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RACIAL EARNINGS DISCRIMINATION: EMPIRICAL RESULTS FOR INDIANA

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I. Introduction

The incomes of black males continues to lag the incomes of white males. In 1969 the median income of white males in the United States, 14 years and over who worked full time the year round was $8,953 while black male workers received a median income of only $6,104, or 68.2 percent of the median income of white workers. In 1979, the median income of the white male workers was $17,984 and the comparable figure for black workers was $13,558. The absolute dollar difference increased from $2,849 to $4,426 during the 1970s, but black male income as a percentage of white male income increased from 68.2 percent to 75.4 percent.

Black male full time workers fared better, both absolutely and relatively to their white counterparts, in Indiana in 1979. The median incomes of white and black full time workers in Indiana in 1979 were $17,995 and $16,579, respectively. For black full time workers, the median income reached 92.1 percent of the median income for comparable white workers. Thus, even though black male workers received incomes in Indiana that were much closer to the incomes received by white male workers, there was still a significant disparity.

Several factors have been used to explain the income differential between black and white workers in the United States. Education, experience, age, geographic location, occupational distribution, industry distribution, and health problems are some of the more common factors that economists have used to attempt to explain the differences in incomes received by black and white workers. Recent studies indicate that approximately one-half of the earnings differential between black and white workers is due to education and geographical location and approximately one-fourth is due to the combined influence of the other factors.

More generally, groups of workers are endowed with unequal amounts of human capital and therefore are not equally productive. Consequently, these groups receive different wage rates, face dissimilar job opportunities and, thus, end up with different earnings. But an equally plausible hypothesis is that earning differentials between two groups result from discrimination in labor markets which occurs when groups of workers with equal amounts of human capital are paid different wage rates because of some characteristic (like race or sex) that does not affect their productivity.

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Our determination of that part of the earnings differential between black men and white men in Indiana representing discrimination and that part reflecting different endowments of human capital relies on similar analysis performed by Oaxaca [3]. Wage equations are estimated for both groups of workers by regressing a man's earnings against his productivity enhancing characteristics, such as, his education, experience, migrational status, occupation and so on. These wage equations enable us to compute the earnings black and white men would have received in the absence of any labor market discrimination. Comparisons of this non-discrimination earnings differential to the earnings differential that actually existed yields a measure of potential discrimination. But in addition to estimating a discrimination coefficient, we also calculate, from another set of regressions, the returns to high school and college education for white and black men with varying years of work experience. These returns permit us to analyze the extent to which labor market conditions have changed for black and white men entering the Indiana labor force over the last three decades.

II. Wage Determination Models

As noted above, economists studying discrimination have taken the view that the earnings differential between two groups of workers reflect in part differences in the productivity of individuals, in part discrimination and in part random factors. This approach has as its foundation the human capital model of income determination. Individuals acquire human capital through investments they make in education, on-the-job training and the acquisition of other productivity enhancing characteristics. Earnings are simply the return in each period to this investment. Other things constant, those with relatively greater investment and larger accumulation of human capital receive relatively higher incomes.

Empirical estimates of two variants of this model form the basis of our discrimination analysis. In the first variant, we regress the earnings of black and white men against education, experience and time worked, this last variable is used to capture differences between black and white earnings due to unequal full time opportunities. An expanded version of the human capital model includes additional productivity related variables — migration, marital status, work disabilities — and a set of industry and occupation variables. The inclusion of industry and occupation variables recognizes that earnings not only reflect an individual's human capital but also where that human capital is employed. Two individuals with identical human capital may receive very different wages, for example two Ph.Ds in economics, one working in a university and the other working in a large bank.

The human capital model suggests that discrimination potentially reveals itself as a residual. The traditional approach is to use the estimated wage equations to determine that part of the differential in black-white earnings that cannot be accounted for by differences in productivity related characteristics. But significant differences in the regression coefficients for black and white men on a particular productivity characteristic may also signal discrimination. In this context, discrimination may surface as a lower return to education, to

experience, or to a particular occupation.

Under certain circumstances the human approach may understate the true extent of discrimination. This is particularly true in the case of blacks where the characteristics used to explain wage differentials may themselves embody discrimination. For example, if we find that a large part of the black-white wage differential is accounted for by blacks having fewer years of education, we might be inclined to then argue that there is very little discrimination against blacks. In one sense, our conclusions are correct. Labor markets pay blacks less because they have less education and lower productivity. In another sense, however, we understate the true extent of the discrimination. This is especially the case if the lower educational level of blacks is due to discrimination — past or present. Similar ambiguity may also exist in variables such as time worked, industry, and occupation. Each of these variables may appear to account for non-discriminating wage differentials and at the same time embody discrimination.

III. Empirical Results

Data used to estimate the wage model are taken from the 1980 census public use micro data files for the state of Indiana. The sample includes 3,416 black men and 58,506 white men. A comparison of black men and white men (see Table 1) reveals that on the average black men have lower wage and salary income ($14,633.40 versus $16,664.88), fewer years of education (13.74 versus 14.57), a small percentage of college graduates (3.5 versus 7.70) fewer hours worked per years (1826 versus 2023), a smaller percentage who are married (57.50 versus 73.20) and a higher divorce rate (10.20 versus 6.00). In addition, black men are more heavily represented in blue collar and service occupations than are white men (60.80 percent versus 40.60 percent) and are more likely to be in manufacturing industries than are white men (49.50 percent versus 41.00 percent) particularly durable manufacturing (42.40 percent versus 32.10 percent).

Regression equations based on these data are presented in Tables 2 and 3. Many of our results confirm findings of others studying black-white earnings differentials. Jencks et. al [2, p. 198] found that between 1967 and 1971 the return to a college degree increased dramatically while returns to other years of schooling decreased for non-whites. Although our Indiana data are not directly comparable to their United States data, we do find that our estimate of the proportionate return to a college degree of 0.1788 is substantially higher than the insignificant -0.034 coefficient Jencks et. al. found for 1969 and that our returns to other years of schooling of 0.0521 is about two-thirds of their 1969 coefficient of 0.08 (Table 2). Other calculations we carried out more strongly support the probable recent increase in the advantage a college degree has for non-whites. Based on our entire sample of black men, we estimate that an undergraduate degree increases a man's earnings by 47 percent. For those black men who entered the labor market in 1973-1977 and in 1978-1980, however, an undergraduate degree increased earnings by 77 percent and 86 percent respectively (Table 5).

TABLE 1

Characteristics of Indiana Black Men and White Men 1979

Characteristic	Mean Values	
	Black males	White males
Personal Characteristics		
Wage and Salary income	14633.40	16664.88
Grade (years)	13.74	14.57
Experience (years)	17.74	16.89
Time worked (hours)	1825.96	2023.22
Disability (percent)	5.50	5.10
Migrant (percent)	4.60	4.30
Married (percent)	57.50	73.20
Divorced (percent)	10.20	6.00
Separated (percent)	4.00	.80
Widowed (percent)	1.70	.70
Occupation Characteristics (percent)		
Managerial and Professional	10.60	20.10
Technical, Sales and Support	12.90	16.60
Precision Production, Craft	15.70	22.70
Operators, Fabricators, Laborers	44.10	30.80
Service occupations	16.70	9.80
Industry characteristics (percent)		
Manufacturing — durables	42.40	32.10
Manufacturing — nondurables	7.10	8.90
Transportation, Communications and Public Utilities	9.70	9.10
Wholesale	3.00	5.50
Finance, Insurance, Real Estate	3.00	3.40
Professional and Related Services	11.20	9.80
Public Administration	5.40	3.50
Retail Trade	13.50	23.10
Number of observations	34.16	58506

Source: Public use micro data tapes — 5% sample

Jencks et. al. also found that "whites receive higher dollar returns to years of education than blacks [and] that the proportional returns are similar for both groups . . ." [2, p. 196]. Our results show that other things constant an additional year of education adds $890 to white earnings and $548 to black earnings while the proportional increase for white men and black men are 0.0526 and 0.0521, respectively (Table 2).

Our results also document the conclusion of Welsh [6, p. 50] "[that] the increase in the relative value of schooling for more recent vintages supports a

TABLE 2

Supply Characteristic Wage Equations: Black Men and White Men

	Dependent = Earnings		Dependent = Ln (Earnings)	
	Black Men	White Men	Black Men	White Men
BA	2419.38	3326.82	0.2596	0.2021
	(3.12)	(22.06)	(2.99)	(15.83)
GRADE	625.06	989.83	0.0631	0.0655
	(10.67)	(64.32)	(9.96)	(50.22)
EXPERIENCE	726.79	980.38	0.0889	0.0959
	(28.83)	(126.46)	29.73)	(146.10)
$(Experience)^2$	-12.80	-17.30	-0.0015	-0.0018
	(22.02)	(97.69)	(22.75)	(119.88)
Constant	-765.38	-6054.17	7.6200	7.7355
	(0.85)	(25.17)	(75.41)	(375.64)
R^2	0.23	0.29	0.24	0.31
F	341	5632	119	2608
Se	9770	9024	0.76	0.77
Mean Earnings	14633.40	16664.88	9.270	9.440
BA	1854.02	2861.75	0.1788	0.1419
	(2.53)	(19.86)	(2.25)	(12.46)
GRADE	548.12	890.44	0.0521	0.0526
	(9.85)	(60.34)	(8.65)	(45.08)
EXPERIENCE	589.18	734.58	0.063	0.0640
	(21.97)	(90.73)	(21.84)	(100.10)
$(Experience)^2$	-9.65	-12.38	-0.0010	-0.0012
	(16.83)	(68.21)	(16.67)	(80.88)
Time Worked	4.08	4.53	0.0006	0.0006
	(19.70)	(75.06)	(25.99)	(123.27)
Constant	-5688.62	-12014.80	6.9161	6.9620
	(6.38)	(49.42)	(71.94)	(362.48)
R^2	0.31	0.35	0.36	0.45
F	303	6361	300	9641
Se	7507	8673	0.82	0.69
Mean Earnings	14633.40	16664.88	9.27	9.440

1. Earnings = wages and salary earnings of men with earnings
2. Figures in parenthesis are t-values.

view of diminishing discrimination." Welsh shows that in 1966 the ratio of black-white returns to an additional year of education for those with one to three years of experience was 0.82. The same black-white ratio for men in our sample with one to three years of experience is 1.17 (Table 5). Even more dramatically, those black men in Welsh's 1966 United States sample with four to seven years of experience had only two-thirds the additional earnings from

TABLE 3

Industry and Occupation Wage Equations For Black Men and White Men

	Dependent = Earnings		Dependent = Ln (Earnings)	
	Black Men	White Men	Black Men	White Men
Personal characteristics				
Grade	-813.51	-372.66	-0.0621	0.0287
	(3.89)	(5.00)	(2.69)	(4.98)
Grade squared	51.20	43.45	0.0044	0.0009
	(6.46)	(17.01)	(4.97)	(4.42)
Experience	386.92	582.06	0.0415	0.0431
	(13.51)	(65.15)	(13.11)	(62.36)
Experience squared	-6.36	-9.76	-0.0007	-0.0008
	(10.98)	(51.57)	(10.51)	(53.31)
Time worked	3.29	3.86	0.0005	0.0005
	(17.13)	(64.86)	(23.67)	(112.08)
Disability	-2246.67	-2305.78	-.1747	-.1744
	(4.35)	(14.58)	(3.06)	(14.24)
Migrant	-769.66	-226.78	-0.1430	-0.0259
	(1.36)	(1.32)	(2.29)	(1.96)
Married	2649.46	2004.49	0.2728	0.3079
	(7.60)	(17.62)	(7.07)	(34.96)
Divorced	728.208	242.18	0.0833	0.2188
	(1.50)	(1.39)	(1.55)	(16.27)
Separated	1338.36	683.15	0.2363	0.2297
	(2.05)	(1.73)	(3.27)	(7.49)
Widowed	1743.26	387.76	0.1122	0.1876
	(1.77)	(0.94)	(1.03)	(5.65)
Never married	—	—	—	—
Occupation Variables				
Professional	3406.98	5102.54	0.3488	0.4747
	(6.61)	(33.36)	(6.11)	(40.09)
Technician, Sales	1377.01	1624.77	0.2011	0.3283
	(2.95)	(10.94)	(3.89)	(28.54)
Precision Work	3738.92	2993.81	0.4145	0.4647
	(8.17)	(21.32)	(8.19)	(42.75)
Laborers	1285.74	892.59	0.2637	0.3167
	(3.18)	(6.49)	(5.90)	(29.74)
Service Occupations	—	—	—	—
Industry Variables				
Manufacturing — Durables	4703.95	2589.52	.4701	0.2963
	(11.98)	(26.05)	(10.83)	(38.49)
Manufacturing — Nondurables	2013.65	1528.25	0.2636	0.2037
	(3.64)	(11.02)	(4.31)	(18.98)
Transportation	2300.53	1953.67	0.3277	0.2358
	(4.36)	(13.93)	(5.62)	(21.71)
Wholesale	162.96	957.44	0.0433	0.1262
	(0.217)	(5.76)	(0.52)	(9.81)
Finance	-252.41	942.14	0.1542	0.1183
	(0.33)	(4.57)	(1.82)	(7.40)

Services	-2033.61	-1776.99	-0.0883	-0.0959
	(3.22)	(10.13)	(1.27)	(7.05)
Professional	-1717.92	-4206.67	-0.0793	-0.1254
	(3.40)	(28.21)	(1.42)	(10.86)
Administrative	-707.70	-2138.62	0.0644	0.0842
	(1.14)	(9.91)	(0.94)	(5.05)
Government	1196.08	1554.81	0.10858	0.1335
	(2.16)	(6.54)	(1.77)	(7.26)
Retail—	—	—	—	
	—	—	—	—
Constant	959.43	-4613.67	7.3171	6.7141
	(0.62)	(7.92)	(42.59)	(148.96)
R^2	0.43	0.41	0.454	0.517
F	109.00	1662.00	119	2608
SE	6795.41	8309.56	0.7517	0.6433
N	3416	58506	3416	58506

1. Earnings = wage and salary earnings
2. Figures in parentheses are t-values.

the marginal years of education as did their white counterparts. The comparable ratio in our Indiana sample is 1.61. Indeed, the ratio of the marginal value of black returns to education and white returns to education at all levels of experience is greater for our Indiana 1980 black men than for black men in Welsh's 1966 United States sample.

TABLE 4

Regression Estimates By Experience Cohorts of the Returns to Years of Schooling (Grade) and to an Undergraduate Degree (BA) for Indiana Black and White Men

Experience Cohort (Years)	White Men				Black Men			
	Earnings		LN (Earnings)		Earnings		LN (Earnings)	
	Grade	BA	Grade	BA	Grade	BA	Grade	BA
1-3	681.54	430.54	0.0612	0.0307	796.86	1768.77	0.1011	0.1640
4-7	858.44	1033.93	0.0602	0.0540	1377.93	1795.45	0.1010	0.2187
8-11	1128.87	2171.24	0.0600	0.1115	771.76	1575.86	0.0503	0.1030
12-15	1186.59	3128.91	0.0605	0.1390	837.13	5600.91	0.0867	0.2428
16-19	1182.61	6534.75	0.0667	0.2192	630.50	8251.99	0.0370	0.3158
20-32	1135.41	5010.08	0.0571	0.1444	699.53	-8724.99	0.0596	-0.7191
All cohorts	890.44	2861.75	0.0526	0.1419	548.12	1854.02	0.0521	0.1788

Estimates are based on regression equations for each cohort in which time worked and within cohort experience were also included as independent variables.

TABLE 5

Comparisons of the Returns to Education of Indiana Black Men and White Men by Experience Cohort

Cohort (years)	Marginal Value of A Year of Schooling (Black/White)[1]	Percent Gain in Earnings: 7 years of High School[2] Black Men	7 years of High School[2] White Men	4 years of College[3] Black Men	4 years of College[3] White Men
1-3	1.17	49.84	27.74	76.54	31.72
4-7	1.61	49.78	27.23	86.40	34.29
8-11	0.68	23.27	27.12	36.64	42.12
12-15	0.71	41.46	27.38	80.34	46.37
16-19	0.53	15.95	30.58	59.01	62.58
20-32	0.62	26.92	25.67	-38.16	45.20
All	0.66	23.17	23.42	47.29	42.23

1. Calculated from data in Table 4 as the ratio of the regression coefficient of grade for white men to that of black men (e.g., 796.86/681.54 = 1.17).
2. Calculated from data in Table 4 as $e^{4 \text{ (coefficient for grade)}} - 1$. e.g., for black men with 1-3 years experience: $e^{4(0.1011)} - 1 = .4984$.
3. Calculated from data in Table 4 as: $e^{4 \text{ (coefficient for grade)} + \text{(coefficient for BA)}} - 1$. e.g., for black men with 1-3 years experience: $e^{4(.1011 + .1640)} - 1 = .7654$.

Welsh [6, p. 47] has also observed that "the labor market operates so that a major part of a person's career profile is determined at the time he enters the market." Our regression results indicate that, aside from the fact that more recent entrants faced less discrimination, when an individual came into the labor market is much more relevant for black men than for white men. A white man entering the labor market any time after World War II could expect to experience a percentage gain to a high school education of between 25 and 30 percent. In contrast, a black man entering the labor force in the period 1961 to 1964 with a high school education increased his earnings because of that education by about 16 percent. Another black man with the same high school education but entering the labor market in the period 1965 to 1968 would have gained 41 percent more earnings.

The percentage gains in earnings from a college degree are also much more sensitive to when a black man entered the labor market than when a white man entered. Black men who entered the labor market in either the early 1960s or the early 1970s gained one-half to two-thirds as much from a college degree as did those black men who entered the labor market at the middle or end of each of these decades.

The entry conditions in the labor market for black men are all the more important given our findings on the experience profile for white and black men. Although white men gain more from experience than do black men, the difference is relatively small. In fact, the equations relating earnings and

TABLE 6

Differences in LN (Earnings) of Black and White Men Resulting From Differences in Group Characteristics: $(LnE_{BM} - LnE_{WM})_{ND}$

Characteristic	Mean Differ. (Black-White)	Coeff. from Black Men Equation	Percent Differ. in Ern.	Coeff. from White Men Equation	Percent Differ. in Ern.
PERSONAL					
Grade	-0.83	-0.0621	0.0515	0.0287	-0.0238
Grade squared	-22.29	0.0044	-0.0981	0.0009	-0.0201
Experience	0.85	0.0415	0.0353	0.0431	0.0366
Experience sq.	45.99	-0.0007	-0.0322	-0.0008	-0.0368
Time worked	-197.26	0.0005	-0.0986	0.0005	-0.0986
Disability	0.004	-0.1747	-0.0007	-0.1744	-0.0007
Migrant	-0.0003	-0.1430	-0.0004	-0.0259	-0.0001
Married	-0.1570	0.2728	-0.0433	0.3079	-0.0483
Divorced	0.040	0.0833	0.0033	0.2188	0.0088
Separated	0.032	0.2363	0.0076	0.2297	0.0074
Widowed	0.100	0.1122	0.0010	0.1867	0.0019
TOTAL PERSONAL			-0.1746		-0.1737
OCCUPATION					
Professional	-0.045	0.3488	-0.0331	0.4747	-0.0451
Technicians	-0.0370	0.2011	-0.0074	0.3283	-0.0121
Precision	-0.070	0.4145	-0.0290	0.4647	-0.0325
Laborers	0.131	0.2637	0.0345	0.3167	0.0415
TOTAL OCCUPATION			-0.0350		-0.0482
INDUSTRY					
Durables	0.1030	0.4701	0.0134	0.2963	0.0305
Nondurables	-0.0018	0.2636	-0.0047	0.2037	-0.0037
Transportation	0.006	0.3277	0.0020	0.2358	0.0014
Wholesale	-0.0250	0.0433	-0.0011	0.1262	-0.0032
Finance	-0.004	0.1542	-0.0006	0.1183	-0.0005
Services	0.001	-0.0883	-0.0001	-0.0959	-0.0006
Professional	0.014	-0.0793	-0.0011	-0.1254	-0.0023
Administrative	0.021	0.0644	0.0014	0.0842	0.0041
Government	0.033	0.1085	0.0036	0.1335	0.0044
TOTAL INDUSTRY			+.0128		+0.0301
TOTAL ALL CHARACTERISTICS			-0.1968		-0.1918

experience for each group are very similar (Tables 2 and 3). Thus black men and white men who enter the labor market with equal starting salaries will experience nearly identical earnings paths over their life times.

Finally, our results allow us to calculate just how much of the earnings differential between Indiana black and white men potentially results from discrimination. The approach we use to assess discrimination is based on the

Becker discrimination coefficient [1, p.9]. In natural log form, that coefficient (d) is given as:

$$1n(D+1) = (1nE_{BM} - 1nE_{WM})_o - (1nE_{BM} - 1nE_{WM})_{ND}$$

where E_{BM} is the earnings of black males and E_{WM} is the earnings of white males. The first term on the right hand side of this equation is the observed (o) difference in earnings of black men and white men measured in logs. On the average, for black men, $1nE_{BM}$ is equal to 9.27 and for white men $1nE_{WM}$ is equal to 9.44. The difference of 0.17 represents the earnings disadvantage for black men. It simply reflects the difference between the average earnings (geometric mean) of black men of $14,633.40 and white men of $16,664.88. The second bracketed term measures the earnings differential that would exist if there were no discrimination and all workers were paid on the basis of their productivity related characteristics. If the difference between the two bracketed terms is zero, there is no discrimination. In such a case all of the actual difference in earnings is a difference based on differences in productivity related characteristics. If the difference in the terms is negative, however, it indicates that the existing shortfall in the observed earnings of black men is greater than the shortfall that would prevail if the characteristics of individuals in each group entirely determined relative earnings. In other words, with a negative observed differential of about 18.5 percent, discrimination would exist if the differential based on characteristics of the two groups led, for example, to a 15 percent negative differential.

An estimate of the earnings differential that would exist in the absence of discrimination is found by using the wage equations in Table A3 to evaluate how much differences in each productivity related characteristic contribute to the 18.5 percent observed differential. As an example, the average time worked of whites exceeds that of blacks by 197.26 hours. Using the regression coefficient from the black earnings equation of 0.0005 to evaluate the impact of this difference indicates that 0.0986 of the 0.17 differential in the log of earnings is accounted for by the variable time worked (see Table 6).

Regardless of whether we use the earnings equation of white men or that of black men, differences in characteristics of black and white men account for all of the difference in relative earnings of black and white men in Indiana. Personal characteristics alone explain most of the earnings differential. We find that if black men had had the same hours of work as did white men and if black men had had the same educational level as white men, they would have had earnings that were about 95 percent those of white men. Indeed, more than half of the gap between the earnings of black and white men would be closed if black men had worked the same hours as did white men. Another one quarter of that gap would be closed if levels of educational attainment where the same as those of white men. Part of the remaining gap is also accounted for by the lower percentage of black men who are married and the greater concentration of black men in relatively low paying occupations. Characteristics such as experience, disability and migration contribute only negligibly to the earnings differential.

Our findings are at odds on two counts with those of Jencks et. al. [2] and Smith and Welsh [5]. First, these studies indicate that a significant part of the black-white wage differential cannot be explained by differences in the characteristics of the two groups. Second, these studies also indicate that a large portion of the earnings gap between black and white men results from differences in the returns to various productivity related characteristics. We find neither of these results. After controlling for differences in the characteristics of the two groups, we find that there is no residual that might suggest the presence of labor market discrimination. Nor do our results reveal differences in the returns to various productivity related characteristics. There are some differences in the coefficients of the equations for black men and for white men given in Tables 2 and 3. Nevertheless, evaluation of differences in productivity related characteristics by either wage equation in Table 3 yields almost identical results. In fact, the contribution of the education and time worked to the earnings differential is 0.1452 from the equation based on black men and 0.1425 from the equation based on white men.

The findings that the wage equations for black men and white men are very similar and that virtually all of the black-white wage differential is accounted for by differences in the characteristics of black and white men tempts one to conclude that labor market discrimination is not the cause of black-white wage differentials in Indiana. Yet as noted earlier, the human capital approach to measuring discrimination cannot address discrimination embodied in the characteristics themselves. One-half of the differential in earnings in this study is accounted for by time worked. Black men, on the average work 197 fewer hours per annum than do white men and thereby have relative earnings that are about 10 percent lower. Are the fewer hours black men work indicative of discrimination or do they simply reflect the impact of other characteristics on the ability of black men to obtain more full time employment? Unfortunately, our data do not allow us to answer this question.

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