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Employer Skill Needs and Labor Market Outcomes by Race and Gender

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Abstract

In this paper I use data from a recent survey of employers to investigate the effects of employer skill needs on the wage levels and employment of newly hired workers, and especially on how these outcomes differ by race and gender. The skill needs are measured by various human capital credentials required of applicants at the hiring stage (educational attainment, specific experience, prior training) and by the daily task performance of those who are newly hired (reading/writing, arithmetic, use of computers).

The results show that few new jobs are available to those workers who lack most of these credentials or who cannot perform most of these tasks. This is true even of jobs that do not require applicants to have college degrees.

The hiring and task performance requirements of new jobs are associated with lower employment levels of blacks relative to whites within each gender, and some tasks are associated with higher employment levels of females relative to males. These requirements also have significant effects on starting hourly wages. Both effects are found even after controlling for the educational attainments of hired workers.

The effects of employer skill needs on employment patterns and wages help to account for some of the observed differences across groups in hourly wages, especially between black and white males, after controlling for education. Recent trends over time in relative wages and employment across these groups also seem to be quite consistent with these findings, along with evidence that these skill needs have been rising among employers.

In addition, I find that various other employer characteristics—such as their size, location, and the racial composition of their clientele—also have significant effects on their tendencies to hire blacks. These findings suggest that employer preferences across racial groups play some role in determining employment outcomes of these groups, even after controlling for skill needs.

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I. INTRODUCTION

In recent years, inequality in labor market outcomes across various demographic groups has grown quite substantially (see, for example, Katz and Murphy, 1992; Levy and Murnane, 1992).[1] In particular, differences in earnings and employment rates across educational groups have risen; within educational groups, those across racial groups have also risen while those across genders have declined somewhat (Bound and Freeman, 1992; Blau and Kahn, 1994).

The growing labor market differences across education and racial groups have often been interpreted as reflecting rising returns to particular skills, associated with shifts in relative labor demand between more and less-skilled groups of labor.[2] Recent work by Murnane, Willett, and Levy (1995) suggests rising market returns to basic cognitive skills, as measured by math test scores, during the 1980s. Indeed, they find that the entire increase in the rate of return to education among females can be attributed to the increasing market value of these cognitive skills during that time.[3]

Other researchers (e.g., O'Neill, 1990; Ferguson, 1993; Neal and Johnson, 1996) have recently found that, in cross-sectional work, differences in measured test scores can account for major portions

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[1]Inequality *within* each of these groups has grown as well.

[2]See, for example, Juhn, Murphy, and Pierce 1993. On the other hand, Card and Lemieux (1994) question whether the recent deterioration in relative returns for blacks can be fully accounted for by shifting demand for skills. Katz and Murphy (1992), among others, also find that shifts in relative supplies of labor across skill categories have also contributed to recent changes in relative wages.

[3]They use test scores available for individuals in the National Longitudinal Survey of the High School Class of 1972 and in the High School and Beyond Survey (for the Class of 1980). Blackburn and Neumark (1993), using Armed Forces Qualifying Test (AFQT) scores in data on the NLS Youth Cohort, find little evidence that rising returns to education can be attributed to biases caused by omitted ability measures, though they use just one cohort of individuals and a one-time measure of test scores in their analysis.

of the black-white wage differential that remains after controlling for education.[4] Effects of test scores on racial differences in employment rates, though smaller, have been found as well (see Rivera-Batiz, 1992; Neal and Johnson, 1994).

But these results raise a number of important questions. Why do these measured test scores help to account for observed levels or increases in inequality? Are there important and growing returns to cognitive skills per se, or are these just correlated with other job-related skills that are more directly valued by employers? If the latter is true, what exactly are these skills that employers now seek? What personal credentials do employers require as predictors of these skills (and other job-related attributes of applicants), and how do these affect the labor market options available to minorities and/or less-educated workers?[5]

From the viewpoint of public policy, it is clearly important to identify the specific skills that employers perceive to be lacking among various disadvantaged groups, so that education and training policies can be appropriately focused on these skills. Unfortunately, there has been little direct evidence to date on these issues, at least partly because of the paucity of available data that deals directly with the *demand* side of the labor market.[6]

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[4]These studies all use the AFQT scores in the NLSY. These scores were measured in 1980, for a panel of individuals who were ages 15–23 at that time. These data therefore do not capture the relative improvements in test scores of blacks that have been observed elsewhere during the 1980s (e.g., Grissmer, Kirby, Berends, and Williamson, 1994), and any relative deterioration in labor market performance that may have occurred for subsequent cohorts of younger blacks.

[5]For instance, Bishop (1989) argues that math scores are correlated with a variety of occupation-specific skills. See Hunt 1995 for a review of the psychometric literature on test scores, their effects on measured task performance, and racial differences in both.

[6]More *qualitative* evidence on employer skill needs can be found in the Bureau of Labor Statistics 1984, 1986; Bailey 1990; and Levy and Murnane 1995. Moss and Tilly 1995 also provide evidence from open-ended employer interviews on their "soft" skill needs (i.e., attitudes and communication skills) and how they affect the hiring of black males. Summary quantitative evidence on specific skills sought by employers has appeared in several recent reports, such as those issued by the U.S. Department of Labor's SCANS Commission (1991), the National Center on the Educational Quality of the Workforce (1995), and the New York City Department of Employment (1995). But these reports provide no analysis of the relationships between skill needs and observed employment outcomes among various groups of workers.

In this paper, I provide new evidence on employer skill needs, and how they affect relative labor market outcomes by race and gender. The data are drawn from a survey of over 3,000 employers that I recently administered in four large metropolitan areas of the United States.

The analysis here focuses on the effects of two types of employer skill needs: (1) human capital credentials that employers demand of applicants before the hiring decision is made, such as educational degrees, specific experience, and prior training; and (2) tasks that employers require new employees to perform on the job once they are hired, such as daily reading/writing, arithmetic, computer use, and dealing with customers. This list of tasks, though clearly not exhaustive, seems to capture the types of cognitive and social/interactive skills that have been emphasized in many recent discussions of changes in employer skill needs, although employers are likely to view the credentials listed as "signals" of applicants' abilities on these (and other) dimensions of work performance. The analysis below assumes that these job skill needs are given, and therefore analyzes the process of "matching" jobs to workers of differing characteristics in the short run (see Pissarides, 1988; Davidson, Martin, and Matusz, 1988).[7]

After tabulating these employer skill needs in various educational and occupational categories, I consider estimates of their effects on two types of labor market outcomes: the probabilities that employers hire blacks and/or females into starting positions; and the hourly wages paid to these new employees. I then calculate the extent to which these estimates can account for differences in wage and employment outcomes between these demographic groups, and in recent trends over time in these differences.

I first provide some background information on the employer survey that generated these data and on some sampling issues associated with it.

II. THE EMPLOYER SURVEY

[7]In this class of models, wages can either be fixed ex ante or determined ex post as a function of bargaining between the employer and worker. The latter is a bit more consistent with the estimation strategy chosen here, in which wages are estimated as functions of worker characteristics as well as those of firms and jobs.

The survey from which the data in this paper were drawn was administered to 800 employers in each of four metropolitan areas: Atlanta, Boston, Detroit, and Los Angeles.[8] The survey was administered between June 1992 and May 1994, as the national economy was recovering from the recession of the early 1990s.[9]

The survey, administered over the phone, averaged roughly 35 minutes in length. Questions focused on overall employer and employee characteristics (e.g., establishment size, presence of collective bargaining, recent hiring and turnover behavior, composition of current employees by race and gender); the numbers and characteristics of all currently vacant jobs; and the characteristics of the most recently filled job in the establishment and of the worker hired into that job.

The sample of firms was drawn from two sources: (1) a listing of firms and their phone numbers provided by Survey Sampling Inc. (SSI); and (2) the employers of respondents in the household surveys that were also administered in each of these four metro areas.[10] The latter were drawn in order to generate a sample of "matched pairs" of individuals and employers. The numbers of firms drawn from each of these sources vary somewhat across the metro areas, because of differences in the timing of household surveys and other factors.[11] But sampling weights have been constructed to

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[8]The survey is part of a broader project known as the Multi-City Study of Urban Inequality, which consists of household surveys and an in-depth, qualitative study of a smaller sample of employers in each of these four metro areas. The project has been financed by the Ford and Russell Sage Foundations.

[9]The survey was administered to firms in Detroit from June 1992 to February 1993; it was administered in the other areas from March 1993 to May 1994. The timing was deliberately chosen in order to coordinate with the surveying of households in each area, as part of the multi-city study. Dummy variables for metro area and year of survey are included in all multivariate analyses below to control for differences between areas and over time in local labor market conditions.

[10]The SSI listings are drawn primarily from local phone directories that are supplemented by other sources. For another example of employer data drawn from SSI listings see Barron, Berger, and Black 1994.

[11]A total of 1,006 firms (or approximately 31 percent of the total) were drawn from the household surveys, with 425 in Detroit, 296 in Atlanta, 160 in Boston, and 125 in Los Angeles.

account for any differences in firm characteristics that might be attributable to these different sampling strategies, so that data from these two sources can be pooled.[12]

Despite the differences between these two sources, both were designed to generate *employee-weighted* samples of firms. For the SSI sample, this was accomplished by ex ante stratification of the sample based on establishment size, with the distribution of firms chosen to approximate the distribution of employees across size categories in the workforce.[13] For the household-generated sample, the distribution of firms should approximate the distribution of employment in the population by definition (at least when sample-weighted).

Thus, no additional size-weighting of firms is necessary with this sample. When focusing on the characteristics of each firm's most recently filled job, the sample will provide extra weight to firms that do a lot of hiring because of their size (but not because of high turnover).[14] The sample of new jobs should thus reasonably approximate the stock of jobs available to employees searching for work over a limited time period.

The overall response rate for the survey was roughly 67 percent for firms that were successfully screened.[15] This response rate compares quite favorably with other surveys of employers administered

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[12]Sampling weights are applied to the household-generated firms that adjust for: (1) the underrepresentation of jobs requiring college, since the SSI sample focused on noncollege jobs; (2) the oversampling of low-income and minority residents in the household surveys; and (3) the incomplete household samples in Boston and Los Angeles from which employers were drawn.

Most characteristics of workers and jobs that have been analyzed do not differ significantly across firms, regardless of the data source.

[13]The stratification scheme was: 25 percent in establishments with fewer than 20 employees; 50 percent in establishments with 20–99 employees; and 25 percent in those with 100 or more employees. These distributions were drawn from a weighted sample of firms in the Employment Opportunity Pilot Project (EOPP) of 1980 and 1982.

[14]The lack of extra weighting for high-turnover firms seems appropriate, since a single job that turns over frequently is only available to a single worker at any time. Unfortunately, there was no easy way to put extra weight on firms whose rate of hiring was temporarily high due to their net employment growth.

[15]A successfully screened firm was one where I contacted the correct firm and the person responsible for hiring into the relevant types of positions, and where I determined that the firm had hired someone in the past three years into one of the relevant positions.

over the phone (see Kling, 1995). In addition, because I have some measured characteristics of firms in the SSI sample that did not respond to the survey (i.e., establishment size, industry, and location), I could check for differences in response rates across these *observable* categories that might generate sample selection bias. Few significant differences were found in response rates across the categories measured by these variables.[16]

Comparisons of the industries and sizes of firms in the sample were also made with firms in the most recently available published data from the *County Business Patterns* of these metro areas, and the two samples appear to be quite comparable.[17] Finally, I compared the distributions of occupations among the most recently filled jobs with those in the 1990 Census of Population for these areas, and with the distributions of occupations and worker characteristics among all employees in the surveyed firms, to see whether or not the sample of "marginal" employees (i.e., new hires) here differs greatly from the "average." Once again, I found little evidence that this was the case.[18]

III. EMPIRICAL RESULTS

Summary Data

I begin by considering some summary data on the skill needs of employers in the sample. As noted above, skill needs are measured through two sets of variables: (1) credentials that individuals

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[16]For more details see the appendix to Chapter 1 in Holzer 1996. Only response rates among firms in construction and in the smallest size category were significantly lower than the others, while those in the public sector and the largest establishments were significantly higher. But response rates were within .10 of the mean (.67) in all of these categories.

[17]The published data show that jobs in retail trade, the services, and manufacturing respectively account for .17–.21, .31–.40, and .13–.24 of total employment in these areas. The distribution of employment across industries in my survey is comparable to these.

[18]Some small differences can be found between the two samples; for example, the new hires do contain fewer white males (.26 v. .32), more blacks (.20 v. .17), and more blue-collar workers (.35 v. .26) than do all current employees.

generally need to have before they are hired; and (2) tasks that individuals are expected to perform once they are hired on a daily basis.[19]

The top panel of Table 1 presents frequencies for each of these two sets of requirements in newly filled jobs. These data are presented for all jobs and for subsamples based on whether a college degree was required and on occupational groupings. All frequencies are sample-weighted.

The results show that, in newly filled jobs, most credential requirements and task performance needs are widespread. Although college degrees are required in only about one-fourth of all jobs, at least a high school diploma is required in over three-fourths; specific experience is required in almost two-thirds, and previous training is required in over 40 percent.[20] The ability to perform each of the tasks listed is required in over two-thirds of all jobs, except for computer use, which is required in well over half.[21]

As expected, hiring and task performance requirements are higher in jobs that require college; but even in those that do not, skill requirements are still substantial and do not differ greatly from those described above. Likewise, across occupations, I find that requirements are higher in the white-

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[19]For each of the hiring requirements (except for college degree, where response options were simply "yes" or "no"), firms were asked whether it was "absolutely necessary,""strongly preferred," "mildly preferred," or "doesn't matter." Each factor is counted as a requirement here if the respondent gave either of the first two responses. For each of the tasks, respondents could list required performance as "daily," "weekly," "monthly," or "not at all." Since the vast majority of respondents listed either the first or the last of these categories, these are transformed into dichotomous variables for daily use. Dealing with customers in person and over the phone were listed separately in the survey, as were reading and writing paragraphs; these two sets of factors are each combined here, with each task counted as a daily requirement if either underlying task is performed daily. The category of "vocational training" under hiring requirements is based on a single survey question dealing with vocational education in school/military or "other previous job training or skill certification."

[20]In response to a separate question, over 90 percent of respondents who listed a high school degree as a requirement also said they would probably accept an applicant with a GED or a participant in a government training program (the two categories were combined after pretests showed that the responses to separate questions were very highly correlated). These results do not necessarily contradict those of Cameron and Heckman 1993 or Murnane and Willett 1994, who find that the GED is not a perfect substitute for the high school diploma in terms of wage determination.

[21]Krueger 1993 reported that 39 percent of CPS respondents reported using computers at their jobs in 1989. The higher fraction of computer users here might represent the later date of the survey or the focus on newly filled jobs.

TABLE 1
Skill Requirements of New Jobs

		College Required		*Occupation*				
	All Jobs	Yes	No	Prof./Mg.	Cl./Sales	Service	Craft/Op.	Laborer
A. Requirement Frequencies								
Hiring Requirements								
College diploma	.245	1.000	.000	.618	.153	.069	.044	.014
High school diploma	.783	1.000	.712	.946	.840	.617	.548	.512
Specific experience	.642	.741	.610	.739	.637	.556	.619	.348
Vocational training	.425	.556	.383	.516	.367	.347	.431	.257
Daily task performance								
Deal with customers	.729	.819	.700	.800	.837	.775	.408	.307
Read or write paragraphs	.683	.906	.610	.878	.670	.577	.543	.339
Arithmetic	.677	.769	.647	.761	.702	.517	.620	.529
Computers	.564	.740	.507	.663	.753	.225	.231	.165
B. Number of Above Requirements per Job								
Hiring Requirements (excluding college)								
0	.122	—	.159	.019	.100	.233	.213	.351
1	.233	.161	.255	.165	.251	.270	.247	.324
2	.327	.376	.313	.353	.361	.250	.282	.180
3	.317	.463	.274	.464	.289	.247	.259	.144
Daily Tasks								
0	.063	.000	.083	.009	.022	.108	.167	.295
1	.121	.023	.151	.046	.082	.175	.268	.268
2	.201	.106	.229	.154	.168	.339	.250	.277
3	.343	.474	.304	.416	.367	.287	.257	.107
4	.272	.347	.234	.375	.360	.091	.058	.054
No Requirements or Tasks	.026	.000	.034	.002	.012	.044	.058	.144
No more than one requirement and one task	.110	.071	.142	.017	.067	.173	.248	.432

Note: All means are sample-weighted.

collar jobs and lower in the blue-collar ones (craft, operative, and laborer occupations), though requirements are still substantial among the latter. Requirements are generally highest for professional/managerial jobs; customer contact and computer use are highest for clerical/sales jobs. Service jobs are generally more likely than blue-collar ones to require that applicants have high school diplomas, and these jobs are more likely to involve customer contact and reading/writing; but the craft/operatives jobs require more specific experience (62 percent), vocational training (43 percent), and arithmetic (62 percent) than do the service jobs.

The second panel of Table 1 presents distributions on the *number* of these hiring credentials (except for college) and/or daily tasks that are required in each job category. The results show that *very few new jobs are available that require none of these hiring credentials (about 12 percent), none of these tasks (about 6 percent), and, especially, none of either (about 3 percent),* whereas only about 20 percent of new jobs require no more than one credential or task. In fact, the median number of these required credentials per new job is two (out of three), while the median number of these tasks performed on a daily basis is three (out of four).[22] Again, hiring and task performance requirements are quite high even among jobs that do not require college degrees and in blue-collar occupations.

Of course, the extent to which these skill needs on the *demand* side of the labor market result in low wages and/or employment for various groups of workers (as some of the recent literature on "skills mismatch" suggests) depends on the availability of these skills among job-seekers (actual or potential) on the *supply* side of the market.[23] Based on a variety of summary data, it seems quite likely that certain groups of less-skilled individuals (such as long-term AFDC recipients), whose residences and work/job-

[22]In about 70 percent of the cases where only one credential is required, it is the high school diploma. Where only one task is required, it is either customer contact or arithmetic in about two-thirds of the cases.

[23]Skills mismatch has been emphasized as a barrier to employment among less-educated, inner-city minorities by Kasarda 1995 and Wilson 1987, among others. In the absence of nominal wage rigidities, imbalances between the supply of and demand for skills should generate low equilibrium wages and/or employment but not *un*employment. In the presence of such rigidities, all of these outcomes are possible.

search activities are heavily concentrated in central-city areas, will face very limited employment and earnings prospects in the near future.[24]

Another question that can be raised about these results is the extent to which job requirements really constitute hurdles for less-educated workers. For instance, employers are no doubt sometimes willing to hire applicants who do not meet all of their stated requirements (especially in tight labor markets); and even the least-educated workers in the labor force may not always have difficulty performing the tasks listed here. Computer use, for example, might range from extremely simple tasks (such as running products over a scanner in a supermarket) to those requiring complicated programming skills, and this survey provides no additional information on task complexity. The extent to which these tasks, on average, measure meaningful workplace skills that might be in relatively short supply must therefore be inferred from their estimated effects on labor market outcomes, such as who gets hired into various jobs and what these employees are paid.

Table 2 presents summary evidence on the race and gender of newly hired workers, in all jobs and in subsets based on whether college is required and on the numbers of tasks or credentials (excluding college) required. To simplify the analysis, I focus only on white and black males and females here.[25]

The top row of Table 2 indicates that black males and black females each account for roughly 10 percent of all new hires in these four Metropolitan Statistical Areas (MSAs), and that white

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[24]To take one example, longer-term welfare recipients alone constitute 10–15 percent of the household heads in the central cities of these four metropolitan areas (Wacquant and Wilson, 1989), and they may soon be required to enter the labor force in substantial numbers. Roughly half of these are high school dropouts (Bane and Ellwood, 1994), few can officially report any recent work experience, and most score in the bottom quartile on written tests such as the AFQT (Burtless, 1994). When they work or search for work, they are most likely to do so in areas close to home (Holzer, 1995); yet skill requirements among central-city employers are generally higher than among suburban employers, whereas the ratios of available vacant jobs to unemployed workers are substantially lower in the former than the latter. For more evidence and discussion on these issues, see Holzer 1996.

[25]For similar evidence on a sample that also includes Hispanics and Asians, see Holzer forthcoming.

TABLE 2
Race/Gender of New Hires by Skill Requirements

	White Males	*Black Males*	*White Females*	*Black Females*
All Jobs	.353	.102	.447	.097
College Required				
Yes	.419	.055	.481	.044
No	.333	.117	.437	.114
All Jobs				
Number of Requirements (excluding college)				
0	.349	.221	.313	.117
1	.310	.134	.432	.123
2	.352	.076	.489	.082
3	.378	.071	.463	.089
Number of Tasks				
0	.492	.237	.178	.093
1	.440	.173	.259	.128
2	.375	.130	.394	.102
3	.334	.085	.486	.096
4	.302	.055	.560	.083
Jobs Not Requiring College				
Number of Requirements				
0	.349	.221	.313	.117
1	.313	.137	.412	.139
2	.331	.085	.481	.103
3	.350	.086	.466	.099
Number of Tasks				
0	.492	.237	.178	.093
1	.415	.186	.265	.134
2	.371	.141	.373	.115
3	.300	.094	.487	.120
4	.250	.057	.597	.097

Note: Rows sum approximately to one.

females account for almost half. The fraction of new hires accounted for by blacks is almost exactly equal to the average fraction of the non-Hispanic and non-Asian populations in these MSAs accounted for by blacks (Holzer, 1996); while the higher fraction of females relative to males (at least among whites) appears to reflect higher rates of *becoming* employed among the former, which is fully consistent with their higher turnover rates out of employment into nonemployment.[26]

Comparing across rows, I find a strong correlation between numbers of hiring requirements or tasks and the gender of the last worker hired. As the number of tasks required rises, the fraction of white females employed rises dramatically, while the fraction of white males generally declines. Among blacks, the hiring of females *relative to males* also rises with the numbers of tasks performed and credentials required.

This gender effect of task and hiring requirements arises at least partly because of the relatively greater concentration of females than males in clerical and sales jobs, and some of this no doubt occurs because of occupational choices of employees by gender as well as employer preferences.[27] Even the component of the gender effect attributable to employer preferences may not be directly causal—that is, employers may prefer to hire females for certain types of clerical jobs for reasons other than that these tasks are performed more frequently in those jobs.

Within each gender group, I also find that *fewer blacks than whites are hired into jobs that require college or a higher number of credentials and tasks*. Indeed, employers are more than twice as

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[26]In any period, the probability of becoming employed for members of a specific demographic group will equal $P_u P_{ue} + P_o P_{oe}$, where e, u, and o represent employment, unemployment, and out of the labor force respectively; and where the first probabilities in each term reflect incidences while the second reflect flows between states. Empirically, the gender difference in P_o swamps all others in magnitude (Clark and Summers, 1982), and therefore the overall probability of becoming employed is higher for white females than white males. Their higher incidences of nonemployment among blacks appear to roughly offset their lower probabilities of leaving these states (or higher durations of nonemployment), thus generating fractions becoming employed that mirror their fractions in the relevant populations.

[27]In regressions in which the number of tasks is the dependent variable, a set of 1-digit occupation dummies reduces the magnitude of the coefficient on a female dummy variable by more than half.

likely to hire blacks into jobs that do not require college as into those that do; and the hiring of blacks falls monotonically with rising hiring requirements and tasks.[28] In fact, employers are more than four times as likely to hire blacks into jobs requiring none of the tasks as into those requiring all; and they are almost four times as likely to hire blacks into jobs requiring no credentials as into those requiring all. The negative association between numbers of tasks or credentials and the hiring of black females also becomes much clearer when compared with the hiring of white females across the various skill frequencies.

Employment Equations

The summary data of Table 2 suggest that employer skill needs affect the race and gender of the workers they hire. But these results do not control for a variety of other employer, job, and worker characteristics.

Therefore, in Tables 3 and 4 we therefore present estimated coefficients from the following multinomial logit equations:

$$(1) \qquad P_{ijk} = \exp(\beta_{1i}SK_j+\beta_{2i}X_j+\beta_{3i}X_k)/ \Sigma_i\exp(\beta_{1i}SK_j+\beta_{2i}X_j+\beta_{3i}X_k)$$

where P is the probability that race and gender of the newly hired worker in job *j* and firm *k* is *i* (white males are the omitted group). SK represents a set of dummy variables for whether each task or credential is required on job *j*, and X represents a variety of other characteristics of the job *j* or firm *k*.[29]

[28]The one exception to this general observation can be found for black females, who are more likely to be hired into jobs requiring one task than those requiring none. But for blacks overall, the monotonicity of this relationship still holds.

[29]Unlike the top panel of Table 1, dummies for requirements of college and high school diplomas are now entered as mutually exclusive categories.

The firm-specific variables include dummies for the size and location of the establishment (i.e., both across and within metro areas), 1-digit industry, and the year in which the individual was hired.[30] To control for other factors affecting the firm's relative demand for black or female labor, I include a dummy for whether the firm reports the use of Affirmative Action in recruiting or hiring; for the reported fractions of the establishment's customers and overall noncollege employees who are black; and for the race/gender of survey respondents (those responsible for hiring).[31] The job-specific variables include various recruitment and screening methods used by employers in filling these jobs, such as the recruitment method that generated this employee, whether or not preemployment tests (other than physicals) were administered, and whether or not there is a probationary period for employees hired in the job.

Results from four specifications of these equations are presented. The first includes all of the variables described above. The second then adds variables for the fractions of applicants at the firm who are black males and females, to control for the racial composition of labor supply available to the firm. The third adds dummy variables for the age and education of the worker actually hired, to control for other human capital characteristics of these workers besides race and gender that might have influenced their selection; the fourth equation adds 1-digit occupational dummies to control for other

[30]Within metro-area location is measured by two dummies: one for whether the establishment is located in the "primary" central city—the city of Atlanta, Boston, and so on; and another for whether it is located in another central city or a municipality whose population is at least 30 percent black (omitted category is suburbs). Establishment size dummies are for the following categories: 1–20, 21–50, 51–100, and 101–500 (omitted category is >500).

[31]Missing-value dummies are also included on some variables, such as percentage of customers who are black, and missing values are replaced with zeroes in these cases.

characteristics of these jobs.[32] Since questions might exist about the appropriateness or interpretations of each of these additions, the full range of estimates appears in both Tables 3 and 4.[33]

The first of these tables presents results for the educational and other skill requirements (β_{1i}), while the second presents results for the other job- and firm-specific measures (β_{2i} and β_{3i}) for black males and females. Partial derivatives evaluated at sample means are also included in each table (in brackets).

The results in Table 3 show that the various hiring requirements and task performance needs, even excluding (but separately controlling for) educational requirements, have jointly significant effects on the race and gender of workers who are hired.[34]

Regarding their separate effects, I find that *virtually every required credential or task (except for computer use) has a negative coefficient for black males*; those for reading/writing, arithmetic, specific experience, and vocational training are at least marginally significant (i.e., at the .10 level in a one-tailed test) in most specifications. For both black and white females, dealing with customers or using computers on a daily basis will raise the probability of being hired relative to white males, whereas requirements for vocational training, specific experience, or reading/writing frequently have negative effects for both.[35] Like their male counterparts, the negative effects of specific experience

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[32]Age dummies are 16–24, 25–34, 35–44, and 45–54. For education, they are high school dropout, high school graduate, some college, or college graduate (omitted category is graduate degree).

[33]For instance, the applicant measure for the firm is likely endogenous with respect to racial outcomes, though perhaps less so with respect to the last worker hired. Including the age and education of these workers transforms the equation into something like a conditional logit model, where choice characteristics also affect choice outcomes; but these characteristics are themselves conditioned by the hiring choices, making their inclusion somewhat problematic. Finally, the occupation dummies control for a major mechanism by which skill requirements might affect hiring outcomes, thus generating only within-occupation effects.

[34]Likelihood ratio tests for the joint significance of the four tasks together or of the four tasks plus specific experience and vocational training generated chi-squared values of well above 100 for all specifications except the fourth, where they drop to 78.2 and 69.3 respectively. All are easily significant at the .01 levels.

[35]When the computer-use dummy is eliminated, the negative effects of reading/writing on the hiring of females becomes insignificant.

TABLE 3
Effects of Job Requirements and Tasks on Race/Gender of Last Hire

	White Females				*Black Males*				*Black Females*			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Job Requirements												
College degree	-.129	-.151	.392	.131	-.792	-.590	.038	.151	-1.125	-1.080	.309	.146
	(.270)	(.271)	(.317)	(.331)	(.427)	(.435)	(.510)	(.522)	(.434)	(.437)	(.518)	(.531)
	[.077]	[.059]	[.075]	[.015]	[-.060]	[-.037]	[-.022]	[.007]	[-.117]	[-.114]	[.014]	[.007]
High school degree	.395	.428	.428	.111	-.198	-.167	-.154	-.219	.221	.192	.311	.113
	(.182)	(.184)	(.188)	(.200)	(.239)	(.246)	(.254)	(.257)	(.261)	(.266)	(.274)	(.281)
	[.093]	[.101]	[.093]	[.032]	[-.046]	[-.044]	[-.045]	[-.032]	[.007]	[.001]	[.016]	[.011]
Specific experience	-.191	-.214	-.173	-.114	-.347	-.356	-.319	-.247	-.542	-.554	-.452	-.468
	(.156)	(.158)	(.161)	(.167)	(.225)	(.230)	(.238)	(.242)	(.225)	(.228)	(.235)	(.239)
	[.004]	[-.000]	[.002]	[.013]	[-.018]	[-.018]	[-.018]	[-.013]	[-.049]	[-.049]	[-.040]	[-.047]
Vocational training	-.268	-.234	-.267	-.197	-.373	-.312	-.354	-.349	-.267	-.205	-.239	-.190
	(.149)	(.150)	(.152)	(.160)	(.226)	(.231)	(.234)	(.239)	(.223)	(.227)	(.232)	(.237)
	[-.030]	[-.028]	[-.032]	[-.018]	[-.022]	[-.018]	[-.021]	[-.025]	[-.010]	[-.006]	[-.007]	[-.005]
Daily Tasks												
Customer contact	1.023	1.016	1.066	.852	-.158	-.185	-.107	-.197	.869	.877	.973	.898
	(.169)	(.171)	(.173)	(.186)	(.233)	(.236)	(.242)	(.256)	(.268)	(.273)	(.281)	(.294)
	[.204]	[.204]	[.206]	[.163]	[-.086]	[-.089]	[-.085]	[-.082]	[.049]	[.051]	[.058]	[.064]
Reading/writing	-.243	-.296	-.287	-.303	-.435	-.388	-.385	-.341	-.326	-.336	-.304	-.309
	(.152)	(.153)	(.157)	(.165)	(.212)	(.216)	(.220)	(.223)	(.215)	(.220)	(.225)	(.229)
	[-.017]	[-.031]	[-.031]	[-.037]	[-.029]	[-.021]	[-.022]	[-.016]	[-.018]	[-.017]	[-.013]	[-.014]
Mathematics	-.095	-.105	-.111	-.014	-.814	-.869	-.838	-.860	-.649	-.652	-.604	-.502
	(.153)	(.153)	(.155)	(.163)	(.209)	(.214)	(.217)	(.222)	(.212)	(.216)	(.221)	(.228)
	[.058]	[.059]	[.053]	[.071]	[-.073]	[-.078]	[-.075]	[-.084]	[-.060]	[-.059]	[-.053]	[-.046]

(table continues)

TABLE 3, continued

	White Females				*Black Males*				*Black Females*			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Computers	.920	.913	.974	.503	.130	.179	.297	.302	.928	.963	1.038	.736
	(.149)	(.150)	(.154)	(.168)	(.218)	(.223)	(.230)	(.246)	(.222)	(.226)	(.234)	(.249)
	[.161]	[.155]	[.159]	[.062]	[-.051]	[-.045]	[-.037]	[-.006]	[.057]	[.061]	[.065]	[.055]
-Log Likelihood	1551.6	1513.3	1483.0	1424.8	1551.6	1513.3	1483.0	1424.8	1551.6	1513.3	1483.0	1424.8

Notes: Equations are estimated using multinomial logit, with white males as the base group.
Standard errors are in parentheses, and partial derivatives (evaluated at sample means) are in brackets.
Sample size is 1761.
Other independent variables in column 1 include controls for MSA, location within the MSA (central city v. suburbs), year of hire, industry, collective bargaining, percentage of customers who are black, race and gender of the survey respondent, race-gender composition of the workforce, establishment size, whether the firm uses Affirmative Action to recruit or hire workers, other recruitment methods, whether the firm uses pre-employment testing, and whether the firm uses a probationary period for new hires. Controls for the percentage of applicants who are black males or black females are added in column 2. Controls for the age and education levels of the last hire are added in column 3; and one-digit occupation dummies are added in column 4. Omitted categories are >500 for establishment size and public agencies (state employment services, schools, community agencies, and unions) for recruitment methods. Tests do not include physicals or drug tests.

and arithmetic requirements on the hiring of black females are particularly significant, even relative to those for white females. Thus, skill requirements have a negative effect on the hiring of blacks within each gender.

Not surprisingly, controlling for the age and education of the worker hired generally eliminates the negative effects of college requirements on the hiring of blacks, but few other estimated effects are dramatically changed. Thus, differences in the educational requirements of jobs and the educational attainments of individuals do not account for the effects of the other skill requirements on the hiring of blacks relative to whites. Furthermore, controlling for occupation at the 1-digit level reduces the magnitudes of some effects (such as the use of computers on the hiring of females) but does not eliminate them in most cases.

When I transform the multinomial logit coefficients into partial derivatives at the sample means, I find that each task reduces the hiring of black males by 1–9 percentage points, and each required credential reduces their being hired by another 1–6 points. Relative to the mean of the dependent variable for this group (.10), these are large effects. Customer contact and computer use have huge effects on the probabilities of hiring white females (15–20 percentage points), whereas both effects for black females are much smaller (5–6 points).

The effects of a variety of firm- and job-specific variables on the hiring of black males and females appear in Table 4. The results show that the hiring of blacks is relatively greater at establishments located in central cities, at larger establishments, at those with relatively greater fractions of black customers and employees, and where the survey respondent was also black.[36] Furthermore, the magnitudes of these effects (as indicated by the bracketed partial derivatives) are sometimes quite substantial.

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[36]Although I find no effect of Affirmative Action here on the hiring of blacks, an effect was found for white females. For more evidence on this question see Leonard 1990 and Holzer 1996.

TABLE 4
Other Effects on the Race/Gender of Last Hire

	Black Males				*Black Females*			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Percentage of Customers Who Are								
Black	.019	.013	.013	.014	.026	.019	.021	.023
	(.006)	(.006)	(.006)	(.006)	(.005)	(.006)	(.006)	(.006)
	[.002]	[.001]	[.001]	[.001]	[.003]	[.002]	[.003]	[.003]
Percentage of Employees Who Are								
White female	.054	.174	.243	.137	2.224	2.131	2.210	2.051
	(.524)	(.537)	(.547)	(.548)	(.464)	(.470)	(.483)	(.486)
	[-.185]	[-.163]	[-.163]	[-.162]	[.100]	[.095]	[.096]	[.090]
Black male	4.404	3.503	3.578	3.605	3.195	3.924	3.965	4.063
	(.631)	(.701)	(.706)	(.712)	(.716)	(.792)	(.805)	(.810)
	[.417]	[.253]	[.260]	[.250]	[.307]	[.353]	[.356]	[.355]
Black female	2.080	1.749	1.791	1.582	5.345	3.966	4.044	3.954
	(.669)	(.730)	(.745)	(.760)	(.618)	(.661)	(.679)	(.692)
	[.053]	[.089]	[.090]	[.075]	[.533]	[.424]	[.430]	[.430]
Race-Gender of Respondent								
White female	-.254	-.263	-.243	-.236	.254	.203	.190	.236
	(.229)	(.233)	(.237)	(.240)	(.216)	(.219)	(.225)	(.229)
	[-.051]	[-.050]	[-.048]	[-.050]	[.015]	[.010]	[.008]	[.010]
Black male	.563	.521	.580	.561	.119	.068	.111	.046
	(.512)	(.524)	(.537)	(.542)	(.524)	(.543)	(.560)	(.564)
	[.046]	[.038]	[.042]	[.045]	[-.011]	[-.021]	[-.019]	[-.023]
Black female	.607	.539	.746	.624	.622	.345	.499	.430
	(.539)	(.547)	(.565)	(.571)	(.518)	(.526)	(.546)	(.549)
	[.016]	[.020]	[.034]	[.026]	[.021]	[-.006]	[.004]	[.002]

(table continues)

TABLE 4, continued

	Black Males				*Black Females*			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Percentage of Applicants Who Are								
Black males	—	.019	.018	.018	—	-.010	-.013	-.012
		(.006)	(.006)	(.006)		(.006)	(.006)	(.006)
		[.003]	[.003]	[.003]		[-.000]	[-.001]	[-.001]
Black females	—	.010	.011	.011	—	.035	.036	.034
		(.007)	(.007)	(.008)		(.007)	(.007)	(.007)
		[-.001]	[-.001]	[-.000]		[.003]	[.003]	[.003]
Primary Central City	.223	.176	.249	.206	.372	.360	.453	.412
	(.279)	(.287)	(.291)	(.294)	(.286)	(.293)	(.300)	(.304)
	[.011]	[.006]	[.008]	[.011]	[.034]	[.033]	[.039]	[.043]
Affirmative Action	-.013	.016	.025	-.009	-.383	-.478	-.478	-.500
	(.211)	(.218)	(.221)	(.223)	(.211)	(.216)	(.222)	(.225)
	[.002]	[.009]	[.011]	[.008]	[-.051]	[-.061]	[-.061]	[-.061]
Establishment Size								
1–20	-1.050	-1.107	-1.122	-1.118	-1.401	-1.441	-1.468	-1.417
	(.377)	(.385)	(.393)	(.399)	(.369)	(.373)	(.384)	(.390)
	[-.066]	[-.072]	[-.071]	[-.074]	[-.127]	[-.132]	[-.132]	[-.129]
21–50	-.493	-.489	-.524	-.555	-.703	-.721	-.800	-.718
	(.384)	(.392)	(.400)	(.409)	(.372)	(.377)	(.387)	(.393)
	[-.030]	[-.032]	[-.030]	[-.039]	[-.066]	[-.070]	[-.074]	[-.068]
51–100	-.144	-.253	-.329	-.343	-.402	-.400	-.466	-.421
	(.393)	(.404)	(.413)	(.416)	(.382)	(.389)	(.400)	(.407)
	[.006]	[-.009]	[-.013]	[-.019]	[-.031]	[-.032]	[-.035]	[-.033]
101–500	.017	-.001	-.108	-.072	-.478	-.560	-.675	-.611
	(.339)	(.346)	(.354)	(.359)	(.332)	(.336)	(.346)	(.351)
	[.010]	[.009]	[.004]	[.003]	[-.060]	[-.070]	[-.078]	[-.074]

(table continues)

TABLE 4, continued

	Black Males				*Black Females*			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Recruitment Methods								
Informal referrals	-.913	-.937	-.913	-.961	-.950	-.996	-1.008	-.972
	(.319)	(.325)	(.331)	(.336)	(.342)	(.346)	(.354)	(.359)
	[-.117]	[-.121]	[-.119]	[-.126]	[-.140]	[-.148]	[-.151]	[.147]
Private employment services	-.644	-.776	-.630	-.723	.400	.391	.502	.540
	(.532)	(.550)	(.552)	(.559)	(.498)	(.498)	(.508)	(.521)
	[-.165]	[-.182]	[-.172]	[-.183]	[-.039]	[-.041]	[-.035]	[-.028]
Signs/walk-ins	-.826	-.776	-.738	-.809	-.112	-.203	-.224	-.209
	(.365)	(.369)	(.378)	(.385)	(.368)	(.373)	(.383)	(.389)
	[-.135]	[-.129]	[-.124]	[-.131]	[-.053]	[-.066]	[-.069]	[-.064]
Newspaper ads	-.554	-.623	-.638	-.695	-.621	-.658	-.683	-.772
	(.334)	(.339)	(.345)	(.349)	(.353)	(.356)	(.362)	(.367)
	[-.107]	[-.116]	[-.115]	[-.113]	[-.133]	[-.139]	[-.139]	[-.141]
Tests	-.152	-.070	-.076	-.028	.237	.188	.162	.175
	(.208)	(.213)	(.216)	(.219)	(.202)	(.207)	(.211)	(.214)
	[-.032]	[-.021]	[-.020]	[-.018]	[.020]	[.012]	[.011]	[.008]
Probation Period	-.002	-.026	-.026	-.041	.366	.281	.222	.293
	(.232)	(.238)	(.243)	(.248)	(.238)	(.240)	(.245)	(.248)
	[-.014]	[-.015]	[-.013]	[-.022]	[.037]	[.028]	[.020]	[.023]

Notes: Equations are estimated using multinomial logit, with white males as the base group.
Standard errors are in parentheses, and partial derivatives (evaluated at sample means) are in brackets.
Sample size is 1761.
Other independent variables in column 1 include controls for MSA, location within the MSA (central city v. suburbs), year of hire, industry, collective bargaining, percentage of customers who are black, race and gender of the survey respondent, race-gender composition of the workforce, establishment size, whether the firm uses Affirmative Action to recruit or hire workers, other recruitment methods, whether the firm uses pre-employment testing, and whether the firm uses a probationary period for new hires. Controls for the percentage of applicants who are black males or black females are added in column 2. Controls for the age and education levels of the last hire are added in column 3; and one-digit occupation dummies are added in column 4. Omitted categories are >500 for establishment size and public agencies (state employment services, schools, community agencies, and unions) for recruitment methods. Tests do not include physicals or drug tests.

What is the correct interpretation of these findings? Given that I include the race/gender composition of job applicants to these firms in most specifications, I at least partly control for differences in supply factors.[37] On the demand side, Becker (1971) first suggested that the racial preferences of customers as well as co-workers could affect employer hiring.[38] Also, the race and gender of the respondent might well be correlated with the respondent's race/gender preferences across applicants;[39] and employer size and location are also likely to affect their hiring decisions out of any given pool of applicants.[40]

The evidence here is thus strongly consistent with the notion that employer preferences across racial groups have effects on the race and gender of employees hired, even after controlling for their skill needs.

Finally, I note that some of the control variables for recruitment and screening methods in Table 4 have significant effects on the race of the last hire. In particular, most recruitment methods are less likely to lead to the hiring of blacks than are public employment services and agencies (the omitted recruitment category); black males seem particularly disadvantaged by informal referrals and direct

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[37]The quality of the controls for supply might be limited by measurement error, the firm-wide nature of the applicant measures, and the lack of data on applicant *quality* rather than quantity.

[38]The effects of the racial composition of customers on the hiring of blacks are generally stronger when the jobs involve daily contact with customers, thus supporting the interpretation that this variable at least partly captures the employer's perception of customer preferences. For more evidence on this see Holzer and Ihlanfeldt (1996).

[39]The effects attributed to race of current employees and respondent might reflect some unobserved variable affecting the race of *all* employees at the firm, such as the racial preferences of owners or high-level managers. But it is less obvious why such a variable would also determine the race of customers. Within central-city or suburban areas, geographic distance to heavily black neighborhoods might be one such unobservable, though its effects should be heavily captured in the racial composition of applicants.

[40]Nardinelli and Simon 1990 and Ihlanfeldt and Young 1994 have provided some evidence in favor of customer-based discrimination, though their samples are somewhat unique (the former looks at the market for baseball cards, the latter at fast-food restaurants in Atlanta). It seems likely that large firms and those in the central city might hire more blacks because they face relatively greater legal pressure (since size determines the need to file Equal Employment Opportunity-1 forms with the federal government, and distance to minority populations often is used in legal cases to measure the racial composition of potential applicants). Large firms also are much more likely to use the kinds of formal recruiting and screening procedures that are beneficial to the hiring of blacks (Brown, Hamilton, and Medoff, 1990; Holzer, 1987).

walk-ins (see Holzer, 1987). For black females, the use of probationary periods and tests have positive effects (though the latter is not significant).

It is also important to note that the negative effects of tasks and requirements on the hiring of blacks depicted in Table 3 imply that employers *perceive* skill deficiencies on their part. But, without accurate data on the relative *quality* of black and white applicants, it is impossible to ascertain the extent to which these perceptions are accurate. The hiring behavior associated with these perceptions might therefore also reflect discrimination, in either a pure or a statistical sense. The racial gap in test scores noted above suggests that, at least to some extent, the perceived gap in skills is real, but questions remain about the extent to which these test scores really predict actual job performance, and whether or not employers accurately perceive the magnitudes of any such gaps.[41]

One way of inferring the accuracy of employer perceptions might be to compare the effects of these tasks and credentials on the hiring of blacks across employers who have relatively more or less accurate information about the job applicants' abilities, or where the need to obtain such information is relatively higher or lower. Therefore, in Table 4, I have estimated the Column 2 specification of Equation (1) separately for subsamples of employers based on whether or not they use preemployment tests or probationary periods, on the grounds that those using tests may have more accurate information while those using probationary periods need less accurate information. I also estimate these equations separately by recruitment method, across which the amount and quality of information available to employers vary as well.[42]

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[41]The statistical discrimination model in its simplest form implies that, at the means, employers accurately perceive racial gaps in skills between groups (Cain, 1986). But if employers exaggerate the magnitude of the racial skill gaps at the means, we are likely to have some combination of pure and statistical discrimination. The negative effects of the credential requirements, observable ex ante, on the hiring of blacks more strongly suggest actual deficiencies in their credentials; but the extent to which these measures predict skill or actual job performance remains an open question (see Fn. 5).

[42]The notion that the degree of discrimination against blacks might vary with the amount of information available to employers (especially over time) has recently been emphasized by Oettinger 1996 and Altonji and Pierret 1996. The notion that some recruitment methods, especially informal referrals, provide better quality

The results appear in appendix Table A1 by employer use of tests or probation periods and in Table A2 by recruitment method.[43] On the one hand, I find that hiring requirements and tasks (especially reading/writing, arithmetic, specific experience, and vocational training) have somewhat less negative effects on the hiring of blacks when there is a probationary period, or where recruitment is done through informal referrals;[44] these findings suggest that some part of the effect of these skill needs on hiring may really reflect discrimination. On the other hand, some negative effects of these skill needs can be found even with the above methods of hiring, and most negative effects are at least as large when tests are used as when they are not.

Thus, it seems likely that the effects of employer skill needs on the outcomes of hiring by race reflect some combination of actual skill deficiencies among blacks and discriminatory perceptions by employers with imperfect information.

Wage Equations

If employer skill needs, and other factors, affect the extent to which blacks or females are hired, such needs will no doubt affect the wages received by those hired. What are the magnitudes of these effects?

Table 5 presents coefficients on tasks and hiring requirements from log wage equations of the following form:

$$(2) \qquad \ln W_{jkl} = \gamma_1 SK_j + \gamma_2 X_j + \gamma_3 X_k + \gamma_4 X_l + \epsilon_{ijk}$$

information to employers than others was stressed in Rees 1966.

[43]I combined the categories of public and private agencies, since the individual sample sizes were very small.

[44]The small sample sizes and large standard errors here generally preclude finding differences in estimated effects across methods that meet conventional standards of statistical significance.

TABLE 5
Effects of Job Requirements and Tasks on Log (Starting Wages)

	Pooled Sample		*White Males*		*White Females*		*Black Males*		*Black Females*	
	1	2	1	2	1	2	1	2	1	2
Job Requirements										
College degree	.361	.323	.428	.422	.294	.242	.585	.501	.301	.280
	(.038)	(.038)	(.067)	(.069)	(.064)	(.063)	(.164)	(.172)	(.096)	(.096)
High school degree	.059	.051	.046	.055	.044	.016	.123	.119	.043	.033
	(.021)	(.021)	(.036)	(.036)	(.040)	(.039)	(.054)	(.055)	(.050)	(.052)
Specific experience	.102	.024	.121	.115	.087	.083	.054	.040	.064	.054
	(.018)	(.018)	(.035)	(.035)	(.030)	(.030)	(.053)	(.053)	(.045)	(.046)
Vocational training	.086	.079	.123	.106	.074	.070	.101	.094	.002	.022
	(.018)	(.017)	(.033)	(.033)	(.029)	(.028)	(.060)	(.060)	(.042)	(.042)
Tasks										
Customer contact	-.010	-.002	-.012	-.009	-.051	-.059	.034	.041	.079	.081
	(.020)	(.020)	(.034)	(.035)	(.037)	(..038)	(.065)	(.066)	(.058)	(.062)
Reading or writing	.076	.067	.091	.076	.060	.049	.033	.013	.081	.080
	(.017)	(.017)	(.032)	(.032)	(.030)	(.029)	(.048)	(.050)	(.042)	(.042)
Arithmetic	.014	.010	.053	.048	-.025	-.024	.053	.049	.041	.040
	(.017)	(.017)	(.033)	(.033)	(.029)	(.028)	(.056)	(.056)	(.038)	(.039)
Computers	.055	.033	.006	-.001	.121	.082	-.045	-.071	-.007	-.037
	(.018)	(.019)	(.033)	(.034)	(.031)	(.032)	(.052)	(.055)	(.042)	(.044)
R^2	.518	.544	.568	.581	.488	.531	.620	.660	.694	.715

Notes: Specifications 1 and 2 in this table are comparable to 4 and 5 in the previous tables, except that both age and education levels of workers are now included in both. The equation for the pooled sample also includes dummy variables for race/gender groups. Sample sizes are 1620 for the pooled sample, 504 for white males, 661 for white females, 210 for black males, and 246 for black females.

where l represents the last worker hired; the dependent variable is the log of starting hourly wages; and the independent variables are identical to those in the third and fourth specifications of Tables 3 and 4 (i.e., those that include age/education of the worker hired in both equations and occupation dummies in the latter), except that dummies have been added for the worker's race and gender in the pooled equations. But since F-tests consistently rejected such pooling, separate equations by race and gender are presented as well.[45]

The results of the pooled equations show that tasks and hiring requirements both have significant effects on starting wages, even after controlling for the age and educational attainment of the worker. Among the hiring requirements, educational requirements substantially affect wages beyond the attainments of the workers; thus, a college graduate in a job requiring a college degree earns over 30 percent more than one in a job not requiring college. Jobs requiring specific experience pay 9–10 percent more than those that do not, and jobs requiring previous vocational training pay almost as much.[46] Among the daily tasks, reading/writing and computer use have the largest positive effects on wages. The effect of computer use is somewhat smaller than that estimated by Krueger 1993, partly because of my controls for other skills and requirements.[47]

The separate results by race and gender also show some interesting variation in these returns across race/gender groups. For instance, returns to computer use are consistently positive and significant only for white females, whereas white males earn the highest returns to specific experience, vocational training, and reading/writing.[48] According to Table 3, these are largely the same

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[45]F-values for the restrictions imposed by pooling were all above 3 in value.

[46]Each set of requirements is jointly significant at the 1 percent level in the pooled equations.

[47]When I estimate these equations without the other skill need variables, the return to computer use rises to .10 in the first specification and .08 in the second. Other possible causes of the lower return here include the focus on starting wages, so that the possible effects of these skills on wage growth of workers over time are not captured here.

[48]Standard errors on these differences across groups can be obtained by calculating the square root of the sum of squared standard errors for any two groups.

characteristics that had positive effects on the probabilities of hiring white males (relative to the other groups).

Accounting for Group Differences and Trends in Outcomes

How do these estimated returns to tasks and hiring credentials affect observed differences in earnings across race and gender? Can these factors account for changes over time in the relative employment and earnings of these groups?

Table 6 presents estimates of the unadjusted differences in sample means of starting wages between white males and the three other groups, and compares these to estimated differences based on both specifications used for Table 5 (i.e., without and with occupation dummies). For each specification, I present the estimated race/gender differences without and with the controls for the tasks and *non*educational hiring requirements (i.e., specific experience and training), to see the extent to which the latter can account for residual differences across groups.[49] Finally, I present results from both pooled and separate samples here; estimated differences between groups are represented by coefficients on dummy variables in the former case and by differences between actual and predicted wages (using the decomposition developed by Blinder 1973 and Oaxaca 1973) in the latter case.

The results in Table 6 show that differences in tasks and hiring requirements can account for fairly major portions of starting wage differences between white and black males. In the pooled samples, hiring requirements and tasks account for 3–4 percentage points of the difference in log starting wages, which is 14–18 percent of the unadjusted difference and almost 30 percent of the residual difference that remains in each specification after controlling for all other observable

[49]I focus here on the net effects of noneducational requirements only, since the educational requirements are highly correlated with the attainments of individuals, and these are usually controlled for elsewhere (and here).

TABLE 6
Starting Wage Gaps Relative to White Males

	White Females	*Black Males*	*Black Females*
Unadjusted Differences	-.044	-.210	-.259
	(.025)	(.035)	(.033)
From Pooled Samples			
Column 1, no tasks and reqs.	-.044	-.125	-.131
	(.022)	(.031)	(.032)
Column 1, with tasks and reqs.	-.052	-.088	-.133
	(.021)	(.030)	(.030)
Column 2, no tasks and reqs.	-.066	-.104	-.152
	(.022)	(.030)	(.031)
Column 2, with tasks and reqs.	-.063	-.075	-.145
	(.021)	(.029)	(.029)
From Separate Samples, $(\gamma_i - \gamma_{wm})X_i$			
Column 1, no tasks and reqs.	.002	-.118	-.107
Column 1, with tasks and reqs.	.027	-.099	-.092
Column 2, no tasks and reqs.	-.005	-.093	-.109
Column 2, with tasks and reqs.	.020	-.087	-.106
From Separate Samples, $(\gamma_i - \gamma_{wm})X_{wm}$			
Column 1, no tasks and reqs.	-.089	-.056	-.253
Column 1, with tasks and reqs.	-.083	.014	-.183
Column 2, no tasks and reqs.	-.124	-.051	-.264
Column 2, with tasks and reqs.	-.097	.005	-.203

Notes: Columns 1 and 2 correspond to specifications in Table 5, with tasks and job requirements (only specific experience and training) excluded or included.

characteristics.[50] Using the estimates obtained from separate samples, I again find that tasks and requirements can consistently account for significant fractions of the starting wage gap between black and white males, with less accounted for using coefficients weighted by sample means of black male characteristics and more explained using coefficients weighted by those of white male characteristics.

In contrast, the tasks and requirements account for virtually none of the gaps between females and white males in the pooled equations. Using estimates obtained from separate samples, controlling for tasks and requirements does raise the relative wages of white and black females, though by greatly varying amounts across these estimates.[51] Given that females obtain jobs with relatively more tasks and requirements than white males in some cases, these results are not surprising.

Overall, the Table 6 results for white and black males are partially consistent with those of O'Neill; Neal and Johnson; and others who find fairly large effects of racial differences in cognitive skills (as measured by AFQT scores) on wages. However, the job skills and hiring requirements measured here do not account as fully for racial differences in wages as do the AFQT scores in those papers.[52] Perhaps there are other relevant skills needed to perform these jobs that the test scores measure, or perhaps the AFQT scores are spuriously correlated with other wage-determining factors and with race.

It should be stressed again that the calculations in Table 6 are based on a sample of *starting* wages among new hires, rather than estimates for current wages of the overall labor force. The

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[50]The unadjusted differences represent unweighted calculations, to maintain consistency with estimated regressions. Using the sample weights leads to larger estimated differences across groups, but percents of differences accounted for in sample-weighted regressions are comparable to those in the unweighted regressions.

[51]The results imply that female wages would be strongly improved if they earned the returns of white males to their characteristics, while black males would do relatively better with the characteristics of white males and their own returns.

[52]Neal and Johnson continue to find some racial difference in hourly wages among men (but not among women) after controlling for AFQT, though the difference is only about one-third as large as the difference before controlling for it. O'Neill no longer finds any significant racial difference, though in her equations she has controlled for factors, such as individual's labor market experiences, that might themselves reflect discrimination.

frequency of task use is likely higher among new hires than among all workers, perhaps leading us to overstate their contributions to changes observed among the latter. On the other hand, the effect of tasks and requirements on starting wages might well *understate* their effects on wages over time (Murnane, Willett, and Levy, 1995).

An alternative question is the extent to which increases in employer skill needs have contributed to observed changes in relative outcomes between these groups over time. Table 7 presents some estimates of relative shifts in labor demand and relative changes in earnings and employment predicted under a variety of assumptions, and these are compared to changes that actually occurred during the 1980s and early 1990s.

To predict these demand shifts, I multiply partial derivatives of relative employment with respect to the noneducational hiring and task requirements (from column 2 of Table 3) by various estimates of increases in these employer skill needs over time.[53] Since we do not have very precise estimates of the increases in employer skill needs over time, I use three sets of assumptions regarding the percentage-point magnitudes of increases in computer use, other tasks, and noneducational hiring requirements respectively: (1) .15, .10, and .00; (2) .25, .20, .00; and (3) .25, .20, and .20. The various upper and lower bounds for these changes are derived from some additional questions in my

[53]The coefficients from relative employment equations can be used to predict relative demand shifts across groups since they measure *relative* changes in employment (across firms and employee groups) that can affect both overall wage and employment levels of each group. The partials for white males are those implied by estimates for the other three groups, since partials across all four groups should sum to zero.

TABLE 7
Implied and Actual Changes in Employment and Earnings by Race and Gender

		White Male	*White Female*	*Black Male*	*Black Female*
Implied Shifts in Labor Demand, Assuming Increases in Computer Use, Other Tasks, and Hiring Requirements of					
.15, .10, .00		-.073	.115	-.197	.066
.25, .20, .00		-.118	.235	-.287	.103
.25, .20, .20		-.061	.221	-.325	-.030
Predicted Effects On					
Wages:	low	-.153	.089	-.394	-.023
	high	-.295	.181	-.650	.079
Employment:	low	-.018	.089	-.079	-.023
	high	-.030	.181	-.130	.079
Annual earnings:	low	-.171	.178	-.473	-.046
	high	-.325	.362	-.780	.158
Actual Changes					
1985–93:					
Hourly wages		-.104	-.016	-.088	-.035
Hours per week		-.010	.013	-.025	-.001
Employment		-.048	.179	-.080	-.029
Annual earnings		-.162	.176	-.193	-.065
1979–93:					
Hourly wages		-.210	-.075	-.228	-.104
Hours per week		-.031	.008	-.053	.008
Employment		-.101	.097	-.200	-.027
Annual earnings		-.321	.030	-.481	-.123

Notes: Hiring requirements include only specific experience and training. Increases in tasks and hiring requirements are measured in percentage points while all table entries represent percentage changes. All computations are described in the text.

employer survey and other sources.[54] Predicted shifts in labor demand are transformed from absolute (i.e., percentage-point) into percentage terms.[55]

The predicted effects of these demand shifts on each group's wages and employment are then based on estimates of labor supply and demand elasticities that are relevant for each group.[56] I present high and low predictions, based on the three different assumptions regarding changes in skill needs over time. Predicted changes in annual earnings reflect the sums of those for wages and employment. The predicted changes can then be compared to changes in these measures which actually occurred for each group during the 1980s and early 1990s, after controlling for the age and educational characteristics of individuals.[57]

The results show that increases in employer skill needs imply relative shifts in labor demand that are qualitatively similar to outcomes actually observed for all groups. In these calculations, white

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[54]Krueger 1993 found that computer use increased by .13 in the short period from 1985 through 1989; a lower bound of .15 for the decade thus seems reasonable. In my survey, I asked whether or not overall skill needs on the recently filled job had risen in the past 5–10 years; if they had, whether the increases were in reading/writing/numeric or social/verbal skills, and whether those changes were linked to greater use of computers. Counting only those responses for jobs that use each task daily generated increases of .23–.25 in each category. Since questions in the survey on the reading, writing, and numeric skills are listed separately when measuring daily tasks but jointly when referring to increases, I use .10 and .20 as lower and upper bounds respectively for increases in each of these tasks and .25 as the upper bound for computers. With no direct information on changes in the hiring requirements, I use .00 as the lower bound and changes comparable to the noncomputer daily tasks as the upper bound.

[55]Percentage changes for each group can be approximated by d/(m-d) where d is the absolute predicted difference and m is the fraction of new hires currently accounted for by that group (from the top row in Table 2).

[56]The effects of labor demand shifts on wages and employment are $1/(\epsilon+\eta)$ and $\epsilon/(\epsilon+\eta)$ respectively, where ϵ and η are labor supply and demand elasticities. I use .3 as the estimate of the elasticity of labor demand facing each group (Hamermesh, 1993); and .1, .2, and 1.0 as the overall labor supply elasticities (for participation as well as hours) for white males, black males, and females, respectively (Juhn, Murphy, and Topel, 1991; Smith and Ward, 1985). The estimate for females here is the midpoint of a range of estimates by the Smith and Ward that run from .4 to 1.6 under a variety of assumptions. Small variations in these estimates had little effect on the predicted magnitudes presented here.

[57]These changes are from regressions based on outgoing rotation groups of the CPS in 1979, 1985, 1989, and 1993. The dependent variables were for log hourly wages, log hours worked per week, and employment (as a proxy for weeks worked); the independent variables were dummies for age, education, and year. Separate estimates were obtained for each race/gender group, and the year dummies are used to generate the changes over time. I present estimates for the period 1979–93, over which time large changes occurred in relative wages across these groups; and for 1985–93, where the endpoints represent more similar positions in the business cycle.

females face sizable positive labor demand shifts while black females face much smaller ones; white males face some negative demand shifts and black males face negative shifts that are much larger in percentage terms.

Predicted and actual changes in employment and earnings for these four groups show very similar patterns in qualitative terms and, to some extent, even in magnitudes.[58] For white males, the predicted and actual changes match up quite well; among the other groups, wage changes are somewhat overpredicted for all (and in the wrong directions for females), but employment changes are overpredicted only for black males.[59]

Thus, rising employer skill needs might well account for substantial parts of observed changes in relative employment outcomes across these groups in the 1980s. It is, of course, quite possible that a different set of tasks or required skills would have generated a different set of results by race and gender. As noted above, I chose to focus on a set of skills that appear to be of growing importance and are frequently stressed in descriptive or popular discussions of these problems.

Finally, I note again that the direct causal interpretation of the relationship between skill needs and outcomes by both race and gender here are subject to question. The greater observed tendency for females than males to be hired into jobs requiring these skills may simply reflect their own preferences for these jobs, as well as those of employers, and estimated race differences might well reflect discriminatory employer perceptions and preferences as well as real skill deficiencies on the part of

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[58]Using estimates of partial derivatives from column 3 of Table 3 rather than column 2 has very little effect on the results presented here; those of column 4 (including occupational controls) generate predictions that are less positive for white females and more positive for white males. But since changes in occupations have clearly contributed to changes in relative earnings by race and gender over this period (e.g., Bound and Freeman, 1992; Blau and Kahn, 1994), and since these occupations are clearly a mechanism through which relative demand shifts operate, we find the column 2 estimates more persuasive.

[59]Relatively larger predicted than actual changes in wages and smaller ones in employment are consistent with rigid wages and market disequilibria, especially among low-wage groups. Relatively larger predicted changes in both outcomes are more consistent with supply adjustments across groups that offset some of the demand shifts than the cross-sectional estimates suggest.

blacks. With only a single cross section of data from only the demand side of the labor market, it is not possible to distinguish conclusively between various interpretations.

IV. CONCLUSION

In this paper I use data from a new survey of employers to investigate the effects of employer skill needs on the wage and employment outcomes of newly hired workers, and especially on how these outcomes vary by race, gender, and educational group. The skill needs are measured by a variety of credentials required of applicants at the hiring stage, such as educational degrees, specific experience, and prior training; and also by task performance that is required on a daily basis of those who are hired, such as reading/writing of paragraph-length material, arithmetic, computer use, and customer contact.

The results show that most new jobs require these credentials before hiring and these tasks after hiring. Indeed, very few new jobs are available to workers who lack these credentials and the ability to perform at least some of these tasks. This is true even for jobs that do not require applicants to have college degrees.

The hiring and task performance requirements are associated with lower employment of blacks relative to whites within each gender group. They also have significant effects on hourly wages. Both of these effects are found even after controlling for the educational attainment of the worker hired.

The estimated effects of employer skill needs on relative wages and employment among men are at least broadly consistent with other recent studies that find that differences in cognitive ability (as measured by test scores) account for major parts of the black-white wage differences at a point in time, though the magnitudes of my measured effects are smaller. But, the magnitudes of implied shifts in labor demand that might be attributable to increases in employer skill needs (beyond those in education) look substantial, and at least qualitatively similar to changes in relative earnings across race/gender groups in recent years.

I also find that employer hiring among racial groups is strongly related to factors such as their location, establishment size, and the racial composition of their customers/employees, even after controlling for education and skill needs. These findings suggest that employer preferences across racial groups continue to play important roles in determining whether and where blacks become employed.

APPENDIX

TABLE A1
Effects of Job Requirements and Tasks on Race/Gender of Last Hire: By Use of Tests or Probation Periods

	White Females				*Black Males*				*Black Females*			
	Test		Probation		Test		Probation		Test		Probation	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Job Requirements												
College degree	-1.068	.400	-.101	-.257	-.335	-.921	-.630	-1.301	-1.751	-.751	-.989	-1.558
	(.485)	(.358)	(.339)	(.524)	(.728)	(.629)	(.523)	(1.323)	(.678)	(.650)	(.516)	(1.236)
	[-.121]	[.185]	[.073]	[.072]	[.050]	[-.116]	[-.046]	[-.097]	[-.157]	[-.091]	[-.112]	[-.120]
High school degree	.276	.569	.363	.775	.142	-.223	-.111	-1.772	-.504	.724	.177	.528
	(.348)	(.233)	(.216)	(.406)	(.481)	(.313)	(.273)	(.940)	(.452)	(.374)	(.301)	(.890)
	[.097]	[.110]	[.082]	[.252]	[.010]	[-.070]	[-.036]	[-.216]	[-.091]	[.057]	[.002]	[.034]
Specific experience	-.026	-.331	-.213	-.300	-.523	-.250	-.254	-1.593	-.612	-.655	-.491	-1.014
	(.284)	(.205)	(.187)	(.341)	(.442)	(.293)	(.260)	(.908)	(.398)	(.315)	(.260)	(.662)
	[.063]	[-.031]	[-.006]	[.050]	[-.039]	[.000]	[-.007]	[-.129]	[-.072]	[-.053]	[-.046]	[-.063]
Vocational training	-.034	-.295	-.098	-.481	.168	-.682	-.186	-.305	-.049	-.386	-.124	-.796
	(.261)	(.201)	(.178)	(.338)	(.408)	(.310)	(.257)	(.903)	(.374)	(.321)	(.259)	(.673)
	[-.013]	[-.014]	[-.006]	[-.067]	[.019]	[-.057]	[-.013]	[.003]	[-.007]	[-.016]	[-.006]	[-.049]
Daily Tasks												
Customer contact	1.664	.813	1.150	1.108	-.108	-.153	-.066	-1.348	.961	1.201	1.084	.908
	(.317)	(.218)	(.210)	(.364)	(.443)	(.306)	(.277)	(.812)	(.453)	(.392)	(.328)	(.682)
	[.346]	[.140]	[.211]	[.296]	[-.108]	[-.084]	[-.091]	[-.196]	[.014]	[.098]	[.072]	[.050]
Reading/writing	.025	-.594	-.271	-.503	-.925	-.109	-.488	.302	-.180	-.536	-.216	-1.006
	(.275)	(.200)	(.176)	(.370)	(.399)	(.287)	(.239)	(.895)	(.374)	(.303)	(.247)	(.727)
	[.064]	[-.108]	[-.026]	[-.092]	[-.089]	[.029]	[-.037]	[.065]	[-.010]	[-.028]	[-.001]	[-.075]

(table continues)

TABLE A1, continued

	White Females				*Black Males*				*Black Females*			
	Test		Probation		Test		Probation		Test		Probation	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Daily Tasks, continued												
Mathematics	-.876	.216	-.044	-.274	-1.109	-.857	-.640	-2.066	-1.463	-.416	-.709	.065
	(.286)	(.199)	(.186)	(.312)	(.399)	(.282)	(.246)	(.765)	(.374)	(.298)	(.249)	(.628)
	[-.057]	[.120]	[.069]	[.029]	[-.040]	[-.105]	[-.056]	[-.189]	[-.117]	[-.044]	[-.078]	[.043]
Computers	.662	1.156	.937	1.053	.366	.108	.138	.110	.656	1.246	.982	1.170
	(.258)	(.206)	(.179)	(.344)	(.389)	(.300)	(.255)	(.788)	(.373)	(.318)	(.261)	(.717)
	[.098]	[.206]	[.155]	[.200]	[-.008]	[-.072]	[.054]	[-.054]	[.036]	[.080]	[.068]	[.060]
-Log likelihood	556.1	864.1	1137.5	283.6	556.1	864.1	1137.5	283.6	556.1	864.1	1137.5	283.6

Notes: Equations are estimated using multinomial logit, with white males as the base group.
Standard errors are in parentheses, and partial derivatives (evaluated at sample means) are in brackets.
Other independent variables in column 1 include controls for MSA, location within the MSA (central city v. suburbs), year of hire, industry, collective bargaining, percentage of customers who are black, race and gender of the survey respondent, race-gender composition of the workforce, establishment size, whether the firm uses Affirmative Action to recruit or hire workers, other recruitment methods, whether the firm uses pre-employment testing, and whether the firm uses a probationary period for new hires. Controls for the percentage of applicants who are black males or black females are added in column 2. Controls for the age and education levels of the last hire are added in column 3; and one-digit occupation dummies are added in column 4. Omitted categories are >500 for establishment size and public agencies (state employment services, schools, community agencies, and unions) for recruitment methods. Tests do not include physicals or drug tests.
Sample sizes are 716 for testing, 1045 for no testing, 1314 for probationary period, and 447 for no probationary period.

TABLE A2
Effects of Job Requirements and Tasks on Race/Gender of Last Hire: By Recruitment Method Used

	White Females				*Black Males*				*Black Females*			
	Ref.[a]	Ag.[b]	Walk[c]	News[d]	Ref.[a]	Ag.[b]	Walk[c]	News[d]	Ref.[a]	Ag.[b]	Walk[c]	News[d]
Job Requirements												
College degree	-.367	.474	1.632	-.520	.557	-2.972	2.243	-.957	-1.575	-1.982	3.253	-3.484
	(.448)	(1.255)	(.900)	(.564)	(.717)	(2.067)	(1.651)	(.964)	(.814)	(2.061)	(1.361)	(1.208)
	[.010]	[.432]	[-.020]	[.103]	[-.020]	[-.401]	[.079]	[-.023]	[-.135]	[-.223]	[.392]	[-.290]
High school degree	.288	.277	.760	.929	-.928	-.2.277	.722	.340	-.291	1.147	.869	-.121
	(.299)	(.913)	(.485)	(.412)	(.440)	(1.179)	(.749)	(.608)	(.520)	(1.308)	(.695)	(.713)
	[.126]	[.140]	[.062]	[.222]	[-.107]	[-.381]	[.020]	[-.015]	[-.030]	[.213]	[.072]	[-.064]
Specific experience	-.390	-.452	.498	-.213	.210	-3.143	-.604	-.169	-1.014	-1.357	.013	-.590
	(.258)	(.701)	(.458)	(.345)	(.423)	(1.067)	(.741)	(.544)	(.441)	(.983)	(.702)	(.568)
	[-.057]	[.187]	[.140]	[-.013]	[.054]	[-.384]	[-.098]	[.002]	[-.088]	[-.069]	[-.019]	[-.042]
Vocational training	-.474	.852	-.549	-.196	-.648	-.316	-.059	-.333	-.109	.686	-.496	-.121
	(.253)	(.656)	(.508)	(.299)	(.431)	(.963)	(.773)	(.499)	(.446)	(.915)	(.721)	(.539)
	[-.078]	[.176]	[-.078]	[-.026]	[-.044]	[-.122]	[.037]	[-.019]	[.019]	[.052]	[-.044]	[.002]
Daily Tasks												
Customer contact	.900	-.227	.908	1.932	-.341	-3.669	.178	.505	.692	-.629	.840	1.688
	(.287)	(.747)	(.518)	(.362)	(.437)	(1.315)	(.828)	(.569)	(.504)	(1.130)	(.897)	(.688)
	[.200]	[.227]	[.123]	[.368]	[-.087]	[-.496]	[-.052]	[-.069]	[.034]	[.035]	[.074]	[.051]
Reading/writing	-.357	-.638	-.663	-.087	.009	.776	-1.675	-.927	.539	-2.141	-1.318	-.363
	(.265)	(.649)	(.458)	(.325)	(.405)	(.906)	(.720)	(.486)	(.470)	(.929)	(.664)	(.533)
	[-.110]	[-.063]	[.045]	[.044]	[.010]	[.218]	[-.125]	[-.075]	[.070]	[-.286]	[-.131]	[-.020]
Mathematics	-.011	1.286	.868	-1.135	-.291	-2.219	-1.866	-1.378	-.737	.487	.191	-2.072
	(.260)	(.637)	(.462)	(.332)	(.394)	(1.014)	(.752)	(.498)	(.405)	(.858)	(.666)	(.524)
	[.044]	[.415]	[.269]	[-.105]	[-.020]	[-.419]	[-.277]	[-.045]	[-.070]	[.053]	[.028]	[-.120]

(table continues)

TABLE A2, continued

	White Females				*Black Males*				*Black Females*			
	Ref.[a]	Ag.[b]	Walk[c]	News[d]	Ref.[a]	Ag.[b]	Walk[c]	News[d]	Ref.[a]	Ag.[b]	Walk[c]	News[d]
Daily Tasks, continued												
Computers	.849	1.370	.634	1.339	-.351	2.206	.560	.225	1.017	2.283	.130	1.799
	(.257)	(.735)	(.465)	(.313)	(.423)	(1.038)	(.729)	(.517)	(.444)	(.997)	(.643)	(.558)
	[.174]	[.030]	[.104]	[.228]	[-.090]	[.161]	[.033]	[-.066]	[.069]	[.170]	[-.050]	[.096]
-Log Likelihood	499.8	144.4	218.9	364.4	499.8	144.4	218.9	364.4	499.8	144.4	218.9	364.4

Notes: Equations are estimated using multinomial logit, with white males as the base group.
Standard errors are in parentheses, and partial derivatives (evaluated at sample means) are in brackets.
Other independent variables in column 1 include controls for MSA, location within the MSA (central city v. suburbs), year of hire, industry, collective bargaining, percentage of customers who are black, race and gender of the survey respondent, race-gender composition of the workforce, establishment size, whether the firm uses Affirmative Action to recruit or hire workers, other recruitment methods, whether the firm uses pre-employment testing, and whether the firm uses a probationary period for new hires. Controls for the percentage of applicants who are black males or black females are added in column 2. Controls for the age and education levels of the last hire are added in column 3; and one-digit occupation dummies are added in column 4. Omitted categories are >500 for establishment size and public agencies (state employment services, schools, community agencies, and unions) for recruitment methods. Tests do not include physicals or drug tests.
[a] "Ref." = informal referrals.
[b] "Ag." = agencies (public or private).
[c] "Walk" = signs/walk-ins.
[d] "News" = newspapers advertisements.
Sample sizes are 648 for informal referrals, 257 for agency referrals, 323 for signs/walk-ins, and 533 for newspaper advertisements.

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