The Structure of Disadvantage: Individual and Occupational Determinants of the Black-White Wage Gap

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This study is motivated by the idea that the racial gap in earnings is generated not only by individual differences but also by systematic variation in the occupational structure that attenuates or exacerbates the effects of race. Using data from the 1990 census and the Dictionary of Occupational Titles, a hierarchical linear modeling approach is employed that allows the simultaneous exploration of the mechanisms of income inequality operating both within and between occupations. Among private-sector employees, striking evidence shows that racial disparities increase in both absolute and percentage terms as one moves up the occupational earnings hierarchy. The association between average occupational earnings and within-occupation racial disadvantage reveals an overlooked source of racial earnings inequality which constrains the opportunities available to upwardly mobile black men in the private sector. This association cannot be explained by measured individual characteristics, or by the status, demographic composition, or skill demands of occupations. In the public sector, on the other hand, racial inequality in earnings is not systematically associated with average occupational earnings, and is instead more closely tied to individual human capital and occupational placement. The implications of these results are considered and directions for future research are suggested.

At the start of the 1990s, the economic status of black men was characterized by two opposing trends. On one hand, unprecedented numbers of black men were employed in high-level professional, managerial, and technical occupations (Farley 1996). Occupational segregation had declined appreciably over the preceding two decades, allowing black men to enter elite economic sectors previously dominated by whites (King 1992). Despite the gains made by blacks in overcoming occupational segregation, however, black men's earnings continued to fall far short of the earnings of their white peers at all levels of economic attainment (Harrison and Bennett 1995). Of greater concern, this gap in earnings had widened substantially over the 1980s (Bound and Freeman 1992), despite narrow-

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ing black-white gaps in both educational attainment and cognitive test scores (Jencks and Phillips 1998; Mare 1995).

The existing research on racial earnings inequality, broadly divided along two lines of inquiry, does little to reconcile these opposing trends. The occupational segregation approach emphasizes the importance of occupational placement and mobility in the earnings attainment process (Hout 1984; Stolzenberg 1975). This structural approach highlights the disproportionate representation of blacks in occupations of low status, skill, and earnings (Braddock and McPartland 1987; Parcel and Mueller 1983) with the implicit assumption that most of the racial wage gap can be overcome through progressive occupational redistribution (e.g., Tomoskovic-Devey 1993). And yet, as noted above, the black-white gap in earnings has increased over recent years despite advances in black occupational mobility. Clearly, there is more to the story than occupational placement alone.

The second line of inquiry analyzes earnings inequality across the labor market, demonstrating the persistence of wage disparities between blacks and whites net of extensive statistical controls (Bound and Freeman 1992; Cain 1986; England et al. 1988). Research in this tradition emphasizes global factors in earnings attainment rather than factors specific to occupations or labor markets. When labor market variables are brought into such analyses, they are typically introduced as a series of dummy variables representing broad occupational or industrial categories (e.g., Kilbourne, England, and Beron 1994), often ignoring the potential variation in racial earnings inequality at different points in the occupational structure.[1]

Although both these approaches offer useful insights into the factors underlying pervasive racial disparities, neither offers an integrated perspective on how labor market placement may mediate the emergence of racial wage disparities. Understanding how location in the occupational structure shapes the nature of disparities in earnings by race is fundamental to gaining an accurate picture of how earnings inequality develops. If certain positions in the labor market are associated with a more severe racial penalty than others (i.e., if there is an interaction between occupation and race), then treating these indicators separately overlooks a key element of racial stratification.

The importance of this relationship has been highlighted in the work of Kaufman (1983). Using data from the 1970 census, Kaufman demonstrates that black men face the greatest disadvantage in labor market divisions at the high end of the earnings hierarchy. The implication of this finding is that an equalization of the racial distribution across labor market divisions would move blacks from low-paying jobs with a small racial gap to higher-paying jobs with a larger racial gap. While improving the absolute earnings of blacks, this shift would increase black disadvantage relative to their white coworkers and widen levels of inequality across comparable employees. Given recent empirical trends toward greater *equality* in occupational attainment and greater *inequality* in earnings, the relationship between these processes merits further investigation.

The present study builds on the important insights offered by Kaufman's work. Using more contemporary data, we investigate the relationship between occupations and racial earnings inequality, explicitly investigating variation in the severity of the race penalty across the occupational hierarchy. We then go beyond this descriptive decomposition to provide an explanatory model of occupational earnings inequality, looking to the characteristics of occupations that may generate the observed patterns of racial disparities.

[1] One noteworthy exception is the dual labor market literature, which explicitly investigates variation in the racial earnings penalty across labor market sectors (Beck, Horan, and Tolbert 1978; Dickens and Lang 1985; Doeringer and Piore 1971; Sakamoto and Chen 1991). While providing valuable insights, the broad labor market distinctions employed in this literature leave a tremendous amount of internal heterogeneity unexplored. This line of research has received extensive criticism concerning the imprecision and inconsistency with which labor market distinctions are made and the oversimplification of its dualist construction (for extensive reviews, see Cain 1976; Hauser 1980; Hodson and Kaufman 1982).

A STRUCTURAL MODEL OF RACIAL EARNINGS INEQUALITY

The notion that rewards inhere in jobs or labor market positions rather than individual assets has been fundamental in motivating the sociological understanding of the earnings attainment process. In particular, the role of occupations in shaping employment experiences is well established (Grusky and Sørensen 1998; Kohn 1977; Sørensen 1996), and the direct association between occupations and earnings is demonstrably strong (Featherman and Hauser 1978; Sewell and Hauser 1975; Stolzenberg 1975). Although we do not preclude the possible influences of other labor market structures (e.g., industry, firm, job), we view the occupational structure as a central mediating mechanism in the process of earnings allocation and worker differentiation.

Building on this understanding, we develop a structural model of racial earnings inequality that distinguishes among the occupational mechanisms that may contribute to the black-white gap in earnings. Our model evaluates three potential sources of earnings inequality at the occupational level: between-occupation sources, within-occupation sources, and the interaction of the two.

The first of the three sources, *between-occupation earnings inequality*, develops through a process of occupational sorting whereby certain occupations enjoy higher wage rates than others. To the extent that blacks are disproportionately concentrated in lower paying occupations net of their own individual attributes, racial disparities in earnings inevitably emerge. We do not directly model the *process* of occupational sorting, but view the observed matches of individuals to occupations as the *outcome* of that process.

The second mechanism operates *within occupations*, whereby blacks and whites in the same occupation are offered different wage rates. Certain occupations may demonstrate more severe penalties to blacks than others, leading to variation in racial earnings inequality across the occupational structure.[2] To the extent that this variation is associated with observable characteristics of occupations, we can develop causal explanations regarding the differences between the earnings of black men and white men within the same occupation.

The third mechanism can be thought of as an *interaction of the between- and within-occupation* sources of inequality. This mechanism is present only if racial disparities within occupations vary systematically according to the average earnings across (between) occupations. This mechanism is a potentially important and much overlooked source of racial earnings inequality. As discussed above, Kaufman's (1983) analysis of the 1970 census suggests a positive relationship between average earnings and racial earnings inequality, such that black disadvantage grew larger as the average earnings of a labor market division increased. Since that time, however, the American economy has changed a great deal. Some would argue that today's economy demands more skills of its workers than ever before (Murphy and Welch 1994), with high-earning employees increasingly recruited on the basis of individual achievement rather than group ascription. If the competitiveness of today's economy leaves less room for discrimination, then we would expect a reversal in the relationship between earnings and inequality, such that the black-white gap should narrow (net of other characteristics) as the earnings of an occupation increase.

Without taking into account the interaction of average occupational earnings and the magnitude of within-occupation earnings disparities by race, we could under- (or over-) estimate the degree to which redistribution of blacks into higher-paying occupations affects earnings inequality by race overall—the move into higher-paying occupations may be accompanied by a lower (or higher) racial earnings penalty. Using our structural model of racial earnings inequality, we can simultaneously identify the sources of racial earnings inequality that emerge between occupations, within occupations, and through the interaction of the two.

[2] For example, there is some indication that blacks in service sector occupations suffer a greater-than-average racial penalty, while the wages for manufacturing occupations demonstrate less of a race effect (Cotton 1989; Moss and Tilly 1996).

Our Approach

In the first part of our paper we present a decomposition of the racial gap in earnings into its three constituent parts. This analysis allows us to assess the relative influence of individual versus occupational effects on the black-white wage gap, as well as to provide estimates of the between- versus within-occupation sources of inequality. Next, we seek to explain each of the three mechanisms that operate at the occupational level (between-, within-, and the interaction of the two). We consider a variety of occupational characteristics (discussed below) that may contribute to the observed pattern of earnings inequality from each source. Finally, we provide a qualitative analysis of those occupations with the most (and least) severe racial wage gap, identifying potential mechanisms not captured by standard quantitative analyses. With this approach, we hope to provide new insight into the labor market processes leading to persistent racial disparities in wages.

DATA AND VARIABLES

Data for these analyses come from the 1990 Public Use Microdata Samples (PUMS) of the decennial census. We restricted our sample to noninstitutionalized civilian men between the ages of 25 and 64 who were employed in nonfarm occupations at the time of the decennial census and who had positive earned income for 1989. Public- and private-sector samples were drawn separately to allow all parameters to vary by sector and in recognition of the fact that there is a small subset of occupations unique to each sector that makes the fit statistics and parameters for each sector not strictly comparable.[3] For the private-sector file, all nonwhites and a random 25-percent sample of whites were extracted from the 5-percent PUMS; for the public-sector file, the full 5-percent PUMS sample was used in order to provide sufficient cell counts in our occupation-level analyses. The samples include over 1 million African American, Hispanic, Asian, and white men, about three-quarters of whom are employed in the private sector. Appendix A presents details concerning the sample selection. Table 1 describes each variable and presents means and standard deviations for all measures by sector of employment.

To understand the characteristics of occupations that determine wage rates, we consider a variety of compositional and requisitional factors that have demonstrated important effects in previous research. We focus on three sets of occupational characteristics that may contribute to within- and between-occupation earnings inequality: occupational prestige, composition, and skill requirements.[4] These components may operate differently in the public and private sectors, and for men and women, so we estimate models separately by sector and limit our analysis to men.[5]

Occupational Prestige

A long history of research has addressed the relationship between occupational standing and earnings, demonstrating the sizable premium for employment in prestigious or high-status positions, net of individual background characteristics (Duncan 1961; Featherman and Hauser 1978; Sewell and Hauser 1975). Additional evidence suggests

[3] Examples of such occupations include, in the public sector, legislators and air traffic controllers, and in the private sector, private household workers.

[4] Note that all labor market variables discussed here refer to the prestige, composition, and skill requirements of a national pool of occupations, rather than to the characteristics of an individual's job. To the extent that this operationalization is incorrect (i.e., to the extent that labor market effects obtain at the job or firm level and not at the occupation level), our estimates of these effects may be attenuated by aggregation error. We expect that wage valuation is affected by the general characteristics of an occupation, but should wages depend more on local labor market factors, this variation will not be accounted for in the present analyses.

[5] We have initiated a parallel set of analyses for women, which we intend to pursue in a separate paper. The complexities which emerged in our model specification for women (related to additional family structure variables and corrections for racial variation in women's labor force participation) prevent direct comparability and are thus more satisfactorily examined in an independent analysis.

Table 1. Definitions and Descriptive Statistics for Individual and Occupational Variables

	Private Sector		Public Sector	
Variable	Mean	S.D.	Mean	S.D.
INDIVIDUAL VARIABLES				
log of hourly earnings[a]	2.48	.72	2.55	.60
Education				
No school	.01	.09	.00	.06
Less than 8th grade	.05	.22	.02	.16
Some high school	.13	.33	.07	.25
High school diploma/GED [b]	.31	.46	.24	.43
Some college	.20	.40	.22	.41
Associate's degree	.06	.24	.07	.26
Bachelor's degree	.16	.37	.19	.39
College +	.09	.28	.19	.39
Race/Ethnicity				
White (not Hispanic)	.82	.49	.78	.50
African American (not Hispanic)	.08	.27	.14	.34
Hispanic	.08	.26	.06	.24
Asian	.03	.16	.03	.16
Years of Work Experience				
Work experience [c]	22.49	11.12	22.86	10.70
Work experience squared	629.27	581.41	637.14	553.37
Region				
Northeast	.06	.23	.05	.22
Midlle Atlantic	.15	.36	.15	.36
East north central	.18	.38	.13	.34
West north central	.07	.25	.07	.25
South Atlantic	.17	.38	.21	.41
East south central	.06	.23	.06	.23
West south central	.10	.30	.10	.30
Mountain	.05	.22	.06	.25
Pacific	.16	.36	.16	.37
Marital Status				
Married	.72	.45	.75	.44
Widowed	.01	.08	.01	.08
Divorced	.09	.29	.09	.28
Separated	.02	.15	.02	.15
Never married	.16	.37	.14	.34
Spouse absent (Yes/No)	.02	.14	.02	.15

(Table 1 continued on next page)

that occupational standing may be positively associated with racial disparities (Telles 1994; Tienda and Lii 1987), making it a prime candidate for explaining both within- and between-occupation wage inequalities. Following this argument, we expect that while overall wages will rise with occupational standing, so will the racial wage gap, leaving high-status blacks at a greater relative earnings disadvantage than their lower

(Table 1 continued)

Variable	Private Sector Mean	Private Sector S.D.	Public Sector Mean	Public Sector S.D.
OCCUPATIONAL VARIABLES				
Occupational Standing				
Percent some college	.51	.28	.52	.28
Prestige	43.63	14.53	44.34	14.58
Occupational Composition				
Percent black	.10	.06	.10	.06
Percent female	.37	.30	.36	.29
Occupational Skill Requirements				
Cognitive skills [d]	–.01	.92	.02	.91
Interpersonal skills [e]	–.02	.88	.01	.88
Manual skills [f]	.02	.79	–.01	.79

[a] Hourly earnings is estimated by dividing total earnings in 1989 by the product of weeks worked in 1989 and average hours worked per week in 1989.

[b] Unfortunately, census data do not allow us to distinguish between high school graduates and those who obtain a GED, a distinction that has important implications for wages (Murnane et al. 1995).

[c] Work experience is defined as age minus years of education minus 5. Years of education were assumed to be 0 for no school, 12 for high school diploma/GED, 14 for an associate degree, 13 for some college, 16 for college graduate, 18 for a masters degree, 19 for a professional degree, and 21 for a Ph.D.

[d] Additive composite, including indicators of complexity in working with data, complexity working with people, general educational development, intellectual aptitude, verbal skills, and numerical aptitude.

[e] Additive composite, including indicators of adaptability to dealing with people, demand for talking or hearing, verbal skills and complexity in dealing with people.

[f] Additive composite, including indicators of manual dexterity, and three separate requirements of reaching, climbing and stooping.

status peers. In these analyses, we use the Nakao-Treas prestige score as a proxy for occupational standing (Nakao and Treas 1994).[6]

Occupational Composition

Although prestige is an important dimension of occupational standing, attributes of occupational incumbents may also contribute to the desirability of an occupation independent of prestige. Tomaskovic-Devey (1993) discusses the process of status composition, whereby the typical race or gender of an occupation "becomes a fundamental aspect of the job, influencing the work done as well as the organizational evaluation of the worth of the work" (p. 6).[7] All else being equal, therefore, the higher the concentration of minority and female workers, the less the work will be rewarded (England et al. 1988; Tienda and Lii 1987). With respect to compositional effects on the within-occupation racial gap in earnings, we take the view that an occupation's racial and gender composi-

[6] We also estimated models that included occupational education as a proxy for occupational status (Hauser and Warren 1997). In these models, the coefficient for occupational education is in the same direction as that for occupational prestige, but is not statistically significant.

[7] There is some circularity here which is difficult to reconcile. Tomaskovic-Devey (1993) asserts that occupational composition determines earnings, but it may be the case that earnings actually determine occupational composition. The latter argument would be consistent with the ethnic queuing perspective in which members of low-status minority groups are relegated to the least desirable positions (Lieberson 1980; Model 1997; Waldinger 1989). Our research cannot conclusively adjudicate between these competing explanations. Our main interest is in testing for the presence of such an association (regardless of causal direction) and examining its implications for racial earnings inequality.

tion serve as status markers, with minority- and female-dominated occupations having lower standing than white- or male-dominated occupations. Following our predictions for occupational prestige, we expect that high concentrations of blacks and/or women will have a negative effect on the average earnings for an occupation and will attenuate racial wage inequality within occupations. Our measures of racial and gender occupational composition are straightforward: the percentage of workers in each occupation who are black or female.

Occupational Skills

The substantive requirements of occupations have frequently been cited as a potential source of earnings inequality within and between groups (England et al. 1988; Spenner 1983). We consider three types of skill demands as possible sources of wage inequality: cognitive skills, interpersonal skills, and manual skills.[8]

The effects of *cognitive skills* have received a great deal of attention in prior literature, as the rapid development of technology, increases in international trade, and the huge growth in white-collar employment have contributed to a rising premium on intellectual aptitude and ability (Freeman 1996; Murnane, Willett, and Levy 1995; Murphy and Welch 1994). Heightened competition in the economy has increased the incentive for employers to weigh individual competence over ascribed characteristics such as race.[9] We expect, therefore, that cognitive skill demands will be associated with higher average occupational earnings and lower within-occupation earnings disparities by race.

Interpersonal skills represent a second skill dimension of growing importance, particularly given the rapidly expanding service sector. Moss and Tilly (1996) cite interpersonal (or soft) skills as an important factor in racial wage disparities, arguing that employers tend to devalue the communication skills and personality traits of blacks relative to whites who have equivalent formal credentials. Likewise, we expect that while interpersonal skills are characteristic of low-earning occupations overall, they will be associated with greater earnings inequality between blacks and whites.

Finally, *manual skills* represent an important third dimension of occupational differentiation which may shape the income profiles of black and white incumbents. Manual skills, including physical strength and dexterity, may be rewarded in the market when cognitive or interpersonal skills are not. If this is the case, and if blacks are discouraged from entering occupations with an emphasis on analytic skills, differentiation along the lines of manual skills may help explain another facet of racial earnings inequality. Furthermore, the products of occupations emphasizing manual skills may be more concrete and thus easier for a supervisor to evaluate. This may lead to a more meritocratic basis for decisions regarding employee compensation. We think that occupations that require manual skills, while offering a lower average rate of pay, will tend to have a lower racial gap in earnings than occupations that do not emphasize manual skills.

Our scales for cognitive, interpersonal, and manual skills are derived from measures included in the Dictionary of Occupational Titles (DOT). The DOT is one of the few data sets to offer measures of jobs that are not based on reports of job holders or on aggregations of job holder attributes. Thus, any errors in measures derived from the DOT are likely not related to biases or errors associated with individual job holders.

On the other hand, the Dictionary of Occupational Titles was last updated in 1977, over a decade prior to the collection of the data used in these analyses. Furthermore, many job titles were not updated for the

[8] Unfortunately, we have no comparable measure at the individual level, and therefore, to the extent that individual skill and occupational skill are correlated net of individual predictors, our estimates of the effects of occupational skill demands on earnings may be upwardly biased.

[9] Alternatively, however, some argue that the incentives for statistical discrimination rise with the quality of the job, as the costs of training and forgone productivity are higher in such markets (Tomaskovic-Devey and Skaggs 1999). Employers facing poor information about productivity differences among applicants may increasingly base their decisions on group averages (or stereotypes), particularly when the costs of a faulty selection are high.

1977 edition. Finally, data for the DOT were collected at the job level (on 12,099 jobs) rather than the occupation level (501 occupations for 1990). To create measures that map onto census occupation codes, researchers have aggregated measures across jobs, often summing scales of items that were ordinal but not interval (England and Kilbourne 1988). This adds an unknown amount of error to DOT measures.[10]

Despite these limitations, the DOT offers the best available data on the characteristics of occupations and is well-suited for the evaluation of occupational attributes. No other data source provides measures of such an extensive range of occupational characteristics, particularly with respect to specific skill dimensions. Scales we estimate from the DOT have good face validity and reliability (Cronbach's alpha ranges from .80 to .96). Furthermore, the cognitive-skill-demands scale correlates at .90 at the occupational level with the Hauser and Warren (1997) measure of occupational education. This represents fairly strong construct validity for an independent scale estimate.

We use a simple additive model to construct the three skill factors.[11] The cognitive skills factor is a linear composite of six indicators: complexity in working with data, complexity in working with people, general educational development, intellectual aptitude, verbal skills, and numerical aptitude. The interpersonal skills factor is based on indicators of adaptability to dealing with people, demand for talking or hearing, verbal skills and complexity in dealing with people.[12] Finally, the manual skills indicator is an additive function of manual dexterity and three separate requirements of reaching, climbing and stooping. We would have preferred to include measures more closely aligned to manual skill and craftsmanship, but such measures were not available in the DOT. Nonetheless, we believe that the manual skills factor should be moderately correlated with true manual skills.

Each scale has a mean of 0, with standard deviations of .92, .88, and .78 for cognitive, interpersonal, and manual skills, respectively. These scales are not constrained to be orthogonal, and in fact, the correlation between cognitive and interpersonal skill demands is substantial (.81). These scale characteristics should be kept in mind when interpreting the skills coefficients; skill demand effects are estimated net of other skills and relative to other occupations. We cannot conceive of a job characterized by the absence of skills, only jobs with relatively strong or weak demands for each of the skills specified.

Occupational Sector

One final feature of the labor market associated with the magnitude of earnings disparities by race is the distinction between public and private sectors. The public sector has long been regarded as the "vanguard of equal opportunity" (Krislov 1967), closely approximating Weber's ideal-type bureaucracy with its highly rationalized system of hiring, promotion, and remuneration (Grandjean 1981). The established bureaucratic procedures that direct all stages of employment decisions in the public sector are thought to shield against forms of discrimination that may prevail in private-sector firms (DiPrete and Soule 1986; Moulton 1990).[13] Indeed, empirical evidence suggests that the wage

[10] Cain and Treiman (1981) offer a more detailed discussion of the strengths and weaknesses of the DOT as a data source for sociological analyses.

[11] Before settling on this additive model, we also estimated a measurement model (with errors in indicators and the latent factor) and a principle-components factor model. The factor measures derived from the three models were correlated with one another above the $r = .95$ level, and results of our multilevel models using different factor indicators are similar in substance to the findings we report here, although the size of the skills coefficients vary slightly.

[12] Note that verbal skills and complexity in dealing with people are included in both the interpersonal and cognitive skills indicators. In our measurement models of these factors (not reported here), we found that these indicators demonstrated strong loadings on both skill types, suggesting that they were important indicators of both cognitive and interpersonal skill.

[13] But see Bridges and Nelson (1989) for evidence that the bureaucratic procedures that determine wage rates in government positions may in fact produce greater wage disparities for lower status workers.

gaps by race and gender are substantially lower in the public sector than they are in corresponding private-sector occupations, and that a disproportionate number of blacks and women are employed in public-sector positions (Ehrenberg and Schwarz 1986). We consider the relationship between occupational sector and earnings disparities by race, assessing the extent to which the public sector effectively attenuates the negative relationship between race and earnings across the occupational distribution.

METHODS

We first estimate conventional OLS models to assess the contribution of individual-level variables to racial earnings inequality. These models provide a baseline estimate of racial earnings inequality net of individual characteristics. The strength of our approach, however, emerges when we move to a two-level framework. Using this approach, we can directly test the hypotheses that result from our structural model of earnings inequality.[14] In these models, the level-1 unit of analysis is the individual, while the level-2 unit of analysis is the occupation.[15] A single error term is estimated at the individual level, while separate error terms are estimated for each occupational outcome (occupational earnings and the racial gap in earnings).

The estimation of separate occupational disturbances offers several analytic advantages. By partitioning earnings variance into its within- and between-occupation components, the two-level model allows us to test empirically whether there is significant variation across occupations in average earnings, as well as in the relationship between race and earnings. Partitioning variance also lets us assess the extent to which occupational earnings and racial earnings inequality are correlated net of individual-level predictors.

If there is meaningful variation between occupations in some individual-level outcome or predictor (i.e., earnings or race), we can model this variation at the occupation level. The intercept or slopes from the individual-level equation thus become outcomes at the occupation level of analysis, each with its own disturbance. The occupation-level model has two components—a fixed-effects component that is a function of occupational attributes, and a random component that represents unmeasured occupational attributes and random error. Correlation among random components reflects the relationship between occupational outcomes net of observed individual and occupational characteristics.

MODELS

At the individual level, we estimate the log of hourly earnings as a function of individual human capital, race and ethnicity, region of residence, marital status, and a randomly distributed disturbance.[16] Formally, the individual-level model is:

[14] Many of the analyses we conduct using multilevel models could be executed in a single-level framework. The fixed-effects portions of our models are simply complex interaction terms. For example, the within-occupation racial earnings difference in an OLS model could be evaluated with a dummy variable for each $j - 1$ of j occupations and an interaction of the $j - 1$ dummy variables with the indicator for blacks. Similar interactions could be added to estimate the effects of each of the occupational characteristics included in our models. The standard errors around these level-1 parameters would then have to be corrected by allowing for the correlation of disturbances within occupations. The cumbersome nature of these procedures, however, in addition to the advantages of a multilevel modeling approach outlined below, make individual-level approaches less desirable.

[15] Occupations are coded according to the 1990 three-digit detailed census classification.

[16] We are conscious of the problems of scaling earnings in the loglinear form discussed by Hauser (1980), Hodson (1985) and recently revived by Peterson (1999). We favor the loglinear transformation for both technical and rhetorical reasons. Technically, we need to correct for heteroskedastic variation across the earnings distribution in order to meet the standard assumptions of our modeling approach. Rhetorically, we are interested in talking about relative earnings differences within occupations. The semilog form of the earnings equation allows us to do so in a straightforward manner. To assess the effect of this transformation, we ran a parallel set of analyses using untransformed hourly earnings as our dependent variable. The results provided substantially stronger evidence of the effects we re-

$$Y_{ij} = \beta_{0j} + \beta_{1\text{-}7j}(Education) + \beta_{8j}(Black) + \beta_{9j}(Hispanic) + \beta_{10j}(Asian) + \beta_{11j}(Experience) + \beta_{12j}(Experience^2) + \beta_{13\text{-}20j}(Region) + \beta_{21\text{-}26j}(Marital\ Status) + r_{ij}.$$

where i indexes individuals and j indexes occupations. The disturbance r_{ij} is assumed to be random normal with a mean of 0 and variance of σ^2.

If we impose the assumption that occupations are identical in their wage functions and that, net of observed variables, individuals are randomly assigned to occupations (formally, that the r_{ij} are independent within occupations), the individual-level model is identical to a simple OLS regression model that excludes dummy variables for occupation.

We challenge these assumptions in our two-level models, in which we allow the intercept term (which represents mean occupational earnings for white men) and the race coefficient (which reflects the within-occupation racial gap in earnings) to vary freely across occupations. This approach allows us to directly assess the extent to which black disadvantage is generated through disproportionate concentration of blacks in lower-paying occupations (reflected in the intercept), their concentration in occupations in which they receive less pay than their white counterparts (reflected in the race parameter), or both.

To explore the effects of occupational characteristics on the process of earnings allocation, we estimate the intercept term and the race parameter for black men from the individual-level equation as dependent variables at the occupational level.[17] Formally, the model for the intercept is:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}(Prestige) + \gamma_{02\text{-}03}(Composition) + \gamma_{04\text{-}06}(Skill\ Demands) + u_{0j}.$$

where j indexes occupations, β_{0j} is the intercept term from the individual-level equation (representing average occupational earnings adjusted for individual attributes), and u_{0j} is an occupation-specific disturbance assumed to be normally distributed with a mean of 0 and variance τ_{00}.

Similarly, the formal model for the effects of occupational characteristics on the racial gap in earnings within occupation j is:

$$\beta_{8j} = \gamma_{80} + \gamma_{81}(Prestige) + \gamma_{82\text{-}83}(Composition) + \gamma_{84\text{-}86}(Skill) + u_{8j}.$$

where β_{8j} is the race coefficient for blacks in occupation j and u_{8j} is an occupation-specific disturbance in the association between race and earnings assumed to be normally distributed with a mean of 0 and variance τ_{88}.

Under this model specification, the intercept term represents the average earnings of white men in occupation j, while the race coefficient represents the deviation of the average earnings of black men in occupation j from the average earnings of white men in the same occupation. Our interest is in racial earnings inequality (the race coefficient), but in order to accurately assess the role of occupation-level variables in generating racial earnings inequality, we must estimate both the intercept and the race coefficients simultaneously. If we estimated only the race coefficient at the occupation level, our estimates of $\gamma_{80\text{-}86}$ as well as the variance of u_{8j} would be upwardly biased to the extent that these occupational factors (and unobserved sources of variation in occupational earnings) affect both white and black workers.

Before moving on, we wish to caution readers regarding the interpretation of occupation-level coefficients and standard errors. In most applications of the two-level random coefficients model, researchers have samples of units at both levels of analysis. For example, in research on school effects researchers might have a sample of students taken from a sample of schools. Ideally, the sampling probabilities for both levels of analysis will be known, and standard errors (and perhaps point estimates) can be adjusted accordingly. In the present study, we have a sample of individuals but a *census* of occupations (with the exception of those oc-

port here, leading us to conclude that our use of the semilog specification represents a conservative estimate of the relationships we observe.

[17] This modeling approach is also known as a slopes-as-outcomes model or random coefficients model.

cupations excluded because of sample restrictions). Our final sample represents over 90 percent of the employed civilian nonfarm male population between the ages of 25 and 64 and *all* of the occupations in which they are employed. Although standard errors for individual-level predictors can be interpreted in the usual fashion, standard errors at the occupation level, because of the nature of the occupation-level sample, have a more ambiguous interpretation. We recommend that the occupation-level standard errors be viewed as estimates of parameter dispersion contaminated by measurement error rather than as the traditional measure of sampling error. The smaller the standard error, the more consistent the effects of that measure at the occupation level.

RESULTS

Individual-Level Variation

Our initial (single-level) estimates of the earnings inequality experienced by black men are shown in Table 2a. The predicted unadjusted difference in log hourly earnings of black men and white men in the private sector is –.34 log units (a difference of $3.65 per hour at the private-sector mean) (see OLS Model 1). This coefficient becomes the baseline for the percentage of the black-white gap in earnings that is left unexplained. By definition, 100 percent of the gap is unexplained in the initial model.

Adding human capital variables (educational attainment and potential years of experience) (OLS Model 2) reduces the coefficient for blacks by 38 percent to –.21. The regional variables (in OLS Model 3), included to control for geographic differences in earnings due to labor supply and demand factors, reduce the black coefficient by another 3 percent to –.20 Finally, including marital status and an indicator for whether a spouse is absent (OLS Model 4) reduces the predicted race gap to –.16.[18] In total, the inclusion of education and potential experience, region and marital status reduces the association between race and log hourly earnings by one-half for men working in the private sector, leaving a substantial wage penalty for black men net of individual-level predictors.[19]

In the public-sector sample, we find important differences in the nature of racial disparities. First, the baseline OLS difference in expected log hourly earnings for black men and white men in the public sector is appreciably smaller than it is in the private sector. Nonetheless, without adjusting for any individual differences we find black men earn about 21 percent less than white men in the public sector (a difference of $2.85 at the public-sector mean). Adding education and potential experience to the equation halves the earnings disadvantage for blacks in the public sector from –.24 log units to –.11 log units. This is a larger proportionate reduction than was associated with the inclusion of human capital measures in the private sector where black-white differences were reduced by 38 percent. While not perhaps color blind, the public sector appears to operate under a more meritocratic system of wage allocation than the private sector, weighing more heavily the formal credentials of education and experience.

Adding controls for region has essentially no effect on public-sector racial earnings differences, but including indicators for marital status and spouse absence reduces the predicted racial earnings difference by an additional 10 percent relative to the OLS baseline coefficient for black men. The final adjusted OLS estimate of black earnings disadvantage in the public sector is 9.0 percent, a little more than half of the predicted 15.5 percent difference found for the private sector. While perhaps not the "vanguard of equal opportunity," the public sector comes much closer to achieving racial parity in earnings than does the private sector.

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[18] The role of marital status in earnings equations for men has been the subject of some controversy in the literature. Although we are inclined to follow Korenman and Neumark (1990) in attributing the bulk of the male marriage effect to increased productivity rather than selection, we do not advance that claim with these data. Rather, we include marital status as a predictor to obtain a conservative estimate for the black-by-earnings association.

[19] These estimates are consistent with previous research on black-white wage differences using data from similar time periods. For example, Bound and Freeman (1992) estimate an adjusted gap of –.179 using the 1989 CPS earnings data.

Table 2a. Individual-Level (OLS) and Multilevel (HLM) Model Estimates of the Coefficient for Racial Differences in Wages: PUMS, 1990

Model	Private Sector		Public Sector	
	Estimated Effect	Percent Unexplained	Estimated Effect	Percent Unexplained
Individual-Level Models				
OLS Model 1 (baseline)	–.338 (.003)	100.00	–.239 (.003)	100.00
OLS Model 2 (adds human capital variables)	–.212 (.003)	62.83	–.114 (.003)	47.69
OLS Model 3 (adds region)	–.201 (.003)	59.70	–.113 (.003)	47.38
OLS Model 4 (adds marital status)	–.155 (.003)	46.06	–.090 (.003)	37.59
Occupation-Level Models				
OLS Model 5 (adds occupations)	–.087 (.003)	25.86	–.047 (.003)	19.75
HLM Model 1 (occupation free)	–.089 (.003)	—	–.048 (.003)	—
HLM Model 2 (occupation and race free)	–.093 (.005)	—	–.048 (.008)	—

Note: Numbers in parentheses are standard errors.

Table 2b. Measures of Fit for HLM Models

Measure of Fit	HLM Model 1		HLM Model 2	
	Private Sector	Public Sector	Private Sector	Public Sector
Mean Occupational Earnings of Whites				
Variance	.050	.043	.052	.044
χ^2	95,345	42,191	90,794	36,082
D.f.	463	465	450	431
Reliability	.930	.872	.942	.889
Black Deviation				
Variance	—	—	.005	.013
χ^2	—	—	1,052	1,584
D.f.	—	—	450	431
Reliability	—	—	.354	.497
Overall deviance	1,464,922	533,758	1,464,523	533,230
r (intercept, black)	—	—	–.551	–.141

Although important differences emerge from our public- and private-sector analyses, both analyses reveal a substantial race gap left unexplained by individual-level variables. We thus turn to our occupation-level analyses as a means of better understanding the mechanisms which underlie racial disparities in earnings.

BETWEEN-OCCUPATION VARIATION

The occupation-level analysis assesses the importance of each of the three inequality generating mechanisms discussed earlier—variation in earnings between occupations, variation in the within-occupation earnings disadvantage experienced by black men, and

the interaction of the two. The first mechanism operates through the differential concentration of blacks and whites in high- or low-paying occupations. The magnitude of this source of variation can be measured in the OLS framework by including dummy variables for each of the 468 private-sector (or 471 public-sector) occupations, or by moving to a two-level hierarchical linear model in which the intercept (representing average occupational earnings for whites) varies freely across occupations.

Models including controls for occupation are shown in the bottom panel of table 2a. The estimates for OLS Model 5 are directly comparable and quite similar to the HLM results for the model in which only the intercept is freed (HLM Model 1).[20] Note that by including controls for occupation, the interpretation of the race coefficient changes. The indicator for race now represents the expected *within-occupation* difference in log earnings between white workers and black workers (in contrast to the average black-white earnings difference due to *both* within- and between-occupation differentiation). This allows us to distinguish between earnings inequality that emerges as the result of differential placement versus that due to differential rewards. Under both models, occupations mediate approximately 20 percent of the black-white gap in earnings.[21] Allowing occupational intercepts to vary (or including dummy variables for occupation) brings the total percentage of the expectation of the race coefficient we have accounted for to roughly 75 percent. Thus, a majority of the racial gap in earnings can be accounted for by individual differences in human capital, region, and marital status (55 to 60 percent) and by the concentration of blacks in low-paying occupations (20 percent). There remains, however, a significant effect of race, even after controlling for individual characteristics and occupational sorting.

The race effect in HLM Model 1 represents the *average* difference in earnings between black and white workers in the same occupation. If the effect of race were constant across the occupational structure (net of differences due to occupational sorting), then this estimate would provide an accurate assessment of the within-occupation racial gap in wages. If, however, the effect of race varies depending on one's position in the labor market, then this average estimate conceals important information regarding the role of occupations in shaping racial disparities. HLM Model 2, the HLM baseline model, provides an empirical test of this proposition. This model includes all of the individual-level predictors and allows both the intercept and the race coefficient to vary across occupations. Essentially, this amounts to estimating a separate intercept and slope term for each occupation included in our sample.

The results of this model indicate that racial earnings inequalities vary significantly across occupations in both the public and private sectors ($\chi^2 = 1{,}052$, d.f. = 450 in the private sector, and $\chi^2 = 1{,}584$, d.f. = 431 in the public sector).[22,23] The hypotheses for homo-

[20] These models formally differ with respect to specification of the error term. While the OLS model includes one error term that varies across individuals, HLM models include error terms at both the individual and occupation levels.

[21] The test statistics for HLM Model 1 demonstrate the significant improvement in fit that results from allowing average earnings to vary across occupations ($\chi^2 = 95{,}345$, d.f. = 463 in the private sector and $\chi^2 = 42{,}191$, d.f. = 465 in the public sector). Significance tests for occupation-level variation test the model specified against a model in which occupational variation is constrained to 0.

[22] For a model in which a single level-1 slope (or only the intercept) is freely estimated, the reliability for the level-1 parameter is equal to the parameter variance divided by the sum of the parameter and error variance for a particular occupation. In the case of the intercept, that quantity is $\tau_{00}/(\tau_{00} + v_{qqj})$, where v_{qqj} is the error variance of the intercept estimate for men in occupation j. v_{qqj} comes from the error variance-covariance matrix for occupation j, and in the case of one randomly varying coefficient the matrix is scalar and equals σ^2/n_j, where σ^2 is the level-1 error variance and n_j is the number of observations for occupation j. However, in the case of two random coefficients, the covariance of the two coefficients must be taken into account. The formula for v_{qqj} then becomes $\sigma^2 (X_j' X_j)^{-1}$ where in this case the matrix X_j includes a column of 1s for the intercept and a column for the race indicator (1 for black men, 0 for white men).

[23] Although the intercept term is estimated quite reliably in each model (with reliability > .90), the race coefficient is not. The average reliability of

geneity in both occupational earnings and within-occupation racial earnings differences are thus soundly rejected. This finding supports two of our basic hypotheses concerning the mechanisms by which racial earnings inequalities obtain at the occupation level.[24]

The Relationship between Occupational Earnings and Racial Disadvantage

To evaluate the third possible mechanism of racial earnings inequality—the interaction between occupational earnings and racial earnings differences within occupations—we regressed estimated within-occupation earnings differences on estimated average occupational earnings.[25] The regression line, along with point estimates for predicted within-occupation black earnings differences (plotted along the *y*-axis) and average occupational earnings (plotted along the *x*-axis) are illustrated in Figure 1. The regression estimate shows a striking relationship between occupational earnings and within-occupation racial earnings differences: For each unit increase in the occupational earnings of white men, we expect a –.17 unit decrease in the relative earnings of blacks in that occupation. In other words, the higher the average earnings of white men in an occupation, the greater the relative penalty experienced by their black co-workers.[26]

That blacks in higher-earning occupations experience a greater racial penalty than do their lower-earning peers reveals an important and often overlooked source of racial earnings inequality. If we were to constrain the race effect to be uniform across the occupational distribution (as is conventional in research using standard analytic techniques), we would miss a substantial range of variation in within-occupation racial differences in earnings. While the average earnings difference between black men and white men in the private sector is about 9 percent, observed differences vary across occupations from about a 10-percent advantage for blacks among clergy to a disadvantage of around 22 percent for podiatrists, actuaries, and lawyers. Overlooking this variation is particularly consequential for our understanding of black occupational mobility. Even as black men enjoy higher earnings in an absolute sense as they move up in the occupational hierarchy, in a relative sense they find themselves ever further behind their white co-workers. This result reinforces the earlier research of Kaufman

the black-white wage gap estimate remains around .35. This may be due in part to the relatively low variance in the adjusted wage gap across occupations (relative to variance in wages overall), and may be further compounded by the substantial intercept-race correlation.

[24] The estimate of the *average* race effect under this model does not differ substantively from the preceding HLM model. The slight change in the size of the coefficient for private-sector models is due to the use of Bayesian estimation procedures that place greater weight on more reliable estimates. In this model, we are less interested in the fixed-effect estimate presented than with the randomly varying estimate produced for each occupation that serves as one of our dependent variables in the following analyses.

[25] We used the empirical Bayes estimates of earnings for the occupational earnings/within-occupation racial earnings differences for these analyses, rather than the OLS estimates. Given the size of our overall sample and the reliability of intercept estimates, the OLS and empirical Bayes estimates for occupational earnings are almost identical (r = .98). The estimated coefficients for within-occupation earnings differences, however, have a much lower reliability and much lower sample sizes in general. To correct for these shortcomings, we use the empirical Bayes estimates for within-occupation earnings differences. Results using OLS estimates are in the same direction (the correlation between the two is .54), but the relationship between occupational earnings and within-occupation earnings inequality using OLS estimates is about twice as strong as what we present here.

[26] The distinction between relative and absolute earnings differences is important. If the absolute earnings difference were constant across occupations, the relative earnings difference between black men and white men would decline as occupational earnings rose. This is because equations for individuals in different occupations have different intercepts, and in order for the dollar amount of a difference to be constant for all men, the relative difference between men in high-earning occupations would have to be less than for men in lower-earning occupations. We find just the opposite, implying greater racial disparities in higher-earning occupations in both a relative and absolute sense.

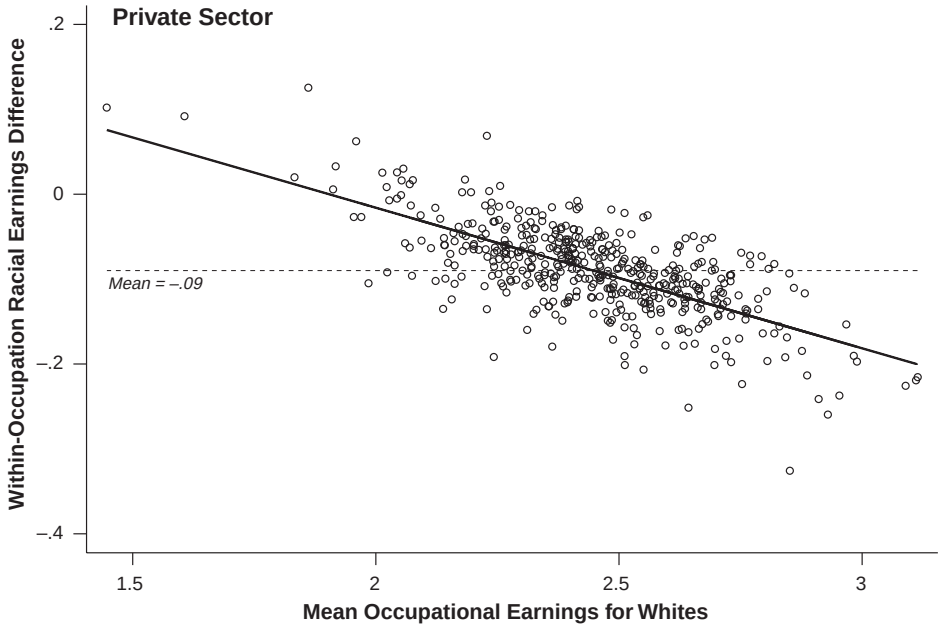

Figure 1. Regression of Within-Occupation Black-White Differences in Earnings on Mean Occupational Earnings for Whites: Private Sector

Note: Models includes no occupation-level predictors.

(1983) that found that ". . . eliminating unequal employment opportunities should move blacks into the core [high earnings] sector where they would be facing even greater wage discrimination" (p. 585). Those occupations with the greatest rewards are also those in which blacks suffer the greatest disadvantage relative to their white peers.

In the public sector, we find a different relationship. Unlike the private sector where earnings gains associated with advancement into higher-earning occupations are in part offset by the greater relative wage penalty to blacks in such occupations, the public sector demonstrates no such trend. Figure 2 plots the relationship between mean occupational earnings for whites along the *x*-axis and within-occupation earnings inequality (mean earnings for blacks minus mean earnings for whites) along the *y*-axis.[27] Although occupational earnings for whites and within-occupation racial earnings inequality are related, this association is weak (with a regression slope of –.03). Black men working their way up into higher-paying public-sector jobs, therefore, come closer to achieving earnings parity with white men than they would were they employed in identical private-sector occupations.

This is not to say that earnings for blacks are equal to earnings for whites across public-sector occupations. In fact, racial disparities in earnings in the public sector vary widely across occupations. Unlike the private sector, however, this variation is only weakly related to the occupational earnings distribution and is not always in the direction of black disadvantage. For example, while black public-sector bakers and miscellaneous woodworking machine operators suffer an earnings penalty of more than 30 percent, black public textile sewing machine operators and hand packers and packagers

[27] These results correspond to a model in which five highly leveraged occupations have been deleted. Those occupations are folding machine operators, shaping and joining machine operators, crushing and grinding machine operators, dressmakers, and hand packers and packagers. Including these occupations yields a regression coefficient –.05 compared with the above estimate of –.03. Eliminating highly leveraged occupations in the private-sector equation had virtually no effects on our estimates.

Figure 2. Regression of Within-Occupation Black-White Differences in Earnings on Mean Occupational Earnings for Whites: Public Sector

Note: Models includes no occupation-level predictors.

enjoy an earnings *advantage* of nearly 20 percent. In fact, fully 18.6 percent of black men in the public sector have estimated occupational earnings higher than those of otherwise similar white colleagues compared with only 2.5 percent of private-sector black men. This more randomly distributed racial earnings penalty bodes well for black men working their way up in the public sector.

Explaining Racial Inequality in Earnings

The preceding analyses have demonstrated the importance of the three mechanisms of racial earnings inequality. In both sectors, we found a substantial impact of the disproportionate concentration of blacks in low-paying occupations, and in the private sector we found that the racial gap in earnings grows wider with average occupational earnings for whites. But what factors account for the differential returns to occupational placement? And what explains the remaining race-by-earnings association? The following analysis explores the contributions of occupational standing, occupational composition, and occupational skills to the between- and within-occupation sources of racial earnings inequality.

Our models of inequality in mean occupational earnings for whites are quite successful in explaining variation in occupational earnings and generally support our hypotheses (see Table 3). Occupational prestige has a strong positive effect on occupational earnings, while percent black and percent female are negative predictors of occupational earnings (although the coefficient for percent black does not reach statistical significance). Likewise, the skill indicators show effects in the expected direction, with cognitive skill demands leading to higher average earnings and interpersonal and manual skill requirements associated with lower occupational returns.[28]

Table 3 also shows estimates for models predicting variation in within-occupation ra-

[28] Note that the effects of both cognitive and interpersonal skills on average occupational earnings are more than twice as large in the private sector than in the public sector, suggesting that remuneration in private-sector occupations is more closely tied to skill demands relative to their public-sector counterparts.

Table 3. Explaining Between- and Within-Occupation Sources of Racial Earnings Inequality, by Sector

	Average Occupational Earnings		Within-Occupation Racial Earnings Disadvantage	
Independent Variable	Private Sector	Public Sector	Private Sector	Public Sector
Occupational Status and Composition				
Intercept	2.447	2.507	–.090	–.049
	(.008)	(.008)	(.006)	(.008)
Occupational prestige/10	.062	.060	–.003	–.003
	(.011)	(.010)	(.007)	(.010)
Percent black	–.213	–.221	–.113	.126
	(.169)	(.168)	(.112)	(.172)
Percent female	–.266	–.249	.048	–.023
	(.033)	(.031)	(.023)	(.031)
Occupational Skills				
Cognitive skills	.078	.034	.002	–.028
	(.025)	(.023)	(.018)	(.024)
Interpersonal skills	–.075	–.028	–.019	.039
	(.019)	(.017)	(.014)	(.018)
Manual skills	–.034	–.031	–.002	–.009
	(.015)	(.014)	(.010)	(.014)
Model Fit				
Variance	.027	.021	.005	.012
χ^2	40,838	12,825	1,030	1,478
D.f.	444	425	444	425
Reliability	.909	.828	.363	.493
Overall deviance	—	—	—	—
r (intercept, black)	—	—	–.629	–.093

Note: Numbers in parentheses are standard errors.

cial earnings inequality. The most striking result, in our view, is that few of our occupation-level predictors explain variation in the wage gap between occupations. Although the null hypothesis of homogeneity in racial inequality across occupations is soundly rejected in our baseline model and all other models we estimate, our indicators of occupational prestige, composition, and skill requirements account for little of this variation. In the private sector, only percent female is a significant predictor of variation in racial earnings inequality across occupations, with occupations that have high concentrations of women demonstrating a lower racial gap in wages. In the public sector, interpersonal skills demonstrate a significant effect: Occupations that emphasize interpersonal skills appear to be those in which black men are relatively closer in earnings to their white colleagues. If there is a trend to be found in this analysis, it is that blacks fare better relative to their white colleagues in occupations lower on the status hierarchy (i.e., occupations characterized by high concentrations of women and/or with a strong emphasis on interpersonal skills). Overall, however, we are unable to explain much of the variation in the wage gap across occupations.

The Relationship between the Occupational Earnings of Whites and Racial Disadvantage

Does the inclusion of occupation-level predictors help account for the increase in the racial disadvantage at higher levels of occupational earnings? Although we expected that occupational characteristics would ac-

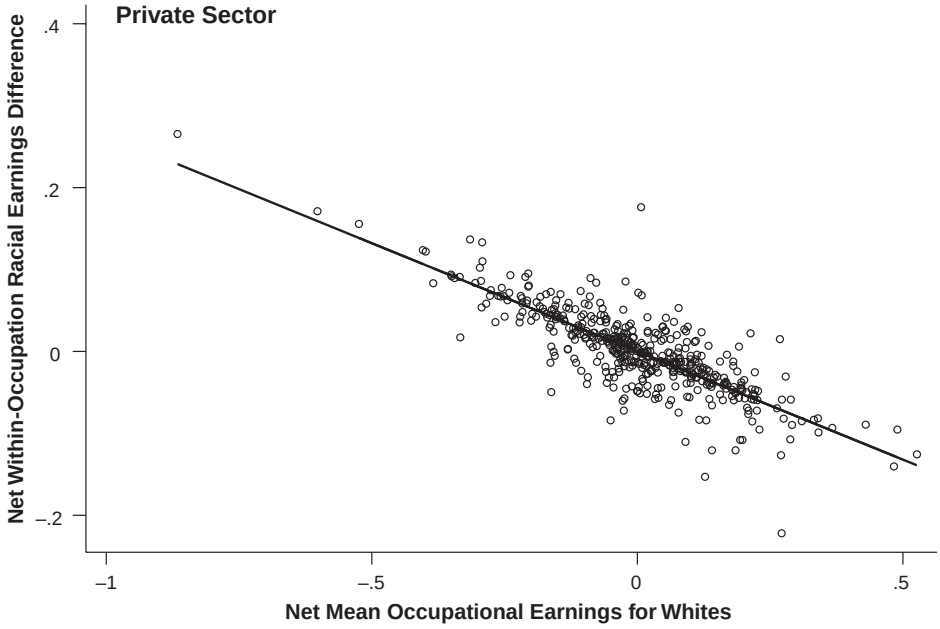

Figure 3. Regression of Net Within-Occupation Black-White Differences in Earnings on Net Mean Occupational Earnings for Whites: Private Sector

Note: Models includes all occupation-level predictors.

count for some of this relationship, we found instead that the correlation between occupational earnings and within-occupation earnings inequality in the private sector *increases* with the inclusion of occupational predictors, from –.55 in the baseline model to –.63. Figure 3 plots the net relationship between occupational earnings and within-occupation racial earnings inequality estimated from a model that includes controls for all of our measured individual and occupational characteristics. The distribution across the downward slope is substantially less dispersed in the private sector, suggesting a strong relationship between occupational earnings for whites and within-occupation earnings inequality, net of our observed predictors. The increasing black disadvantage observed higher in the occupational hierarchy is therefore not a function of occupational status, composition, or skills (despite the fact that these variables predict average occupational earnings). Something distinct about the earnings profiles of occupations corresponds to the magnitude of racial inequality, apart from the other dimensions of occupational characteristics measured here.

In the public sector, including occupational characteristics produces the opposite effect, attenuating the residual correlation between within- and between-occupation earnings inequality relative to the baseline model. Where the relationship between earnings inequalities within and between occupations was weak from the start, it becomes even weaker with the addition of occupation-level predictors. Figure 4 plots the relationship between net occupational earnings for whites and net within-occupation racial earnings differences from a model including all significant predictors reported above. After controlling for indicators of occupational prestige, composition, and skills, the already modest relationship between racial disparities and occupational earnings is further attenuated. The regression line, estimated by regressing the residual component of the within-occupation earnings differences on the residual component of occupational earnings, is virtually flat, again indicating the lack of association between these indicators. Unlike the private sector where racial disparities are systematically related to the occupational earnings of whites, in the public sector, net of occu-

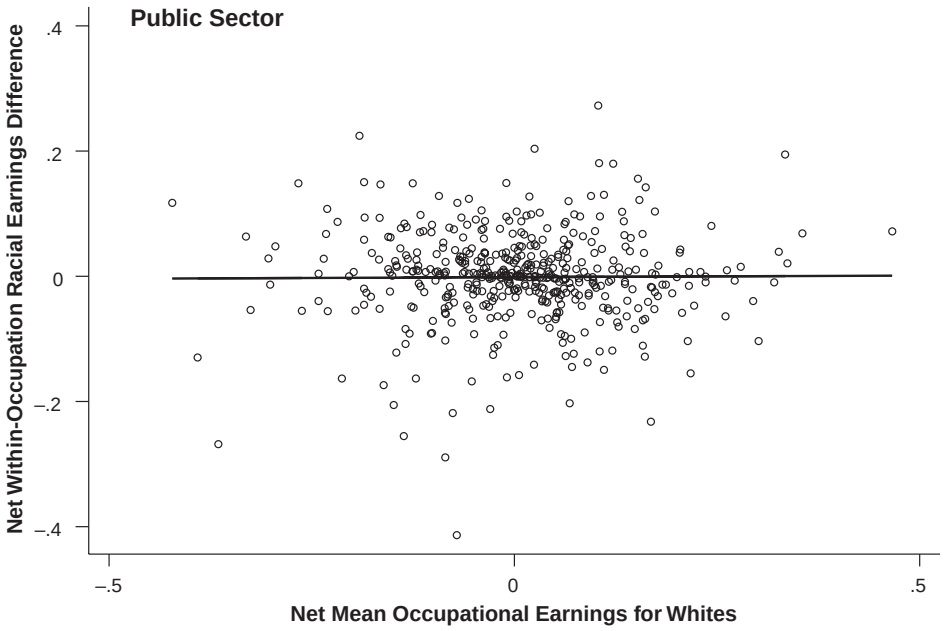

Figure 4. Regression of Net Within-Occupation Black-White Differences in Earnings on Net Mean Occupational Earnings for Whites: Public Sector

Note: Models includes all occupation-level predictors.

pational characteristics, we find no such trend.

Identifying a Mechanism of Racial Disadvantage

That average occupational earnings are systematically related to the magnitude of racial disadvantage is a troubling finding with respect to prospects for upwardly mobile black men. We tested several plausible explanations for this pattern but failed to find support for any of our initial hypotheses. What is it about high-earning occupations that generates patterns of increasing disadvantage? What are the attributes of occupations that lead to greater or lesser racial disparities?

To answer these questions, we look to the specific private-sector occupations that demonstrate the most and least pronounced racial disparities. By examining the clusters of occupations that produce the revealed patterns of inequality, we can generate an inductive explanation of the attributes of occupations that may yield the observed results. While this qualitative examination is not conclusive, it should provide a useful set of hypotheses to be more formally tested in future research.

Table 4 presents the occupations with the highest and lowest black-white wage gaps. An interesting pattern emerges: Many of the occupations with the largest racial gap in wages, such as securities and financial services, insurance sales, managers in properties and real estate, actuaries, lawyers, and physicians, are occupations that rely on developing a profitable clientele for success. If blacks and whites in the same occupation have fairly segregated social networks, then we would expect whites in these occupations to benefit from the wealthier pool of potential clients to which they have access. Differences in the resource base of clients could therefore account for the observed disparity in earnings of white and black men in the same (high-earning) occupations.

Support for this argument is found in the literature on the occupational mobility of black men. Hout (1986), drawing on Lieberson (1980), develops the concept of "queue jumping" whereby low-status minorities gain access to restricted occupations, given a sufficient minority community size to support such employment. Hout

Table 4. Occupations with the Largest and Smallest Racial Gap in Earnings

Occupation	Racial Gap
Largest Racial Wage Gap	
Securities and financial services sales occupations	.722
Podiatrists	.771
Insurance sales occupations	.778
Longshore equipment operators	.786
Lawyers	.789
Dentists	.798
Managers and administrators, n.e.c.	.799
Physicians	.803
Actuaries	.806
Stevedores	.808
Managers, properties and real estate	.813
Smallest Racial Wage Gap	
Upholsterers	1.017
Cooks, private household	1.020
Religious workers, n.e.c.	1.025
Taxicab drivers and chauffeurs	1.026
Miscellaneous woodworking machine operators	1.031
Teachers, prekindergarten and kindergarten	1.034
Hotel clerks	1.064
Bus drivers	1.071
Family child care providers	1.096
Child care workers, private household	1.107
Clergy	1.134

Note: The race gap is defined as the mean earnings of blacks in an occupation divided by the mean earnings of whites in that same occupation.

(1986) argues that "ethnic segregation creates ecological niches that tend to be filled by in-group members" such that "a sizeable minority, if sufficiently segregated, can support a number of service professionals, proprietors, and tradesmen" (pp. 222, 215). Hout's emphasis is on occupational opportunities; our extension of this argument is that while blacks may gain access to these elite occupations because of the ethnic niche, they are then relegated to a less affluent client-base for their services. Black professionals and service providers may therefore reach nominal parity with whites, but their actual work conditions and rewards remain far from equal.

These opportunities may likewise be seized by white employers who seek to best exploit the "black market" by assigning their minority employees to serve minority communities. If black real estate agents, for example, are assigned disproportionately to black clients and black neighborhoods, then it follows that their sales commissions will be significantly lower than otherwise equal whites (Kiel and Zabel 1996). Evidence of this type of employee channeling can be found in the work of Collins (1983 1989 1993) and Durr and Logan (1997).[29]

Consistent with this hypothesis, we see that those occupations with the smallest racial disparities are often those whose salary depends little on the type of clients served. Upholsterers, bus drivers, hotel clerks, and woodworking machine operators, for example, are occupations whose wage rates are set on the basis of production or labor rather than the demand for service from a particular clientele. These occupations leave less room for racial differentiation in earnings, as salaries are determined without respect to the social networks of individual workers. Of course, the present data do not allow us to conclusively test this argument. Such a test would require data not only about the racial composition of employees within an occupation, but also about the racial composition of those who patronize an occupation (by race of employee). We do, however, believe that this preliminary investigation reveals an important possible mechanism of racial stratification not previously examined. We hope that future work will pay greater attention to sources of occupational differentiation that emerge both within and beyond the workplace. The segregated networks of most American workers may be an important source of earnings dis-

[29] This explanation is also consistent with recent allegations made by Frank Warren et. al. against Xerox Corp (*Frank Warren et al. v. Xerox Corp.*, No. 01-CV-2909, E.D. N.Y.). Warren et al. have alleged that African-American employees "were assigned to sales territories in low-income and minority neighborhoods" and as a result made significantly less money than their white counterparts ("Xerox . . ." 2001).

parities by race, not only in terms of gaining access to elite occupations (Mouw 2000), but also in terms of profiting from one's labor once there.

DISCUSSION

We have examined the individual and occupational characteristics that are associated with earnings inequality between black men and white men. Our findings show that just over one-half of the racial gap in earnings can be accounted for by variation in individual attributes such as human capital, region, and marital status. An additional 20 percent of the race gap in earnings is due to the differential placement of blacks and whites across the occupational distribution—blacks are concentrated in occupations with low average earnings, even after controlling for individual characteristics. In general, these lower-paying occupations are characterized by low prestige, few hard skill requirements, an emphasis on soft skills, and high proportions of female and black incumbents.

The extent to which the racial gap in earnings is a reflection of individual differences and occupational segregation is not surprising. Previous research has extensively documented the effects of these variables; such research commonly finds that racial disparities in earnings persist even after accounting for these factors.

Our study extends prior work on earnings disparities by race by concentrating on variation in the effects of race on earnings across the occupational distribution and the extent to which occupational measures can explain that variation. While most analyses assume the race gap to be constant for all occupations, our empirical tests lead us to reject this assumption. There is significant variation in the magnitude of racial earnings inequality across occupations in both the public and private sectors, even after controlling for a host of individual attributes. Recognizing variation in the degree of racial disparity that emerges at different points in the occupational structure is critical to gaining a comprehensive understanding of the black-white gap in wages.

For the 23 percent of black men employed in the public sector, we find encouraging evidence that occupations confer their rewards primarily on the basis of individual qualifications, with largely random variation in the magnitude and direction of racial wage inequality. For the 77 percent of black men employed in the private sector, however, we are less confident that meritocracy is the driving force behind wage allocation. The strong and systematic relationship between occupational earnings for whites and racial disparities in earnings suggests that race remains a salient feature in the occupational hierarchy of the private sector. High-earning private-sector occupations are characterized by greater racial inequalities in earnings, tempering the rewards for occupational advancement and widening the gulf between high-achieving black and white employees. We were surprised to find that occupational standing, composition, and skill requirements were unable to account for even part of this relationship. To what then do we attribute our findings for the private sector?

We first consider the possibility of omitted-variable bias. Recent research argues that previous measures of human capital have failed to fully capture the skill differentials between blacks and whites and therefore have overstated the effects of discrimination. Several researchers have found that including direct measures of cognitive ability (using the Armed Forces Qualifying Exam) can substantially (though not fully) attenuate the racial differences in standard earnings equations that remain after controlling for education and other related factors (Farkas and Vicknair 1996; Neal and Johnson 1996; O'Neill 1990). Particularly among college graduates and women, differences in skills can explain nearly all of the wage gap between blacks and whites. While some of these findings seem compelling, they have not gone unchallenged. Spurred on by Herrnstein and Murray's (1994) *The Bell Curve*, others have provided evidence that suggests that, even net of substantial controls for both background and ability, racial differences in earnings remain large and statistically significant (Raudenbush and Kasim 1998). Furthermore, recent work by Cawley et al. (1996), Ashenfelter and Rouse (1999), and Card and Limieux (1994) casts doubt on the as-

sertion that unmeasured skills exert any substantial bias on earnings equations that include educational attainment, or that the returns to educational attainment are biased due to unmeasured skills.

More to the point, Raudenbush and Kasim (1998) directly test the hypothesis that black-white skill differences are responsible for variation in the within-occupation racial gap in earnings. If the racial gap in skills (e.g., the difference in average cognitive ability between blacks and whites) also varies according to occupational earnings such that the black-white skill gap is larger in high-paying occupations than in low-paying occupations, then variation in racial earnings inequality may be an artifact of actual skill differences between black and white workers within the same occupation. However, in a model that includes individual- and occupation-level indicators of literacy skills (a measure highly correlated with conventional measures of cognitive ability), Raudenbush and Kasim find that a substantial portion of the occupational variation in black-white earnings inequality remains unexplained. There is little indication from previous research, therefore, that unmeasured skills are the driving force behind our findings.

We have further explored the possibility that unmeasured skill differences are affecting our results through two indirect tests. First, if skill differences were the driving force behind racial wage inequalities, we would expect at least some of this effect to be picked up by our measures of occupational skill requirements. Given that individual skill and occupational skill requirements are likely correlated, in the absence of a direct measure of individual skill the occupational variable should provide a modest (if noisy) proxy. Our results do not support this argument—while occupational skills are a strong indicator of occupational earnings overall, they explain none of the variation in racial earnings inequalities.[30]

Second, we have tested for the presence of a race-by-education interaction in our individual-level model. If black-white skill gaps are greater at higher levels of educational attainment, we would expect the race-by-education interaction to be negative and increasing in magnitude across levels of educational attainment. If this interaction term added substantial explanatory power to our model, we would also expect a lower adjusted mean level of racial earnings inequality and more restricted variance in racial inequality across occupations. None of these results obtains, further weakening concerns over the potential skill bias. However, future research should pursue this line of inquiry using direct measures of cognitive skill as an individual-level attribute.

A second possible source of spuriousness emerges from the pattern of variation in earnings across the occupational distribution. For example, if there is greater variation in log occupational earnings in high-earning occupations compared with low-earning occupations, then the observed pattern of racial disparities in earnings may merely reflect greater earnings variation overall. While plausible, in this case a direct test bears evidence to the contrary. We examined the association between the variance and mean of the log of occupational earnings and did not find a positive relationship. In fact, we find that the relationship between earnings variance and average occupational earnings is relatively flat across the occupational distribution. Thus, we can safely reject the concern that general patterns of variance in occupational earnings are driving our reported results.

Having investigated the most plausible sources of spuriousness, we conclude that the relationship between the average earnings of an occupation and the magnitude of racial disparities must be explained on more substantive grounds. Our exploratory analysis demonstrated a tendency for occupations with large racial disparities to be client-based professions that rely on social networks for success. We believe that segregated social networks combined with the disparity in assets possessed by blacks and whites may be an important source of earnings inequality for blacks and whites in the same occupation. While we do not discount

[30] Depending on model specification, cognitive and interpersonal skills are sometimes significant predictors of the race gap in the *public sector*. In the private sector, however, where the relationship between occupational earnings and racial disparities is found, occupational skills never demonstrate a significant effect.

the influence of within-firm processes—particularly the role of direct race discrimination—we think that social forms of segregation may contribute to the perpetuation of racial disadvantage among working black men.

CONCLUSION

We began this investigation by discussing the apparent contradiction between recent trends in occupational mobility and earnings inequality. Our analysis of labor market disparities that takes into account the relationship between occupational placement and racial earnings inequality reveals one mechanism that may underlie these opposing trends. We find that, far from representing independent processes, occupational mobility and earnings inequality are intimately linked such that movement into higher-earning occupations (declining occupational segregation) is associated with greater within-occupation wage disparities (increasing racial wage inequality) for private-sector workers.

Contrary to theories that predict greater rationalization and meritocracy in high-profile occupations, our results suggest that the vertical differentiation of occupations in the private sector is directly associated with the magnitude of observed racial disparities. As black men gain entry to the most highly compensated occupational positions, they simultaneously become subject to more extreme racial disadvantage. Although we cannot conclusively explain this relationship, we believe an important component may be the social segregation of black and white professionals. We hope that future research will investigate this claim more thoroughly. If we want to pursue policies which advance the goal of racial earnings equality, we must gain a better understanding of the occupational processes which drive the persistent earnings disadvantage experienced by black men.

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Appendix A. Selection Procedures for Private and Public-Sector Samples: PUMS, 1990

	Private Sector		Public Sector	
Criterion for Selection	Unweighted N	Percent of Sample Retained	Unweighted N	Percent of Sample Retained
Unconstrained	975,335	100.0	418,904	100.0
Excluding those not African American, white, Hispanic or Asian	953,202	97.7	412,734	98.5
Excluding unemployed	831,526	85.3	390,348	93.2
Excluding earnings < 0	822,631	84.3	388,111	92.6
Excluding military	822,631	84.3	378,260	90.3
Excluding farm workers	781,457	80.1	372,953	89.0
Excluding those in occupations lacking DOT measures	780,236	80.0	372,543	88.9

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