Public and Private Incentives for Investment in Higher Education: Are They Sufficient, Especially for Black Males?

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ABSTRACT

The institutional costs of higher education have been rising. With diminishing public support per student, tuition and fees private costs have also been rising. But so have the real earnings of college graduates. Are there still sufficient incentives on efficiency grounds for additional public investment in higher education? And in particular, given that recent studies reveal that the costs to society of the inadequate education by black males (i.e., costs of reduced tax revenue as a result of lack of marketable job skills as well as their reliance on public assistance) are enormous, are there incentives for public support and/or other policy insights that would help address the problem?

This paper estimates nationwide private and social rates of return computed by the 'full method' by degree for each race and sex, and then repeats this for a specific campus based on tracer study data. It controls for 'ability', and breaks these rates down by field of study. Mincer returns at the campus level are also computed.

Private rates of return are the rates that discount the stream of net increments to earnings after taxes over the lifecycle attributable to education back to their present value and equate them to the private investment costs to students and their families. Therefore the private rates of return are the returns relevant to individual students and their families. Social rates of return are the rates that discount the stream of net earnings differential before taxes over the lifecycle back to their present value and set the result back to the total institutional

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and foregone earnings costs. These social rates are relevant to decisions by government about development policies.

The article finds that both the private and social rates of return for black males are much lower than they are for whites or for black females at the bachelor's level and in each field. Higher 'ability' raises these rates, but its effect on the rates of return is only about 2–3 percentage points, and is not much different for other races and sexes. The larger propensity of black males to choose low net return fields is a major source of the insufficient economic incentives, and additional counseling of other policy approaches may be needed to help reduce the large social costs incurred from the inadequate education of this group.

INTRODUCTION

The rising institutional costs of higher education and higher private costs as tuition and fees increase following falling real public support per student that are a major part of the trend toward privatization are discussed. But earnings of college graduates also have been increasing, and there is a need to put these rising costs in perspective in relation to the returns. Furthermore, new research reveals the enormous costs to society of the under-education of black males that is black males lag behind other groups in educational outcomes (e.g. Levin 2007; Belfield 2007; Rouse 2007; Muennig 2007). Many of these costs are incurred because of under-education at the high school level or even earlier, which make them reliant on public assistance because of lack of marketable job skills. There is also the question about whether the incentives to continue on with college relative to the costs are sufficient, both public and private, to warrant further investment and/or whether non-financial supplemental policies might be needed. The first question can only be answered by the nationwide full method social rates (that include the rising institutional public costs), and nationwide private rates. The answers presumably are 'yes' for the social, and possibly 'yes' for the private; although, in the latter case there are financing constraints that prevent the high private rates from being realized by many due to insufficient national and state-level need-based financial aids and/or institutional support. But the incentives may be too small for black males (see below). So then a possible policy implication is that there is still public underinvestment in higher education, especially at the bachelor's level and especially in engineering sciences, and business fields, in spite of the rising costs overall and the higher costs in these fields as the institution specific data suggests. But the further implication would be that there is still significant underachievement in the education of black males (checked out at the institutional level for 'ability' and choice of field), and that the later has the policy implication that better counseling is needed to raise the social and

private rates of return as black males choose more viable fields. The black male problem is an even larger problem than this data reveals because of the huge costs to society from the under-education of black males (see Levin 2007).

This article estimates nationwide private and social rates of return computed by the 'full method' by degree level for each race and sex, and then repeats this for a specific campus based on tracer study data in order to control for "ability', and breaks these rates down by field of study. The 'full method' is a standard method that reflects institutional costs and net earnings differentials specific to each education level to calculate internal rates of return. Private rates of return (PRORs) are the rates that discount the stream of net increments to earnings after taxes over the lifecycle attributable to education back to their present value and equate them to the private investment costs of education to students and their families. Therefore, the PRORs are the returns relevant to individual students and their families. Social rates of return (SRORs) are the rates that discount the stream of net earnings differential before taxes over the lifecycle back to their present value and set the result back to the total institutional and foregone earnings costs. These rates are relevant to decisions by government about development policies. Mincer returns at the campus level are also computed for the latter for comparison.

The article finds that both the PRORs and SRORs for black males are much lower than they are for whites or for black females especially at the bachelor's level (3%–7% lower for the national averages and 8%–15% lower for a specific campus), and were also lower in each major field at the campus level. Higher 'ability' raises these rates, but its effect on the SRORs is only about 2 to 3 percentage points, and it is not much different than for other races and sexes.

Earlier higher education rate of return (ROR) studies (e.g., Carnoy 2011; Stokes and Wright 2008; Bourne and Dass 2003; Arias and McMahon 2001; Cooper and Cohn 1997; Kimmel 1997) need to be updated in ways that take into account these rising institutional and tuition costs. There is also very limited literature on the economic impact of 'field of study' that takes the differences in the full cost of programs by field and the differences in the 'ability' of the freshmen entrants into account. It is less important to know that fields in engineering and in business command higher salaries (Yong, Heng, Thangavelu and Wong 2007; Grogger and Eide, 1995) than to know whether this is true if the higher institutional unit costs in engineering were taken into account. And what would be the effect if there were controls for differences in the 'ability' of entrants? Would the differences in the ROR between blacks and whites, and/or males and females disappear if there were controls for institutional unit costs and entering ability?

The contribution of this article is that although the nationwide Current

Population Survey earnings data collected for the Census does not permit controls for entering ability, field, or institutional unit costs by field, it is possible to control for these things using tracer study data for a representative university. The paper offers insights into the pattern of returns likely to be found among graduates from comparable university since the labor markets determining earnings and foregone earnings costs are generally reasonably competitive and largely national. Furthermore, the large number of black students in the survey population enables comparison of the fields that blacks select, and the occupational choices that they thereby have made, with both the differences in mean annual earnings and differences in ROR between black males, black females, white males, and white females. There is also a great deal of interest in, and concern about, why it is that black males on average are not going far enough in school, or achieving at a level equal to that of black females, as well as others. It is hoped that this study will also shed some additional light on this important issue.

The above brief citations of the literature suggest that while progress has been made, there is need for more direct and comprehensive measures of the costs and returns that control for differences in institutional unit costs, and prior 'ability,' to better reveal differences in ROR by field, and by race, and sex. Although previous studies aforementioned focused on the ROR to education of a given cohort who are of the same sex and share similar educational attainment, the graduates were not from the same university. Therefore their study cannot adequately account for differences in ROR based on ability since individual universities have different selection criteria.

The ROR based on the tracer study of graduates are compared wherever possible to ROR for the same years computed by the same methods from nationwide earnings data. The limitation with the tracer study data is the response rate for blacks represents only 42% of the black graduates in 1988, and more importantly, there is little knowledge about those who did not respond. However, this paper does attempt to compare the characteristics of respondents to the characteristics of a typical group of graduates in order to try to see where any response bias, could be. Also, nationwide annual survey data is not available on institutional unit costs by field, earnings by field, or the 'ability' levels of those reporting earnings, to make comparisons with those in the tracer study. This limitation however also illustrates the strength of this study. It does offer important insights not available in national data. Furthermore, there is more variability in the nationwide salaries than in the salaries of graduates of the typical research university studied. This is because the nationwide samples include a vast range of colleges. Thus salaries of graduates from the research university studied, even though it can be interpreted as typical of other comparable institutions that all

tend to be reasonably selective, should be expected to be higher and in this sense not vary as widely as the nationwide rates.

Better information about the ultimate benefits of investment in higher education (PRORs) can help guide the field choices and investment decisions by students and their families. Also, controlling for institutional unit costs among fields and degree to obtain the SRORs can help guide governments in their investment decisions, but only when qualitative estimates of the non-monetary private benefits and external benefits to society are added. Estimates of the value of these, but not by field or by degree, can be found in (McMahon 2009; Wolfe and Haveman 2001).

THE DATA

The nationwide data on earnings by age, degree, sex, (and race) are taken from the Current Population Survey for 1993, 1997, and 2008 conducted by the U.S. Census Bureau. Nationwide data on 1988–89 college costs and stipends for public and private universities were obtained from the National Center for Education Statistics (Gerald and Hussar 1998 and 2009), and computed to get nationwide averages. The earnings and costs data are expressed in constant 2008 prices using the Consumer Price Index (CPI) as reported by the U.S. Bureau of Economic Analysis. It was necessary to use the 2008 constant prices to be comparable with the most recent earnings data available with observations at each educational attainment level by race and sex.

The data for a representative public research university is based on a tracer study survey of the 1988 graduates from the University of Illinois at Urbana–Champaign (UIUC). The tracer studies are mandated by the Illinois Board of Higher Education, and conducted by means of sample surveys by the UIUC Office for Planning and Budgeting to follow up on their graduates' post-university professional success. The advantage provided by this data set is that it enables the measurement to build an average earnings 'history' of each group in a particular graduating class, typically at five- to ten-year intervals. In addition, it allows the earnings of the local graduates to be compared with those of graduates nationwide.

Respondents were surveyed in two time periods: 1993 (i.e., five years after graduation) and 1997 (nine years after graduation). The information collected includes earnings, degree and field, race, sex, age, type of employment, and location of employment. A separate effort was made to obtain entry ACT scores for each of these undergraduate students and linked to the files of the 1988 graduates who were surveyed. The data was sorted to control for race, sex, degree, field, ACT scores, and age group. The data used to compute institutional

unit cost of field for all degree levels, graduate students' annual stipends, and scholarships, were obtained from the UIUC Office for Planning and Budgeting. The sample sizes are 220 black graduate respondents out of the 529 Blacks, and 4502 white graduate respondents out of the 8890 Whites of the 1988 cohorts.

MODELS AND METHODOLOGY

The ROR on investment in education is based on human capital theory, which postulates that pecuniary returns rise with additional education because of the productivity-enhancing effects of education. There are several ways to estimate the social and private returns from investment in education. In this study, the 'full method', also referred to as the pure internal rate of return, is used to estimate both the SROR and the PROR among race and sex for an institution of a representative public research university, UIUC and nationwide for comparison. The full method is a standard method that has the advantage of reflecting institutional costs that can be related to net earnings differentials specific to each degree level to calculate the rates of return. For graduates at the UIUC, the Mincerian method is also employed to compute the private returns among fields and by race and sex to compare the results from the full method.

Hypothesis

The following hypotheses are tested:

1. Race, sex, and field held constant, prior college 'ability', as reflected by ACT scores translates into higher ROR. This is tested against the alternative theory that other individuals with low ability levels benefit equally from a representative public research university education.
2. The second hypothesis is that the economic returns for graduates in fields such as engineering and commerce are higher than those for graduates in liberal arts and science, social studies, and fine arts after controlling for differences in costs and in 'ability'. This is tested against the alternative theory that economic returns are the same across fields.
3. The third hypothesis is that the economic returns for an additional year of education beyond a bachelor's education translate into higher returns for individuals from the same campus with race, sex, and field fixed. This is tested against the alternative theory that returns within each field remain the same with an additional year of education beyond a bachelor's degree.
4. Finally, the study tests the hypothesis that the returns to white men are greater than those to blacks and women, against the alternative theory that

the returns for graduates from the same campus, same degree and field are homogeneous across race and sex.

Computation of the Full Method (Internal Rate of Return)

The full method uses the direct institutional costs, specific costs by field, foregone earnings costs, and computed net earnings differentials for specific education level to calculate the pure internal rate of return.

To isolate the 'value added' by UIUC education to the ROR generated by these graduates, the net bias due to undergraduate students' abilities is removed from any measures of these ROR. This is done by controlling for the effect of ability on earnings in the entering freshman class by methods based on nationwide samples of identical twins. These methods developed by (Arias, Hallock and Sosa-Escudero 2000) and adapted by (McMahon 2009), control for measurement error in estimating net ability bias in the return to higher education. McMahon uses the mean ACT and SAT scores for individual campuses, and relates them to each campus's decile on a nationwide scale.

This method allows for the discounting of actual age-earning profiles in 2008 prices to estimate the ROR on investment in higher education. The RORs are calculated by solving the following formula iteratively on the computer, based on micro data covering individual graduates (groups within an age group):

$$\sum_{t=E}^{G}[C(t) + 0.75Y_0(t)]\,(1+r^*)^t = \sum_{t=G}^{R=65}[Y_1(t) - Y_0(t)]\,(1 + r^*)^{-t} \qquad (1)$$

$C(t)$ = direct annual institutional costs; $Y_0(t)$ = mean annual foregone earnings; $Y_1(t) - Y_0(t)$ = net earnings differential attributable to the next higher level of education; r^* = estimated ROR; t= age; E,..,G= graduation for the level of education being evaluated; and R= retirement age, which is 65 in this study.

The direct costs and the foregone earnings are multiplied by the number of years to complete a given degree. The foregone earnings are also multiplied by 0.75 to remove work earnings from holidays, when most students are not enrolled in school. The data required are institutional and private costs, earnings reported in the tracer study, and national annual mean earnings at a given age and degree.

To estimate the data for the complete age earnings profile for respondents in the tracer study, their mean earnings were used to determine Y_0 at two points, at ages 25–29 (representative of five years out), and at ages 30–34 (nine years out). The *shape* of the rest of their age-earnings profile was assumed to be the same as the shape of that for individuals of the same sex and race in the national data. To fit the shape of the latter to the two points determined for ages 25–29

and 30–34 in the tracer study, the local graduates' mean earnings were corrected to account for variance in graduates' ages, since not every graduate in the tracer study obtained a specific degree at a typical national average age. Therefore, to compare the local graduates' age-earnings groups to the national age-earnings groups, the local graduates' mean earnings were adjusted by an appropriate factor. This factor was used to link them to the pattern for the remaining years found in the national data. The points, five and nine years out, seem to be a reasonable basis for estimating the rest of the graduates' expected earnings since individuals five to ten years after graduation are considered to have settled into their long-run age-earnings profile.

The earnings data of respondents then must be adjusted to include the proportion of the sample unemployed, as well as corrected for the characteristics of those that did not respond to the tracer study survey. The proportion of unemployed in the local tracer study is assumed to be the same as the proportion nationwide. So, since the national data also does not include the unemployed, the national unemployment percentage for college graduates is used to adjust both local and nationwide reported earnings. The national unemployment rate for 1993 was 3% for both males and females 25 years and above, so the local and national earnings were both multiplied by 0.97.

The *SROR* is computed using the full social costs of education, which include tax costs, subsidies, or scholarship costs borne by others, and by taking the differences between the mean *pretax* earnings at that level and those at the next lower level of education (since taxes are not a net gain or loss from the point of view of society at large). Total institutional costs for graduate students require additional information such as annual tuition and fee waivers, and annual stipends (which are not included in the institutional cost data). On average, about one-third of master's students receive tuition and fee waivers and a monthly stipend. The *PROR* is calculated the same way, but the mean earnings should be *post-tax* and the direct costs are private costs borne by the student and/or their families.

To estimate the total costs per student for the purpose of computing the ROR, the direct costs, indirect costs and cycle costs for the nationwide graduates and local graduates in the sample are calculated. Total direct costs are computed by estimating the expenditure per full-time-equivalent (FTE) student at each level based on institutional unit cost studies. The FTE weights based on cost per student are 1.0% for bachelors and 2.15% for masters. These weights are based on the institutional unit cost studies calculated by the University of Illinois (UI) for the Illinois Board of Higher Education (UI 1998), which use surveys of the allocation of faculty time after setting aside time allocated to contract research and grants to estimate expenditures per student at each level. Not all

institutions have done such detailed unit costs studies, so the UI weights are employed to estimate the national averages. The nationwide data that is available is for "total educational and general expenditures." The total educational and general expenditures in current 1988 prices were $47 billion for public 4-year institutions and $29.5 billion for private 4-year institutions (Gerald and Hussar 1998 and 2009). To go from the unit direct cost at the bachelor's to those at the graduate levels, the expenditure per FTE bachelor's level is multiplied by the relative unit costs at each level of education.

Nationwide average unit costs for public and private institutions that correspond to the earnings data are used to calculate the ROR (since income does not distinguish between graduates of public and private universities), the separate public and private unit costs are weighted by the corresponding enrollments. The direct costs are multiplied by the proportion of FTE that are at public and private institutions, which are 71% and 29% respectively as a percent of the total enrollment at the bachelor's level and 66% and 34% at the master's level respectively.

The direct institutional costs by educational attainment were first sorted by degree to estimate the expenditure per weighted FTE student with weights based on the unit costs. The direct institutional costs at the bachelor's level by degree and field at the local institution were multiplied by the FTE weights to obtain the direct institutional costs per student by degree in the respective fields. Then the cycle direct costs per student at degree level and field were obtained by multiplying the estimated annual direct costs by the average number of years it takes to complete each degree. The average completion rates according to the national education statistics are five years for a bachelor's degree, and two years for a master's degree (ibid). The computed direct institutional costs and the indirect costs (the opportunity cost of education) per student were linked to the record of each of the 1988 graduates in the survey to compute the total cycle costs to calculate the social and private rates of return.

To get the "value added" to the economic returns by a representative research university, the presorted data by degree and field is sorted again by race and by sex. Then the earnings of the bachelor's degree graduates are adjusted for ability. This is done by dividing the bachelor's graduates' mean earnings by a percentage of bias due to net ability in the rates of return to remove any returns due to innate ability. The factors used are 1.0676 for whites and 1.0302 for blacks. These factors were calculated from the respondents' average ACT scores of the entering freshmen. The method for arriving at the above factors is developed in detail in (McMahon 2009). Since the ACT scores for white men and white women are about the same, the mean ACT scores for white graduates were used to estimate the appropriate factor to control for ability. Similar analysis was done

for black graduates.

The Mincer Earnings Function Method

Guided by theoretical considerations and previous studies, another method, but only for explaining variations in private returns to investment in education is the Mincer "earnings function" (Mincer 1974). There are two versions; the basic and the extended.

Mincer's basic earnings function:

$$\ln E = \alpha + \beta S + \delta_1 X + \delta_2 X^2 + \mu \qquad (2)$$

The earnings function assumes that foregone earnings are the only educational costs, since it leaves out the direct institutional costs. Following the approach used by (Psacharopoulos and Patrinos 2004), the earnings function is extended to meet the objectives of this paper. Human capital theory for the extended earnings function expresses the natural logarithm of the real earnings (E) as a function of educational attainment (S), years of potential work experience (X) used as a proxy for age of the graduates, X^2 tests for diminishing returns to experience, field (F) and ACT test scores of bachelor's graduates (A). The variable (AF) in the extended function is the interaction effect of ACT test scores and field expected to capture the different effect that prior ability may lead to choice of field. The reason for employing all these variables is to gain a fuller understanding of the various factors that influence private returns. The extended earnings function is specified as:

$$\ln E = \alpha + \beta_i S_i + \gamma_i F_i + \phi A + \delta_1 X + \delta_2 X^2 + \delta_3 AF_i + \mu \qquad (3)$$

where: α, β_i, γ_i, ϕ, δ_1, δ_2 δ_3 = unknown coefficients to be estimated; S_i (S_1 = Bachelor; S_2 = Master) are a set of two dummy variables to capture returns by degree level. Bachelor's degree is chosen as the reference group because it contains a sufficient number of cases to allow a reasonable precise estimate of the subgroup means. Bachelor's degree respondents are coded 0 and master's level respondents are coded 1. The regression coefficients for the dummy variables express the average private return for a master's degree relative to that for a bachelor's degree.

For the field variables, "other" is chosen as the reference category because it has diverse groups of students in terms of race and sex. It includes all other majors with the exception of commerce, engineering, and liberal arts and science (LAS). It excludes all professional fields except masters in business. F_2 is the dummy variable that refers to commerce, F_3 to engineering, and F_4 to LAS.

The data is presorted to include only black and white graduates. Two dummy variables are specified. Racedummy =1 if the graduate is white, and sexdummy =1 if the graduate is a male. Using Ordinary Least Squares (OLS) technique, the following earnings equation is estimated separately by race and then sex, producing four distinct sets of coefficient estimates and one pooled data analysis as the following:

$$\ln E = \alpha + \beta_i S_i + \gamma_i F_i + \phi A + \delta_1 X + \delta_2 X^2 + \delta_3 A F_i + \text{sexdummy} + \text{racedummy} + \mu \quad (4)$$

The model employed the random effects specification, in order to capture the effects of the time-invariant variables. Consequently, the Hausman test was used to verify the presence, or otherwise, of the fixed effect with any of the variables. The test failed to confirm the existence of a correlation between the fixed effect and the variables. As a result, the study used the random effects model. The random effects model generates a lower R-square, thus, the low R-squares.

EMPIRICAL RESULTS

The first subsection presents and discusses the computed social and private rates of return for the graduates of a typical public research university by degree, and compares the rates with those of nationwide. It also discusses the RORs by degree and field for a typical public research university. The second subsection presents and discusses the coefficients of the Mincer earnings function and compares them with the private rate of return from the full method. The Mincer regressions contain controls for field, degree, experience, and ACT test scores (in Table 4 only).

The reader should be aware of any potential endogeneity problem, which might bias the results. Field of study and ACT test scores are partly endogenous, that is, determined by individual's ability. Although students may choose degree and field based on their net ability, a vast amount of research has documented non-pecuniary on-the-job satisfaction to which college degree or field contributes. Therefore, the decision by an individual to select a degree and field might not be related to his/her comparative advantage, but by unobserved factors (i.e., passion, or interests) as opposed to the size of the expected economic return.

Results from the Full Method

The social and private rates of return computed by the full method, and after the adjustments for unemployment and for non-respondents, are discussed below.

Comparisons with Nationwide Patterns

The social and private rates of return for graduates at a representative public research university are higher than those of nationwide graduates at each degree level as depicted in Table 1. This is to be expected because students from all colleges nationwide include majorities that have not attended more selective flagship institutions. At the undergraduate level, the SRORs for a public research university graduates after removing the effect of 'ability' and controlling for institutional unit costs are higher than their nationwide counterparts. This portrays a more accurate measurement of the social investment value of a typical university and helps to explain to donors and stakeholders the effectiveness of the institution, for policy implications. It also provides a unique opportunity to measure graduate earnings throughout their lifetime while controlling for direct institutional costs and prior ability of the graduates.

Private Rates of Return (PROR)

The PRORs are presented in column 3 of Table 1. They indicate the economic incentives provided to students in the course of their education. The PRORs at a public research university are considerably higher than those of the nationwide averages at the bachelor's level as shown in Table 1. The most dramatic difference across the local graduates and nationwide groups is the PRORs estimated as 43% for white men and 40% for white women, compared to 21% and 17% of their national counterparts at the bachelor's degree. These reflect an increased educational expenditure supplied by the State of Illinois to match the rise in tuition and fees, as well as the unusually high level of public subsidy through scholarships and monthly stipends for work study. Hence the relatively low cost recovery that benefits those students who receive such financial aids in a typical public research university.

The PRORs for black male bachelor's graduates are low, but not by as much as the social rates of return, which were similar to other estimates (e.g. Cooper and Cohn 1997; Kimmel 1994; Niemi Jr. 1975). Could this be because black men are attracted into sports (football and basketball) where earnings later are very low for almost all of them, except the very few who get big professional contracts? That is, they are drawn into this field by the myth of big earnings later, which does not materialize. This is consistent with the PRORs being somewhat higher because of athletic scholarships, but still relatively poor earnings later.

The unadjusted SRORs at the master's level were only 7% flat for men and women at all races at the national level. At the representative public university level, it ranged from 2% and 6% for black males and black females respectively to 9% for white male and 18% for white female, although the SROR for MBA's

Table 1. The Full Method Social and Private Rates of Return to Investment in Education, Campus-level and Nationwide by Degree level, Race and Sex. No Adjustment for 'Ability' Bias in Brackets

Institution and Degree	Column 1 Social Rate of Return & Biased in Brackets	Column 2	Column 3 Private Rate of Return & Biased in brackets
Bachelor's degree:	10% (11%)	Adjusted	17% (18%)
UI/Black Male	18% (19%)	Adjusted	32% (34%)
UI/Black Female	25% (28%)	Adjusted	43% (48%)
UI/White Male	23% (25%)	Adjusted	40% (45%)
UI/White Female			
National Avg./(BM)	7%	No adjustment	10%
National Avg./(BF)	10%	No adjustment	16%
National Avg./(WM)	14%	No adjustment	21%
National Avg./(WF)	10%	No adjustment	17%
Master's degree:			
UI/Black Male	2%	No adjustment	6%
UI/Black Female	6%	No adjustment	12%
UI/White Male	9%	No adjustment	15%
UI/White Female	18%	No adjustment	34%
National Avg./(BM)	7%	No adjustment	11%
National Avg./(BF)	7%	No adjustment	11%
National Avg./(WM)	7%	No adjustment	11%
National Avg./(WF)	7%	No adjustment	13%

BM= black male, BF= black female, WM= white male, and WF= white female. The rates of return were calculated from the nationwide earnings data, current population survey (Earnings, 2008), and the earnings data of graduates from the class of 1988 from the University of Illinois Tracer Study survey (1993 and 1997).

Source: U.S. Census Bureau; National Center for Education Statistics; the University of Illinois (UI) Office for Planning and Budgeting; and the UI Office of Admissions and Records.

is higher, and also with few exceptions discussed below. The difference in the SROR for bachelors and masters degrees is that the 2 years that it takes to complete a master's degree involves higher foregone earnings costs, which raises the cycle costs and therefore lowers the SROR at that level. Human capital theory postulates that additional educational increases one's productivity, which translates into higher earnings. However, the recent earnings data show only a slight difference between the mean earnings for bachelors and masters degrees except for MBA's.

The higher rates of return at the bachelor's level, however, indicate that bachelor's education has a higher growth payoff, because of the extremely small opportunity cost of pursuing that degree. This refutes the assumption that economic returns for an additional year of education beyond bachelor's education are greater. Similar results were found in (Arias and McMahon 2001). These results suggest that bachelor's degrees remain a very profitable investment for the U.S., which when summed up over time reflect a direct contribution by individual universities, and by higher education as a whole, to economic growth.

Social and Private Rates of Return By Degree, Field, Race, and Sex

Table 2 shows the rates of return for local graduates which do reflect, and therefore control for, the differences in direct institutional costs among fields and degree, and for differences in 'ability,' but the latter at only the bachelor's

Table 2. The Full Method

Social and Private Rates of Return at a Representative Research University by Field, Degree, Race, and Gender (in Percent), and ACT Score for Bachelor's Graduates by Field in Parenthesis; BS = Rates of Return for a Bachelor's Degree with no Ability Bias; BS^{Biased} = Rates of Return for a Bachelor's Degree with Ability Bias; MS = Rates of Return for a Master's Degree

Graduates	Social Rate of Return				Private Rate of Return		
	ACT	BS	BS^{Biased}	MS	BS	BS^{Biased}	MS
	Commerce				Commerce		
Black Male	(23)	6	7	47	9	10	55
Black Female	(22)	18	20	NA	27	28	NA
White Male	(28)	28	31	13	40	44	14
White Female	(27)	26	28	28	37	41	31
	Engineering				Engineering		
Black Male	(20)	8	8	16	13	13	18
Black Female	(26)	26	27	NA	50	52	NA
White Male	(29)	19	21	15	32	35	17
White Female	(29)	21	23	13	37	41	16
	LAS				LAS		
Black Male	(21)	0	1	5	2	3	9
Black Female	(22)	14	15	18	21	23	22
White Male	(27)	19	21	-6	27	30	-7
White Female	(26)	18	20	-6	27	30	-6
	Other				Other		
Black Male	(16)	-15	-4	23	-6	-3	27
Black Female	(19)	16	17	11	29	30	14
White Male	(25)	13	14	4	21	24	5
White Female	(25)	12	14	12	21	24	15

Source: Earnings and institutional cost data from the UI Office for Planning & Budgeting Tracer Study survey (1993 & 1997) and ACT scores from the UI Office of Admissions and Records.

level. The third column presents the SRORs for the bachelor's graduates, while the fourth column presents the SRORs for bachelor's graduates, biased by ability differences. The SRORs for a bachelor's degree are positive for all the local graduates in all the fields. However, the rates were highest for graduates in engineering and commerce and lowest for those in LAS and the fields, 'other' as hypothesized. These findings are similar to those of (Yong, Heng, Thangavelu, and Wong 2007; Grogger and Eide 1995) in that the higher rates of return for these fields reflect the increase in demand for engineering sciences and business professionals. However, Grogger and Eide findings show that engineering science accounts for one-fourth of the increase in the wage premium only for male college graduates. Other conclusions made by (e.g. Vedder 2009; Weston 2009) but at the Master's level show that not all degrees pay off because the cost of a master's degree varies along programs. For instance, a master's degree in LAS or humanities has less incremental earning power than a master's degree in engineering or business. The global financial and economic crisis coupled with technological change and global competition reflects the increased premium paid for graduates in these fields in the United States.

The PRORs in commerce and engineering are also substantial and well above those in LAS and the field, 'other' at all degree levels. The rates suggest that even if the costs are high, the total investment in these fields can still be a good one. However, if the costs are relatively higher than the PRORs, the rate of investment should be reduced, because of declining demands for graduates in these fields.

Individual ability differences raise SRORs by about 2 to 3 percentage points for all races and all sexes, and at all fields for the local graduates in a representative public university. The results obtained lend support to the hypothesis that prior individual 'ability' does raise RORs, but its effect is not large enough to help explain the differences in the RORs. The 'ability' bias results from this paper are found to be somewhat consistent with those of (Grogger and Eide 1995), whose prior 'ability' to college as measured by ACT and high school grades had no effect on the changes in college wage premium for men. But in contrast to this paper, their returns to women who had prior math 'ability' rose considerably.

The rates of return in this paper after correcting for 'ability' are comparable to those of (Arias and McMahon 2001) whose expected SRORs trend upward at the bachelor's level by about 3 percentage points. These authors corrected for 'ability' and other factors, including family and also for measurement error. Although other earlier estimates after correcting for 'ability' bias were smaller or larger than those found in this paper (e.g. Behrman and Rosenzweig 1999; Card 1999; Ashenfelter and Zimmerman 1997; Grogger and Eide 1995; Ashenfelter and Krueger 1994) among others, their conclusions about "net ability bias" are similar to those in this paper. One possible explanation for the low individual

ability differences in the rates is that some high 'ability' students may choose to major in low-paying fields for the passion or interest rather than economic returns to education.

Black males are different, in that they have lower social and private rates of return at the bachelor's level than everybody else in LAS, 'other', and commerce, and even in engineering, where presumably the few that get in are very highly selected. The findings support the hypothesis that returns to white males are substantially higher than those of blacks and women, with few exceptions. This paper's estimates are similar to those of (Carnoy 1996; Cooper and Cohn 1997; Niemi Jr 1975) among others in that they also found relatively low rates of return to education for black males or males of other races (Hines, Tweeten, and Redfern 1970). In these papers, although they found a substantial increase in the returns to blacks' education compared to whites, blacks, particularly black men still earn lower returns than whites. This is an important issue about the underachieving black males, most of whom never make it to college, and those who enroll in college make poor choice of fields, overly attracted by extremely high salaries in professional sports that very few ever get.

The tracer study data clearly show that among blacks, females are more likely than males to enroll in college, and select high-paying fields like engineering (70.0% versus 30.0%) and commerce (77.7% versus 22.2%). According to researchers like (Davies and Guppy 1997), males are more likely to enter fields of study with higher economic returns than females. However, black women have gained ground relative not only to black men but also to white women in technical and professional fields. For example, among black women, the number of first-professional degree holders nationally has increased by 219%, while that of black men increased by only 5%. The proportion of master's degrees holders increased to 5% for black women, but declined by 10% for black men (Jet 1997; Conrad 2005). The 2003 census data show that at the master's and professional degrees, black women fared much better against their white counterparts than black men did in percentage terms. Unlike black men master's degree holders whose median income was 82% of the median income of their white males' counterparts, black and white women with a master's degree had almost identical median incomes, with black women holding a slight edge (JBHE 2009).

Another plausible explanation for the lower RORs for black males could be explained by the choice of occupation reported by the respondents in the tracer study. Nearly 30% of black men classified their primary employer as government (armed forces, state or local government) compared to 6% of white men; and 11% in elementary and secondary schools compared to only 2% of their white male counterparts. These are somewhat low-paying jobs.

After controlling for direct institutional costs, differences among fields at the

master's level, but no controls for ability differences, the rates on average were relatively lower than that of the bachelor's level with few exceptions as shown in Table 2. The higher earnings foregone for pursuing an advanced degree (in successive terms) as found in earlier studies (Arias and McMahon 2001) among others cited largely explain the lower rates. Black men however, have significantly higher RORs at the master's level in all the fields. This in part could be due to the small sample size of black men in the field categories. Another plausible explanation is that as Corporate America is committed to diversifying its work force at the management level, there is a strong demand in the business sector for highly educated black men. But the important issue is the impact of a college education on the black-white rates of return. It is clear from the results that it takes an advanced university education for black men to improve on their economic returns, which is not so for black women or their white counterparts.

White women also have higher rates of return in commerce at the master's level. A possible reasoning is that unlike white men, additional years of education beyond a bachelor's degree for white women in commerce is more beneficial in terms of skills and minority status in the labor market. In that, white women are more likely to benefit from American corporations efforts to fill their minority quota at the expense of other qualified minority groups (e.g. Suh 2000).

The social and private rates of return for black women are about the same as those for white women except in commerce where white women lead black women by 8 percentage points. But the rates for black women in engineering were 5 percentage points higher than white women, and 7 and 18 percentage points higher than white men and black men respectively. The demand-driven costs to create a diverse workforce could in part explain this; employers may offer premium salaries to attract skilled minorities in engineering. The tracer study data clearly show that among blacks, black women have outperformed men in attaining a degree in engineering sciences.

Empirical Results from the Mincer Earnings Function

The coefficient estimates of the earnings function are interpreted as private returns to investment at the representative public university. The results are consistent with the PRORs from the full method. However when it comes to SROR's they show very different things because institutional costs are not included.

Tables 3 and 4 present the estimates for all graduates. In each table, the second and third columns present the estimates for black and white graduates respectively, while columns four and five present the results for men and women graduates in that order.

Except for a few variables, the regression coefficients have the expected signs, are highly significant, and lie within the bounds suggested by the theory of human capital. Since data for ability are available only for undergraduates, the coefficients were re-estimated (based on data only for undergraduates) to include the variable ACT scores as shown in Table 4. This new model specification only allows estimating the value added to higher education by removing any effect of prior academic ability on private returns.

The effect of controlling for the differential impact of ability on the returns to education is the concern that individuals with high ACT scores are inherently better and more skilled students than the low ACT scorers, thereby translating into higher private returns for the former. The coefficient estimates were positive for whites and women, but not significant. This indicates that prior college 'ability' is not a major source of bias in the private returns to higher education, and was consistent with the results from the 'full method' as well as those found in (Arias and McMahon 2001; Ashenfelter and Rouse 1999).

Graduates at the representative university do not receive positive return for experience as shown in Tables 3 and 4. However, over time, experience as reflected in the concavity of experience is positively related to the return only for women baccalaureate recipients in Table 4 and statistically significant at the 10% level. This may indicate that although women earn less, on average, than men, women are more likely to benefit from higher private returns as they approach retiring age. It is also noteworthy that college graduates with only a bachelor's degree or with an advanced degree can compensate the cost of their educational attainment in the labor market with little or no prior work experience.

In the pooled data (Table 3), the estimates for commerce and engineering (high-paying fields) are positive, as predicted, relatively large, and significantly different from zero at $\alpha = .05$ or better. The error terms are less than 0.5 for all the estimated equations, suggesting that an OLS estimation approach is justified in all the equations. This leads to rejection of the null hypothesis that all slope coefficients for fields are equal to zero at any reasonable confidence interval. However, when the analyses are broken out by race, most of the regression coefficient estimates for blacks in column 2 of Tables 3 and 4 reported t-values lower in magnitude than the critical values of ± 1.96. Again, this could be explained by the small sample size of blacks in the various fields. But for engineering, it had the expected positive sign and it is statistically significant, which is consistent with the estimates from the full method. This may suggest that the fewer blacks who earn engineering degrees are considered the 'best' among their cohorts and hence sought after by the high-paying industries.

The signs and magnitudes of the regression coefficients of commerce, engineering, and LAS were consistent with the results of the analyses based on the

Table 3. Mincer Earnings Function Private Returns to Higher Education by Degree Field, (No control for ability)

Variable	Blacks	Whites	Men	Women	All Graduates Pooled Data
Racedummy			0.0655	-0.0975	-0.0611
			(0.0975)	(0.0650)	(0.0529)
Sexdummy	0.0813	0.2777*			0.2740*
	(0.0990)	(0.0163)			(0.0161)
Commerce	-0.0515	0.2850*	0.2427*	0.3081*	0.2773*
	(0.1324)	(0.0241)	(0.0329)	(0.0346)	(0.0237)
Engineering	0.3131**	0.2785*	0.2456*	0.3926*	0.2789*
	(0.1392)	(0.0230)	(0.0265)	(0.0497)	(0.0227)
LAS	-0.1976	0.0618*	0.0578**	0.0520***	0.0551*
	(0.1200)	(0.0203)	(0.0280)	(0.0290)	(0.0200)
Master	0.0841	-0.0711*	-0.0851**	-0.0460	-0.0685**
	(0.1947)	(0.0302)	(0.0378)	(0.0480)	(0.0298)
Experience	-0.0642	-0.0162***	-0.0121	-0.0231***	-0.0180**
	(0.0464)	(0.0091)	(0.0125)	(0.0132)	(0.0090)
Experience2	0.0009	0.0002	0.0001	0.0003	0.00021
	(0.0008)	(0.0002)	(0.0002)	(0.0002)	(0.00015)
	N = 109	N = 5065	N = 2828	N=2346	N = 5174
	R2 = 0.21	R2 = 0.13	R2 = 0.05	R2 = 0.07	R2 = 0.13

Estimated regression coefficients, with standard errors (in parentheses).
* significant at 1%, **significant at 5%, ***significant at 10%.
Source: The University of Illinois Tracer Study Data from survey in 1993 and 1997.

Table 4. Mincer Return to Higher Education, By Degree Field, Bachelor's Level Only, With Controls for 'Ability'

Variable	Blacks	Whites	Men	Women	All Graduates Pooled data
ACT	-0.0014	0.0051	0.0016	0.0066	0.0051***
	(0.0137)	(0.0031)	(0.0042)	(0.0045)	(0.0030)
Racedummy			0.1034	-0.0844	-0.0523
			(0.1263)	(0.0732)	(0.0622)
Sexdummy	0.0810	0.2877*			0.2835*
	(0.1293)	(0.0200)			(0.0197)
Commerce	-0.0546	0.2510*	0.1837*	0.2901*	0.2444*
	(0.1547)	(0.0287)	(0.0406)	(0.0397)	(0.0282)
Engineering	0.3404**	0.2348*	0.1928*	0.3606*	0.2389*
	(0.1732)	(0.0309)	(0.0367)	(0.0617)	(0.0305)
LAS	-0.1955	0.0863*	0.0622***	0.0894*	0.0796*
	(0.1390)	(0.0245)	(0.0352)	(0.0336)	(0.0242)
Experience	-1.9159	-0.0399***	-0.0283	-0.2778**	-0.0424**
	(1.6403)	(0.0206)	(0.0256)	(0.1416)	(0.0202)
Experience^2	0.0563	0.0003	0.0001	0.0064***	0.0003
	(0.0494)	(0.0003)	(0.0003)	(0.0037)	(0.0003)
	N = 88	N = 3594	N = 1924	N = 1758	N = 3682
	R^2 = 0 .12	R^2 = 0.11	R^2 = 0.03	R^2 = 0 .06	R^2 = 0.11

Estimated coefficients with standard errors (in parentheses).
* significant at 1%, ** significant at 5%, *** significant at 10%.
Source: University of Illinois Tracer Study Data from survey in 1993 and 1997.

full method, shown in Table 2 and the conclusions stated above. While graduates in LAS on average receive only 5.6% more than those in the major 'other,' the private returns to graduates in either commerce or engineering is 28% higher than the field, 'other'. The higher private returns for graduates in commerce and engineering reflect the high earnings of master's in business administration (MBA) graduates for the former, and the increased demand for engineers in the high-tech industries where high knowledge skills are needed. This is where the fewer black males who are successful in completing such programs are sought after by companies to fill their minority quota as reflected in the higher rates of return at the master's level.

Women, particularly, black women, have the highest rates in engineering. This seems to suggest that women in engineering may benefit from demand side driving costs to create a diverse workforce; hence employers will offer premium wages to attract minorities in these fields. These results could help freshmen in college and high school graduates thinking about pursuing a university degree to make decisions based on the field. The conclusion to be drawn from these results is that, the chosen field plays a role in predicting the private returns for graduates from a representative public research university.

With the exception of the private returns to master's degrees in business (not shown in the table) the negative coefficient for a master's degree indicates that, among the local graduates, master's degree holders are at a significant disadvantage as concluded in the full method. It suggests that the opportunity costs of two additional years beyond a bachelor's degree exceed the benefits, thus diminishing returns for the master's graduates. For example, in the pooled data in Table 3, the private return for an individual with a master's degree is, on average 6.9% below that for an individual with only a bachelor's degree. The results are consistent with the private rates of return for a master's degree in Tables 1 and 2.

Comparisons Between White and Black Graduates

The regression coefficient for racedummy measures the effect of being white rather than black on the private returns to investment in public research university education. The coefficient for race is not significant for men, but somewhat for women. The estimate suggests that with degree, field and experience fixed, white women make on average about 10% less in income than black women as shown in Table 3. One reason may be the representative university selects the best black females to admit, while their black male counterparts get admission based on their ability to play sports, thus receiving scholarships for sports. To maintain these scholarships, they spend several hours each day practicing at the

expense of their academic work. Or could it be that black men are more likely to experience racial discrimination on the job as addressed in such studies as (Becker 1957; Welch 1973; Carnoy 1996) among others.

Male Versus Female Graduates

The coefficient estimates for the variable representing sex, (sexdummy) is positive and statistically significant for whites, but not for blacks. This suggests that private returns for a white man is, on average, about 28% more than that of a white woman with similar backgrounds (see Table 3, Col.3). After controlling for all factors in the human capital model one would expect to find equal rates of return for racial and gender groups, but that is not the case (e.g. Niemi Jr. 1975; Averett and Dalessondro 2001).

CONCLUSION

The article estimated private and social rates of return computed by the full method by degree level for each race and sex, and then repeated this for a specific public research university based on tracer study data in order to control for 'ability' and broke the rates down by field of study. Mincer returns at the specific campus level were also computed. The results from the Mincer regressions are consistent with the PRORs from the full method. However when it comes to SROR's they show very different things because institutional costs are not included.

In the Mincer regressions, the model employed the random effects specification, in order to capture the effects of the time-invariant variables. Consequently, the Hausman test was used to verify the presence, or otherwise, of the fixed effect with any of the variables. The test failed to confirm the existence of a correlation between the fixed effect and the variables. As a result, the study used the random effects model. The random effects model generates a lower R-square, thus the low r-square. This study is probably the first to analyze the rates of return of university education by field, taking the full institutional costs by field, as well as the 'ability' (ACT test scores) into account.

The differences in 'ability' for a representative public research university do not help to explain differences in the rates of return among fields, which is quite different from the results indicated in earlier studies such as (Davies and Guppy 1997; Grogger and Eide 1995). Ability does help in all fields (earnings are larger), but its effect is not large enough. The results indicate that for all fields individual ability differences raise SRORs by only 2 to 3 percentage points for all races and all sexes for the local graduates in a representative public research university. These

findings are somewhat consistent with earlier conclusions about 'net ability bias' made by studies cited. However, when the effects of 'ability' are removed, the difference in the SRORs between a representative public research university and that of nationwide are still wide, particularly for white graduates. There is more variability in the nationwide values, because they include a vast range of colleges; thus the rates for a typical public research university, a selective institution, are expected to be higher than the nationwide rates.

After accounting for direct institutional unit costs by field and for "ability" in a typical public research university, the differences in the rates of return across fields are still wide. The RORs were highest for graduates in commerce (field in which tuition can be provided at relatively low costs) and engineering sciences, and lowest for those in LAS and 'other' as shown in Table 2. This goes to buttress the findings by Yong, Heng, Thangavelu and Wong (2007), that point out the pay-off to investing in engineering sciences, health science, and business are higher than those in example, humanities and social sciences due to the increasing need of human capital accumulation through specific education for innovation and long-term growth. In a rapidly changing global economy towards high value-added and knowledge based activities, there will continue to be an increase in demand for professional and more technical fields graduates in the US.

Generally, the PRORs to higher education are considerably higher than the SRORs because of the increase in educational expenditure supplied by the state, hence relatively low level of cost recovery, but benefiting those students who receive such financial aids. The foregone earning costs are lower since many undergraduate students receive financial aid in the form of scholarships or work-study during the course of their education.

At the educational attainment level, the SRORs to investment in a bachelor's degree, irrespective of race and sex, tend to be higher than the total return available from other investments with comparable risk. The lower SROR at each higher degree level (masters), with few exceptions is a typical pattern as found in earlier studies. The higher foregone earnings costs for pursuing an advanced degree (in successive terms), which raises the cycle costs and thereafter lowers the SROR at that level largely explain the lower SROR for a master's degree.

On the average, the RORs for black women are about the same as those for white women. The coefficient estimate suggests that with degree, field and experience fixed, white women make on average about 10% less in income than black women as shown in Table 3. This confirms the findings in (JBHE 2009) based on the 2003 census data. They found black women with a bachelor's degree had a median income of $33,142, which was 110% of the $30,082 median income for white women who held a college degaree. This estimate was based on 48% of white women college graduates who worked full-time, year-round compared

to 68% of their black women counterparts. But if these figures are adjusted to compare the incomes of black women and white women college graduates who worked full-time year-round then black women have a median income that is 93% that of white women (JBHE 2009), which shows the persistence of racial discrimination on the job.

Black males, however, generally get lower RORs than anybody else, at the bachelor's level nationally and in all fields at the local campus. This is an important issue for the underachieving black males, most of whom never make it to college, and those who make it to college make poor choice of fields of study. The expected private returns to higher education in relation to the costs of such investment may partly explain the low demand for higher education among certain groups in the country. For example, the imperfect capital market affects private incentives to invest in university education. If comprehensive and consistent policies of funding system are put in place for students who cannot afford higher education, particularly black males, or to subsidize students from families with lower incomes, this could solve the high under-education of this group (e.g. Boarini, Martins, Strauss, Maisonneuve, and Nicoletti 2008; Epple, Romano and Sieg 2006; Cameron and Taber 2000). Furthermore, evidence of racial discrimination against black men in particular, in employment and promotion (Pager and Shepherd 2008; Mason 2005) may partially explain why black men are not pursuing higher education. Such perceived discrimination by young black males may lead to diminished effort or performance in education or the labor market, which itself gives rise to negative outcomes.

The larger propensity of black males to choose low net return fields is a major source of insufficient economic incentives. Thus additional counseling on the choice of more viable fields, as well as occupation, or other policy approaches may be needed to help reduce the large social costs incurred from the inadequate education of this group. The tracer study data clearly show that among blacks, females are more likely than males to enroll in college, and select high-paying fields like engineering (70.0% versus 30.0%) and commerce (77.7% versus 22.2%). Another plausible explanation for the lower RORs for black males could be explained by the choice of occupation reported by the respondents in the tracer study. About 30% of black men classified their primary employer as government (armed forces, state or local government) compared to 6% of white men; and 11% in elementary and secondary schools compared to only 2% of their white male counterparts. These are somewhat low-paying jobs.

Finally, people may choose a field of study and degree level based in part on their ability, which poses potential endogenous education characteristics with effects on returns. However, individuals may choose to major in a field from a wide range of options and for several reasons. Some with high ability may

want to pursue their passion or interests which have no monetary benefits, while others are more pragmatic and select the field they think will be most relevant to their intended careers. Estimation of non-monetary private returns was beyond the scope of this study.

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