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Faculty Working Papers

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EXPECTED AND REALIZED RATES OF RETURN BY OCCUPATIONAL OBJECTIVE, DEGREE LEVEL, TYPE OF INSTITUTION, RACE, AND SEX

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Returns to Investment in Higher Education

Expected and Realized Rates of Return by Occupational Objective, Degree Level, Type of Institution, Race, and Sex

Walter W. McMahon, Nguyen Hoang, and Alan Wagner*

This paper develops and computes for the first time ex ante private rates of return on investment in higher education made by students and their families during 1971-1976. It also considers ex post social rates and ex post private rates, using microeconomic data which take specific investment cost differences into account, and compares the differences in these among occupations, degree levels, races, sexes, and types of institutions.

Finding where social rates of return are highest is a significant help in isolating those kinds of new investment that make the largest contribution to measured economic growth. They also help meet current concerns about the declining economic value of higher education in the 1970's expressed by Freeman (1975a) (1975b) and others, since judicious new investment in high return areas offers possibilities for starting to reverse that trend.

In contrast, the ex post private rates of return are useful for determing which investments have been wise from a private point of view. When compared to the new ex ante rates the latter are seen to be more relevant to explaining student and family investment behavior.

The ex ante private rates are found to be highest for blacks and females, and to sharply exceed their ex post private rates. These groups are also found to expect a more pronounced peaking of their age-earnings profiles than are shown by the ex post caculations. With higher rates of return in some fields, and lower rates in others (such as humanities and teaching), a pattern also noted by Freeman (1975a) in his examination of starting salaries in the 1970's, no trend is found here up through the 1970 Census Data of a secular decline in the returns to higher education, although there undoubtedly are

cyclicalfactors from the 1971 and 1975 recessions (e.g. Bielfield and Parks(1975)). Confining attention to the longer run, although there are some kinds of over-expansion there ar some occupations, leve s, and types of h gher educational institutions where substantial contributions to economic growth can still be obtained.

The advantage of using microeconomic rates of return computed for each student as is done in this paper is that specific differences in costs among schools and specific differences in scholarships, work study, and other financial aids can affect both the private and social rates. Earlier studies (e.g. Becker 1964) have used only the average estimates of costs and returns, or else have used the number of years of schooling as an index of investment costs (e.g. Chiswick and Mincer (1972)). The disadvantages of aggregates have been pointed out by Wachtel (1975), who develops some cost-specific estimates for 1960 for white males by ability groups, but does not develop comparisons by occupation, race, sex, or type of institution. He also makes no comparisons of ex ante to ex post rates of return for different population segments.

A preliminary explanation of the model and the methods used for computing these rates of return for each student in the 5,346 student sample is presented in Section I. The design of the nationwide sample is also described briefly together with the modest re-weighting required so that mean rates of return reflect the census norms. In Section II the rate of return estimates are presented, compared, and discussed. The conclusions are summarized in Section III.

I. The Model and the Data

Analogous to investment in physical capital, investment by the student and his family in the human capital created by higher education can yield a future monetar return to the student. The rate of return here is defined in the normal way as that rate of discount that equates the stream of net returns added by the college education to total investment costs, a superior criteria for arriving at optimal investment decisions over the life cycle (e.g. Hirschleifer

(1958), Becker (1964), Ben Porath (1967)). Because the measurement of expected future non-monetary returns is a major subject unto itself, non-monetary returns will not be included in the computations reported in this paper, resulting in some understatement of the total returns to education.[1] Net returns, therefore, will be earnings after the highest level of college attained, net of the amount that could have been earned with completion of a high school education, and net of earnings attributable to things other than the education combined with experience on the job. Investment costs are the sum of the indirect costs of the student's time, as measured by foregone earnings, plus the direct costs of tuition, fees, and textbooks, all compounded forward at the market rate of interest to the date of graduation.

To obtain the more specific ex post private rates, ex post social rates, ex ante private rates, and occupation specific rates, this theory must be expressed through more specific models.

Ex Post Private Rates of Return

For purposes of computing private internal rates of return, the net earnings added by a college education are computed after taxes. The present value as of the date of graduation of this stream of net earnings, E_j, is given by equation (1) for the jth individual. Here t_2 is the date of graduation, and t_3 the date of retirement:

$$(1) \quad E_j = \int_{t_2}^{t_3} \alpha e^{-rt} [E_4(t) - E_o(t)]dt$$

$E_4(t)$ = the earnings function of a college graduate upon completion of the highest level of college attained, at each age $t = t_2,,, t_3$.

$E_o(t)$ = the earnings function of a high school graduate of the same sex and race, at each age $t = t_2$, t_3, and r = the internal rate of return to the family on its investment in college. The alpha coefficient α, is applied to this differential to remove earnings attributable to things other than education (and) experience, and is assumed to be .66 based on work by Mincer (1974, p. 134). This procedure has been commonly employed by Becker (1964), Denison, Blaug, and Psacharopoulos (1973 p. 28) to remove the effect on earnings of factors other than education.

The differential was further reduced by applying a 20% marginal tax rate appropriate to the average college graduate's earnings for computation of the private rates of return. This net lifetime earnings differential is illustrated by the shaded area to the right of t_2 in Figure 1.

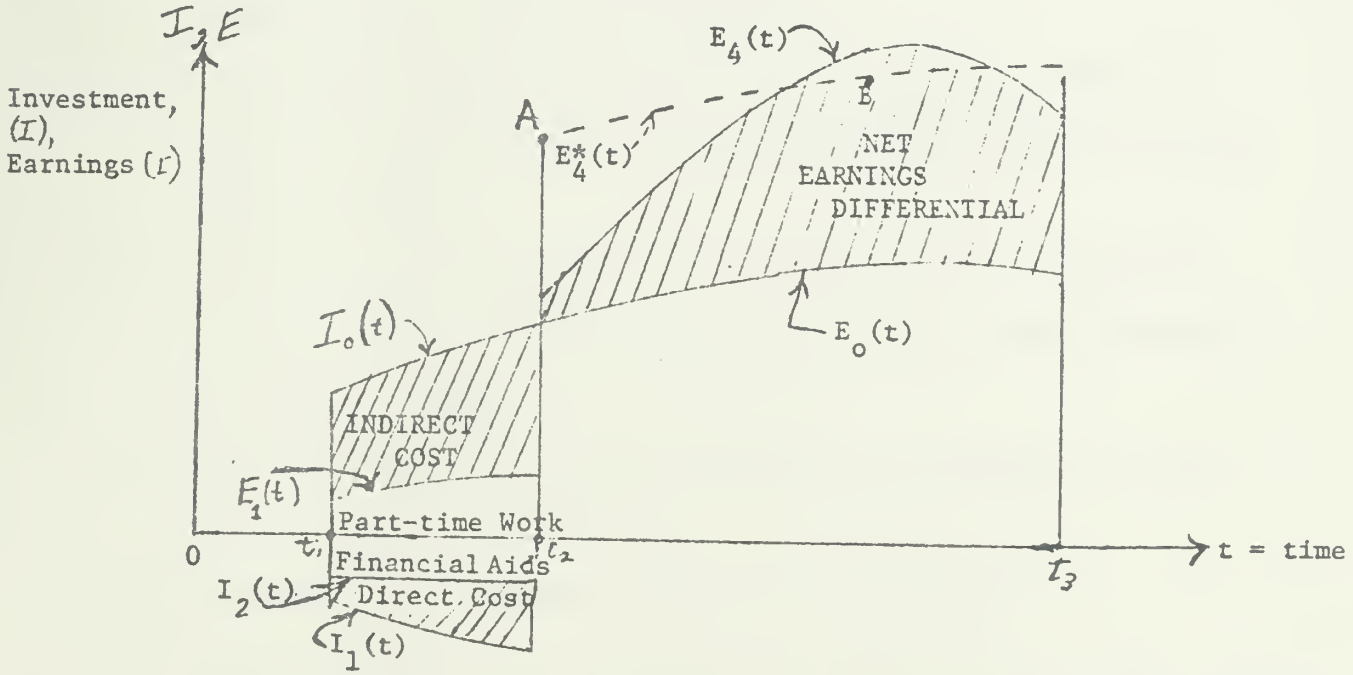

Figure 1. Investment in Higher Education, and Returns Later over the Life Cycle

Total investment by the jth family (i.e. by parents and students), I_j, is shown by shaded area to the left of t_2 in Figure 1 and set out in equation (2) below. It is the sum of indirect cost , which consist mainly of the cost of the student's time invested in learning as measured by foregone earnings, $\mathcal{I}_o(t)$, net of the value of the time spent in part time work, $E_1(t)$, plus direct costs composed of tuition, fee, and book costs, $I_1(t)$, net of student financial aids, $I_2(t)$. Annual investment is compounded to graduation at the market rate i which represents the opportunity cost of the funds in their second best use:

$$(2) \quad I_j = \int_{t_1}^{t_2} e^{it}[\mathcal{I}_o(t) - E_1(t) + I_1(t) - I_2(t)]dt$$

$\mathcal{I}_o(t)$ = the earnings function of a high school graduate of the same race and sex as the jth student at each age $t = t,,., t_2$. (For graduate student years only, $\mathcal{I}_o(t)$ becomes the earnings of a comparable person who has a bachelor's degree).[2]

$E_1(t)$ = the earnings function for part time work. Specific amounts are reported by each student, and regarded as representing time taken away from study.[3]

$I_1(t)$ = tuition and fees as reported by the student from his college's catalogue before deduction of any waivers, plus actual expenditure on books and supplies.

$I_2(t)$ = specific scholarship or grant received by the student, including tuition and fee waivers, and

i = a market rate of interest realizable by households.

Although the market rate available may differ somewhat among families, it is taken here to average 6%, or close to a rate of return on bonds, for most families in computing the total investment cost.

The expost private rate of return is then determined by equating the net returns in (1) to investment costs (2) as of the date of graduation and solving for

(3) $E_j = I_j(r)$.

A procedure was developed to simplify the computerized iterations applied to the data for each individual student, the detail of which is described in Appendix A.

Ex Post Social Rates of Return

Social rates of return are developed in the same way as these private rates except that the costs are the full costs to the society, including all scholarship subsidies to the household, taxes on foregone earnings, and tax and endowment fund income subsidies to the student's institution. Similarly, the returns from the college education are measured before taxes.

The use of taxes to measure the social contribution made by individual students in their later lives underestimates (in the author's opinion) the social contribution made by those students who deliberately choose occupations that yield lower money income out of a sense of service to society. It is possible, but unlikely, that all of the non-monetary benefits are realized privately.

Earlier studies have not had available recent data on specific tuition costs, part time earnings, scholarships, or per student tax and endowment income subsidies to institutions, although some cost differences have been shown to affect rates of return (e.g. Wachtel 1975). Becker (1964, pp. 74-5), Hanoch (1967), and Hines et. al. (1970) assume that net tuition, fee, and textbook

costs equal part time earnings.[4] But the estimates of rates of return presented in Part II use cost data specific to each student on an individual basis permitting some new insights into differences by race, type of institution, and occupation chosen.

Ex Ante Private Rates of Return

An ex ante private rate of return is that discount rate that equates the stream of earnings expected at each age by the student to total family investment costs.

The expected age-earnings profile, $E_4^*(t)$, replaces $E_4(t)$ in equation (1) and in Figure 1. It is estimated here from two expected income figures reported by the students surveyed. Students reported what they expected to receive at graduation (age 22 for a bachelors degree), and the earnings they expected to be receiving 25 years later (age 47 for the bachelors degree). The student's expected age-earnings profile then was approximated for the other ages by forcing an age-earnings curve of the shape obtained by Hanoch (1967) for persons of the same race and sex through these two points. The result is illustrated by the dashed line passing through points A and B in Figure 1.

The other methods of estimating the ex ante rates of return were identical to the methods used for estimating the ex post private rates. This assumes, for example, that the costs students expect as well as the earnings expected by not going to college are based respectively on current costs, and on current earnings of persons of the same race and sex. The comparability with the methods of calculation of the ex post rates excepting only this one difference of $E_4^*(t)$ for $E(t)$ makes

comparisons of the ex ante and ex post results easier.

Occupation-Specific Rates of Return

For the breakdowns of rates of return by occupation, the rates are occupation-specific. That is, each student - respondent was asked to identify his occupational objective from among 97 standard census classifications. Then actual earnings reported in the 1970 Census for persons of the corresponding race, sex, and educational attainment who had chosen that occupation were added to each individual student's file. These occupation-specific age-earnings profiles then enabled occupation-specific rates of return to be computed by the methods previously described.

The Data

A survey was conducted of 7,019 college students nationwide in 1972 designed to collect precise information on college costs, financial aid, part time work, and parental income and assets by W. W. McMahon with the assistance of the National Institute of Education and the American College Testing Program. With two follow-ups plus a supplemental questionnaire to those returning incomplete information, the response rate was 73.6% in the Freshman wave (2,580 usable responses) and 78.7% for the Sophomore wave (2,766 usable responses). The questionnaires are shown in McMahon (1974, pp. 167-79).

Matching information was collected directly from parents who were asked to copy information from specific lines on their Federal Income Tax forms reporting their income and assets and to permit verification. Matching information also was collected about the student's institution from the American Council on Education and College financial aid officers. The ACT Student Profile Section also provided matching information about the student's aspirations, grades and test scores. To this was added data from the 1970 Census (see U. S.

Table 1

Distribution of Students in the Sample and in a Census of All Students

	Freshman Sample, Before Weights	Census of all Students[1]	Freshman Sample Weighted[2]	Non-Freshman Sample, Before Weights	Census of all Students[1]	Non-Freshman Sample Weighted[2]
Public Institutions	73.8	75.5	75.5	80.0%	75.5	75.5
Universities	28.0	21.8	21.8	37.0	21.8	21.7
Male	11.9	10.0	10.0	15.0	10.0	9.8
Female	16.1	11.8	11.8	22.0	11.8	11.9
Four Year	29.0	30.7	30.7	29.1	30.7	29.9
Male	12.5	20.3	20.3	9.9	20.3	19.8
Female	16.5	10.4	10.4	19.2	10.4	10.1
Two Year	16.9	23.0	23.0	14.0	23.0	23.9
Male	7.3	13.0	13.0	5.6	13.0	12.7
Female	9.6	10.0	10.0	8.4	10.0	11.2
Private Institutions	26.1	24.6	24.3	20.0	24.6	24.6
Universities	5.0	5.5	5.5	2.3	5.5	5.3
Male	2.2	2.8	2.8	.6	2.8	2.7
Female	2.8	2.7	2.7	1.7	2.7	2.6
Four Year	17.6	17.1	17.1	16.3	17.1	17.6
Male	7.8	8.8	8.8	5.5	8.8	9.5
Female	9.8	8.3	8.3	10.8	8.3	8.1
Two Year	3.5	1.7	1.7	1.3	1.7	1.7
Male	1.8	.7	.7	.5	.7	.7
Female	1.7	1.0	1.0	.8	1.0	1.0
All Institutions[3]	99.9	100.1	99.8	100.0	100.1	101.0

1. Source: U. S. Office of Education (1972)
2. Weights simultaneously correct for type of institution, sex, and percent receiving financial aid, although the latter dimension is not shown separately.
3. Totals vary from 100% only because of rounding.

Bureau of the Census (1973)) on current earnings at each age of persons of the same sex, race, educational attainment, and occupational choice as described above.

Before tabulating the rates of return for the relevant population segments, the nationwide sample was weighted to reflect a census of all U.S. students. Most entering students are financial aid applicants, the group from which the sample was drawn. A correction was applied, however, for the percent receiving financial aid using national norms for each type of institution (ACE (1972, p. 42), as well as for the type of institution chosen and for sex. The distributions of respondents before and after the weights were applied, together with the census distributions of all U. S. students, are shown for comparison in Table 1. There are only 26.1% of the freshman and 20.0% of the non-freshman respondents at private institutions, but the census of all U. S. students shows a similar 24.6% there, so most of the weights are not very large.

II. Estimates of the Rates of Return to Higher Education

Private and Social Rates of Return in 1970

The private rate of return on investment in higher education is 12.7% for all male 1976 graduates (i.e., 1972 Freshmen potentially reaching the BA), their corresponding 1970 Census age-earnings profiles and institution-specific investment costs. It was higher than this for white males (14.3%) and lower for black males (6.8%) as can be seen in Table 2.

The social rate of return for the same representative sample of white males was 11.3% This is a bit lower than the private rate as is typically the case largely because financial aids, endowments, and subsidies reduce the private investment cost of education to the family below its total cost to the society.

Table 2

Private and Social Rates of Return to Higher Education

Bachelors Level, 1970 Census

	Private Rate of Return 1976 Grads. 1	Social Rate of Return 1976 Grads. 2	Social Rate of Return 1975 Grads. 4
Bachelors Degree	13.0%	9.1%	9.8%
	(.4)	(.3)	(.3)
Male	12.7	10.0	12.3
	(.3)	(.2)	(.5)
White	14.3	11.3	13.4
	(.4)	(.2)	(.6)
Black	6.8	5.6	6.1
	(.4)	(.2)	(.4)
Other	10.5	6.7	7.5
	(1.8)	(.5)	(.2)
Female	13.2	8.0	7.4
	(.7)	(.5)	(.2)
White	11.9	7.5	7.0
	(.8)	(.7)	(.2)
Black	18.5	10.3	9.3
	(1.9)	(.6)	(.2)
Other	10.4	6.3	7.4
	(1.8)	(.5)	(.6)

The social rate of return for Ph.D., Ed.D., MD, DDS, DVM, and JD programs averaged 7.3-10.4% for all males, an average that conceals dispersion among occupations but is soemwhat lower than the rate at the bachelor's level. Lower rates at more advanced levels are typical primarily because of the increasing cost of the student's time as he enters upon his graduate school years. These and all other rates of return to advanced degree programs however are rates of return to the entire degree program, undergraduate and graduate. They are therefore higher than the marginal rates of return customarily found for the graduate years taken alone. Since they are the rates available to those students who select their entire degree program at an early stage they are the rates relevant to the many decisions made early about occupational objectives such as the choice of pre-medicine or pre-graduate degree programs that will require advanced study.

Are the Returns to Higher Education Diminishing over Time?

There has been a large infusion of college graduates into the labor force since 1950 and considerable discussion about whether colleges may have overexpanded in relation to society's needs.[8] The longer run trend in rates of return to higher education are the best index of whether or not diminishing returns to the investments higher education are setting in, since they are not so heavily influenced by the temporary surpluses affecting starting salaries during the recessions of 1971 and 1975.

Table 3 reveals that private rates of return at the bachelor's level have been remarkably stable, all the way from the 14.4% for white males in the 1940 Census to the 14.3% for the white males estimated here for the 1970 Census. It is necessary to use the private rates for white males to maintain comparability with the earlier studies. There was a dip in the interveening period to 12.7% in the 1950 Census data as estimated by Becker (1964) and to 10-13.6% in 1960 as estimated by Hanoch (1967) and Hines et. al.

Table 3

Comparison of Changes in Private Rates of Return to Higher Education

Bachelors Level, 1940 to 1970

	1970 Census Data		1960 Census		1950 Census		1940 Census
	McMahon, Hoang, and Wagner (See Table 2)		Hines et. al.(1970)	Hanoch (1967).	Becker (1964 p.78)	Hansen (1963) (all males)	Becker (1964 pp.76,94)
	1976 Grads Pvt. Rate	1975 Grads. (Social Rate)	Pvt.Rate	Pvt.Rate	Pvt.Rate	Pvt.Rate	Pvt.Rate
Male	12.7	12.3				10.1	
White	14.3	13.4	13.6	10.1	12.7		14.4
Non-White	6.8	6.1	6.0	6.0			8.[1]
Female	13.2	7.4					
White	11.9	7.0	9.9				
Non-White	18.5	9.3	29.1				

1. In this column only, "non-white" refers only to blacks.

(1970) respectively. The private rate for all males in 1950 of 10.1% that was obtained by Hansen (1963) rose toward the 12.7% obtained here for all males in 1970.

The relative stability of rates of return to higher education in the entire post World War II period, and the lack of evidence of diminishing returns, can only be explained by the presence of a growing demand for educated manpower and graduates in possession of the newer skills. Freeman (1975) notes that even in the '71-'75 recession periods, rates have not fallen in some fields.

Ex Ante and Ex Post Private Rates of Return

Black male students and both white and black female students seriously overestimate the amounts they expect their college education to increase their earnings in relation to the age-earnings profiles of blacks and females in Census data. These expectations lead to implicit ex ante rates of return far above the ex post rates by all except white males, as can be seen in Table 4. (Costs were identical in computing ex ante and ex post rates for each student.) High expectations are most pronounced among blacks and females in two year associate and eight-year medical-legal degree programs. But their expected private rates of return are 12 to 22 percentage points higher than the ex post rates even at the bachelor's level. The expectations of white males are very close to the Census data however, except for the higher expectations of white males planning to enter professional madical and legal degree programs.

Blacks and females most likely are recognizing the strong upward drift to earnings of the more recent black and female entrants into the work force. With respect to blacks, F. Welch (1973) has suggested that this is a vintage effect, through which an extra year of schooling for recent 1963-65 urban male labor force entrants has led to an increase of 23.0% in

Table 4

	1976 Graduates (BA)			1975 Graduates (BA)			
	Ex Ante Private Rate of Return	Ex Post Private Rate of Return	Difference	Ex Ante Private Rate of Return	Ex Post Private Rate of Return	Difference	N (Col. 2)
Bachelors Level (4 yrs)	23.2	13.0	10.2	24.6	14.4	10.2	985
Male	12.7	12.7	0	23.5	15.8	7.7	508
White	11.0	14.3	-3.3	21.5	16.6	4.9	383
Black	19.2	6.8	12.4	37.6	14.8	22.8	91
Other	15.9	10.5	5.4	30.0	10.5	19.5	33
Female	34.6	13.2	11.4	25.6	13.1	12.4	477
White	32.6	11.9	20.7	24.2	12.1	12.1	339
Black	40.5	18.5	22.0	31.7	15.3	16.4	106
Associate Level (2 yrs)	25.5	7.9	17.6	33.0	8.1	24.9	223
Male	12.3	8.1	4.2	31.1	9.3	21.8	133
White	5.1	9.6	-4.5				85
Black	31.7	4.9	27.0				27
Female	46.0	7.7	38.3	33.6	7.7	25.9	91
White	45.8	7.7	38.0	31.4	5.7	25.7	64
Black	46.3	8.0	38.3				21
Ph. D., Ed. D. Level (8 yrs.)	17.6	11.1	6.4	13.3	9.6	3.7	225
Male	11.8	12.0	-.2	11.9	10.2	.7	122
White	10.1	13.0	-2.9	8.0	11.1	-3.1	101
Black	17.4	6.7	10.7	20.8	7.8	13.0	15
Other				13.3	9.9	3.4	31
Female	24.4	10.0	14.4	16.8	8.2	8.6	103
White	23.5	6.5	17.0	12.0	6.5	5.5	75
Black	24.5	20.9	3.6	21.6	7.9	13.7	23
MD, DDS, DVM, JD (8 yrs.)	35.4	11.4	24.0	26.7	12.7	14.0	170
Male	27.6	11.6	16.0	25.9	12.7	13.2	91
White	28.3	12.9	15.4	24.6	13.5	11.1	64
Black	29.0	8.4	20.6	34.7	6.5	28.2	14
Female	44.7	11.3	33.4	31.1	12.6	18.5	79
White	47.2	10.6	36.6	30.4	15.4	15.0	42
Black	44.8	15.1	29.7	41.3	9.4	31.9	24

wage rates for blacks and 14.6% for whites. He suggests that this is largely due to a secular improvement in the quality of schooling received by blacks, although for both blacks and females it may also reflect reduced market discrimination,

But in spite of the relative improvements in earnings prospects for blacks and females with education of recent vintage, there still is the suggestion that they may be overestimating their (implicit) rates of return, perhaps by projecting the high recent rates of change. For example, although all students tend to overestimate the absolute amount that college will contribute to their annual earnings in relation to Census data (which is probably also a vintage effect), blacks and females estimate that it will contribute ($2,528 - $3,267) more to their earnings than white males expect it to contribute to theirs ($2,115). (See Column 1, but also Column 3 of Table 5). This probable overestimate is aggrevated as each population group looks 25 years into the future. When doing that, white males consistently underestimate the steepness of their age-earnings profiles (in relation to the Census data), whereas blacks and females who tend to have flatter age-earnings profiles in the first place extrapolate the overestimation to arrive at a higher peak. The result is rates of return for blacks and females that are 11-22 percentage points above the corresponding ex post rates for blacks and females at the bachelor's level, and in the vicinity of 27-38 percentage points above their ex post rates at the Associate Degree and Professional Medical-Legal Degree levels! (See Table 4 .)

When compared to the ex post rates of return received by white males (on the assumption that white-male earnings may influence their expectations) blacks and female expectations still are highest. Some may be explained by the fact that blacks and female

Table 5 Increments to Earnings

Attributable to a Bachelor Level College Education

(Increments above earnings of high school graduates of the same race and sex times $\alpha = .66$ to adjust for other influences)

	EARNINGS INCREMENTS ATTRIBUTED TO COLLEGE ($\alpha = .66$)			
	1976 Graduates		1975 Graduates	
	Expected At Graduation	Later; Average For Ages 25-65	Expected At Graduation	Later; Average For Ages 25-65
Male, Bachelors Level				
White, Ex Ante	$2,115	2,333	2,419	3,427
Ex Post	245	2,731	245	2,731
Over Est.	863%	-15%	987%	125%
Black, Ex Ante	2,528	4,767	2,952	10,647
Ex Post	304	1,073	304	1,073
Over Est.	831%	444%	970%	992%
Female, Bachelors Level				
White, Ex Ante	3,100	5,554	2,365	2,586
Ex Post	602	1,059	602	1,059
Over Est.	514%	524%	392%	244%
Black, Ex Ante	3,267	6,004	2,788	3,734
Ex Post	798	1,447	798	1,447
Over Est.	409%	415%	349%	258

opportunity costs are lower[7], and some by expectations engendered by affirmative action programs from which results may or may not marterialize.

To the extent that there is overestimation by students, the ex ante rates of return contain misleading information that can influence student decisions (e.g. black males increased their enrollment as a percent of all males from 5% to 9% from 1969 to 1975, and female enrollment as a percent of all 18 year olds increased by 11% during the same period. But blacks and females in junior colleges and those headed into advanced professional health fields may suffer frustration unless their high expectations are realized by very large improvements in earnings later in their life cycles.

Differences in Rate of Return on Investment by Type of Institution

The differences in social rates of return, the rates most relevant to social policy, are quite small among the types of institutions. In Table 6 the rates shown are limited to those for students of the same ability level (in the second-from-the-top test quartile) in the effort to eliminate entering ability as a factor and to concentrate on differences in the costs and quality of the education added. The resulting differences in social rates of return among institutions (across the rows) are smaller than the differences within each type of institution among races and sexes (down each column).

Controls are imposed for differences in ability by showing the rates that apply for students who have composite test scores from 15.6 through 20.4 on the ACT assessment. This test taken by entering freshmen gives a composite score covering reasoning ability in each of the four areas of English, math, social science, and natural science. The second rather than the first ability quartile has been chosen to correspond more closely to the average earnings of college graduates of all ability levels given by the 1970 Census. It also is necessary to go to the

Table 6. Rates of Return by Type of Institution, 1976 Graduates Controlled for Ability (Second Ability Quartile), By Race and Sex

(Standard errors shown in parentheses below each mean.)

	Universities		Comprehensives, 4 Year Colleges		2 Year Colleges	
	Public	Pvt.	Public	Pvt.	Public	Pvt.
Social Rate of Return Ex Post						
Male, White	10.4%	11.3%	11. .%	11.3%	16.6%	12.1%
(Male, White, 1975 Graduates; All Four Ability Quartiles this line only)	(9.1)	(7.2)	(12.0)	(10.1)	(12.7)	(13.1)
Male, Black	6.2	4.1	7.4	7.2	6.0	
Female, White	5.5	5.2	7.0	9.1	6.0	6.5
Black	6.9		12.2	9.0	9.0	
Private Rate of Return, Ex Post						
Male, White	14.1	23.6	13.7	16.7	18.4	16.5
Black	9.4	5.7	9.9	9.4	8.4	
Female, White	9.3	10.8	10.4	14.9	8.9	8.4
Black	13.5		18.3		10.7	
Ex Ante Private Rate of Return						
Male, White	17.9	- 1.8	10.6	1.9	23.4	
Black	23.5	13.5	35.0	47.6	12.7	
Female, White	37.3	25.6	29.3	32.2	32.1	
Black	34.5		52.2	24.2	30.6	

second quartile to find enough blacks enrolled to permit comparisons of rates of return between races.

The most interesting comparison is of social rates of return for white males among institutions. They reflect cost differences (i.e. full investment costs, including endowment fund income and/or tax subsidies behind each student), and differences in earnings due to choice of occupation, but not differences in earnings due to differences in quality of instruction among types of institution (see Chiswick and Wachtel, (1975). The ex ante rates reflect higher returns expected by all groups at public institutions. Social rates are nearly the same however, or about 11.3%, except for the higher 16.6% rate at public two year institutions. The latter reflects the presence of many students whose objective is a two year Associate Degree. It is only 10.8% for those students in the top quartile, perhaps because most of the latter plan a four or more year degree program and hence, will incur larger investment costs. This lower rate is more comparable to these computed for the four year institutions.

The private rates of return in contrast to the social rates tend to be higher for whites (but not for blacks) at private universities and four year colleges. This can be seen in rows 6 - 9 in Table 6. This reflects the scholarships received by each student that lowers his family's investment costs, and as well as the subsidy from the endowment fund or from taxes that reflect quality. These rates of return suggest that private institutions are not at a competitive disadvantage with public institutions with respect to those students from the second ability quartile that do enroll, in spite of the tax subsidy for students to public institutions.

The private rates of return expected at public institutions by white males are higher, however, than rates of return expected at private

insitutions for those in the second ability quartile. This advantage over private institutions disappears among white males in the top ability quartile (in brackets in Table 6); perhaps via screening or institutional quality they expect more earnings later. Again black males and most females are expecting what appear to be unrealistically high rates of return. This is especially pronounced for blacks enrolled at four year institutions and for females of both races enrolled at public universities.

Differences Among Occupations

There are wide differences in social rates of return among occupations, as indicated in Table 7. Where the rate of return is above the 13% rate of return on physical capital (the average return on net assets for all manufacturing averaged 13.3% for this 1971-75 period), Table 7 shows fields where the most significant contributions to measured economic growth can still be obtained.

But first, rates of return can be seen to fall as students progress within most fields from bachelors, to masters, to PhD degree levels, as would be expected. The rates fall, 1.) because use of a fixed time horizon does not reflect the tendency of those with an advanced education to retire at a later age, 2.) because foregone earnings and other costs rise faster than the efficiency of learning rises as schooling progresses, and 3.) because the larger externalities generated by graduate education in some fields are not measured.[9] The exceptions are more interesting than is the commonly observed pattern of declining rates. Masters Degrees have a higher rate of return than bachelors degrees for Welfare Workers, Teachers (Primary and Secondary,) those in other academic posts, Other Managers, and Other Professionals. In these fields there either tend to be well

TABLE 7. SOCIAL RATE OF RETURN BY OCCUPATION AND BY DEGREE LEVEL

(Standard errors are in parentheses below each man; means now shown when degree is inappropriate and standard error large.)

	1976 GRADUATES (POTENTIAL BA'S)				1975 GRADUATES (POTENTIAL BA's)			
	Assoc	BA,BS	Mas-ters	Ph. D. Ed.,MD.	Assoc.	BA,BS	Mas-ters	Ph. D Ed.,MD
Accountant	9.8	10.3	10.1	4.0	7.0	11.0	10.9	
	(1.0)	(.5)	(.2)	(.5)	(.1)	(.5)	(1.2)	
Architect		8.5	9.4			8.7	6.9	
		(.6)	(3.3)			(.4)	(.2)	
Artist	8.9	11.3	6.8			7.1	15.7	
	(.6)	(.3)	(.4)			(.4)	(5.3)	
Author, Editor		9.4	5.1			9.2	3.0	4.3
		(.7)	(1.1)			(.7)	(.4)	(0.1)
Chemist			8.2	4.9			6.2	5.7
			(.7)	(.4)			(.5)	(.9)
Clergyman				BD:-16.2		-14.0	-16.2	BD;-16.2
				(.4)		(.02)	(.2)	
College Professor			6.2	10.7			8.5	3.7
			(.5)	(7.2)			(1.2)	(.2)
Doctor, Dentist				MD: 18.4				MD:19.6
				(.6)				(.5)
Engineer		11.1	13.1	5.7		13.2	10.9	7.8
		(.5)	(1.1)	(.6)		(.5)	(.2)	(1.3)
Engineering Tech		1.7				2.3		
		(2.0)				(.3)		
Lawyer				JD: 12.1				JD:16.8
				(.5)				(1.6)
Musician		5.5	1.7			7.4	0.3	-2.8
		(1.1)	(.6)			(2.3)	(1.5)	(.7)
Natural Scientist		10.2	11.4	5.6		9.2	8.9	4.8
		(.9)	(.7)	(.2)		(.4)	(.3)	(.5)
Pharmacist		14.0				13.9		
		(1.1)				(.4)		
Social Scientist			12.7	5.7				7.8
			(1.5	(.5)				(.7)
Welfare Worker		-6.2	4.0			6.7	7.6	
		(2.6)	(.7)			(1.5)	(1.0)	
Teacher (Pri. Sec.)		-5.7	3.2	0.0		1.9	4.9	-0.5
				( )		(.6)	(.3)	(.4)
Medical Technician	1.1	4.2	5.3		8.4	6.1		
	(2.8)	(1.6)	(1.4)		(.3)	(2.2)		
Electronic Tech	-.2	3.7	4.9		1.2	23.1		
	(2.5)	(.3)	(.7)		(.4)	(7.8)		
Other Professional	7.5	8.7	9.1	5.3	13.6	9.6	10.8	5.8
	(.5)	(.2)	(.3)	(.2)	(2.5)	(.2)	.7	(.6)
Other Technical	32.9	12.9			13.8	14.5	11.5	6.1
	(13.7)	(1.1)			(1.5)	(.6)		(1.7)
Mfg. Mgr.			18.9			30.0	28.8	
			(.2)			(1.9)	(3.9)	
Proprietor(Self-Emp)		19.9						9.8
		(.4)						
Retail Mgr.		21.8	9.0			15.6		
		(7.2)	(.0)			(.9)		
Other Mgr.		11.6	13.5			11.6	14.2	
		(1.0)	(.7)			(.8)	(1.3)	
Farmer(Owner Op.)		-4.7				4.9		
		(.3)				(16.0)		
Bookkeepers	-11.7	2.1			2.3	2.5		
	(1.2)	(1.0)			(.2)	(1.4)		
Secretary	-3.5	3.2			4.2	2.4		
	(1.6)	(.4)			(.5)	(.8)		
Other Clerical	-7.6	1.3				-.3		
	(1.9	(.7)				(.5)		
Sales		15.5	9.2			11.5		
		(1.5)	(4.7)			(.0)		
Craftsman	8.4	.8			-10.3	.0		
	(.3)	(.0)			(8.0)	(.8)		
Policeman	5.7	6.9		JD:4.1	3.0	10.6		
	(.0)	(.3)		(.0)	(1.9)	(6.6)		
Service Workers						-14.4		
						(.1)		
Other Labor		-15.6				-14.0		
		(.0)				(.0)		

established professionally oriented masters degree programs (e.g. MBA, Masters of Social Work), or else additional education is important to the salary structure and to advancement (e.g. teaching in Community Colleges).

The only other exception to the usual pattern of declining rates at the more advanced levels is the case of Accountants and Bookkeepers, where it is advantageous for students to go on for a bachelor's degree, but less advantageous beyond that. The social rates of return are very low for two years of college in the Census occupation codes for Secretaries, Bookeepers, Other Clerical, and technicians. But since this group in the Census data completing two years includes drop-outs from four year programs, the low ex post rates may understate the rate of return on the newer Community College programs that have a two year terminal Associate Degree as their objective, and therefore should be interpreted with caution. There are some very low rates at the bachelors level however, such as those of -14.4% for Service Workers, -14-15.6% for Other Labor, and -.8% for Craftsmen, indicating fields where there is over-training. Students with these occupational objectives should not be encouraged to attend college, or else their sights should be raised since these types of investment are not advantageous.

The social rate of return is highest at this bachelors level in Table 7 in business fields (Manufacturing Managers 30%, Self Employed Proprietors 19.9%, Retail Managers 15.6-21.8%, and Salesmen 11.5-15.5%), in Pharmacy (14%), and in Engineering (13.2%). Some of the business occupations reflect selection on-the-job or even some property income (e.g. self-employed proprietors) so that the result is not a pure rate of return on the investment in business education. Nevertheless, since all fields involve some amount of on-the-job screening, the

Table 8: Ex Ante and Ex Post Rates of Return by Occupation

BA - Level Only

	1976 Graduates(Potential BA's)			1975 Graduates(Potential BA's)		
	Private Rate of Return (Ex Ante)	Private Rate of Return (Ex Post)	Social Rate of Return (Ex Post)	Private Rate of Return (Ex Ante)	Private Rate of Return (Ex Post)	Social Rate of Return (Ex Post)
Accountant	33.8	13.2	10.3	34.7	15.4	11.0
Architect	49.2	11.3	8.5	32.0	14.9	8.7
Artist	8.2	13.9	11.3	17.7	11.4	7.1
Engineer	34.8	16.4	11.1	28.4	19.3	13.2
Musician	41.3	10.9	5.5	-	-	-
Natural Scientist	20.4	14.0	10.2	12.9	12.4	9.2
Pharmacist	42.3	26.7	14.0	23.4	17.5	13.9
Welfare Worker	25.1	-1.7	-6.2	24.8	10.8	6.7
Teacher(Primary,Secondary)	12.3	-2.6	-5.7	18.1	6.3	1.9
Medical Tech.	26.0	7.0	4.2	33.0	14.1	6.1
Electronic Tech.	26.1	6.0	3.7	40.5	24.0	23.1
Other Professional	24.1	13.0	8.7	26.6	15.3	9.6
Other technical	22.3	16.3	12.9	21.8	16.2	14.5
Mfg. Mgr.	-	-	-	32.5	38.2	30.0
Proprietor(Self-Employed)	49.8	21.0	19.9			
Retail Mgr.	36.1	23.4	21.8	43.5	20.4	15.6
Other Mgr.	21.1	15.0	11.6	30.0	25.3	11.6
Farmer (Owner- Op.)	36.2	-3.3	-4.7			
Secretary	-0.5	4.6	3.2	30.6	6.1	2.4
Other Clerical	8.4	2.2	1.3	-	-	-
Other Sales	0.9	20.0	15.5	-	-	-
Policeman	35.3	7.9	6.9	22.5	11.2	10.6

contribution of education in business, pharmacy, and engineering fields to economic growth is substantive.

Scholarship aid to students and subsidies to institutions do not distort student choices with respect to these fields since not only the social, but also the private rates of return are highest in these business, pharmacy, and engineering areas (see Table 8). The ex ante private rates of return also indicate that students expect returns in these fields to be highest, but Architecture, Farming (Owner-Operator), and Police work also have very high expected returns with less justificatior.

At the advanced graduate levels, the highest rates of return are in medicine (18.4, 19.6%). This takes the higher costs of medical education into account through the higher foregone earnings and through most of the full institutional costs over the longer period of years required for an MD. The high rate of return is a more meaningful economic criteria for the existence of a shortage of doctors than are head counts of doctors per capita, which do not reflect the economists' concept of scarcity. The rates of return to the JD degree also are high (12.1-16.8%). But with further future increases in the demand for medical care expected with national health insurance and with increases in the income and age of the post World War II population buldge, the returns to society from continued expansion of medical education could be even higher than the current 19%. Those PhD programs oriented only to college teaching have significantly lower rates of return as can be seen in Table 7. With the decline in college enrollments following the 1957-1975 decline in fertility rates that are predicted for the 1980's, the rates of return in those PhD programs oriented to academic job markets could fall even further.

III. Summary and Conclusions

The private and social rates of return calculated here for individual students and their families have the advantage of taking specific cost differences and differences in returns by occupation, degree level, age, race, and sex into account. An imputation must be made by the user for the omission of non-monetary private and social benefits, at least to the extent that these non-monetary returns differ among occupations and degree levels. But with this caution, some interesting new insights are offered.

The ex ante rates of return implicit in students' expected earnings which have not previously been computed are found to be highest for blacks and females. Since these are also the two groups that have accounted for an increasing share of college enrollments from 1969 through 1975, this result is consistent with the hypothesis that the ex ante rates do have a significant effect on private investment behavior. Ex post rates for these two groups are the lowest, so that ex ante rates appear to have the advantage over ex post rates for the analysis of changes in behavior.

Beyond this the high ex ante rates for blacks and females, higher not only than other ex ante rates but also than the ex post rates for white males, suggest that there may be some disillusionment later when expectations remain unfulfilled.

There are not large differences in social rates of return by type of institution, even though full costs and student occupational choices are taken into account, and private rates of return tend to be higher at private institutions. This suggests that public subsidies may not be distorting student choices in this regard to the disadvantage of society as is sometimed claimed. The differences in social rates of return among occupations are larger, and perhaps merit more attention.

The highest ex post social rates of return are in business management, medicine, pharmacy, law, and engineering in that order, with the lowest rates in teaching, humanities, and the less skilled service worker and labour occupations. This is consistent with the declines mostly in the humanities (and steadiness elsewhere) in the 1970's discussed by Freeman (1975), a period affected by recessions. To prevent diminishing returns to higher education from setting in it is increasingly imperative that new investment in higher education by institutions and by students be concentrated more in those fields where the social dividend as indicated by the adjusted social rates of return are highest.

Appendix A

The process of solving for the internal rate of return for each student is sufficiently complex that some simplification is desirable for computational purposes.

The method used for approximating this rate of return, therefore, will be described in this Appendix. It has been shown by Psacharopoulous and Hinchliffe (1973, pp. 156-7) to lead to overestimation of the true rate of return by 21.8%, or 4.3 percentage points for which a correction therefore has been made. Care, however, should be used when comparing these results to the results of others which often use similar approximating methods but make no correction for the overestimate of the true rate of return.

The method of approximating the difference between prospective college earnings and the alternative high school graduate's earnings is to first take the earnings differential at age 22 (college graduation), or

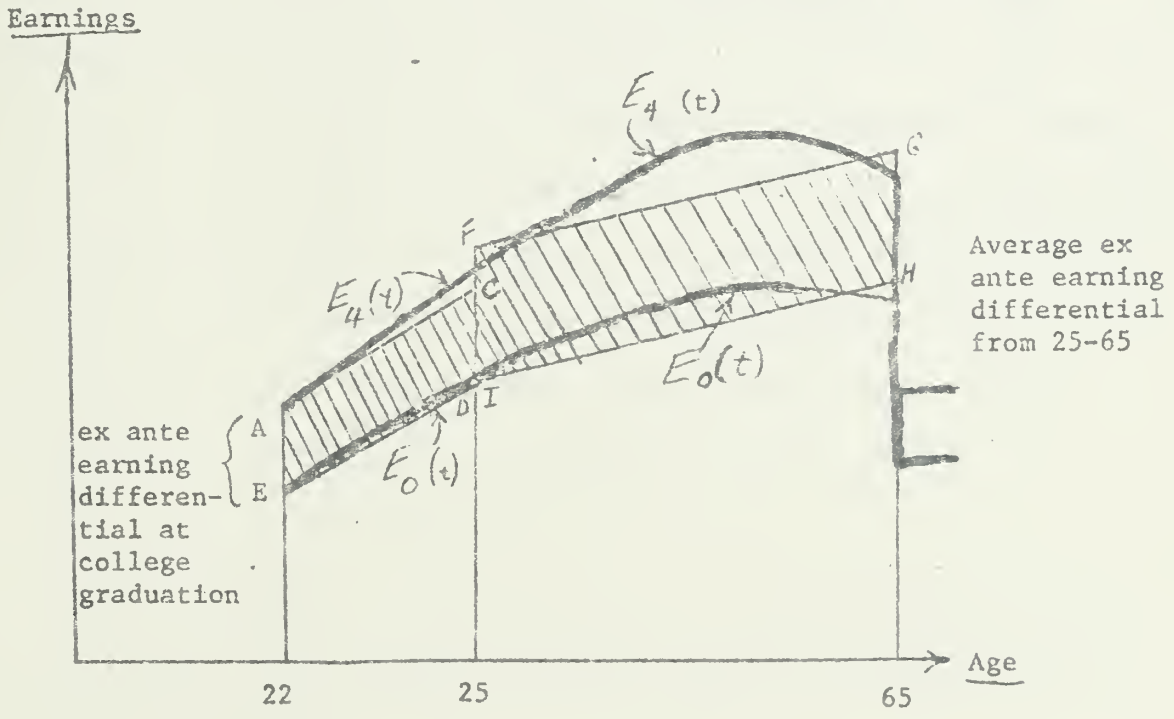

Figure 3. Approximation of The Lifetime Earnings Differential: Excess of A College Graduate's Earnings over a High School Graduates Earnings.

distance $E_4 - E_0$, to be constant from age 22 to 25. (See Figure 3.) Secondly, the earning differential for the remainder of the working life, ages 25 - 65, is also assumed to be constant and equal to the average earnings differential from 25 to 65, (GH=FI).

The lifetime earnings differential can be approximated as the sum of the earnings differentials from 22 - 25 and 25 - 65 which are represented by ACDE and FGHI in Figure 3. To adjust for non-education effects on earnings and tax effects, the earnings differentials are discounted by an "Alpha coefficient," = .66, and 20 percent tax rate. If the ex ante earnings differential at graduation is AE and the average ex ante lifetime earnings differential FH, the total ex ante lifetime earning differential is:

$$(6) \quad TE_1 = \sum_{t=1}^{3} (AE) \left(\frac{1}{1+r}\right)^t + \sum_{t=1}^{43} (GH) \left(\frac{1}{1+r}\right)^t$$

The estimator of each student's total private-investment-cost is presented in Table 1, column 2. The Table is self explanatory; however, some additional notes are needed for clearity. First, items (1), (2), (3), and (6) are individual data which came from the McMahon and Wagner survey 1972 while the item (5), foregone earnings was taken from the 1970 Census data with 20 percent adjustment for income tax. Secondly, items (3) and (4) are used only in the estimation of social cost, hence left empty in the case of private cost. Let the annual student total investment cost be PC, then total investment cost for a student in a B. A. program is

$$(7) \quad TC_1 = \sum_{t=1}^{4} PC \ (1+.06)^t$$

The ex ante rates of return for each of the 5,400 students in the sample are estimated by an iterative computer program that solves for r in equation (3) (from earlier):

$$(3) \quad \sum_{t=1}^{4} PC \ (1+.06)^t = \sum_{t=1}^{3} AE \left(\frac{1}{1+r}\right)^t + \sum_{t=1}^{43} GH \left(\frac{1}{1+r}\right)^t$$

TABLE A-1

ANNUAL HIGHER EDUCATION SOCIAL COSTS[a]

INVESTMENT COMPONENT	1972-73 FRESHMEN	1971-72 NON-FRESHMEN
DIRECT SOCIAL INVESTMENT COSTS		
(1) Tuition + Fees	Actual T+F (reported to ACT by school Financial Aid Officer)	Actual First Term T+F (Question 13-A.1, McMahon (1974) p. 165) X (no. of terms per school year)[b]
plus (2) Books + Supplies	$143 (average B+S expenses experienced by 1971-72 non-freshmen students)	Actual First Term B+S Expenses (Question 13-B.1, McMahon (1974), p. 168) X (no. of terms per school year)[b]
plus (3) Government Appropriations per Student	Federal and State appropriations to the institution divided by total full-time enrollment (ACE, IDHE)[c]	Same as Freshmen
plus (4) Endowment Income per Student	8% of market value of institution's endowment divided by total full-time enrollment (ACE, IDHE)[c]	Same as Freshmen
plus INDIRECT SOCIAL INVESTMENT COSTS		
(5) Gross Foregone Earnings	UNDERGRADUATE: Average earnings of 19 year old high school graduate of similar race sex for 40 week school year	Same as Freshmen
	GRADUATE: Average earnings of 22 year old college graduate of similar race and sex for 28 week school year (1970 Census)[d]	Same as Freshmen

(cont'd)

INVESTMENT COMPONENT	1972-73 FRESHMEN	1971-72 NON-FRESHMEN
minus (6) Part Time Earnings	Income from work-study and other jobs (Question 14-C, McMahon (1974), p. 163) X (no. of terms per school year) (from McMahon (1974), Question 11, p. 173)	Actual First Term Part-Time Earnings (Question 14-D.I, McMahon (1974) p. 168) X (no. of terms per school year),[b] (Question 11, McMahon (1974) p. 168)

NOTES TO TABLE A-1:

a. Source of data or item number in the College Investment Decision study questionnaire for the Freshmen/ Non-Freshmen stage appear in parentheses below the description of the data .

b. The number of terms per school year are semester, trimester=2; quarter=3.

c. Data are from the American Council on Education, Institutional Domain of Higher Education. Subsidy and endowment data are from 1966-67 for universities and colleges, 1965-66 for junior colleges. Enrollment figure (to get "per student") is full-time enrollment, fall 1967.

e. Earnings data are for those in the experienced civilian labor force in 1969. See Table A-2 for earnings data employed.

References

American Council on Education (1972), The American Freshman: National Norms Fall 1972, Office of Research, ACE. Washington, D.C.

Becker, Gary S., (1964), Human Capital, NBER, New York.

Bielefeld and Park (1975), "Earnings from Human Capital Investment" forthcoming in the Quarterly Review of Economics and Business.

Ben-Porath, Y., "The Production of Human Capital and the Life-Cycle of Earnings," Jour. Pol. Econ., 75, 352-65.

Bishop, John H. (1975), "Some Thoughts on the Cost Effectiveness of Graduate Education Subsidies," in H. Folk and G. Russell, eds., Graduate Education, Manpower & Costs, University of Illinois, Urbana (in press).

Chiswick, Barry and J. Mincer (1972), "Time Series Changes in Personal Income Inequality in the U.S. from 1939," Jour. Pol. Econ., Vol. 80, Part II, S34-S66, May/June.

Chiswick, B. and P. Wachtel (1975).

Freeman, R. (1975), "Overinvestment in College Training?" J. Human Resources, Summer 1975.

Freeman, Richard B. and J. H. Hollomon (1975 "The Declining Economic Value of College Going" Change, September 1975, 24-31.

Froomkin, Joseph (1974), "A Study to Identify the Trends in the Sources of Student Support for Post Secondary Education", Report for HEW Contract No. OS-74-243, Joseph Froomkin Inc., Washington, D.C.

Hanoch, Giora (1967), "An Economic Analysis of Earnings and Schooling," Jour. Human Resources, 2, pp. 310-29.

Hansen, W. Lee (1963), "Total and Private Returns to Investment in Schooling," Jour. Pol Econ., (April).

Hines, F., L. Tweeten, and M. Redfern (1970), Social and Private Rates of Return to Investment in Schooling by Race, Sex Groups, and Regions," Jour. Human Resources, V, (3).

Hirschleifer, J. (1958), "On the Theory of Optimal Investment Decision," Jour. Pol. Econ., (August), 329-51.

McMahon, Walter W. (1974), Investment in Higher Education, D. C. Heath and Co., Lexington, Mass., 1974.

Michael, Robert T., The Effect of Education on Efficiency in Consumption, NBER Occ. Paper #116, Columbia University Press, New York.

Mincer, Jacob (1974), Schooling, Experience, and Earnings, NBER, Columbia Univ. Press, New York.

Psacharopoulos, George (1973), Returns to Education, Elservier, Amsterdam, London, and New York.

Solomon, Lewis and P. Wachtel (1975), "The Effects on Income of Type of College Attended," Sociology of Education (forthcoming).

U.S. Bureau of the Census (1973), Earnings by Occupation and Education, Census of Population: 1970 Subject Reports, Final Report PC (2) - 8B, Washington: U.S. Government Printing Office.

U.S. Office of Education (1972), Opening Fall Enrollments in Higher Educational Institutions for 1972, National Center for Educational Statistics, USOE, DHEW, Washington: U.S. Government Printing Office.

Wachtel, Paul (1975), "The Returns to Investment in Higher Education: Another View," in F. T. Juster, ed., Education, Income and Human Behavior, A Report, the Carnegie Commission and the NBER, Berkeley and New York.

Welch, Finis, "Black White Differences in Returns to Schooling," A.E.R., LXIII, No. 5, December 1973, 893-907.

Footnotes

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1. It is reasonable that if education increases the efficiency and the value of work time, it also affects the efficiency of consumption time. The point is discussed by Michael (1972) and by McMahon (1973, 1975). If the net effect is to increase the efficiency of consumption time, total rates of return in this paper should be regarded as understating their true values.

2. Costs through the bachelors assume 4.637 academic years the average for completion of the bachelors degree, for a 40 week school year, and a 48 week school year after that at the higher rate.

3. Computations for the purposes of this paper include work-study in the part-time earnings, even though work experience closely related to the classroom subjects should not be subtracted to the same extent from learning time. For a recent study of part time earnings, see Froomkin (1974).

4. This simplification allows total investment costs to be reduced to earnings alone. That is, if $I_1(t) - I_o(t) = E_1(t)$, then

(3a) $\int_{t_1}^{t_2} e^{it} E_o(t)\, dt = \int_{t_2}^{t_3} e^{-rt} [E_4(t) - E_o(t)]\, dt$ is solved for r.

5. See Apperdix A for the description of the approximating procedure used.

6. For more detailed description of the sample design see McMahon and Wagner (1973). The disposable personal income of all of the families in the sample drawn from among financial aid applicants is slightly lower than that for all U. S. Census families with college-age children where there is a heavier concentration in the $15,000 and over income bracket. The distribution of income in the unweighted survey data almost identical to the distribution of income among all Census families, however. See McMahon and Wagner (1973, Table 1).

7. Ex ante social rates of return which control for differences in financial aids are also higher (by 7.5 percentage points) for non-white males than for white males. Except for limited purposes like this, these ex ante social rates are less meaningful and therefore are not presented in detail.

8. See, for example, R. Freeman (1975).

9. See J. H. Bishop (1975).

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