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Author(s): James J. Heckman, Thomas M. Lyons, Petra E. Todd

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# Understanding Black–White Wage Differentials, 1960–1990

By JAMES J. HECKMAN, THOMAS M. LYONS, AND PETRA E. TODD\*

Relative improvements in years of schooling and quality of schooling are widely acknowledged to be major factors promoting the advance of black economic status over the past 50 years. The principal source of evidence for this belief is research by James Smith and Finis Welch (1986, 1989) showing that replacement of older cohorts by newer cohorts drives improvements in measured relative aggregate wages, combined with evidence that schooling and schooling quality improved more for blacks than for whites over the first half of the 20th century. A major question in the literature is whether these secular factors explain most of the black economic advance. A leading rival explanation assigns significant roles to social activism (as embodied in the 1964 Civil Rights Act and related legislation) and tight labor markets as important contributory factors, especially in the decade of the 1960's when there were large relative wage gains. Improvements across all cohorts in certain periods (1960–1970) suggest a role for activism and policy (see the summary of this debate in John Donohue and Heckman [1991]).

This paper summarizes results obtained from a larger project that examines the robustness of both qualitative and quantitative conclusions on the sources of black economic progress to alternative definitions of samples, to alternative specifications of estimating equations, and to controlling for selective withdrawal of low-

wage persons from the labor force. For the sake of brevity, we focus most of our attention here on black male progress in the crucial period of 1960–1970, when progress was rapid, social activism was intense, and the economy was booming. However, we also update some results based on wage decompositions using 1960–1990 decennial Census data.

We make three main points:

- (i) *Choice of sample matters.* Different analysts use different sample-inclusion restrictions to define their samples. These sample-selection rules produce different estimates of the size and relative importance of change due to improvements in successive cohorts and changes that occur for all cohorts at a point in time. Secular shifts are more likely caused by premarket factors like schooling and schooling quality. Changes that occur for all cohorts at a point in time are more closely linked to tight labor markets and social activism. Vitality, we find that alternative sampling rules affect the weight placed on secular factors, social activism, and tight labor markets.
- (ii) *Specification of estimating equations also matters.* Alternative ways of introducing quality measures into earnings functions critically affect the estimated impacts of quality on the black–white wage gap. For example, allowing for nonlinearity in the rate of return to education in terms of years of schooling, following the evidence in Heckman et al. (1996), greatly affects estimated schooling-quality impacts. There are also multiple channels through which quality can affect earnings, and focusing only on one channel can distort the view of quality's total effect. The literature has mainly emphasized the effect of quality operating on rates of return to schooling. In our reexamination of the evidence, we find that the support for a direct effect of quality in elevating black–white relative re-

\* Heckman: Department of Economics, University of Chicago, 1126 E. 59th Street, Chicago, IL 60637, and American Bar Foundation; Lyons: Northwestern University Medical School, 400 E. Ontario, Chicago, IL 60611. Todd: Department of Economics, University of Pennsylvania, 3718 Locust Walk, Philadelphia, PA 19104. This research was supported by the American Bar Foundation. Versions of the paper that is the source for this paper have been presented at a 1997 APPAM meeting, a 1998 Midwest Economics Association Meeting, and at the University of Wisconsin, Rutgers University, Lehigh University, Johns Hopkins University, and the University of Georgia (June–November 1999). We thank Dan Black and John Ham for comments on this paper.

turns to education is fragile. Constraining quality effects to be equal across cohorts and across time is essential to estimating precisely determined quality effects on rates of return to black education in representative samples. Relaxing these constraints produces very different estimates of quality's impact on earnings. We find more robust evidence, however, for an indirect effect of quality on earnings operating as a determinant of educational attainment levels.

- (iii) *Selective withdrawal from the labor force also matters.* Both black and white labor-force participation rates have declined since 1960, with the decline for blacks being much greater. In most studies of racial wage differences, low-wage dropouts are excluded. Black economic progress measured in terms of mean or median earnings of workers is much less after making an adjustment for labor-force selection. Adjusting for selection also affects the interpretation of decompositions of the sources of relative progress.

### I. Samples Matter

Previous studies in the literature based on decennial Census data differ in the definitions of the samples used to study black-white wage convergence. Alternative sampling rules have important consequences for the phenomenon to be explained. Here, we compare results obtained using five samples: (a) one used in Smith and Welch (1989) to produce a descriptive overview, henceforth SW; (b) one used in David Card and Alan Krueger (1992), henceforth CK(1); (c) a subset of CK(1) used in Card and Krueger's regression analysis of quality effects, henceforth CK(2); (d) our own sample as reported in Heckman et al. (1999b), henceforth HLT(1); and (e) a subsample of HLT(1) used in a regression analysis of quality effects, HLT(2).<sup>1</sup> The HLT samples impose fewer exclusion restrictions and are used to examine the

consequences of various exclusion restrictions. All studies exclude imputed data. SW requires that all persons work at least 27 weeks in a year for inclusion in the sample. CK and HLT samples require that persons work at least one week. Card and Krueger use the most stringent wage intervals for inclusion (weekly wages \$35–\$2,501 in 1979 dollars); for SW the corresponding interval is \$20–\$1,875.<sup>2</sup> HLT samples impose no restrictions. The CK samples' lower wage bounds eliminate 13.3 percent of blacks (15.7 percent of whites) in 1960. For 1970 and 1980, the corresponding percentages are 6.2 (9.1) and 4.7 (5.7), respectively. The SW lower wage bounds are less stringent; for 1960, 1970, and 1980 they eliminate 6.5 (2.2), 3.9 (6.2), and 4.5 (5.2) percent, respectively. However, the 27-weeks-worked criterion eliminates 22.7 (25.2), 22.7 (26.1), and 35.4 (29.5) percent in 1960, 1970, and 1980, respectively. The CK(2) sample is restricted to people born in the South and living in nine northern metropolitan areas. In 1960, this subset includes about 25 percent of U.S. blacks but only 5 percent of whites. The HLT(2) sample is restricted to persons born in states with a substantial black population.<sup>3</sup> In 1960, this subsample includes 99 percent of blacks and 82 percent of whites.

The effects of applying these criteria are displayed in Table 1, which shows the components of change in the average log-wage gap attributable to continuing cohorts (within improvements) or to different weighting of cohorts and new entrants (between improvements). For the 1980–1990 wage changes, the SW and CK samples disagree in magnitude and sign, with the latter producing a decline in the black-white

<sup>2</sup> Another difference is that Smith and Welch's (1989) wage measure includes business income (although self-employed workers not in agriculture are excluded), while Card and Krueger's (1992) wage measure excludes business income. Our wage measure includes business income and self-employed workers. Alternative treatments of business income and self-employment income lead to minor differences among samples.

<sup>3</sup> The restriction to 29 states of birth is imposed so that state-of-birth-specific rates of return to education can be reliably estimated for the black sample. States not included are Alaska, Arizona, Colorado, Hawaii, Idaho, Iowa, Minnesota, Montana, Nebraska, Nevada, New Hampshire, New Mexico, North Dakota, Oregon, Rhode Island, South Dakota, Utah, Vermont, Washington, Wisconsin, and Wyoming.

<sup>1</sup> We have replicated the samples as closely as possible based on the descriptions of sampling rules reported in these papers. Both SW and CK use decennial Census data through 1980. We apply the same sampling rules to extend the analysis to 1990 data.

TABLE 1—DECOMPOSITION OF AVERAGE LOG-WAGE GAP UNDER ALTERNATIVE SAMPLING RULES

Sample	1960–1970	1970–1980	1980–1990
<b>SW</b>			
Δ Log-wage gap	13.1	12.3	2.7
Within-cohort component	4.96	3.72	–1.5
Between-cohort component	8.14	8.57	3.65
<b>CK(1), 48 states</b>			
Δ Log-wage gap	10.3	8.49	–1.4
Within-cohort component	0.27	1.16	–5.5
Between-cohort component	9.99	7.33	4.13
<b>CK(2), S–N migrants</b>			
Δ Log-wage gap	5.11	4.03	–0.25
Within-cohort component	–2.0	–3.5	–6.3
Between-cohort component	7.12	7.53	6.09
<b>HLT(1), 48 states</b>			
Δ Log-wage gap	14.8	8.77	2.43
Within-cohort component	3.70	2.06	–1.6
Between-cohort component	11.1	6.71	4.05
<b>HLT(2), 29-states</b>			
Δ Log-wage gap	14.8	9.05	1.52
Within-cohort component	3.58	2.15	–2.6
Between-cohort component	11.3	6.90	4.08

*Notes:* The table reports the change in the average log-wage gap  $\times 100$  ( $\Delta \text{Log-wage gap}$ ) for each of several sampling rules defined in the text. The within-cohort component is based on continuing cohorts with base-year weights; the between-cohort component is based on replacement cohorts and changing cohort weights. CK(2) is a subsample of CK(1) containing only South–North migrants. HLT(2) is a subsample of HLT(1), containing only persons born in 29 states with substantial black populations.

wage gap. Over the period 1960–1980, wage improvement in the CK samples is less than in the SW samples. The CK(1) sample attributes much less of the overall wage change to within-cohort change and more to between-cohort change than do the SW and HLT samples. CK(2) is anomalous in showing a decline in the crucial “within” effect during 1960–1970. Migrants born in the South living in the North are a selective sample. The black migrants earn on average 20–30 percent more than nonmigrants; for whites the premium is 10 percent. The black migrant samples become increasingly less selective over the 1960–1980 period and become more selective over the period 1980–1990, producing measured cohort improvement as an artifact of selection. In addition, because the CK samples’ lower wage bounds eliminate a larger fraction of low-wage blacks, the sample atten-

uates the effect of labor-force withdrawal in producing wage growth in the crucial 1960–1970 period. It also dampens the effect of the tight labor market of that period which raised relative wages of unskilled minority workers. In the period 1980–1990, the bounds become less stringent and produce a much greater (in absolute value and in relative terms) within-cohort effect compared to that found under other sampling rules.

An important feature of Table 1 that is robust across all samples is the negative “within-cohort” effect in the period 1980–1990. It arises from the adverse change in the labor market for low-skill workers and the fact that blacks are overrepresented among the unskilled. Another robust finding is the decline in the “between-cohort” effect, usually identified with the replacement of low-quality cohorts by high-quality cohorts. One interpretation of this phenomenon is that by 1990 secular “quality” improvements in the overall black workforce were slowing down, so the retirement of cohorts most severely affected by the low schooling quality of the Jim Crow era ceased to be quantitatively important. At the same time, schooling quality of the youngest cohorts, with many members educated in inner-city schools, did not improve as rapidly as the schooling quality of the previous generation improved over its predecessors.

## II. Specification of Estimating Equations Matters

Using Census data, Smith and Welch (1989) estimate an earnings function of the following general form:

$$\ln y = \alpha + \beta S + \gamma Z + \varepsilon$$

where  $S$  is schooling,  $Z$  represents other factors (region of residence, work experience),  $\beta$  is a “rate of return” to schooling, and  $\varepsilon$  is a mean-zero error assumed to be orthogonal to  $(S, Z)$ . Smith and Welch (1989) establish that secular improvements in  $S$  and  $\beta$  for blacks relative to whites are major contributors to black economic progress. Smith (1984) and Smith and Welch (1986, 1989) demonstrate that improvements in  $\beta$  for blacks relative to whites are an especially

important source of black relative wage gains. They conjecture that relative increases in  $\beta$  over time are attributable mainly to relative improvements in black schooling quality, although schooling quality could also plausibly operate through  $\alpha$ ,  $S$ , or  $\gamma$ . (Heckman et al. [1996] present different economic models where quality operates through slopes and/or intercepts and demonstrate the substantial empirical consequences of alternative specifications for empirical estimates of schooling quality effects.)

Card and Krueger (1992) try to disentangle the effect of quality on  $\beta$  from that of labor-market demand influences. Their study extends the analysis of Smith and Welch (1989) by directly estimating the contribution of measured schooling quality (pupil-teacher ratios, term lengths, and teacher salaries) to relative increases in  $\beta$ . State-of-birth-specific  $\beta$  values are estimated using the CK(2) sample and then, in a second stage, regressed on state-level average measures of schooling quality. They claim that quality increases explain 50–80 percent of the relative increase in education returns. Our reexamination of this evidence under alternative sampling rules and functional-form assumptions shows that estimated quality effects are sensitive to variations in sampling rules and functional forms. Only when the sample is restricted to migrants [the CK(2) sample] or when  $\beta$  is constrained to be the same across cohorts and the  $\beta$ 's estimated from multiple Census cross-sections are combined in the second stage do we find a precisely determined positive effect of quality on black earnings. Also, if we allow quality to operate through model intercepts we generally obtain a *negative effect* of quality on black economic progress that offsets its positive effect through slopes.

Card and Krueger (1992) also provide estimates of the total reduced-form effect of quality on wages operating through slopes, intercepts, and schooling levels ( $\beta$ ,  $\alpha$ , and  $S$ ). The racial quality gap explains a significant portion of both the average log-wage gap and the gap in educational attainment (measured in terms of state-of-birth cohort means). However, when we extend their analysis to consider the effect of the quality gap on the average log-wage gap controlling for the racial education gap, the quality effects disappear in all samples. This finding suggests that quality effects on earnings

operate predominantly through their impact on schooling levels. The support for an effect of quality operating through rates of return to schooling (the channel emphasized in the literature) is less robust and more dependent on sample and functional form. By promoting access to schools and reducing the cost of schools, schooling-quality improvements may raise participation in schools without affecting the “Mincer” rate of return, which of course differs from the true rate of return (see Heckman et al., 1999a). The Smith-Welch conjecture that changes in relative quality explain rising relative rates of return to education to the exclusion of other factors, such as social activism and tight labor markets, has yet to be rigorously established.

### III. Labor-Force Selection Matters

Labor-force participation began to decline for black males both relatively and absolutely by 1960. By 1990, black labor-force withdrawal reached 23 percent (compared to 10 percent for whites). The white withdrawal rate is also increasing, but more gradually. The weekly mean earnings of employed blacks relative to employed whites for the economy at large shows a substantial improvement from 1940 to 1990; a similar improvement is found for median wages. However, black economic progress is much less when nonworkers are taken into account. Under the assumption that the low-wage workers are the ones dropping out, the median relative wage indicates stagnation since 1950.

Virtually all of the studies of black economic progress ignore dropouts and use samples of workers to measure wages. Two exceptions indicate that correcting for selective withdrawal is important. Richard Butler and James Heckman (1977) show that black economic wage growth during the period 1960–1977 is inflated by excluding low-wage blacks. By adjusting for selective withdrawal, Charles Brown (1984) reduces the post-1964 upward trend in black progress by roughly 50 percent. Accounting for dropouts greatly affects the measure of black economic progress, a point to which we return below.

We now present a regression accounting analysis that decomposes the change in the black-white wage ratio in two different Census years into the changes due to changing characteristics

and those due to changing returns to characteristics. We examine how results change with perturbations in the sample and with correction for labor-force selectivity. To maintain comparability with the literature, we use the decomposition method set forth in Smith and Welch (1989).

Let  $t$  be the current year and  $\tau$  a base year. Let  $\bar{z}_t^w, \bar{z}_t^b, \bar{z}_\tau^w, \bar{z}_\tau^b$  denote the mean vectors of black and white characteristics included in the earnings model and  $\gamma_t^w, \gamma_t^b, \gamma_\tau^w, \gamma_\tau^b$  denote the associated vectors of coefficients. The change in log black wages minus log white wages between time periods  $t$  and  $\tau$  is decomposed in the following way:  $[(\bar{z}_t^b \gamma_t^b - \bar{z}_t^w \gamma_t^w) - (\bar{z}_\tau^b \gamma_\tau^b - \bar{z}_\tau^w \gamma_\tau^w)] = [(\bar{z}_t^b - \bar{z}_\tau^b) - (\bar{z}_t^w - \bar{z}_\tau^w)] \gamma_\tau^w$  (main effect) +  $(\bar{z}_t^b - \bar{z}_\tau^b)(\gamma_\tau^b - \gamma_\tau^w)$  (race interaction) +  $(\bar{z}_t^b - \bar{z}_\tau^b)(\gamma_t^w - \gamma_\tau^w)$  (year interaction) +  $\bar{z}_t^b[(\gamma_t^b - \gamma_t^w) - (\gamma_\tau^b - \gamma_\tau^w)]$  (race-year interaction).

The decomposition can be performed separately for each of the variables included in the earnings model. The first two terms measure the contribution of changing mean characteristics, valued at base-year returns. The main effect is the change in the wage gap predicted by the change in the characteristics of black workers from year  $\tau$  to  $t$ , valued at base-year white parameter values. The race interaction measures the additional change in the wage gap predicted by the change in black characteristics, taking into account that black and white base-year returns differ. For example, if white returns to education in the base year are higher than black returns, then an increase in mean levels of education overall leads to an increase in the wage gap.

The second two terms measure the contribution of changing returns. The year interaction measures the effect of a change in the wage gap due to an increase in the returns to a characteristic, valued at white mean characteristic levels. If blacks have, on average, less of a characteristic for which the return increases, the wage gap increases. The last component, the race-year interaction effect, measures the change in the wage gap that occurs because black-white relative returns to characteristics are changing over time. This term is most often identified with across-cohort changes in the prices of characteristics, possibly arising from quality improvements or from tight labor markets and social activism that favor black workers.

TABLE 2—TOTAL CONTRIBUTION OF EDUCATION TO CHANGE IN THE RELATIVE WAGE GAP UNDER ALTERNATIVE SAMPLES, HLT MODEL, 1960–1970

Age	Effect	CK(1)	CK(2)	SW	HLT(2)	LFP-corrected <sup>a</sup>
31–40	Main	4.9	4.0	5.0	5.9	4.5
	Race	-3.6	-4.6	-3.9	-4.8	-4.7
	Year	-3.3	-3.0	-4.1	-4.7	-5.2
	Race-Year	7.8	8.4	5.8	13.1	5.7
	Total	5.7	4.8	2.8	9.5	0.4
	Total	8.6	6.5	11.5	12.8	12.8
	$\Delta$ LWG <sup>b</sup>					
	Educ. <sup>c</sup>	66.7	73.6	24.2	74.5	2.8
41–50	Main	3.7	2.8	3.7	4.6	3.4
	Race	-6.0	-3.5	-3.6	-6.7	-9.1
	Year	-7.5	10.4	-8.5	-8.0	-6.8
	Race-Year	8.4	-8.6	5.4	13.3	14.0
	Total	-1.3	1.2	-3	3.1	1.5
	Total	5.6	0.0	10.2	10.1	10.1
	$\Delta$ LWG <sup>b</sup>					
	Educ. <sup>c</sup>	-23.5	-8661	-29.6	31.3	14.5

Note: “ $\Delta$  log wage gap” denotes the change in the log wage gap.

<sup>a</sup> HLT(2), including in model a fifth-order polynomial in the probability of employment to control for selection.

<sup>b</sup> Total  $\Delta$  log wage gap.

<sup>c</sup> Education contribution (percent).

For the sake of brevity, we report in Table 2 decomposition results only for two age groups for the crucial period 1960–1970. We focus only on the contribution of education, which plays a central role in the earlier literature. Results for other variables, time periods, and age groups are reported in our companion paper (Heckman et al., 1999b). Table 2 also compares results obtained with and without correcting for sample selectivity for the HLT(2) sample.<sup>4</sup>

<sup>4</sup> The HLT model includes experience and its square, an SMSA indicator, state-of-birth and region-of-residence intercepts (nine Census regions), and state-of-birth and region-of-residence interacted with years of education. The latter interactions allow for local labor-market effects on the return to education (see Heckman et al., 1996). To control for sample selection in this model, we also include an approximation to the selection-bias function. It is approximated by a fifth-order polynomial in the probability of participating in the labor force (see Heckman, 1980). The participation equation is estimated by a probit model. It includes the variables in the wage equation, as well as number of persons under age 18 in the household, unearned income (when available), a home-ownership indicator, the interval of value of owned home, and unemployment- and welfare-participation rates in the state of residence.

The overall change in the log wage gap is very different across samples. Nonetheless, across all cohorts and in all samples except the CK(2) sample, there is a positive main effect of education and a positive race-year effect that is at least as large in magnitude as the main effect. The race-year effect emphasized by Smith and Welch (1986, 1989) as a major factor in explaining wage convergence is robust to most sample definitions and to correction for sample selection. The total contribution of education to explaining the change in the wage gap is very high for males aged 31–40 for all samples except SW, for which it is a more modest 24 percent. Correcting for selection in the HLT samples substantially reduces the total contribution of education for the youngest age group. A considerable part of the measured contribution of education to eliminating the wage gap in this period is due to the selective withdrawal of low-wage, unskilled blacks from the workforce.

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