Center for Demography and Ecology

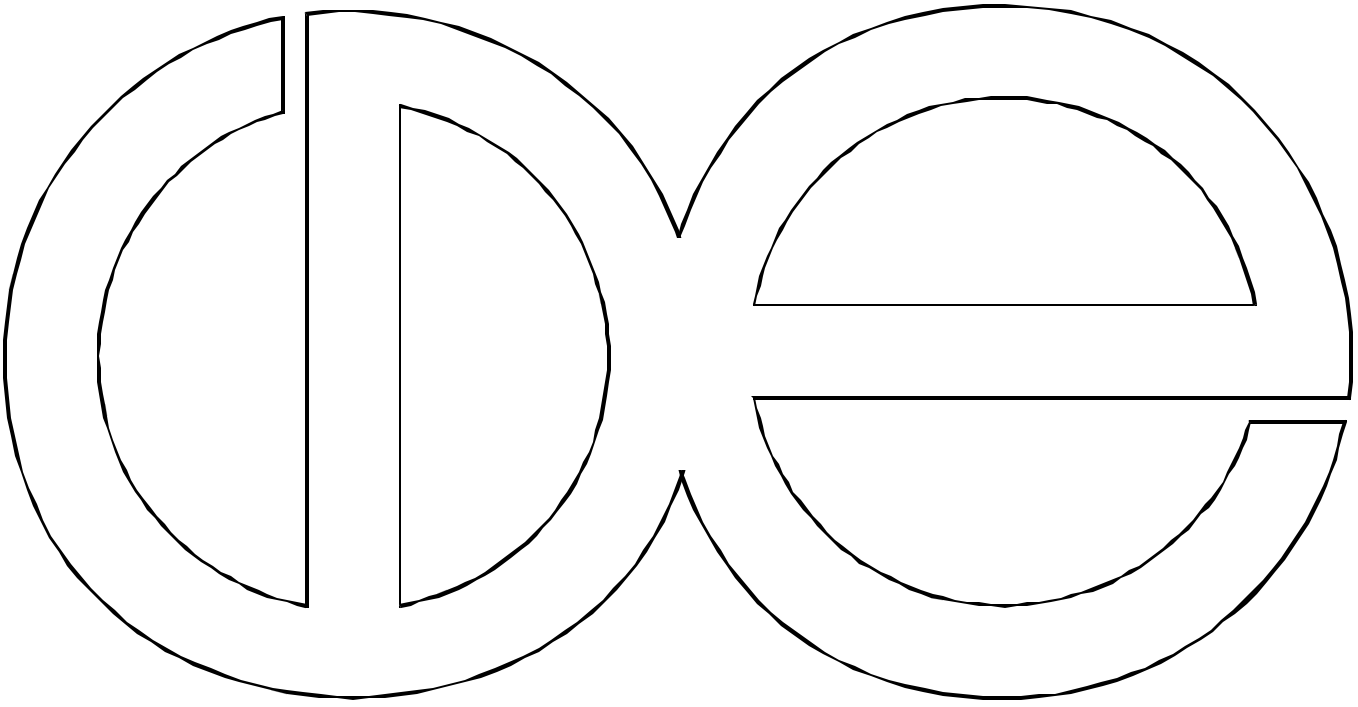
University of Wisconsin-Madison

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

Eric Grodsky

Devah Pager

CDE Working Paper No. 99-28



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

Eric Grodsky and Devah Pager*
University of Wisconsin, Madison

Last revised: 12/15/00

* Order of authorship is alphabetical and does not reflect differences in the contributions of the authors; this is a collaborative project. Our work has been supported in part by a grant to the University of Wisconsin—Madison Center for Demography and Ecology (NICHD HD 05876). In addition, the second author gratefully acknowledges support from the Jacob K. Javits Fellowship. We would like to thank Rob Warren, Adam Gamoran, David Grusky, Bill Carbonaro, Robert M. Hauser, John Allen Logan, Lincoln Quillian, and four anonymous ASR reviewers for their comments on earlier drafts of this work. Findings and conclusions are those of the authors and do not necessarily reflect the views of the supporting agencies.

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

In this paper, we explore individual and occupational sources of earnings inequality between black and white men. Our research is motivated by the idea that the racial earnings gap is generated not only by individual differences but also by systematic variation in the occupational structure that serves to attenuate or exacerbate the effects of race. Using data from the 1990 5% PUMS and the Dictionary of Occupational Titles, we employ a hierarchical linear modeling approach that allows us to simultaneously explore the mechanisms of income inequality which operate within and between occupations. Among private sector employees, we find striking evidence that racial disparities grow larger as one moves up the occupational earnings hierarchy. The association between average occupational earnings and within-occupation racial disadvantage reveals a much 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, nor by the status, demographic composition, or skill demands characteristics of occupations. In the public sector, on the other hand, racial earnings inequality is not systematically associated with average occupational earnings, and is instead more closely tied to individual human capital and occupational placement. We consider the implications of our results and suggest directions for future research.

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

At the start of the 1990's, the economic status of black men was characterized by two opposing trends. On the one hand, unprecedented numbers of black men were employed in higher level professional, managerial, and technical occupations (Farley, 1996). Occupational segregation had declined appreciably over the preceding two decades, allowing black men to gain entrance to elite economic sectors previously dominated exclusively 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 their white peers at all levels of economic attainment (Harrison & Bennett, 1995). Of greater concern, this earnings gap had widened substantially over the 1980's (Bound & Freeman, 1992), despite narrowing black-white gaps in both educational attainment and cognitive test scores (Mare, 1995; Jencks & Phillips, 1998).

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 lower status, skill, and earnings (Parcel & Mueller, 1983; Braddock & McPartland, 1987) with the implicit assumption that a majority 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 earnings gap has grown larger 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 (Cain, 1986; Bound & Freeman, 1992; 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 et al., 1994), often ignoring the potential variation in racial earnings inequality at different points in the occupational structure.[1]

While both these approaches offer useful insights into the factors which underlie 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 racial earnings disparities 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 higher 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 lower 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 co-workers and widens levels of inequality across comparable employees. Given recent empirical trends toward greater *equality* in occupations 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 data from two decades later, we investigate the relationship between occupations and racial earnings inequality, explicitly investigating variation in the severity of the race penalty across the occupational hierarchy. Additionally, we go beyond this descriptive decomposition to provide an explanatory model of occupational earnings inequality, looking to the characteristics of occupations which 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 (Doeringer and Piore, 1971; Sakamoto and Chen, 1991; Beck, Horan, & Tolbert, 1978; Dickens & Lang, 1985). While providing some 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 (see Cain, 1976; Hodson & Kaufman, 1982; Hauser, 1980 for extensive critiques).

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 has been well established in previous literature (Kohn, 1977; Sorensen, 1996; Grusky & Sorensen, 1998) and the direct association between occupations and earnings is demonstrably strong (Sewell & Hauser, 1975; Featherman & Hauser, 1978; Stolzenberg, 1975). While we do not preclude the possible influences of other labor market structures (e.g., industry, firm, job), we view the occupational structure as an important and 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 which distinguishes among the occupational mechanisms which may contribute to the black-white earnings gap. Our model evaluates the contribution of 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 earnings disparities 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 seek to develop causal explanations regarding the differences between the earnings of black and white men within the same occupations.

The third mechanism of interest can be thought of as an interaction of the between- and within-occupational sources of inequality. This mechanism is present only if racial disparities within occupations vary systematically according to the average earnings across (between) occupations. We view this mechanism as a potentially important and much under-researched source of racial earnings inequality. As discussed above, Kaufman's analysis of the 1970 Census suggested 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 & 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 may expect to see a reversal in the relationship between earnings and inequality, such that the black-white gap should grow

[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 (Moss & Tilly, 1996; Cotton, 1989).

smaller (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 racial earnings disparities, we may under- (or over-) estimate the degree to which redistribution of blacks into higher paying occupations would affect racial earnings inequality 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 which emerge between-occupations, within-occupations, and through the interaction of the two.

Our Approach

The first part of our paper provides a decomposition of the racial earnings gap 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-occupational sources of inequality. The second part of the paper then seeks to provide an explanatory account of each of the three mechanisms which operate at the occupational level (between-, within-, and the interaction of the two). We consider a variety of occupational characteristics (discussed below) which 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 wage disparities.

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 non-institutional civilian men between the ages of 25 and 64 who were employed in non-farm occupations at the time of the decennial census and who had positive earned income for 1989. Public and private sector samples were drawn separately both 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, making the fit statistics and parameters for each sector not strictly comparable.[3] For the private sector files, all nonwhites and a random 25 percent sample of whites were extracted from the five percent PUMS, and for the public sector files, the full five percent PUMS sample was used in order to provide sufficient cell counts in our occupational level analyses. The samples we used for our analyses include over a million African American, Hispanic, Asian and white men, about three quarters of whom are employed in the private sector. See Appendix A for details concerning the sample selection and restrictions. Table 1 presents descriptions of each variable, and Appendix B presents means and standard deviations of all measures by sector of employment.

In seeking to understand the characteristics of occupations which determine wage rates, we consider a variety of compositional and requisitional factors which have demonstrated important effects in previous research. We are primarily concerned with three sets of occupational characteristics which

may contribute to within- and between-occupational earnings inequality: prestige, composition, and skill requirements.[4] These components may operate quite differently in the public and private sector, as well as for men and women, so we estimate models separately by sector and limit our present 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 & Hauser, 1978; Sewell & Hauser, 1975). There is additional evidence to suggest that occupational standing is positively associated with racial disparities (Tienda & Lii, 1987; Telles, 1994), 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 higher status blacks at a greater relative earnings disadvantage than their lower status peers. In these analyses, we

---

[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 the characteristics of an individual's job. To the extent that this operationalization is incorrect (i.e., the extent that labor market effects obtain at the job or firm and not the occupational level), our estimates of the effects of composition may be attenuated by aggregation error. We expect that wage valuation is affected by the general characteristics of an occupation (as measured here); should wages depend more on local labor market factors, however, 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.

use the Nakao-Treas prestige score as a proxy for occupational standing (Nakao and Treas, 1994).[6]

Occupational Composition:

While prestige is one important dimension of occupational standing, attributes of occupational incumbents may 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 (Tienda & Lii, 1987; England et al., 1988). With respect to compositional effects on the within-occupation racial earnings gap, we take the view that an occupation's racial and gender composition serve as status markers, with minority- and female-dominated occupations enjoying 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

[6] We also estimated models which included occupational education as a proxy for occupational status (Hauser & Warren, 1997). In these models, the coefficient of occupational education appears in the same direction as occupational prestige, though not statistically significant.

[7] There is some circularity here which is difficult to reconcile. Tomaskovic-Devey 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 whereby members of low status minority groups are relegated to the least desirable positions (Lieberson, 1980; Model, 1997; Waldinger, 1989). In the context of the present research, it is not possible to conclusively adjudicate between these competing explanations. Our main interest, however, is in testing for the presence of such an association (irrespective of causal direction), and examining its implications for racial earnings inequality.

composition are straightforward, representing the percent of workers in each occupation who are blacks or females.

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). In this paper, we consider three types of skill demands as possible sources of wage inequality: cognitive, interpersonal, 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 huge growth in white collar employment have contributed to a rising premium on intellectual aptitude and ability (Freeman, 1996; Murphy & Welch, 1994; Murnane et al., 1995). With increasing competition in the economy, there is greater incentive for employers to weigh individual competence over ascribed characteristics such as race. We expect, therefore, that cognitive skill demands will be associated with higher average occupational earnings and lower within-occupation racial earnings disparities.

Interpersonal skills represent a second skill dimension of growing importance, particularly given the rapidly expanding service sector. Moss & Tilly (1996) cite interpersonal (or soft) skills as an important factor in racial wage disparities, with the argument that employers tend to devalue the

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

communication skills and personality traits of blacks relative to whites with equal formal credentials. Likewise, we expect that while interpersonal skills are characteristic of lower 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 where cognitive or interpersonal skills are not. If this is the case, and if, as we believe, 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 which require manual skills, while offering a lower average rate of pay, will tend to have a lower racial earnings gap than those which 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 strength of the DOT is that it is one of the few data sets to offer measures of jobs which are not based on reports of job holders or on aggregations of job holder attributes. As such, 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 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 which map onto census occupation codes, researchers have aggregated measures across jobs, often summing scales of items that were ordinal but not interval (England & Kilbourne, 1988). This adds an unknown amount of error to DOT measures.[9]

Despite these limitations, the DOT offers some of the best available data on the characteristics of occupations and are 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 (from 0.80 to 0.96). Furthermore, the cognitive skill demands scale correlates at 0.90 at the occupational level with Hauser and Warren's measure of occupational education (Hauser & Warren, 1997), fairly strong construct validity for an independent scale estimate.

We use a simple additive model to construct the three skill factors.[10] 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

[9] See Cain and Treiman, 1981, for a more detailed discussion of the strengths and weaknesses of the DOT as a data source for sociological analyses.

talking or hearing, verbal skills and complexity in dealing with people.[11] 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 0.92, 0.88 and 0.78 for cognitive, interpersonal, and manual skills, respectively. These scales are not constrained to be orthogonal, and in fact the correlation between interpersonal and cognitive skill demands is quite substantial (0.81). 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 racial earnings disparities is the distinction between public and private sectors. The public sector has long been regarded as the

---

[10] 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 0.95 level, and results of our multilevel models using different factor indicators are similar in substance to the findings we report here, though the size of the skills coefficients vary slightly.

[11] 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.

"vanguard of equal opportunity" (Krislov, 1967), representing a close approximation of Weber's ideal type bureaucracy with a highly rationalized system of hiring, promotion, and remuneration (Grandjean, 1981). The established bureaucratic procedures which direct all stages of employment decisions in the public sector are thought to shield against forms of discrimination which may prevail in private sector firms (DiPrete & Soule, 1986; Moulton, 1990).[12] Indeed, empirical evidence suggests that the wage gap by race and gender are both substantially lower in the public sector than in corresponding private sector occupations, and a disproportionate number of blacks and women are employed in public sector positions (Ehrenberg & Schwarz, 1986). We consider the relationship between sector and racial earnings disparities, assessing the extent to which the public sector effectively attenuates the negative relationship between race and earnings.

Methods

We begin our analyses by estimating conventional OLS models of racial earnings inequality. These models allow us to assess the contribution of individual-level variables to racial earnings inequality and to provide a baseline estimate of racial earnings inequality net of individual-level characteristics. The real strength of our approach, however, emerges when we move to a two-level framework. Using this approach, we are able to directly test the hypotheses which result from our structural model of earnings

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

inequality.[14] In these models, the level one unit of analysis is the individual, while the level two 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 earnings gap).

The estimation of separate occupational disturbances offers several analytic advantages. By partitioning earnings variance into its within- and between-occupation components, the model allows us to test empirically whether or not 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 we find that there is meaningful variation between occupations in some individual level outcome or predictor (i.e., earnings and/or race), we can model this variation at the occupational 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 occupational level model then has two components—a fixed effects component which is a function of occupational attributes, and a random component which is variance in the occupational outcome that remains after controlling for observed occupational predictors. Correlation among random components then represents the relationship between

[14] Many of the analyses we conduct using multi-level 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 for each j-1 of j occupations and an interaction of the j-1 dummies with the black indicator. 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-one 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, leave individual-level approaches less desirable.

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:

$$Y_{ij} = \beta_{0j} + \beta_{1\text{-}7j}(\text{education}) + \beta_{8j}(\text{black}) + \beta_{9j}(\text{Hispanic}) + \beta_{10j}(\text{Asian}) + \beta_{11j}(\text{experience}) + \beta_{12j}(\text{experience}^2) + \beta_{13\text{-}20j}(\text{region}) + \beta_{21\text{-}26j}(\text{marital status}) + r_{ij}$$

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

---

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

model which excludes occupational dummy variables.

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 earnings gap) to vary freely across occupations. This approach allows us to directly assess the extent to which black disadvantage is generated through their disproportionate concentration 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:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{prestige}) + \gamma_{02\text{-}03}(\text{composition}) + \gamma_{04\text{-}06}(\text{skill demands}) + u_{0j}$$

where j indexes occupations, β_{0j} is the intercept term from the individual level equation (representing

[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 earning 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 report here, leading us to conclude that our use of the semi-log 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.

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 earnings gap within occupation j is:

$$\beta_{8j} = \gamma_{80} + \gamma_{81}(\text{prestige}) + \gamma_{82\text{-}3}(\text{composition}) + \gamma_{84\text{-}6}(\text{skill}) + u_{8j}$$

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 potential role of occupational-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 $\gamma_{80\text{-}6}$ as well as the variance of u_{8j} would be upwardly biased to the extent that these occupational factors (and unobserved sources of occupational earnings variation) affect both white and black workers.

Before moving on to the results section, we wish to caution readers with regard to 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 our research, we have a sample of individuals but a *census* of occupations (with the exception of those occupations excluded due to cell size). Our final sample represents over 90 percent of the employed civilian non-farm male population between the ages of 25 and 64 and *all* of the occupations in which they are employed. Though 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 the traditional measure of sampling error. The smaller the standard error, the more consistent the effects of some measure at the occupational level.

Results

Individual Level Variation

Our initial (single-level) estimates of the earnings inequality experienced by black men are shown in Table 2. The predicted unadjusted difference in log hourly earnings of black and white men in the

private sector is –0.34 log units (a difference of $3.65 per hour at the private sector mean) (see Model 1). Adding educational attainment and potential years of experience (Model 2) reduces the black coefficient by 38 percent to –0.21. The regional variables (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 –0.20 Finally, including marital status and an indicator for whether or not a spouse is absent (Model 4) reduces the predicted race association to –0.16.[18] In total, the inclusion of education and potential experience, region and marital status reduces the association between race and log hourly earnings by 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 some important differences in the nature of racial disparities. First, we see that the baseline OLS difference in expected log hourly earnings for black 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 black earnings disadvantage in the public sector from -0.24 log units to -0.11 log units. This is a larger proportionate reduction than we found associated with the inclusion of human capital measures in the private sector, where black-white differences were reduced by 38 percent.

[18] The role of marital status in earnings equations for men has been the subject of some controversy in the literature. Though 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 attempt to 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.

While not perhaps color blind, the public sector seems 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.

Though important differences emerge from our public and private sector analyses, both models demonstrate a substantial race effect 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-Occupational Variation

At the occupation level of these analyses, we assess 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

---

[19] These estimates are consistent with previous research on black-white wage differences using data from similar time

first mechanism of earnings inequality 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 middle section of table 2. The OLS estimates for Model 5 are directly comparable and quite similar to the HLM results for the model in which only the intercept is freed (HLM comparison model).[20] Note that by including controls for occupation, the interpretation of the race coefficient changes. The black indicator now represents the expected *within-occupation* difference in log earnings between white and black workers (in contrast to the average black-white earnings difference due to *both* within- and between- occupational differentiation). This allows us to clearly distinguish between earnings inequality which emerges as the result of differential placement versus that due to differential rewards. Under both models, we see that occupations mediate approximately 20% of the black-white earnings gap.[21] It is interesting to note that the wages in private sector occupations appear to be more influenced by individual characteristics (with about 19 percent of the variance in wages found *between* occupations) while in the public sector

---

periods (e.g., Bound and Freeman (1992) estimate an adjusted gap of -.179 using the 1989 CPS earnings data).

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

[21] The test statistics for the HLM comparison model demonstrates the significant improvement in fit which results from allowing average earnings to vary across occupations (χ^2= 82457,df= 450 in the private sector and χ^2=34654, df=431 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.

occupational structure plays a greater determining role (with 26 percent of wage variation explained at the occupational level). Not only, then, are wages in the public sector more closely linked to individual human capital, but also the public sector appears to regulate wages more closely according to occupational title. Allowing occupational intercepts to vary (or including occupational dummies) brings the total proportion of the expectation of the race coefficient we have accounted for to roughly 75 percent. Thus a majority of the racial gap in earnings for men in the private sector 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 lower 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 the random intercepts model represents the *average* difference in earnings between black and white workers within 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 wage gap. 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. The final model in table 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 slope term for each occupation included in our sample.

The results of this model indicate that racial earnings inequalities do in fact vary significantly across occupations in both the public and private sectors (χ^2=1012, df=450 in the private sector and χ^2=1576, df=431 in the public sector).[22,23] The hypotheses for homogeneity 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 occupational 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-

---

[22] For a model in which a single level one slope (or only the intercept) is freely estimated, the reliability for the level one 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 race coefficient, 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 s^2/n_j, where s^2 is the level one error variance. 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 $s^2(X_j'X_j)^{-1}$ where the matrix X_j includes a column of 1s for the intercept and a column for the black indicator (1 for black men, 0 for white men).

[23] Though the intercept term is estimated quite reliably in each model (with reliability > 0.90), the black coefficient is not. The average reliability of the black-white wage gap estimate remains around 0.35. This may be in part due 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-black correlation (about -0.55).

[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 which place greater weight on more reliable estimates (see footnote 25). In this model, we are less interested in the fixed effect estimate presented in this table than with the randomly varying estimate produced for each occupation which serves as one of our dependent variables in the following analyses.

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 would expect a –0.17 unit decrease in the earnings of blacks within that occupation. In other words, the higher the average earnings of 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 their lower earning peers reveals an important and much 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 analyses using standard analytic techniques), we would miss a substantial range of variation in within-occupation racial earnings differences. While the average earnings difference between black and white men is about 9 percent, observed differences vary across occupations from about a 10 percent black

[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 quite similar (correlated at 0.98). 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 prefer to 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 0.54), but the relationship between occupational earnings and within-occupation earnings inequality using OLS estimates is about twice as strong as what we have presented here.

advantage 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 coworkers. This result reinforces the earlier research of Kaufman (1983) which 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 most relative to their white peers.

In the public sector, we find that the relationship is quite different. Unlike the private sector in which 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 white occupational earnings along the x-axis and within-occupation earnings inequality (mean black earnings – mean white earnings) along the y-axis.[27] Though we find that white occupational earnings and within-occupation racial earnings inequality are related, this association is quite weak (with a regression slope of –0.03). Black men working their way

---

[26] The distinction between relative and absolute earnings differences is important. If in fact the earnings difference were constant across occupations, the relative earnings difference between black 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 higher 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.

up into higher paying public sector jobs, therefore, come closer to achieving earnings parity with whites than they would were they employed in identical private sector occupations.

This is not to say that black earnings are equal to white earnings across public sector occupations. In fact, racial earnings disparities 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 entirely in the direction of black disadvantage. For example, while at one extreme 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 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 to 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 earnings inequality

In the preceding analyses, we 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 lower-paying occupations, and in the private sector we found that the racial earning gap grows wider

---

[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 –0.05 compared to the above estimate of –0.03. Eliminating highly leveraged occupations in the private sector equation had virtually no effects on our estimates.

with average white occupational earnings. But what are the mechanisms which account for the differential returns to occupational placement? And what might help us explain the remaining race by earnings association? In the following analyses, we explore 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 white occupational earnings (shown in the first two columns of Table 3) are quite successful in explaining occupational earnings variation and generally support our hypotheses. Prestige has a strong positive effect on occupational earnings while both percent black and percent female are negative predictors of occupational earnings (though the coefficient of 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]

The next two columns of Table 3 show estimates for our models of variation in within-occupation racial earnings inequality. The most striking feature of the table, in our view, is that very few of our occupation-level predictors are able to explain variation in the wage gap between occupations. While the null hypothesis of homogeneity in racial inequality across occupations is soundly rejected in our baseline model and all other models we estimate, we are able to account for very little of this variation with our indicators of prestige, composition, and skill requirements. In the private sector, only

[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, suggesting that remuneration in private sector occupations is more closely tied to skill demands relative to their public sector counterparts.

percent female emerges as a significant predictor of variation in racial earnings inequality across occupations, with occupations that have high concentrations of women demonstrating a lower racial wage gap. In the public sector, interpersonal skills demonstrate a significant effect: occupations which emphasize interpersonal skills appear to be those in which black men are relatively more equal 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, in occupations characterized by high concentrations of women and/or a strong emphasis on interpersonal skills. Overall, however, we are left with little to explain systematic variation in the wage gap across occupations.

The Relationship between White Occupational Earnings and Racial Disadvantage

Does the inclusion of occupation-level predictors help us to account for the earlier finding that racial disadvantage increases at higher levels of occupational earnings? While we expected that occupational characteristics would account for at least some of this relationship, we found instead that the correlation between occupational earnings and within-occupational earnings inequality (in the private sector) *increases* with the inclusion of occupational predictors, from
-0.55 in the baseline model to –0.63. In Figure 3, we plot the net relationship between occupational earnings and within-occupation racial earnings inequality estimated from a model which includes controls for all of our measured occupational characteristics. The distribution across the downward slope is

substantially less disbursed in the private sector, suggesting a strong relationship between white occupational earnings and within occupation earnings inequality, net of our observed predictors. The increasing black disadvantage we observe 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, quite apart from the other dimensions of occupational characteristics as measured here.

In the public sector, we find just the opposite effect of including occupational characteristics. This model produces a smaller 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 as we add occupation-level predictors to our equation. Figure 4 plots the relationship between net occupational earnings and net within-occupational racial earnings differences from a model including all significant predictors reported above. After controlling for indicators of 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 distinct lack of association between these indicators. Unlike in the private sector where racial disparities are systematically related to white occupational earnings, in the public sector, net of occupational

characteristics, we find no such trend.

Discussion

In this paper we have examined the individual and occupational characteristics which are associated with earnings inequality between black and white men. Our findings show that just over half of the racial earnings gap 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 lower average earnings, even after controlling for individual characteristics. In general, these lower paying occupations are characterized by lower prestige, fewer hard skill requirements, greater emphasis on soft skills, and higher proportions of female and black incumbents.

The extent to which the racial earnings gap is a reflection of individual differences and occupational segregation is not surprising. Previous research has extensively examined these processes and documented their effects. Common to most of this research is the finding that racial disparities in earnings persist even after accounting for each of these factors.

Our study extends prior work on racial earnings disparities by concentrating on inter-occupational variation in the effects of race on earnings 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 which emerges at different points in the occupational structure is critical to gaining a comprehensive understanding of the black-white wage gap.

For the 23 percent of black men employed in the public sector, we find encouraging evidence that occupations levy 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 find less reassurance that meritocracy is the driving force behind wage allocation. The strong and systematic relationship between white occupational earnings and racial disparities suggests that race remains a salient feature in the occupational hierarchy of the private sector. Higher earning private sector occupations are characterized by greater racial earnings inequalities, 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, occupational composition and occupational skill requirements were unable to account for even part of this relationship. To what then do we attribute our private sector findings?

In seeking to make sense of these results we must first consider the possibility of omitted variable bias. Recent research has argued that previous measures of human capital have failed to accurately 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 & 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 in large part by Herrnstein and Murray's *The Bell Curve,* others have provided evidence which suggests that, even net of substantial controls for both background and ability, racial earnings differences 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) cast doubt on the assertion that unmeasured skills exert any substantial bias on earnings equations in the presence of 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 earnings gap. If in fact the racial skill gap (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 higher paying occupations than in lower paying ones, then the variation in racial earnings inequality we observe may be an artifact of actual skill differences between black and white workers. However, in a model which includes individual- and occupation-level indicators of literacy skills (a measure highly correlated with

conventional measures of cognitive ability), Raudenbush and Kasim find skill differences leave a substantial portion of the occupational variation in black-white earnings inequality unexplained. There is little indication from previous research, therefore, that unmeasured skills are the driving force behind our findings.

In our work, we have further tested for the possibility that unmeasured skill differences may present a source of spuriousness affecting our results. Two indirect tests bear relevance to this question. 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 to be 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.[29]

Second, we have tested for the presence of a race by education interaction in our individual level model. If black/white skill gaps become 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 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 obtain, further weakening concerns over the

[29] 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.

potential skill bias. In any case, we hope that future research will pursue this line of inquiry, using direct measures of cognitive skill as an individual-level attribute.

A second possible source of spuriousness may emerge from the general pattern of earnings variation across the occupational distribution. For example, if there exists greater variation in log occupational earnings within higher earning occupations than lower earning ones, then the pattern of racial earnings disparities we observe 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 level of log occupational earnings, finding no sign of a positive relationship. In fact, based on our log scale of earnings, 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.

To what then can we attribute this striking relationship? To try to answer this question through a more qualitative investigation, we looked to the specific private sector occupations which demonstrate the most and least pronounced racial disparities. An interesting pattern emerges from this analysis: Many of the occupations with the largest racial wage gap, such as securities and financial services, insurance sales, managers in properties and real estate, lawyers, and physicians, can be characterized as occupations which rely on developing a profitable clientele for success. If it is the case that blacks and whites within 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.

Support for this argument can be 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 may gain access to restricted occupations given a sufficient minority community size to support such employment. Hout 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" (Hout, 1986:222,215). The emphasis here is on occupational opportunities; the extension of this argument, however, is that while blacks may gain access to these elite occupations because of the ethnic niche, they are then relegated to a fairly poor 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 directly follows that their sales commissions will be significantly lower than otherwise equal whites (Kiel & 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).

Reinforcing this conclusion, 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, elevator

operators, 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.

An interesting implication of this pattern is that studies of occupational segregation would be well-served to pay attention not only to the racial composition of employees within an occupation, but also to the racial composition of those who patronize an occupation (by race of employee). The segregated networks of most American workers may be an important source of racial earnings disparities, not only in terms of gaining access to elite occupations (Mouw, 2000), but also in terms of profiting from one's labor once there.

Conclusion

We began this investigation by pointing out the apparent contradiction between recent trends in occupational mobility and earnings inequality. By providing an integrated analysis of labor market disparities which takes into account the relationship between occupational placement and racial earnings inequality, we reveal one mechanism which may underlie the opposing trends we observe. 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 which 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 become more successful in gaining entry to the most highly compensated occupational positions, they simultaneously become subject to more extreme racial disadvantage. 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.

References

Ashenfelter, Orley and Cecilia Rouse (1999). "Schooling, Intelligence, and Income in America: Cracks in the Bell Curve." National Bureau of Economic Research Working Paper 6902.

Beck, Elwood M., Patrick M. Horan, and Charles M. Tolbert II. 1978. "Stratification in a Dual Economy: A Sectoral Model of Earnings Determination." *American Sociological Review* 49:454-73.

Bound, John and Richard Freeman. 1992. "What Went Wrong? The Erosion of Relative Earnings and Employment among Young Black Men in the 1980s." *Quarterly Journal of Economics*, CVII:201-232.

Braddock, Jomills Henry and James M. McPartland. 1987. "How Minorities Continue to Be Excluded from Equal Employment Opportunities: Research on Labor Market and Institutional Barriers." *Journal of Social Issues* 43(1):1-78.

Bridges, William and Robert Nelson. 1989. "Markets in Hierarchies: Organizational and Market Influences on Gender Inequality in a State Pay System." *American Journal of Sociology* 3(November):616-58.

Cain, Glenn. 1986. "The Economic Analysis of Labor Market Discrimination: A Survey." In O. Ashenfelter & P. Layard (Eds.), *Handbook of Labor Economics*. New York: North-Holland.

Cain, Glen. 1976. "The challenge of segmented labor market theories to orthodox theory." *Journal of Economic Literature* 14: 1215-1257.

Card, David and Thomas Lemieux. 1994. "Changing Wage Structure and Black-White Wage Differentials." *American Economic Review*, 84(2):29-33.

Cawley, John, Karen Connelly, James Heckman, Edward Vytacil. 1996. "Measuring the Effects of Cognitive Ability." NBER working paper #5645.

Collins, Sharon. 1993. "Blacks on the Bubble: The Vulnerability of Black Executives in White Corporations." *Sociological Quarterly* 34(3): 429-448.

Collins, Sharon. 1989. "The Marginalization of Black Executives." *Social Problems* 36(4): 317-331.

Collins, Sharon. 1983. "The Making of the Black Middle Class." *Social Problems* 30(4): 369-381.

Cotton, Jeremiah. 1989. "Opening the Gap: The Decline in Black Economic Indicators in the 1980s." *Social Science Quarterly*, 70(4), pp.803-819.

Dickens, William T. and Kevin Lang. 1985. "A Test of Dual Labor Market Theory." *American Economic Review* 75(4):792-805.

DiPrete, Thomas and Whitman Soule. 1986. "The Organization of Career Lines: Equal Employment Opportunity and Status Advancement in a Federal Bureaucracy." *American Sociological Review* 51(June):295-309.

Doeringer, Peter and Piore, Michael. 1971. *Internal Labor Markets and Manpower Analysis*. Lexington: Lexington Books.

Duncan, Otis Dudley. 1961. "A Socioeconomic Index for All Occupations." Pp. 109-138 in A. J. Reiss (ed.) *Occupations and Social Status*. New York: The Free Press.

Durr, Marlese and John R. Logan. 1997. "Racial Submarkets in Government Employment: African American Managers in New York State. *Sociological Forum* 12(3): 353-370.

Ehrenberg, Ronald, and Joshua Schwarz. 1986. "Public-Sector Labor Markets." In Orley Ashenfelter and Richard Layard, eds., *Handbook of Labor Economics*. Amsterdam: North-Holland, pp.1219-68.

England, Paula, George Farkas, Barbara Kilbourne, & Thomas Dou, 1988. "Explaining Occupational Sex Segregation and Wages: Findings from a Model with Fixed Effects." *American Sociological Review* 53:544-59.

England, Paula and Barbara Kilbourne. 1988. *Occupational Measures from the Dictionary of Occupational Titles for 1980 Census Detailed Occupations* [Computer File]. Richardson, TX: Paula England and Barbara Kilbourne [producers], 1988. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor], 1988.

Farkas, George and Kevin Vicknair (1996). "Comment: The Need to Control for Cognitive Skill." *American Sociological Review* 61 (4): 557-564.

Farley, Reynolds. 1996. *The New American Reality: Who We Are, How We Got Here, and Where We Are Going*. New York: Russell Sage Foundation.

Feagin, Joe and Melvin Sikes. 1994. *Living With Racism: The Black Middle-Class Experience*. Boston: Beacon Press.

Featherman, David L., and Robert M. Hauser. 1978. *Opportunity and Change*. New York: Academic Press.

Freeman, Richard. 1996. "When Earnings Diverge: Causes, Consequences, and Cures to the New Inequality in the U.S." Unpublished manuscript. Cambridge, MA: Harvard University and National Bureau of Economic Research.

Grandjean, Burke. 1981. "History and Career in a Bureaucratic Labor Market." *American Journal of Sociology* 86(5):1057-1091.

Grusky, David and Aage Sorensen. 1998. "Can Class Analysis Be Salvaged?" *American Journal of Sociology* 103(5):1187-1234.

Harrison, Roderick J. and Claudette E. Bennett. 1995. "Racial and Ethnic Diversity," in *State of the Union: America in the 1990s, Volume II: Social Trends.* New York: Russell Sage Foundation, Chapter 4.

Hauser, Robert and John Warren. 1997. "Socioeconomic Indexes of Occupational Status: A Review, Update, and Critique." Pp.177-298 in *Sociological Methodology*, 1997, Adrian Raftery, ed. Cambridge: Blackwell Publishers.

Hauser, Robert M. 1980. "Comment on Beck, Horan, and Tolbert, 'On Stratification in a Dual Economy.'" *American Sociological Review* 45:702-12.

Herrnstein, Richard J, and Charles Murray. 1994. *The Bell Curve: Intelligence and Class Structure in American Life.* New York: The Free Press. (Ch. 1-12, Appendix 4)

Hodson, Randy. 1985. "Some Considerations Concerning the Functional Form of Earnings." *Social Science Research* 14(4): 374-394.

Hodson, Randy, and Robert L. Kaufman. 1982. "Economic Dualism: A Critical Review." *American Sociological Review* 47:727-39.

Hout, Michael. 1984. "Occupational Mobility of Black Men, 1962 to 1973." *American Sociological Review* 49:308-22.

Hout, Michael. 1986. "Opportunity and the Minority Middle Class: A Comparison of Blacks in the United States and Catholics in Northern Ireland." *American Sociological Review* 51:214-23.

Jencks, Christopher and Meredith Phillips (eds.). 1998. *The Black-White Test Score Gap.* Washington, D.C.: Brookings Institution Press.

Kaufman, Robert. 1983. "A Structural Decomposition of Black-White Earnings Differentials." *American Journal of Sociology* 89(3):585-611.

Kiel, Katherine and Jeffrey Zabel. 1996. "House Price Differential in U.S. Cities: Household and Neighborhood Racial Effects." *Journal of Housing Economics* 5:143-65.

Kilbourne, Barbara, Paula England, and Kurt Beron. 1994. "Effects of Individual Characteristics on Earnings: Intersections of Race and Gender." *Social Forces*, 72(4):1149-1176.

King, Mary. 1992. "Occupational Segregation by Race and Sex, 1940-88." *Monthly Labor Review*, April.

Kohn, Melvin (1977). *Class and conformity : a study in values, with a reassessment*. Chicago : University of Chicago Press.

Korenman, Sanders and David Neumark (1990). "Does Marriage Really Make Men More Productive?" *The Journal of Human Resources* 26 (2): 282-307.

Krislov, Samuel. 1967. *The Negro in Federal Employment.* Minneapolis: University of Minnesota Press.

Lieberson, Stanley. 1980. *A piece of the pie : Blacks and white immigrants since 1880*. Berkeley : University of California Press.

Mare, Robert D. 1995. "Changes in Educational Attainment and School Enrollment." Pp. 155-213 in R. Farley (ed.) *State of the Union: America in the 1990s; Volume One: Economic Trends*. New York: Russell Sage Foundation.

Model, Suzanne. 1997. "An Occupational Tale of Two Cities: Minorities in London and New York." *Demography* 34(4):539-550.

Moss, Philip and Chris Tilly. 1996. "'Soft' Skills and Race: An Investigation of Black Men's Employment Problems." *Work and Occupations* 23(3):252-276.

Moulton, Brent. 1990. "A Reexamination of the Federal-Private Wage Differential in the United States." *Journal of Labor Economics*, 8(2), pp.270-293.

Mouw, Theodore. 2000. *Four Essays on the Social Structure of Urban Labor Markets.* Ph.D. Dissertation, University of Michigan.

Murnane, Richard, John Willett, and Frank Levy. 1995. "The Growing Importance of Cognitive Skills in Wage Determination." *The Review of Economics and Statistics:* 251-266

Murphy, Kevin and Finis Welch. 1994. "Industrial Change and the Rising Importance of Skill." In S. Danziger and P. Gottschalk (eds.) *Uneven Tides: Rising Inequality in America.* New York: Russell Sage Foundation.

Nakao, Keiko, and Judith Treas. 1994. "Updating Occupational Prestige and Socioeconomic Scores: How the New Measures Measure Up." *Sociological Methodology 1994*. (Volume 24): 1-72.

Neal, Derek, and William Johnson. 1996. "The Role of Premarket Factors in Black-White Wage Differences." *Journal of Political Economy*, 104(5):869-895.

O'Neill, June. 1990. "The Role of Human Capital in Earnings Differences between White and Black Men." *Journal of Economic Perspectives*, 4(4).

Parcel, Toby L. and Charles W. Mueller. 1989. "Temporal Changes in Occupational Earnings Attainment, 1970-1980." *American Sociological Review* 54 (August): 622-634.

Peterson, Trond. 1999. "Functional Form for Continuous Dependent Variables: Raw Versus Logged Form." Presentation at the American Sociological Association Annual Meetings, Chicago.

Raudenbush, Stephen and Rafa Kasim. 1998. "Cognitive Skill and Economic Inequality: Findings from the National Adult Literacy Survey." *Harvard Educational Review* 68(1):33-79.

Sakamoto, Arthur and Meichu D. Chen. 1991. "Inequality and Attainment in a Dual Labor Market." *American Sociological Review* 56:295-308.

Sewell, William H., and Robert M. Hauser. 1975. *Education, Occupation, and Earnings: Achievement in the Early Career*. New York: Academic Press.

Sorensen, Aage. 1996. "The Structural Basis of Social Inequality." *American Journal of Sociology* 101 (5): 1333-1365.

Spenner, Kenneth I. 1983. "Deciphering Prometheus: Temporal Change in the Skill Level of Work." *American Sociological Review* 48:824-37.

Stolzenberg, Ross. 1975. "Education, Occupation, and Wage Differences between White and Black Men." *American Journal of Sociology* 81(2):299-323.

Telles, Edward E. 1994. "Industrialization and Racial Inequality in Employment: The Brazilian Example," *American Sociological Review* 59: 46-63.

Tienda, Marta and Ding-Tzann Lii. 1987. "Minority Concentration and Earnings Inequality: Blacks, Hispanics, and Asians Compared." *American Journal of Sociology*, 93(1):141-165.

Tomaskovic-Devey, Donald. 1993. Gender and Racial Inequality at Work: The Sources and Consequences of Job Segregation. Ithaca, NY: ILR Press.

Waldinger, Roger. 1989. "Immigration and Urban Change," *Annual Review of Sociology* 15: 211-232.

Table 1. Variable Names and Descriptions

INDIVIDUAL LEVEL DATA	
Education	Categorized into no school, 8th grade or less, some high school, high school diploma/ GED (omitted)[1], some college, associate degree, bachelor's degree, more than college
Black	Coded 1 for non-Hispanic black, 0 otherwise
Hispanic	Coded 1 for Hispanic, 0 otherwise
Experience[2]	Age- education- 5
Experience squared	
Region	Categorized into nine census divisions: New England (omitted), Middle Atlantic, East North Central, West North Central, South Atlantic, East South Central, West South Central, Mountain and Pacific
Marital status	Currently married (omitted), widowed, divorced, separated, never married
Spouse absent	Coded 1 for yes, 0 for no
OCCUPATIONAL LEVEL DATA	
Status	
Occupational education	Percent of occupational incumbents with at least some college education
Prestige	Nakao-Treas prestige score divided by 10
Composition	
Percent black	Percent of occupational incumbents that are black
Percent female	Percent of occupational incumbents that are women
Skills	
Cognitive skills	Additive composite, including indicators of complexity in working with data, complexity working with people, general educational development, intellectual aptitude, verbal skills, and numerical aptitude.
Interpersonal skills	Additive composite, including indicators of adaptability to dealing with people, demand for talking or hearing, verbal skills and complexity in dealing with people.
Manual skills	Additive composite, including indicators of manual dexterity, and three separate requirements of reaching, climbing and stooping.

[1] Unfortunately Census data do not allow us to distinguish between high school graduates and those who obtained a GED, a distinction which has important implications for wages (see Murnane et al., 1995).

[2] Years of education were assumed to be 0 for no school, 12 for high school diploma/ GED, 14 for an associates degree, 13 for some college, 16 for college, 18 for a masters degree, 19 for professional school, and 21 for a Ph.D.

Table 2: Individual-Level (OLS) and Multi-Level (HLM) Model Estimates of the Race Coefficient

	Private Sector		Public Sector	
	Estimated effect	**% unexplained**	**Estimated effect**	**% unexplained**
OLS Model 1 (baseline)	-0.338 (0.003)	100.00	-0.239 (0.003)	100.00
OLS Model 2 (+ human capital)	-0.212 (0.003)	62.83	-0.114 (0.003)	47.69
OLS Model 3 (+ region)	-0.201 (0.003)	59.70	-0.113 (0.003)	47.38
OLS Model 4 (+ marital status)	-0.155 (0.003)	46.06	-0.090 -(0.090)	37.59
OLS Model 5 (+ occupations)	-0.087 (0.003)	25.86	-0.047 (0.003)	19.75
HLM Model 1 (occupation, free)	-0.089 (0.003)		-0.048 (0.003)	
HLM Model 2 (occupation, race free)	-0.093 (0.005)		-0.048 (0.008)	

HLM Model Fit	**Model 1**		**Model 2**	
	Private	**Public**	**Private**	**Public**
Mean white occ earnings				
variance	0.050	0.043	0.027	0.022
chi squared	95344.8	42191.2	40837.6	12825.0
df	463	465	444	425
reliability	0.930	0.872	0.909	0.828
Black deviation				
variance	----	----	0.005	0.012
chi squared	----	----	1030	1478
df	----	----	444	425
reliability	----	----	0.363	0.493
overall deviance	1464922	533758	1464313	533056
r(intercept,black)	---	----	-0.629	-0.093

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

	Average Occupational Earnings		Within-Occupation Racial Earnings Disadvantage	
	Private	**Public**	**Private**	**Public**
Status and Composition				
Intercept	**2.447**	**2.507**	**-0.090**	**-0.049**
	(0.008)	**(0.007)**	**(0.006)**	**(0.008)**
prestige/10	**0.062**	**0.060**	-0.003	-0.003
	(0.011)	**(0.010)**	(0.007)	(0.010)
% black	-0.213	-0.221	-0.113	0.126
	(0.169)	(0.168)	(0.112)	(0.172)
% female	**-0.266**	**-0.249**	**0.048**	-0.023
	(0.033)	**(0.031)**	**(0.023)**	(0.031)
Skills				
cognitive	**0.078**	0.034	0.002	-0.028
	(0.025)	(0.023)	(0.018)	(0.024)
interpersonal	**-0.075**	-0.028	-0.019	**0.039**
	(0.019)	(0.017)	(0.014)	**(0.018)**
manual	**-0.034**	**-0.031**	-0.002	-0.009
	(0.015)	**(0.014)**	(0.010)	(0.014)
Model Fit				
variance	0.027	0.021	0.005	0.012
chi squared	40838	12825	1030	1478
df	444	425	444	425
reliability	0.909	0.828	0.363	0.493
overall deviance				
r(intercept,black)			-0.629	-0.093

Figure 1

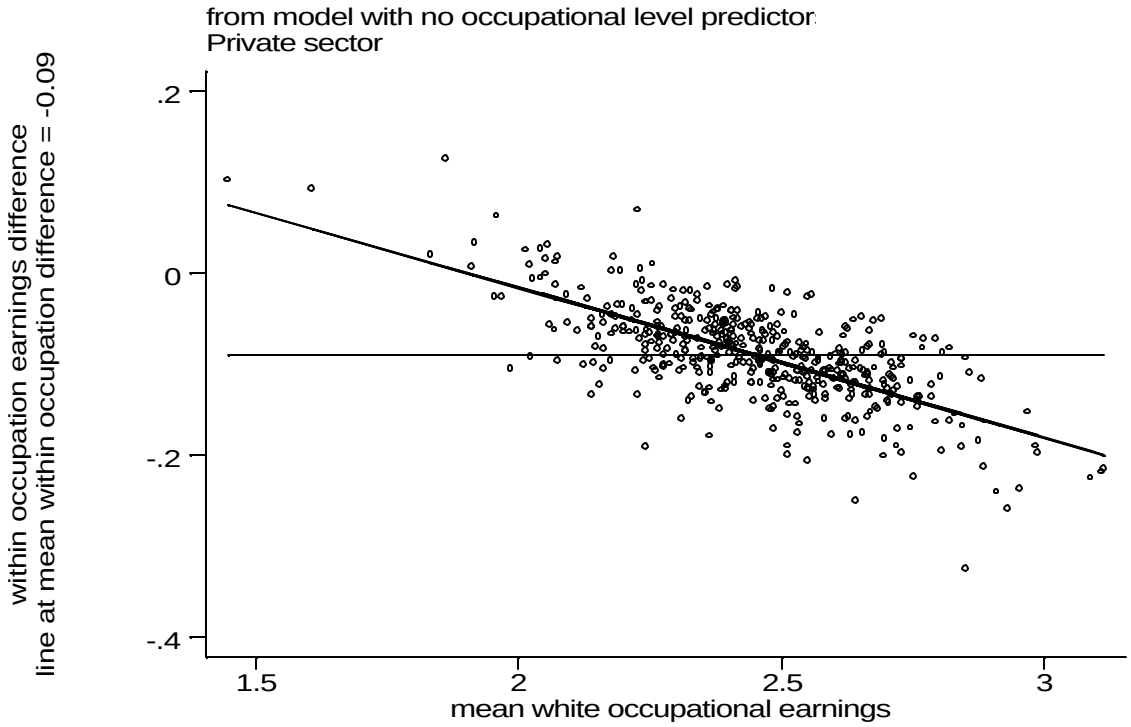

from model with no occupational level predictor
Private sector
within occupation earnings difference
line at mean within occupation difference = -0.09
.2
0
-.2
-.4
1.5
2
2.5
3
mean white occupational earnings

Figure 2

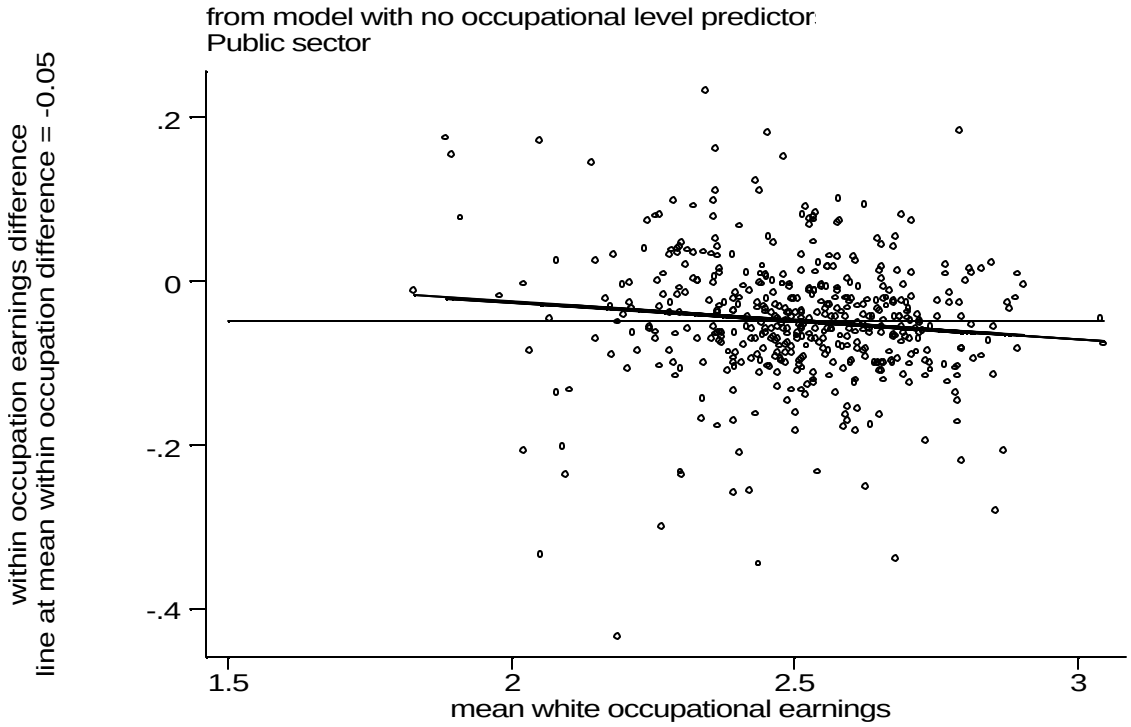

from model with no occupational level predictor
Public sector
within occupation earnings difference
line at mean within occupation difference = -0.05
.2
0
-.2
-.4
1.5
2
2.5
3
mean white occupational earnings

Figure 3

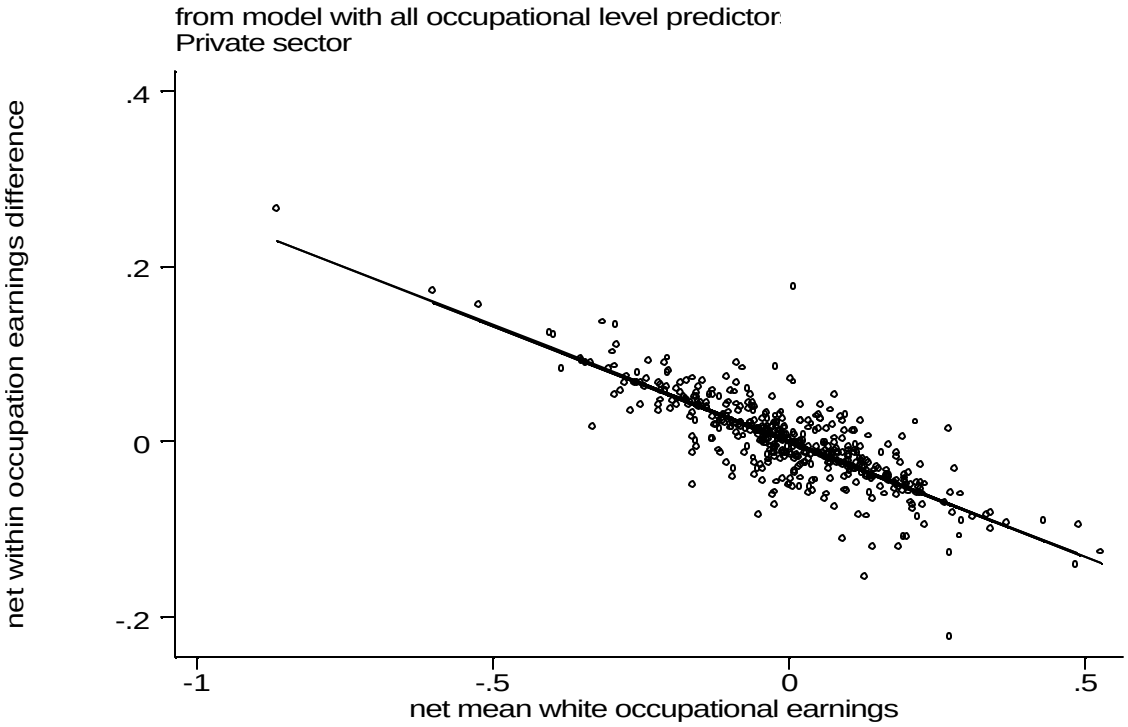
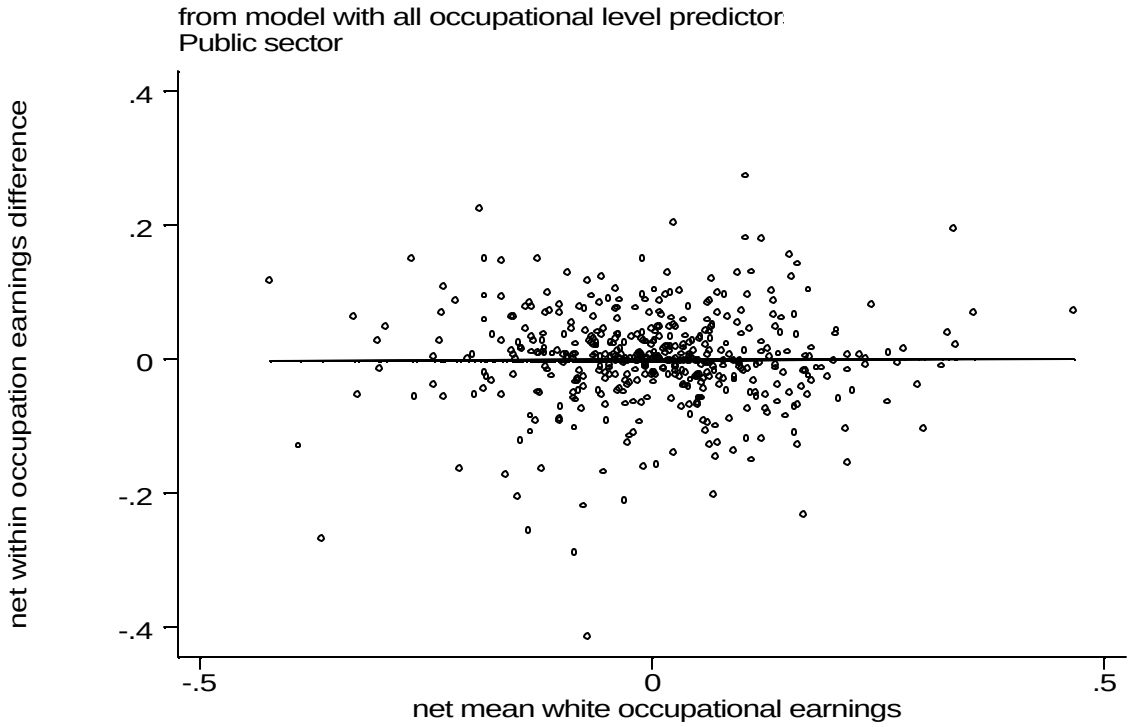

from model with all occupational level predictor
Private sector
net within occupation earnings difference
.4
.2
0
-.2
-1
-.5
0
.5
net mean white occupational earnings

Figure 4


from model with all occupational level predictors
Public sector
net within occupation earnings difference
.4
.2
0
-.2
-.4
-.5
0
.5
net mean white occupational earnings

Appendix A. Sample Selection Procedures

	Private Sector		Public Sector	
	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%	366,195	87.4%
Excluding military	822,631	84.3%	356,304	85.1%
Excluding farm workers	781,457	80.1%	350,953	83.8%
Excluding those in occupations missing DOT measures	780,236	80.0%	350,540	83.7%

Appendix B. Descriptive Statistics for Individual and Occupational Variables

	Private Sector		Public Sector	
	Mean	**Std.Dev.**	**Mean**	**Std.Dev.**
Individual Variables				
ln hourly earnings	2.48	0.72	2.55	0.60
Education				
No school	0.01	0.09	0.00	0.06
Less than 8th grade	0.05	0.22	0.02	0.16
Some HS	0.13	0.33	0.07	0.25
HS diploma/ GED	0.31	0.46	0.24	0.43
Some college	0.20	0.40	0.22	0.41
Associate's degree	0.06	0.24	0.07	0.26
Bachelor's degree	0.16	0.37	0.19	0.39
College +	0.09	0.28	0.19	0.39
White (not Hispanic)	0.82	0.49	0.78	0.50
African American	0.08	0.27	0.14	0.34
Hispanic	0.08	0.26	0.06	0.24
Asian	0.03	0.16	0.03	0.16
Experience	22.49	11.12	22.86	10.70
Experience squared	629.27	581.41	637.14	553.37
Region				
North east	0.06	0.23	0.05	0.22
Midlle Atlantic	0.15	0.36	0.15	0.36
East north central	0.18	0.38	0.13	0.34
West north central	0.07	0.25	0.07	0.25
South Atlantic	0.17	0.38	0.21	0.41
East south central	0.06	0.23	0.06	0.23
West south central	0.10	0.30	0.10	0.30
Mountain	0.05	0.22	0.06	0.25
Pacific	0.16	0.36	0.16	0.37
Marital status				
Married	0.72	0.45	0.75	0.44
Widowed	0.01	0.08	0.01	0.08
Divorced	0.09	0.29	0.09	0.28
Separated	0.02	0.15	0.02	0.15
Never married	0.16	0.37	0.14	0.34
Spouse absent	0.02	0.14	0.02	0.15
Occupational Variables				
Status				
Percent some college	0.51	0.28	0.52	0.28
Prestige	43.63	14.53	44.34	14.58
Composition				
Percent black	0.10	0.06	0.10	0.06
Percent female	0.37	0.30	0.36	0.29
Skill requirements				
Cognitive	-0.01	0.92	0.02	0.91
Interpersonal	-0.02	0.88	0.01	0.88
Manual	0.02	0.79	-0.01	0.79

Center for Demography and Ecology
University of Wisconsin
1180 Observatory Drive Rm. 4412
Madison, WI 53706-1393
U.S.A.
608/262-2182
FAX 608/262-8400
comments to: egrodsky@ssc.wisc.edu
requests to: cdepubs@ssc.wisc.edu