

Dissertation Awards

---

2001

Labor Market Dropouts and the Racial Wage Gap:  
1940-90: Dissertation Summary

Amitabh Chandra  
*University of Kentucky*

---

# Labor Market Dropouts and the Racial Wage Gap: 1940–90

Amitabh Chandra

Writing almost a quarter century ago, Butler and Heckman (1977) cautioned social scientists to look beyond the dynamics of the racial wage gap for full-time workers, and to study the richer set of behaviors observed at the extensive margin of employment. They argued that as the employment rate for blacks declined—primarily because of expansions in the generosity of transfer programs—observed relative wages increased because of the selective withdrawal of the least-skilled blacks from the labor force. At the time, Butler and Heckman could not have anticipated the phenomenal increase in the returns to skill that would occur in the 1980s. Therefore, in addition to expanding transfer programs, it is also possible that falling skill prices for the least skilled have reinforced the incentives to withdraw from the labor force. For both reasons, a preoccupation with the wages of full-time workers may cause social scientists to overstate the success of Title VII legislation or to spuriously conclude that discrimination against blacks has declined.

In one of the first tests of this thesis, Brown (1984) adjusted aggregate Current Population Survey (CPS) data to obtain estimates of the racial wage gap that reflected non-employment by race. He found that even though the published earnings ratios converged from 0.59 in 1953 to 0.71 in 1978, the corrected ratios moved from 0.57 to only 0.61 over the same period. Under the identifying restriction that nonworkers earn below what the median agent earns, Brown's results attribute two-thirds of the observed convergence to the selective withdrawal of blacks from the labor force (the observed gain of 20 percent is only 7 percent when the non-employed are accounted for). Despite the magnitude of Brown's findings, the United States Commission on Civil Rights (1986) remained extremely cautious of accepting the relevance of the selective-withdrawal hypothesis. In the same spirit, much of the subsequent literature on the racial wage gap has continued to analyze the convergence of the wage gap for workers, or even more restrictively, for full-time workers. Most recently, Juhn (1997) found that the selective

withdrawal of blacks reduces the observed convergence by one-third over 1968–1988, whereas Western and Pettit (1999) attributed one-half of the observed convergence to this hypothesis for the 1982–1996 period.

This dissertation uses data from the U.S. decennial censuses from 1940–1990 and summarizes the results of a larger inquiry into the empirical content of the selective-withdrawal hypothesis (see Chandra 2000 for further details). The use of 50 years of data allows me to subsume all the time periods examined by previous studies, hence allowing me to compare my estimates to those obtained in the literature. As part of my analysis, I demonstrate the importance of not relying on inferences made on the racial wage gap from CPS data. The CPS has the advantage of producing a fairly consistent yearly time series from 1964 onwards; however, it does not sample members of the armed forces and contains no information on the incarcerated population. These omissions bias empirical estimates of the racial wage gap. Researchers overstate the racial wage gap because of the significant role of employment in the armed forces compressing the racial wage gap. The military sample is typically excluded from most analyses of labor markets because the CPS does not collect earnings data on this sample. Ignoring the incarcerated sample overstates the convergence over time because it ignores the role of increasing criminal activity as a response to changing wage structure. I restrict my analysis to men because the extent of non-employment among black women has fallen over time, in sharp contrast to the increase for black men.<sup>1</sup> Furthermore, I restrict my analysis to prime-age men (ages 25–55) so that my results are not contaminated by the increasing prevalence of early retirement amongst men. In addition, a substantial fraction of younger cohorts in the 20–25 age group are enrolled in college. To avoid incorrectly classifying these youths as being out of the labor force, I exclude them from my analysis.<sup>2</sup>

## WHAT ARE THE FACTS?

I begin with U.S. census data for men ages 25–55. Not conditioning on any variables, these data indicate that in 1940, black men's weekly wages were 48.4 percent of white men's wages. By 1990, that value had increased to 75 percent, an improvement of 60 percent over five decades, although the improvement from 1980 to 1990 has been stationary. Simultaneously, the racial difference in the employment rates has increased over time. There was also a phenomenal convergence in black/white earnings over the 1940s. This convergence is particularly remarkable because it precedes the passage of *Brown vs. Board of Education* and the major civil rights initiatives of the 1960s. Running parallel to these trends in relative weekly earnings is the corresponding decline in the employment rates of black men relative to whites. Together, these two series provide preliminary evidence in favor of the selective-withdrawal hypothesis. Whereas observed wage ratios have improved, the data also indicate that a growing fraction of men are not working.

I examined the current labor force employment status for prime-age men and noted a decline in black self-employment over time.<sup>3</sup> Also noted was the growing share of black men in the armed forces as well the fraction that are in the "not in the labor force" (NILF) category. The institutionalized fraction (which includes those who are incarcerated) has been growing over time. I interacted the employment status variables with broad measures of education attainment for 1940 and 1990 by race. From the results, it is possible to see that a substantial portion of the less skilled (those with less than a high school degree) are also unemployed, NILF, or incarcerated. Furthermore, this trend has increased over time. In 1940, a little less than 7 percent of blacks ages 25–55 who were high school dropouts were NILF or institutionalized. By 1990, this number had grown to almost 35 percent, providing direct evidence in favor of the Butler-Heckman hypothesis: the least-skilled members of society are also the ones who are the most likely to be not working.

Confronted with these facts I ask the following questions in this dissertation:

1. How much of the convergence in wages may be explained by the selective withdrawal of lesser skilled black males from the labor force? Furthermore, given the thoroughly documented increase in "within-skill" inequality and its applications to the racial wage gap, what is the empirical content of the selective-withdrawal

hypothesis for more narrowly defined "skill" groups?

2. Does the selective-withdrawal hypothesis also hold for a within-cohort analysis? A within-cohort analysis has the advantage of controlling for unobserved factors such as differences in the quality of schools attended by blacks and whites and allows for observing behavior over the life cycle. These are factors that Chay and Honore (1998) argued are of importance because across-cohort analysis may be contaminated by across-cohort vintage effects in participation.
3. Are lower-skilled workers withdrawing from the labor force because of increasing reservation wages (caused by expanding transfer programs or increasing informal market opportunities) or because of falling skill prices? The identification of the actual cause of the increase in non-employment has important policy implications and is therefore of interest in its own right. Increases in transfer programs or the returns to nonmarket activities operate by raising an agent's reservation wage; however, falling skill price affects the probability of non-employment by affecting an agent's expected offer wage. If young men in the 1980s and 1990s are not working because of the latter hypothesis, then it suggests that policies which raise the price of skill (such as training programs, employment subsidies, or the Earned Income Tax Credit) ought to be the appropriate intervention.
4. Does the selective-withdrawal hypothesis also provide an explanation for the slowdown in racial wage convergence for the most-skilled workers? If the lowest-skilled blacks are the least likely to participate, then observed convergence ought to be greatest for lower-skilled blacks, whereas given the consistently high participation rates for college graduates, the slowdown in their wage convergence may not be surprising if actual wages have remained relatively constant since the 1970s.

## ESTIMATES OF THE WAGE GAP ACCOUNTING FOR NON-EMPLOYMENT

I used three alternative methods to predict the mean of the unobserved distribution of offer wages. For each year of data I report the observed average weekly earnings for whites and blacks (Table 1).<sup>4</sup> Also shown are the results from the estimator that reproduces the approach of Brown (1984), which

**Table 1 Estimates of the Racial Wage Gap Accounting for Nonemployment, Males Ages 25–55**

Year	Estimator	Whites	Blacks	Ratio
1940	Observed	\$308	\$149	0.484
	Brown	252	109	0.433
	Matching-cell min.	275	129	0.469
	Matching-cell mean	307	148	0.482
1950	Observed	401	251	0.626
	Brown	355	213	0.600
	Matching-cell min.	360	221	0.614
	Matching-cell mean	400	250	0.625
1960	Observed	560	346	0.618
	Brown	505	290	0.574
	Matching-cell min.	527	310	0.588
	Matching-cell mean	558	344	0.616
1970	Observed	712	491	0.690
	Brown	659	428	0.649
	Matching-cell min.	672	442	0.658
	Matching-cell mean	712	487	0.684
1980	Observed	769	582	0.757
	Brown	699	450	0.644
	Matching-cell min.	726	483	0.665
	Matching-cell mean	766	572	0.747
1990	Observed	799	602	0.753
	Brown	684	430	0.629
	Matching-cell min.	754	500	0.663
	Matching-cell mean	794	585	0.737

SOURCE: Author's tabulations from U.S. census PUMS data. The Brown estimator refers to Brown's (1984) assumption that all nonworkers are drawn from below the median of the unconditional offer wage distribution. The cell minimum estimator assigns the minimum value of observed earnings in each (age H schooling) group to all nonworkers in that cell, and the cell mean matching estimator assigns the cell mean to all nonworkers. All dollar figures have been deflated to 1997 dollars using the Implicit GDP Price deflator and the data are weighted using person-weights.

generates the maximum possible value for the racial wage gap because it makes the identifying assumption that nonworkers are drawn from below the median of the offer wage distribution. According to this estimator, even though the observed convergence in the average ratio from 1950–1990 was 13 percentage points, the “true” convergence was only approximately 3 percentage points. As a validity check, the results for 1950–1980 provide estimates that are found to be generally consistent with Brown's original analysis. The “matching-cell minimum” estimator is motivated by Manski (1995); it proceeds by saturating the data by seven schooling groups and six age groups and then matching all nonworkers in a given (age × education) cell to the lowest earner in that cell.<sup>5</sup> Finally, the more traditional matching estimator of Juhn (1997) assigns the mean cell wage to all nonworkers in that cell. The power of matching estimators is that they do not impose an arbitrary functional form on the data and their estimates are readily interpretable. However, each must assume the logic of ignorable selection once age and schooling are (pointwise) conditioned on.

The results in Table 1 support the selective-withdrawal hypothesis. As expected, the Brown estimator results in the most substantial correction to the observed ratios. The matching estimator that relies on using cell minimums provides estimates that are between those from the Brown estimator and those from the cell mean estimator. Regardless of the estimator chosen to “correct” for non-employment, it is evident that during the 1960s black males made substantial gains relative to their white counterparts. This analysis is therefore consistent with the conclusion that the civil rights legislation played an important role in improving the labor market outcomes of black men. More generally however, the results should caution social scientists who focus only on observed wages about the importance of studying the joint determination of wages and employment.

#### ESTIMATES FROM CONTROL FUNCTION ESTIMATION

The econometric model advocated in this dissertation here utilizes the method of “index sufficiency” developed by Heckman. The power of these models is that the role of unobservables is explicitly formalized in a rationalizable economic model. In order to minimize the possibility that my results are being generated by the choice of model, I estimate a variety of models for each year of data and for blacks and whites separately.

- Model 1: The traditional parametric model. This model uses a traditional Mincerian relationship between skill price and its determinants. In this model, the log of weekly wages is modeled as a quadratic function of age and a linear term in schooling. An exclusion restriction is defined by including household nonlabor income in the participation equation.
- Model 2: The traditional parametric index-sufficient model with a flexible functional form. The flexible functional form allows for sheepskin effects in schooling and allows the age-earnings profile to vary by schooling level. Following the results of Murphy and Welch (1990) on the empirical structure of the age-earnings profile, the age-earnings profile is fitted using a quartic term in age. An exclusion restriction is defined by using the instruments used by Heckman, Lyons, and Todd (2000). These include the total number of persons under the age of 18 in the household, total unearned income, an indicator for home ownership, indicators for interval value of owned home, and the aggregate unemployment rate and welfare participation rate in the state of residence.
- Model 3: Model for estimation of the propensity of participating through a logit equation and then approximating the control function through an orthogonal polynomial expansion. The orthogonal polynomial expansion is obtained by using a Gram-Schmidt procedure to generate two basis vectors for the unknown control function.
- Model 4: Following Gallant, I approximate the unknown control function using a Fourier flexible form approximation of the control function. Gallant demonstrated that the Fourier approximation of an unknown function can be made arbitrarily precise over the range of the function by picking a suitable number of approximating terms.

There are two results worth noting. First, the Fourier flexible form wreaks havoc in the estimates. This may be caused by the extremely periodic nature of the Fourier flexible form, which might tend to “overfit” the data. Second, the semi-parametric estimator (Model 3) appears to work quite well for blacks, but for whites from 1940 to 1980, its results are counterintuitive. The most stable set of estimates come from the series expansion of the logit participation function.

The results from Models 3 and 4 are disappointing; both suggest that much more work is needed in order to

specify models that utilize the principle of index sufficiency. However, each offers support for the premise that both observable and unobservable characteristics affect the offer wages of workers. As such, they suggest that estimates from matching models may overstate the true offer wages of nonworkers. In the light of these results, it appears that the simple assumptions that characterize the median estimators are the most useful in studying the racial wage gap.

## CONCLUSIONS

In this dissertation I have studied the empirical content of the Butler-Heckman thesis. Using U.S. decennial census data from 1940 to 1990, I demonstrate that studies which have made inferences based on the CPS have excluded the institutionalized and incarcerated populations and thereby dramatically understated the extent of black nonemployment. By identifying the distribution of offer wages to blacks and whites as the distribution of interest in assessing black economic progress, I discuss the economic content of alternative identifying assumptions used to recover this latent distribution. Skill prices are estimated for nonworkers through a variety of nonparametric, semi-parametric, and parametric estimators, and the empirical content Butler-Heckman thesis is evaluated under each set of alternative estimates. I find that matching models and their variants are inappropriate for the study of the racial wage gap as they ignore the role of unobservable characteristics in determining wages and participation. Using flexible functional forms, I find support for the traditional index sufficiency characterization of selection bias. However, I also document the extreme sensitivity of control-function estimators to the estimation samples.

Contrary to previous studies that have found little or no support for the selective-withdrawal hypothesis, my estimates indicate that a significant portion of the convergence in wages from 1940 to 1990 can be explained by ignoring the selective withdrawal of nonparticipants (over 30 percent from the period 1950–1990 and over 40 percent of the 1970–1990 convergence). Similar results are obtained for an within-cohort analysis. Additionally, preliminary estimates find that in 1950–1970, increasing reservation wages were responsible for the withdrawal of young blacks from the labor force; however, falling skill prices explain much of the subsequent withdrawal.

I find that since 1980, black males are not working because of declining skill prices. For this period, I do not find evidence for the hypothesis that rising reservation wages are causing black males to withdraw

from the labor force. When this finding is combined with the results of Neal and Johnson (1996), the role of public policies that affect relative wages becomes clearer. Because less-skilled black men are not working because of low offer wages, such interventions should be made early in life and should be directed at closing the skill gap that exists between blacks and whites before they enter the labor market.

#### NOTES

This summary is of the author's doctoral dissertation for the University of Kentucky; his advisor was Mark C. Berger. Dr. Chandra is now at Dartmouth College.

1. Aggregate data separated by race are available from the Bureau of Labor Statistics from 1972 onwards. According to these data, black women aged 25–55 increased their employment to population ratios from 45.9 in 1972 to 61.2 percent in 1998. Over the same period, the corresponding numbers for white women went from 40.6 to 57.7. Based on these numbers, the selective-withdrawal hypothesis appears to be non-existent for women.
2. Other sample restrictions include the requirement that no respondent should have imputed values for race, age, education, weeks worked, or wage and salary earnings. In addition, the weekly wage distributions (by year and race) were trimmed at 1 percent and 99 percent to guard against outliers. This approach circumvents the problem of imposing a real dollar cut-off on the wage distributions.
3. In their analysis of the self-employment behavior of white and black men, Fairlie and Meyer (1999) included all men age 16–64. They restricted their sample to include nonagricultural workers who worked 40 or more weeks last year and 35 or more hours last week. I am examining workers age 25–55 with no restrictions on industry worked or on labor supply. In earlier years my classification of farmers as being self-employed raises estimates of the self-employment rate. This effect aside, in all years my estimates of the self-employment rate will be lower than those of Fairlie and Meyer because I am looking at their share of the population, and not of all workers.
4. An additional sample restriction is placed for this exercise. It may not be correct to treat weekly self-employment earnings or weekly earnings for those in the armed forces as providing a measure of skill prices for these two groups. The former includes a return to physical and financial capital, and the latter group receives a large fraction of their compensation in the form of in-kind compensation. Therefore, based on current employment status, both groups were dropped for this portion of the analysis.
5. My approach is similar to Juhn (1997), but not identical. Juhn treated all workers who worked 1–13 weeks as being nonworkers and imputed wages for this group as well as for respondents who worked zero weeks last year by

matching them to similar workers who worked 14–26 weeks last year.

#### REFERENCES

- Brown, Charles C. 1984. "Black-White Earnings Ratios since the Civil Rights Act of 1964: The Importance of Labor Market Dropouts." *Quarterly Journal of Economics* 95(1): 31–44.
- Butler, Richard, and James J. Heckman. 1977. "The Government's Impact on the Labor Market Status of Black Americans: A Critical Review." In *Equal Rights and Industrial Relations*, Leonard J. Hausman et al., eds. Madison, Wisconsin: Industrial Relations Research Association, pp. 235–281.
- Chandra, Amitabh. 2000. "Labor Market Dropouts and the Racial Wage Gap: 1940–1990." Unpublished Ph.D. dissertation, University of Kentucky.
- Chay, Kenneth Y., and Bo E. Honore. 1998. "Estimation of Semiparametric Censored Regression Models." *Journal of Human Resources* 33(1): 4–38.
- Fairlie, Robert W., and Bruce D. Meyer. 1999. "Trends in Self-Employment among White and Black Men, 1910–1990." Working paper no. 7182, National Bureau of Economic Research, Cambridge, Massachusetts.
- Heckman, James J., Tom Lyons, and Petra Todd. 2000. "Understanding Black-White Wage Differentials 1960–1990." *American Economic Review* 90(2): 344–49.
- Juhn, Chinhui. 1997. "Labor Market Dropouts, Selection Bias, and Trends in Black and White Wages." University of Houston, photocopy.
- Manski, Charles F. 1995. *Identification Problems in the Social Sciences*. Cambridge, Massachusetts: Harvard University Press.
- Murphy, Kevin M., and Finis Welch. 1990. "Empirical Age-Earnings Profiles." *Journal of Labor Economics* 8(2): 202–229.
- Neal, Derek, and William Johnson. 1996. "The Role of Pre-market Factors in Black-White Wage Differences." *Journal of Political Economy* 104(5): 869–895.
- United States Commission on Civil Rights. 1986. *The Economic Progress of Black Men in America*. Clearinghouse Publication 91, Washington, D.C.
- Western, Bruce, and Becky Pettit. 1999. "Black-White Earnings Inequality, Employment Rates, and Incarceration." Department of Sociology, Princeton University, photocopy.