunities that are associated with being nonwhite, caused nonwhite earnings to be 51 percent of white earnings for men with bachelor's degrees.

Table 4	THE EFFECTS	OF	COLOR	ON	THE	AVERAGE	WEEKLY	EARNINGS	OF	COLLEGE MEN.	BY	LEVEL	OF	DEGREE
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		Gross effect	1	Net effect <sup>2</sup>				
Color	b	ு <sub>b</sub>	Mean weekly earnings in dollars	b	6 <sup>0</sup>	Mean weekly earnings in dollars		
Level I White Nonwhite Level II	-67	Intercept 17.7	214 147	Adjusted -49	Intercept 17.5	214 165		
White Nonwhite	-83	Intercept 29.1	232 149	Adjusted -48	Intercept 27.9	231 183		

<sup>1</sup>Regression of earnings on color.

<sup>2</sup>Regression of earnings on color with college rank, age, and field of specialization as control variables.

Table	5DISTRIBUTIO	ON OF S.	AMPLE AN	10NG	COLLEGE	RANKS	AND	FIELD	OF S	PECIALIZATION	FOR	MEN
	WHOSE	HIGHES	T DEGREI	IS IS	A BACHEI	LOR DEC	GREE,	TOTAL	AND	NEGRO		

College rank	Total	Negro	Field of specialization	Total	Negro
Total, all ranks O 1 2 3 4 5 6	100.0 2.8 11.7 14.6 30.4 22.6 10.6 7.3	$     100.0 \\     24.0 \\     36.0 \\     6.0 \\     8.0 \\     16.0 \\     6.0 \\     4.0     $	Total, all fields Education Biological sciences Business and commerce Engineering Health Humanities Physical sciences Religion Social sciences Other Not reported	$100.0 \\ 13.5 \\ 5.0 \\ 25.2 \\ 20.6 \\ 2.6 \\ 6.0 \\ 9.0 \\ 0.6 \\ 12.5 \\ 3.2 \\ 1.8 $	$   \begin{array}{r}     100.0 \\     34.0 \\     4.0 \\     18.0 \\     4.0 \\     8.0 \\     0.0 \\     14.0 \\     0.0 \\     14.0 \\     0.0 \\     4.0 \\   \end{array} $

Degree group and rank of college as mea- sured by the index of freshmen aptitude	Regression coefficient without color <sup>1</sup>	Increment in mean earnings over preceding aptitude group in dollars	Regression coefficient with color <sup>2</sup>	Increment in mean earnings over preceding aptitude group in dollars
Level I				
Intercept 1 2 3 4 5 6	46 26 41 50 59 81 100	 26 15 9 9 22 19	63 13 25 35 43 65 84	 13 12 10 8 22 19
Level II				
Intercept 1 2 3 4 5 6	55 26 92 80 86 62 122	 26 66 -12 6 -24 60	65 21 85 75 79 58 118	 21 64 -10 4 -21 60

Table 6.--CHANGES IN SIZE OF REGRESSION COEFFICIENTS FOR INDEX OF FRESHMEN APTITUDE DUE TO THE ADDITION OF "COLOR" AS A CONTROL VARIABLE

<sup>1</sup>Regression of earnings on college rank, with age and field of specialization as control variables.

 $^{2}\text{Regression}$  of earnings on college rank, with color, age, and field of specialization as control variables.

# Background variables

Earlier studies have demonstrated that background factors are important in determining a person's educational attainment.<sup>5</sup> Whether or not the parents have a college education has been shown to be important in determining if a child will get a college education or degree. The regression analysis presented here suggests that among college graduates, the educational attain-ment and occupation of the family head does not have a demonstrable effect on earnings. Of the two variables, it was found that father's occupation has a stronger influence than the father's education even though neither were important. Whether or not a man lived in a metropolitan area when he graduated from high school proved to be of minimal importance.

### CONCLUSION

Using all of the variables we have considered, including the background variables, about 13.5 percent of the variation in earnings for college men with bachelor's degrees and 18.4 percent for men with Level II degrees can be explained. Using college rank, age, field of specialization, and race we can explain 13.4 percent of earnings variation for Level I and 18.0 percent for Level II. There are, of course, many factors which affect earnings that have not been taken into account in this analysis. More of the variation in earnings could have been explained if it were possible to measure factors such as physical and mental health, personality, ambition, and intelligence.

Earnings appear to be positively related to college rank, as measured by the index of freshman aptitude. In addition, some choices of major in college are clearly superior to others in terms of earnings potential. However, the same majors are not the most promising at all degree levels. Furthermore, nonwhites have an earnings disadvantage even after accounting for the rank of their college, their age, and college major. For Negroes, all of the factors we have considered, work cumulatively to lower their earnings as compared to whites. The family background variables studied seem to have almost no effect on earnings.

#### ACKNOWLEDGMENTS

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## FOOTNOTES

<sup>1</sup>Another factor may counteract or overwhelm this underestimation of significance. Since the Current Population Survey is taken from a statified sample, the measures of variance derived for statistics from this sample will tend to be smaller than these that would be derived from a random sample.

## FOOTNOTES--Continued

<sup>2</sup>The adjusted intercept for college rank is calculated as the sum of the multivariate intercept and the products of the regression coefficients, for age, field of specialization, and race, and the proportion of the sample falling in each category of these variables. Net mean earnings for college rank are then derived as the sum of the adjusted intercept and the appropriate regression coefficient for college rank. Thus the net mean earnings data indicate the effects of college rank after the effects of age, field of specialization, and race have been accounted for. Net mean incomes for age, field of specialization, and race are calculated similarly.

<sup>3</sup>Indeed, the regression coefficients might be said to measure the cardinal distances between aptitude groups. If one chooses to define college quality in terms of the relative earning power of graduates from the different rank colleges, we are measuring college quality rather than testing a hypothesis that relative college quality is related to earnings.

<sup>4</sup>Using either field of specialization or occupation alone makes the results biased in the sense that earnings effects would be allocated to one factor when both share in their determination. If we had included occupation as a variable, the regression coefficients for the several fields of specialization would have been smaller and probably less statistically significant. However, for the questions being asked here, occupation is not useful as a variable. Since one's college major influences his occupation and not vice versa, some of the effects that would be attributed to occupation would actually be due to college major. Thus, if occupation were included in the regressions, the effects of one's choice of a college major would be underestimated. An additional factor to consider is the assumption of additivity in the regressions for field of specialization. It is shown below that there is a significant interaction effect between age and field of specialization. Typically, an engineer or a physicist has an initial earnings advantage over a lawyer or a doctor, but the same relationship does not hold for persons in middle or late career. Therefore, to come extent the earnings differentials due to age and field of specialization are not being separated from one another by this analysis.

MEDIAN	I	NCOMES	3	IN	SELE(	CTED	00	CUI	PATIONS	FOR	PER-	
SO	NS	WITH	5	OR	MORE	YEAF	ເຮ	OF	COLLEGE	, BY	AGE:	
196	60											

1	Age (years)							
Selected occupation	25 to 34	35 to 44	45 to 54	55 to 64				
Lawyers and judges Electrical engineers. Physicians & surgeons Physicists	7,272 9,010 4,866 8,808	12,157 11,529 19,663 11,676	14,636 11,142 21,048 (NA)	13,635 10,145 17,664 (NA)				

Source: U.S. Bureau of the Census, <u>U.S. Cen-</u> sus of Population: 1960, <u>Subject Reports</u>, <u>Occu-</u> pation by Earnings and Education, Final Report PC(2)-7B, U.S. Government Printing Office, Washington, D.C., 1963.

<sup>5</sup>Brazer, Harvey E., and Martin David, "Social and Economic Determinants of the Demand for Higher Education," in U.S. Department of Health, Education, and Welfare, Office of Education, Economics of Higher Education (Washington, D.C., U.S. Government Printing Office, 1962), pp. 21-42.