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Measuring the Effect of Attending Historically Black Colleges and Universities on Future Wages of Black Students

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Abstract

This paper estimates the effect of attending historically black college and universities (HBCUs) on future wages of black students. The analysis attempts to determine if HBCUs have a causal effect on wages by first modeling and estimating all the choices available to black high school graduates. Wages are then estimated conditional on the determinants of this choice. Data from the National Longitudinal Survey of the Class of 1972 (NLS-72) are used to estimate the models. Students that attend HBCUs appear to come from lower in the potential wage distribution than students that attend mixed or historically white institutions. The value added, in terms of future wages, from attending appears to be over 30% for some individuals. These results suggest HBCUs played an important role in the labor market success of black students in the 1970s.

Measuring The Effect of Attending Historically Black Colleges and Universities on Future Wages of Black Students

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One of the few uncontroversial statements that can be made about historically black colleges and universities (HBCUs) is that they have played an important role in educating blacks in the United States. Throughout much of their histories, HBCUs were virtually the only source of higher education for black students. These schools persist nearly 40 years after the U.S. Supreme Court (in its landmark Brown V. Board of Education decision in 1954) made it illegal to maintain segregated public institutions. However, a series of recent higher court rulings (including U.S. v. Fordice, U.S. Supreme Court, July 1992) pose possibly the greatest challenge ever faced by HBCUs.

There is a myriad of evidence that the economic returns to education increased in the 1980s particularly the return to graduating from a four year college or university (see Blackburn and Neumark 1993 or Blackburn, Bloom, and Freeman 1990). There is also some evidence that blacks lost ground to whites in terms of earnings in the 1980s (see Bound and Freeman 1992 , Blau and Beller 1992, or Smith 1991). Throughout the 1980s HBCUs continued to produce a disproportionately large share of black students with Bachelor's degrees. Hence, a study of the economic effects of attending an HBCU can make important contributions to both economics and higher education.

The fundamental economic question is whether HBCUs enhance the labor market performance of black students (relative to other institutions). Despite their ongoing financial woes, the success rate of HBCUs in graduating black students with Bachelor's degrees is very well documented, in 1990 HBCUs enrolled 17% of all black students but produced 27% of all black Bachelor degrees (Hoffman, 1992). Part of this success is due to lower dropout rates for black students at HBCUs than for black students at traditionally white four year institutions. The persistence of students at HBCUs has been studied extensively by psychologists and education experts (see Deskins 199 1, Pascarella and Terenzini 199 1 and Flemming 1983 and 1984). It is believed that students persist at HBCUs for two reasons: (i) the schools are prepared to offer more remedial courses for first year students with relatively poor high school training and (ii) the environments are more supportive. Students at HBCUs are found to be more confident, more involved in campus activities, and more interactive with the faculty.

It would seem that an increased likelihood of obtaining a Bachelor's Degree and a more positive college experience must be benefits of attending an HBCU. However, very little research has been done to test whether these benefits translate into positive outcomes once the individuals leave college. For example, since HBCUs have less stringent admission requirements, perhaps HBCU students persist more easily because the overall quality of the students is lower. Although there is an extensive literature in economics on the returns to obtaining a college degree, those returns could be partially offset by attending a lower quality institution. Even the confidence gained by students at HBCUs could be offset when they have to compete in racially integrated environments. Finally, even if HBCU attendees perform better in the labor market, it is still important to determine whether this success is due to attending an HBCU or to the individual. In other words, there may be characteristics of the individual, such as upbringing or attitudes, that cause both good performance in college and good outcomes in the labor market.

Economists have only begun to analyze the labor market outcomes of HBCU attendees (Ehrenberg and Rothstein, 1993). Ehrenberg and Rothstein restrict their analysis to individuals at four year institutions and find that students who attended HBCUs were more likely to receive a B.A. degree, controlling for college and individual characteristics, but reaped no labor market benefits in the form of additional wages.

This study differs from Ehrenberg's and Rothstein's in two important ways. First, I model the choice to attend an HBCU and then correct for differences in unobservable characteristics that cause students to self-select into an HBCU and thus may also cause differences in wages. An important contribution of this paper is to model all the choices available to a black high school graduate (i.e. no four year college, four year HBCU, four year non-HBCU) as opposed to restricting the analysis to individuals that have chosen to attend four year institutions. Second, this study uses wages observed for individuals later in their careers' than the analysis by Ehrenberg and Rothstein.

The Model of College Choice

The model of college choice used here follows the model of postsecondary school selection developed by Manski and Wise (see College Choice in America, 1983). In this model, I assume black students have three choices: (i) do not attend a four year postsecondary institution (vocational or community colleges attendees are in this category as well as individuals with no schooling past high school), (ii) attend a four year HBCU, or (iii) attend a four year non-HBCU. An individual has utility over all three choices and chooses the option that maximizes current and future utility.

Specifically, let Z represent the characteristics of an individual i with j choices. In this model each Z_{ij} represents a vector of characteristics (family background and ability measures) that determines the individual's ease and success in college as well as benefits from college. It also includes characteristics of the j choices such as the "cost" of attending college. I take a human capital approach to the utility that individuals derive from schooling past high school and assume that they view it as an investment decision, i.e. they wish to maximize future income.[1]

The utility of the jth alternative to the ith individual is

$$(1) \quad U_{ij} = \overline{U}_j\,(Z_{ij}) + \varepsilon_{ij}$$

$$\text{Where:} \quad \overline{U}_j(Z_{ij})$$

is the average value of utility conditional on observable characteristics. The value of alternative j to person i deviates by ε_{ij}, where ε_{ij} is a random variable representing unobserved or unmeasured characteristics of person i when she makes choice j. Assume the jth choice is chosen by person i if:

$$(2) \quad U(Z_{ij}) > U(Z_{ik}) \;\forall\; k \neq j$$

I am assuming utility is linear in the Z_{ij}'s. The probability that the jth choice is chosen by individual i is:

$$(3) \quad P_{ij} = Pr(\,(Z_{ij}\gamma + \varepsilon_{ij}) > (Z_{ik}\gamma + \varepsilon_{ik})\,) \;\forall\; k \neq j$$

where k ranges over all the choices available to individual i. The effect each variable has on the likelihood that an individual chooses j, as opposed to a reference sector, is measured by y. Assuming a logistic distribution over ε_{ij} yields the conditional logit model:

$$(4) \quad P_{ij} = e^{Z_{ij}\gamma} / (e^{Z_{i1}\gamma} + e^{Z_{i2}\gamma} + \ldots + e^{Z_{iJ}\gamma}) \quad j = 1 \ldots J$$

Therefore, the probability that individual i chooses alternative j is conditional on **all** the choices that are available to the individual.

Estimation of Wage Effect

The concern in measuring the impact on wages of attendance at HBCUs is that there will be unobservable variables that affect the decision to attend college and also affect wages. If this is true, it is difficult to estimate whether HBCUs have a causal effect on wages. That is, if we simply observe that students that attended HBCUs have higher or lower wages than students that attended non-HBCUs, it is difficult to tell whether attendance at HBCUs caused the difference or whether differences are attributable to unmeasurable factors (e.g. innate ability). Since I only observe wages given the choice an individual makes, I must condition on this choice when estimating wage equations or the parameter estimates may be biased.

Heckman (1979) derived the form of this bias and developed a two-stage estimation method to correct the estimates. Heckman’s two-stage method was developed for models in which the initial choice was a dichotomous choice, Since I want to estimate wages conditional on one of three choices an individual makes after graduating from high school, I will rely on the method developed by Lee (1982, 1983). The two steps involved in the Lee method are: (1) estimate the choice equation using a multinomial logit model, and, (2) estimate wage equations for each choice.

If I could measure all of the characteristics of an individual that affect wages, I could simply estimate the following equation:

$$(5) \quad W_* = Y \Pi + S \pi$$

where S is a dummy variable indicating which sector is chosen. The coefficient π would be an estimate of the effect on wages of chosing a given sector. Since I can not measure all the characteristics, W^*_s contains some latent variables. The wage equation I can estimate is:

$$(6) \quad W_s = X_s B_s + \mu_s \qquad s = 0,\ 1,\ 2$$

where s represents the sector choice (the individual subscript i is dropped for convenience).

The dependent variable W* in equation 5 is unobservable, but it has an observable realization from the utility model shown in equation 2. Call the indicator of the highest utility I, which is obtained from the probability model in equation 3.

$$(7) \quad I_s = Z_s \gamma_s + \xi_s$$

$$D_s = 1 \qquad s = 0,\ 1,\ 2$$

The index I, represents the difference in utility between the choices.[2]

The vector of characteristics Z are the same ones described in the choice model. The vector of characteristics X represents those characteristics in Z which directly affect wages. This includes variables such as ability and family income, but not measures of the direct costs of attending college.

The most important step in estimating a model which starts with more than two choices is to reduce the problem down to a choice between two sectors, the sector actually chosen and the next most likely sector chosen (i.e. the sector that yielded the next highest utility). Define ϵ_s as:

$$(8) \quad \epsilon_s = \max U_j \qquad j = (0, 1, 2) \quad (j \neq s)$$

that is, ϵ_s represents the maximum of the two alternatives not chosen. It must be true that $D_s=1$ iff $\epsilon_s < Z_s\gamma_s$, that is, the sector chosen yields higher utility than the maximum of the two sectors not chosen.

Lee shows that a given continuous cumulative distribution function $F(\epsilon_s)$ of ϵ_s can be transformed to a standard normal random variable distributed N(0,1) where: $\epsilon^*_s = J(\epsilon_s) = \Phi^{-1}(F(\epsilon_s))$. ($\Phi^{-1}$ is the inverse of the standard normal distribution.) Since J(.) is strictly increasing it must be true that:

$$\epsilon^*_s < J(Z_s \gamma_s)$$

ϵ^*_s is strictly worse than the sector chosen. If the u's and ξ's in equations 6 and 7 are jointly normally distributed $(0,\sigma_s^2)$ and (0,1) with a correlation coefficient = p, then unbiased estimates of the wage equation can be obtained. The form of the wage equation corrected for censoring due to the choice of sector is:

$$(9) \quad W_s = x_s B_s - \phi(J(Z_s \gamma_s)) / F_s (Z_s \gamma_s) \lambda_s + \eta_s$$

The two step estimation of equation 9 yields heteroskedastic residuals, so a weighted least squares approach must be used. Since the Lee method reduces a polychotomous choice problem down to a choice between two sectors, the error covariance matrix has the same form as in the dichotomous choice model.

Points about The Multinomial Logit Model

In addition to serving as the indicator model shown in equation 7, the logit model enables me to estimate the predicted probability of being in each sector for each individual. This is important when reducing the polychotomous choice problem down to a dichotomous choice. I need to know the most likely alternative (to the sector actually chosen) to estimate the second term in equation 9. I use the predicted probabilities from the conditional logit model to determine which sector was the likely alternative. The model I estimate in the first step is a reduced form choice model. I expect that many factors influence the decision to attend college. Specifically, since I assume future wages are important determinants of college choice, variables besides family background and high school achievement such as perceived likelihood of obtaining a four year degree, type of occupation desired, expected years of work, and desired hours of work are likely to all be important factors. I consider these other outcomes such as B.A. attainment and occupational choice to be endogenous to this model, that is, they are functions of the same background variables that determine college choice. The choice model only includes the background variables that I believe affect all of these outcomes. The major criticism of using this approach is that it specifies the choice model in a multinomial logit framework. The multinomial logit model is very often used in multiple choice models because it facilitates the calculation of the probabilities of each choice. It is much less computationally burdensome than the multinomial probit model. However, one major shortcoming of the multinomial logit specification is its assumption of the "Independence of Irrelevant Alternatives" (IIA).[3]

Hausman and McFadden (1984) have developed a specification test for this property. The test consists of estimating a restricted and unrestricted choice model. The test statistic is:

$$q = [B_r - B_u]'[V_r - V_u][B_r - B_u] \sim \chi^2_k$$

where B_r and B_u are the estimated coefficient matrices of the restricted and unrestricted models and V_r and V_u are the covariance matrices of each. Based on this test statistic ($q \cong .4$), I do not reject the assumption of IIA. The multinomial logit specification should yield unbiased estimates.

The NLS-72 Data Set

The main source of data is the NLS-72, a survey of the high school graduating class of 1972. There were approximately 22,000 respondents in the base year survey. They were followed up four times, most recently in 1986. In the most recent survey, the respondents are approximately 32 years old and have been out of high school for 14 years. Respondents were asked about their schooling and work histories. There are over 3,000 black students in the NLS-72, but only 1,192 have good wage observations in 1986. Most of the observations I lose are due to individuals not being resurveyed (or dropping out of the survey) between 1979 and 1986. Very few are lost due to unusually high or low hourly wages.[4]

I model the decision of whether to attend college as a function of ability, other individual characteristics, family background, and measures of the direct costs of attending college. I will briefly discuss the variables used in the estimation. A complete list of variables and how they were constructed is in Appendix A.

Identification of the Model

An important issue in estimating systems of equations is identification of the parameters in the equations. Since the theory behind the choice model dictates that an individual considers future wages when making the college investment decision, all variables that affect future wages must also affect the decision to attend college. Therefore, I also employ some "zero restrictions", variables that should be in the choice equation and not the wage equation, to identify the parameters of the choice model separately from the wage models. I will note these variables as I describe them below.

The ability measures used are high school rank and test scores. Manski and Wise find high school rank and test scores to be the two most important predictors of the college application, admission, and attendance decision.[5] [6] The family background variables that I use are mother's education, father's occupational status (SEI) index, and family income. I include a dummy variable to control for gender and participation in athletics in high school.[7] I also include a dummy variable indicating whether the respondent is from the South. This variables is included in both the choice equation since there is a public HBCU in every southern state and the in wage equation to capture the lower cost of living (and lower earnings)in the South.

Since I am estimating wage equations, it is reasonable to have separate models for males and females. This is difficult to do with these data since sample sizes become rather small.

These variables all represent individual characteristics. I expect these individual characteristics to effect both college choice and future wages. These variables could impact the ability to attend college (both financially and academically), success in college and return from attending college. Hence, they should all be included in the choice equation. I also expect these variables to affect future wages. Variables such as test scores, gender, and participation in athletics may directly affect wages if they are correlated (or perceived to be correlated) to productivity. Family background variables may affect future wages more indirectly, through occupational choice for example.

The set of variables I describe below are included in the choice equation and not the wage equation. They are largely geographic variables. I assume these variables affect the likelihood of choosing a particular sector. That is, they are characteristics related to the sector choice as well as the individual. Unfortunately some of these variables could also affect wages. Variables that affect only the sector choice and not future wages would be ideal candidates for excluding from the wage equation. In practice, these are difficult variables to obtain. One variable 1 use to identify the system is a measure of the direct cost of attending college. To measure direct costs I use the distance to the nearest two year and four year institutions as proxies for price.[8] At least one empirical study has shown proximity of college is an important determinant of college attendance(See Card, 1993).[9] I include several variables which I expect to affect the decision to attend a HBCU versus a non-HBCU. The most important is whether there is a public HBCU in the respondent's state. Since most students attend college in state,(see Manski and Wise, 1983) the presence of a public HBCU is likely to be crucial in determining whether a student will attend. Public HBCUS are, on average, a lower tuition alternative to other institutions. The public HBCU variable overlaps the South variable since there is a public HBCU in every Southern state.

I also include a measure of the percent of teachers in the respondent's high school who are black. I interact this variable with the public HBCU variable. If a student lives in a public HBCU state and has a high percent of black teachers in high school, it is likely a large percent of those teachers are HBCU graduates. These teachers may encourage students to apply to HBCUs or may work with contacts to assist students through the application and admissions process. Unfortunately, racial composition of the faculty of a high school may also pick up other effects, such as high school quality or economic variations within a region smaller than the state, so it is difficult to predict the effect of this variable.

Descriptive Statistics

I assign individuals to a sector based on their responses to questions concerning their activities within three years after graduating from high school. Individuals in each of the two college sectors reported being at a four year HBCU or non-HBCU in the Fall of 1972,73, or 74, and everyone else is in the high school/two year school sector. Manski and Wise (1983) find that the vast majority of individuals attend a postsecondary institution immediately after high school, and within three years, 85% have gone to college. The students that attend college much later are quite different from students that go soon after high school and might fit a different model of college choice.

Table 1 shows the means of relevant variables for each sector. The table includes four dummy variables for educational attainment as of 1979, as reported from Post Education Transcript Survey (PETS).[10] The much cited difference in educational attainment between HBCU and non-HBCU students is supported by these data. Fifty-six percent of the individuals in the HBCU sector receive a B.A., compared to forty-eight percent in the non-HBCU sector. This is not as large a difference as is sometimes cited since it is restricted to individuals who went to a four year institution.[11]

Individuals in the HBCU sector report slightly higher mean hourly wages in 1986 than individuals in the non-HBCU sector ($12.3 1 vs. $11.68). This is somewhat striking given that HBCU attendees appear academically and economically less well off than their non-HBCU counterparts. High school rank is a value between 0 and 1 where closer to 1 is better. HBCU individuals have slightly lower high school rank and much lower test scores (183 versus 194) than non-HBCU individuals. This supports the popular perception that admission requirements (particularly standardized test scores) are more stringent at non-HBCUs and may be prohibitive to some black students. As expected, individuals in the high school sector report much lower test scores and high school rank than individuals in the other sectors.

The family income variables represent dummy variables for categories of family income ranging from less than $3,000 to $12,000+[12]. Individuals in the high school sector come from families with much lower income than either of the four year college groups. HBCU attendees also appear to come from slightly poorer families than non-HBCU attendees. However, the family income effect is a regional effect. Controlling for living in the South, HBCU attendees have slightly higher mean family incomes, but this difference is not statistically significant. It is fair to say that within regions HBCU and non-HBCU attendees have similar family incomes. The same is true for parent's education.

The biggest difference between individuals in the HBCU sector and all others is that over 90% percent of them reside in public HBCU states, compared to 76% of high school individuals and 60% in the non-HBCU sector. Students that attend HBCUs come from high schools in more rural areas than individuals from either of the other sectors as measured by the distance to the nearest four year college and junior college.

The distribution of students in public HBCU states shown in Table 1 reinforces the important policy implications of this analysis. Over 90% of students that attended HBCUs went to high school in states with public HBCUs, implying the presence of public HBCUs in particular is an important determinant of college choice. The distribution of students also suggest these data are well suited to test the effect of attending an HBCU. Since more than half of the students in the non-HBCU sector also live in states with public HBCUs, there are obviously students who choose not to attend an HBCU when a public HBCU is an option. This variation in choice is helpful in trying to determine the effects of public HBCUs.

Results of the Choice Model

Table 2 shows the marginal effects, in the choice model, of each variable in each sector. The coefficients can be interpreted as the percent increase (or decrease) in the chance of being in a given sector associated with each variable. All of the significant variables in the HBCU and non-HBCU sectors have the expected sign. Note that both high school rank and test score variables are positive and significant. Since these are marginal effects, these estimates simply indicate that individuals with higher test scores and high school rank are more likely to go to college. However, the marginal effects of both of these variables are much larger for non-HBCU students than HBCU students. Hence, controlling for other characteristics, better performance in high school increases your chances of attending a non-HBCU more than an HBCU. Individuals in all sectors appear sensitive to the price of going to college as measured by distance to a junior or four year college. Distance to a junior college is only significant for the high school and HBCU sectors and distance to a four year college is significant only in the non-HBCU sector. Females are also more likely to be in the HBCU sector than males. All significant coefficients have the expected sign.

Note that both living in the South and living in a state with a public HBCU increases the chances of attending a HBCU. In this sample there are about 100 individuals from HBCU states that are not from the South. The effect of a public HBCU in the state appears to be very important even in this small sample.

The impact of residing in a public HBCU state has a large (12%) and significant effect on the probability of attending an HBCU. Note also, that residing in an HBCU state has a large negative effect (-10%) on the chance of being in the high school/two year sector, although the estimate is fairly imprecise. Therefore, a very important effect of public HBCUs may be to draw into four year HBCUs those students who would have attended a two year institution or perhaps no college at all.

Table 3 shows the parameter estimates from the choice model. The parameter estimates can be thought of as the relative risk of being in one sector compared to the reference sector. The reference category is attendance at a non-HBCU, so these estimates show the impact that each variable has on the other sector choices as compared to the non-HBCU choice. Therefore, the statistical significance of the parameter estimates in Table 3 indicate whether the apparent differences between the HBCU and non-HBCU sectors shown in Table 2 are also statistically significant. The parameter estimates themselves do not have an appealing interpretation.

The significant variables in the HBCU sector are the dummy variable for living in the South (positive), test scores (negative) and distance to a four year college (positive). The public HBCU estimate is not quite significant at the ten percent level, but the coefficient is large and positive.[13] These result support many of the common beliefs about students at HBCUs. It is somewhat surprising that family income variables do not seem to matter. However, in the 1970s there was great deal of Federal financial aid available to students, so family resources may not be a very binding constraint.[14] All of the significant variables in the high school sector have the expected sign.

Estimation of the Wage Equations

Table 4 shows the results of the wage equations estimated for each sector, i.e. estimates of equation 9 shown earlier. Columns 1,2, and 3 include the Lee selection correction variable and the coefficient on that variable, LAMBDA. The most important result is that while there is no significant selection into the high school or non-HBCU sector, there is a significant, negative selection in the HBCU sector (the parameter estimate is -0.418). A negative selection term means the unobservable characteristics that caused an individual to choose a HBCU (over the next most likely alternative) are ones which would cause lower wages. For example, the individual may be of lower innate ability or have poorer elementary and secondary training.

Columns 1A, 2A, and 3A in Table 4 show the same wage equations not corrected for selection. Note the constant term in the HBCU sector is much lower when I do not include the selection term. This may indicate that the impact of attending a HBCU is a direct shift upward of the intercept in the wage model. However, other parameters in the model also change substantially. For example, the estimate of the effect of being from the South has a moderate negative effect on earnings in column 2A, although the estimate is very imprecise. Once I control for the decision to attend a HBCU, the negative impact on earnings of living in the South is more severe, as shown in column 2.

This model suggests that if similar individuals from the HBCU and non-HBCU group had not attended college at all, we would expect the non-HBCU individual to earn higher wages based on their unobservable characteristics. Hence, the “value added” of attending an HBCU may be quite large.

The analysis so far suggests that there may be a significant effect on wages of attending an HBCU. Table 1 shows that mean wages are somewhat higher in the HBCU sector and the choice/wage model indicates HBCU attendees are likely to be from lower in the wage distribution, so the wage effect may be even larger than indicated by the difference in average wages. In order to estimate the magnitude of the wage effect I analyze the difference in predicted wages in each sector based on the wage models.

Predicted Wages

One measure of the treatment effect of HBCU attendance is the mean difference in predicted wages for all individuals in the HBCU and non-HBCU sectors. By comparing the mean of the difference in predicted wages for all individuals in the HBCU and non-HBCU sectors, an estimate of the effect can be obtained. I compare the estimates from wage equations which do not include a selection term to the estimates from the equations corrected for selection. Comparing the uncorrected and corrected estimates will help to determine the order of magnitude of the bias when the effect of HBCU attendance on wages is considered without conditioning on the choice to attend an HBCU.[15]

Table 5 shows the difference in predicted wages for each sector. Both models (uncorrected and corrected) predict a higher wage in the HBCU sector. The uncorrected estimates predict a wage 8% higher, on average, in the HBCU sector than in the non-HBCU sector. That difference rises to 38% in the model corrected for college sector choice.[16] The uncorrected model shows an 8% difference in wages which is slightly larger than the 5% difference in means shown in Table 1. This is not surprising since the OLS estimates control for observable characteristics such as test scores and family background and Table 1 showed that HBCU attendees appear to be slightly less well off on these measures. However, the corrected estimates show how much not accounting for selection understates the mean effect of HBCU attendance on wages.

Uncorrected Estimates of Wage Equations

The results of this study are quite different than the wage effects found in the study by Ehrenberg and Rothstein. As mentioned before, Ehrenberg and Rothstein find that HBCU attendance can increase the likelihood of obtaining a B.A. degree by anywhere from 9 to 29%, but find no additional wage benefits beyond that. In fact, they find no overall wage effect because students that do not graduate from HBCUs earn lower wages than students that do not graduate from non-HBCUs (Ehrenberg and Rothstein, Table 15). Table 5 in this analysis showed a difference in predicted wages of 38%. I believe there are two main reasons for these differences.

Unlike the Ehrenberg and Rothstein study, the sample in this analysis includes all individuals that have good wage observations in 1986, whether they attended a four year institution or not. The results in Tables 2 and 3 suggest that one of the effects of an HBCU is to draw in students that would not have attended a four year institution if an HBCU were not available. Hence, in this study, the presence of HBCUs increase the likelihood of obtaining a B.A. degree for two reasons; (i) HBCUS increase the likelihood that a high school graduate will attend a four year institution and (ii) once a student is at a four year institution, they have a better chance of persisting at an HBCU. Ehrenberg and Rothstein capture only the second effect.

Another important difference in this study is the use of wages in 1986 instead of 1979. In this analysis the respondents are approximately 32 years old as compared to 25 in the Ehrenberg and Rothstein study. Human capital models of investment and wages predict lower wages while individuals invest in themselves (through formal schooling or training), and then rising wages as individuals realize the return on their investment (see Becker 1975 and Mincer 1974). Hence, using wages from later in an individual's career is a better indicator of the return on human capital investment. In this model, it is difficult to tell what is generating the results (i.e. the different specification of the choice model, the use of wages when the individuals are older, or both). One way to compare results between this and the Ehrenberg and Rothstein study and to see the impact of using 1986 wages, is to estimate uncorrected wage equations similar to those in their study.

Table 6 shows the results of ordinary least squares estimates of reduced form wage equations. To mimic the Ehrenberg and Rothstein study, the sample used for this table is all four year college attendees, Equation 1 is the same reduced form equation used in Table 4 where it was run separately by sector. Equation 2 shows an 11% increase in wages associated with attending an HBCU for the college population without controlling for eventual B.A. attainment. Equation 3 includes a dummy variable for B.A. attainment by 1979 and shows that the return to obtaining a B.A. for the college population is very large, 21%. As expected, the effect of HBCU attendance is reduced somewhat when degree attainment is included. The increase in wages from HBCU attendance is still 8%, although the estimate is not quite significant at the 10% level. To test whether the benefits of HBCU attendance is accrued entirely to individuals that eventually obtain a Bachelor’s degree, I add an interaction term, HBCU attendance with B.A. attainment. The coefficient on the interaction term is small, .03 and the coefficient on HBCU attendance drops to .06. Both parameters are estimated very imprecisely and are not significantly different from zero.

Two important conclusions can be drawn from the results in Table 6. First, no population of students appears to suffer from reduced wages due to attending an HBCU. This contradicts the findings of Ehrenberg and Rothstein in estimating wage equations for 1979. They found a 12% reduction in wages from HBCU attendance after including BA attainment and the interaction term.[17] Clearly, using wages from later in an individual’s career is very important and yields quite different results. This should not be surprising especially for individuals that have invested in four years of college. Initial wages may not reflect long term earnings for a variety of reasons. In practice, one could imagine college graduates considering going on in graduate school to be working in jobs for some years that do not reflect their eventual earnings. The results in Table 6 also support the findings in Table 5 which show how large the estimation bias may be when the college choice is not considered. The estimate of the effect of attending and HBCU without controlling for B.A.

attainment in the OLS equations in Table 6 is 1 I%, very close to the 8% difference in predicted wages in the first column of Table 5. As is also shown in Table 5, these OLS estimates significantly understate the effect of HBCU attendance on wages.

Conclusions

This analysis has answered the question laid out at the beginning of the paper. There is an effect on future wages of attending an HBCU. Attendance at an HBCU appears to yield a value added, in terms of wages, of 38% on average. Even the uncorrected OLS estimates show a boost to wages of between 8 and 11% and as this paper has shown, there is reason to believe that effect is understated.

One potential shortcoming of this analysis, apart from the difficulty is obtaining ideal variables to identify the system, is the pooling of the sample for men and women. As mentioned in the paper, I combine the sample for men and women and include only a dummy variable for gender, hence only allowing the intercept to vary by gender. There are many reasons why the decision to attend college may differ for men and women and why the return to certain background variables in the wage equation may also vary. This implies the effect of attending HBCUs should be estimated separately for men and women. Preliminary results of the anlyses by gender show that the model presented in this paper is appropriate for men, but not for women."

The results of this research have important policy implications. Students that attended HBCUs in the 1970s appeared to receive a substantial boost to future wages from attending an HBCU. In light of this finding, decisons about dissolution of these institutions, as they are currently known, should be made with careful consideration, It is true that many of these schools are lagging in terms characteristics that are typically thought to represent the quality of an institution and the education it provides. Obviously HBCUs provide benefits to students that are not captured by standard quality gauges.

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1. See Mincer (1972). I do not take a strict human capital approach and assume future earnings are the only benefit of college. If this were the case, I should include the difference in future wages in the choice model. I specify the choice model as a more general utility maximization model with one of the measurable outcomes being future wages.

2. For a description of the index function see Schmertmann, 1994.

3. The IIA property arises from the assumption that error terms are independent across choices. The property implies that the odds of choosing one alternative over another are independent of the presence of any number of other alternatives. This property is theoretically unappealing when there is reason to believe that the error terms across similar choices are correlated.

4. Individuals with wages greater than $200 per hour or less than $1.67 were eliminated. (I chose $1.67, one-half the minimum wage in 1986, as a lower bound to allow for individuals earning less than minimum wage.) The 1986 follow up of the NLS-72 only included a subsample of 14,489 of the original 22,652 sample. Some individuals (such as college graduates) were more likely to be in the 1986 survey (see Research Triangle Institute, 1981). This oversampling of college graduates means that HBCU attendees are somewhat overrepresented in this sample, since they are more likely to be college graduates. For example, HBCU attendees make up 45% of the total four year college population in this study,

when in 1972 - 1976, they comprised between 30 - 40% of the black four year college population

5. The test scores used are from a test battery consisting of six sections administered to the NLS-72 respondents. The sections are reading, mathematics, vocabulary, picture number, letter group, and mosaic composition. The first four tests are similar to the SAT and a factor analysis on all test scores show the first four load onto one factor (see Research Triangle Institute, 1981). My test score measure is the sum of the student's score on these four tests.

6. Other studies (Manski and Wise, Ehrenberg and Rothstein) use SAT and ACT scores as ability measures. Manski and Wise were attempting to address policy debates concerning use of the SATs and Ehrenberg and Rothstein were studying college characteristics, so SAT scores were required. However, the SAT and ACT are not the same tests and although there are methods for converting the scores to be comparable, I minimize measurement error by using the same test administered to all respondents.

7. Manski and Wise find participation in athletics to be an important predictor of college application, admission, acceptance, and financial aid receipt.

8. I did have data on average tuition for state residents at public institutions that I tested in several specifications. Its effect was not significant and the sign of the coefficient was positive. Both Behrman, et.al... (1992) and Manski and Wise (1983) have found a positive effect of tuition on attendance and

posit that it is acting as a college quality measure.

9. Distance to the closest HBCU and non-HBCU would be better variables to include since they would more directly measure the costs of these two choices, but those variables were not available in these data.

10. The PETS is an important attachment to the NLS-72. Transcripts were gathered from the postsecondary institutions that students said they attended from 1972 - 1979. The PETS data yield a measure of degree attainment that is not self-reported. Even though I do not model B.A. attainment explicitly in this paper, it is worthwhile to note the difference in degree attainment between HBCU and non-HBCU students in these data.

11. Some of the difference in B.A. attainment rates cited earlier in the paper is also because nearly all HBCUs are four year institutions as opposed to many non-HBCUs which are two year institutions that do not grant Bachelors degrees.

12. This variable was recoded from a family income variable that ranged, by category, from less than $3,000 to $18,000+. I recoded the variable because so few individuals reported family incomes in the top two categories.

13. This may be due to the use of four year non-HBCU as the reference category. If the reference category was the high school/two year sector, the public HBCU parameter estimate would most likely be significant.

14. The family income variable is also self-reported so it may suffer from enough measurement error that the coefficient is too

biased (toward zero) to infer very much.

15. To calculate selection corrected predicted wages in each sector, all parameters estimates are used from equations 2 and 3 in Table 4 but, the coefficient on the selection term lambda is replaced with a zero. Since I am interested in the treatment effect of HBCU attendance, I want to know what the expected

Table 1. Means of Individual Characteristics
(standard deviations in parentheses)

Individual Characteristics	HSorTwoYear (N =711)	FourYear HBCU (N =217)	FourYearNon-HBCU (N =264)
Hourly Wage-1986	8.56 (10.6)	12.31 (13.9)	11.68 (13.6)
Highschool or Voc	0.69 (0.46)	0.17 (0.38)	0.13 (0.34)
College-no degree	0.23 (0.42)	0.26 (0.44)	0.38 (0.49)
2yeardegree	0.05 (0.22)	0.01 (0.12)	0.01 (0.51)
Bachelors	0.03 (0.18)	0.56 (0.50)	0.48 (0.50)
City	0.41 (0.49)	0.41 (0.49)	0.50 (0.50)
Public HBCU state	0.76 (0.43)	0.93 (0.26)	0.60 (0.49)
Test scores	163 (24)	183 (25)	194 (29)
High school rank	0.41 (0.25)	0.60 (0.25)	0.63 (0.27)
% students black	0.57 (0.33)	0.62 (0.31)	0.55 (0.33)
% teachers black	0.31 (0.21)	0.40 (0.25)	0.29 (0.22)
Family income < $3000	0.27 (0.44)	0.24 (0.42)	0.20 (0.40)
Family income $3000-$6000	0.27 (0.45)	0.24 (0.42)	0.23 (0.42)
Family income $6000-$9000	0.25 (0.43)	0.22 (0.42)	0.21 (0.41)
Family income $9000~$12000	0.12 (0.33)	0.15 (0.36)	0.16 (0.37)
Family income > $12000	0.07(0.26)	0.15 (0.36)	0.19 (0.40)
Dad SEI index	24.75(17.67)	34.06(24.51)	33.10(21.7)
Father's education	10.90(1.44)	11.60(1.92)	11.84(2.02)
Mother's education	11.17(1.58)	11.92(1.98)	11.99(1.97)
Miles to 4 year college	15.12(18.9)	16.96 (19.3)	10.36 (17.7)
Miles to junior college	15.81 (21.4)	19.93 (25.1)	15.16 (23.5)
South	0.67 (0.47)	0.86 (0.35)	0.49 (0.50)
Athlete	0.42 (0.49)	0.57(0.50)	0.53 (0.50)
Female	0.62 (0.49)	0.68 (0.47)	0.64 (0.48)

Table 2. Marginal Effects from the College Choice Model (standard errors in parentheses)

Model Parameters	HS or Two Year (N=711)	Four Year HBCU (N = 217)	Four Year Non-HBCU (N = 264)
Constant	2.489** (0.333)	-1.215** (0.127)	-1.274** (0.153)
Public HBCU state	-0.104 (0.104)	0.121** (0.051)	-0.017 (0.098)
South	-0.006 (0.069)	0.092** (0.037)	-0.086 (0.057)
High school rank	-0.51 o** (0.108)	0.186" (0.050)	0.324** (0.073)
Test scores'	-0.065** (0.011)	0.020** (0.005)	0.045" (0.007)
Dad SEI index"	-0.031** (0.010)	0.019" (0.005)	0.011* (0.007)
Mother's education	-0.041** (0.011)	0.019** (0.006)	0.022" (0.008)
Family income	-0.015 (0.017)	0.014 (0.009)	0.001 (0.013)
Female	-0.051 (0.042)	0.043** (0.021)	0.009 (0.032)
Athlete	-0.146** (0.043)	0.088** (0.022)	0.058' (0.031)
% teachers black	-0.033 (0.050)	0.026 (0.026)	0.007 (0.047)
% teachers black* HBCU	0.022 (0.053)	-0.008 (0.027)	-0.030 (0.049)
City	**0.001** (0.046)	0.027 (0.024)	-0.029 (0.036)
Miles to junior college	-0.002* **(0.001)**	**0.001**** (0.0005)	**0.001** **(0.001)**
Mile to 4 year college	0.001 (0.001)	0.001 (0.001)	-0.002 • (0.001)

(**) Significant at the 5% level (*) Significant at the 10% level
a Coefficient and standard error have been multiplied by 10
Model includes dummy variables **for missing values**

Table 3, Parameter Estimates from the College Choice Model (parameter estimates for four year non-HBCU set to zero)

Model Parameters	HS or Two Year	Four Year HBCU
Constant	10.399**	-1 .184**
	(1.005)	(1 .195)
Public HBCU state	-0.070	0.863
	(0.410)	(0.636)
South	0.437	1.028**
	(0.303)	(0.385)
High school rank	-2.450**	-0.480
	(0.430)	(0.508)
Test scores	-0.033**	-0.011** .
	(0.004)	(0.005)
Dad SEI index	-0.011**	0.006
	(0.005)	(0.005)
Mother's education	-0.175**	0.012
	(0.049)	(0.055)
Family income	-0.031	0.085
	(0.079)	(0.093)
Female	-0.125	0.226
	(0.183)	(0.222)
Athlete	-0.522**	0.265
	(0.182)	(0.220)
% teachers black	-0.086	0.133
	(0.211)	(0.314)
% teachers black* HBCU	0.189	0.206
	(0.221)	(0.326)
City	0.149	0.322
	(0.205)	(0.251)
Miles to junior college	-0.006	0.003
	(0.004)	(0.005)
Mile to 4 year college	0.01 o*	0.013**
	(0.006)	(0.007)

See footnotes to Table 2

Table 4. Reduced Form Wage Equations With and Without Correction for College Choice. (standard errors corrected)

Independent Variables	HS or Two Year (1)	HS or Two Year (1A)	Four Year HBCU (2)	Four Year HBCU (2A)	Four Year Non-HBCU (3)	Four Year Non-HBCU (3A)
Constant	1.102**	1.034**	3.345**	1.773"	2.62**	1.620**
	(0.454)	(0.209)	(0.908)	(0.475)	(0.933)	(0.488)
South	-0.089**	-0.088**	-0.343**	-0.060	0.031	-0.082
	(0.045)	(0.044)	(0.186)	(0.136)	(0.125)	(0.082)
High school rank	0.218	0.240**	0.256	0.492**	0.244	0.439"
	(0.161)	(0.097)	(0.241)	(0.218)	(0.240)	(0.177)
Test scores [a]	0.039**	0.042**	-0.015	-0.002	-0.017	0.008
	(0.019)	(0.010)	(0.023)	(0.023)	(0.027)	(0.017)
Dad SEI index[a]	0.007	0.008	-0.014	0.007	-0.014	-0.009
	(0.014)	(0.012)	(0.023)	(0.021)	(0.020)	(0.020)
Mother's education	0.022	0.024**	-0.026	-0.009	-0.009	0.004
	(0.017)	(0.013)	(0.025)	(0.024)	(0.022)	(0.02)
Family income	0.009	0.010	0.091**	0.106**	0.074"	0.072**
	(0.019)	(0.019)	(0.039)	(0.04)	(0.031)	(0.031)
Female	-0.183"	-0.181**	-0.015	0.027	-0.241'	-0.238**
	(0.042)	(0.040)	(0.097)	(0.098)	(0.080)	(0.083)
Athlete	0.059	0.065	0.082	0.206"	-0.007	0.028
	(0.056)	(0.042)	(0.114)	(0.10)	(0.082)	(0.079)
City	0.040	0.039	-0.076	-0.045	0.154**	0.142*
	(0.041)	(0.041)	(0.092)	(0.094)	(0.076)	(0.078)
Lambda	0.034	—	-0.418**	---	-0.268	---
	(0.203)		(0.208)		(0.230)	
R-squared	0.08	.08	0.04	.03	0.10	.09
N	711	711	217	217	264	264

a Coefficient and standard error have been multiplied by 10

Table 5. Difference in Predicted Wages for Four Year College Attendees

	Four Year College Attendees	
	OLS Estimates	Corrected Estimates
HBCU Wage	$9.10	$17.11
Non-HBCU Wage	$8.45	$12.38
Ln wage difference	0.074	0.324
Percent Difference	8	38

Table 6. OLS Estimates of Impact of HBCU Attendance on Wages In 1986

Independent Variables	(1)	(2)	(3)	(4)
Constant	1.748**	1.687**	1.74**	1.75**
	(0.290)	(0.291)	(0.287)	(0.288)
South	-0.043	-0.092	-0.071	-0.072
	(0.063)	(0.068)	(0.067)	(0.067)
High school rank	0.448**	0.462**	0.394**	0.396**
	(0.136)	(0.136)	(0.135)	(0.135)
Test scores[a]	-0.001	0.002	-0.003	-0.003
	(0.013)	(0.013)	(0.013)	(0.013)
Dad SEI index[a]	0.000	0.000	-0.002	-0.002
	(.014)	(0.014)	(0.014)	(0.014)
Mother's education	0.000	0.000	-0.003	-0.003
	(0.015)	(0.015)	(0.015)	(0.015)
Family income	0.082**	0.080**	0.076"	0.076**
	(0.025)	(0.024)	(0.024)	(0.024)
Female	-0.116*	-0.121"	-0.115'	-0.115
	(0.062)	(0.062)	(0.061)	(0.062)
Athlete	0.100*	0.0951	0.090	0.091
	(0.061)	(0.061)	(0.060)	(0.060)
City	0.086	0.079	0.103*	0.103*
	(0.059)	(0.059)	(0.058)	(0.058)
Attended HBCU	—	0.113*	0.081	0.064
		(0.060)	(0.059)	(0.081)
BA by 1979	—		0.213**	0.200**
			(0.055)	(0.074)
HBCU*BA in 1979	—	—	—	0.034
				(0.107)
R-squared	0.06	0.06	0.09	0.09
N	481	481	481	481

a Coefficient and standard error have been multiplied by 10

Appendix A

Description of Variables

Hourly wage 1986 - Log of hourly earnings reported in 1986. Hourly earnings of less than $1.67 (one-half minimum wage in 1986) or over $200 are excluded.

Public HBCU State - Dummy variable equal to 1 if respondent's high school is in a state with a public HBCU, 0 otherwise. See Appendix A for list of institutions and public/private status.

South - Dummy variable equal to 1 if respondent's high school is located in the South, 0 otherwise.

High school rank - Variable from 0 to 1 indicating student's high school percentile rank as reported by the high school. A rank of .90 means student is in the top ten percent of the class.

Test scores - Sum of scaled test scores on four sections of test administered for NLS-72 respondents. The test sections are; reading, mathematics, vocabulary, and picture number. Scores in this sample range from 0 to 266.

Dad SEI index - Duncan SEI occupational index for Father's occupation as reported by respondent in 1972. Index ranges from 0 to 99.

Mother's education - Years of education of respondent's mother as reported by respondent in 1972. Years of education range from 10 to 16.

Family income - Categorical variable ranging from 1 to 5 representing family income as reported by respondent in 1972. Category 1 represents income of $3,000 or less and each category represents an increase of $3,000 up to $12,000.

Female - Dummy variable equal to 1 if respondent is female, 0 otherwise.

Athlete - Dummy variable equal to 1 if respondent participated in athletics in high school, 0 otherwise.

% teachers black - Categorical variable ranging from 1 to 5 representing percentage of black teachers in respondent's high school as reported by the high school. Category 1 is 20% or fewer black teachers and each category represents a 20% increase in percent of black teachers.

City - Dummy variable equal to 1 if respondent's high school is in a city larger than 50,000 as reported by the high school, 0 otherwise.

Miles to junior college - Distance to nearest junior or community college as reported by respondent's high school. Variable ranges from 0 to 250 miles.

Miles to 4 year college - Distance to nearest four year college or university as reported by respondent's high school. Variable ranges from 0 to 250 miles.

High school or voc. - Dummy variable equal to 1 if respondent has no post-secondary schooling (except for vocational training) past high school as of 1979, 0 otherwise.

College no degree - Dummy variable equal to 1 if respondent has some post-secondary schooling but no degree as of 1979, 0 otherwise.

2 **year degree -** Dummy variable equal to 1 if respondent has a two year academic degree as of 1979, 0 otherwise.

Bachelors - Dummy variable equal to 1 if respondent has a B.A. degree or more as of 1979, 0 otherwise.