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Report to the Chairman, Committee on Governmental Affairs, U.S. Senate

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AFFIRMATIVE EMPLOYMENT

Assessing Progress of EEO Groups in Key Federal Jobs Can Be Improved

GAO/GGD-93-65

GAO

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The Honorable John Glenn
Chairman, Committee on
Governmental Affairs
United States Senate

Dear Mr. Chairman:

In October 1991, we testified before your Committee on the representation of women and minorities in the federal workforce.[1] At that time, we agreed to analyze further the representation of women and minorities in key jobs, including their hiring, promotion, and separation—voluntary or involuntary departure—from those jobs.[2] Key jobs are those that are or can lead to middle and upper management positions. This report, which covers a total of 262 key jobs in 25 of the largest federal agencies, provides that information.

Background

Federal agencies have been required, as a result of the Civil Rights Act of 1964 and the Equal Employment Opportunity Act of 1972 that amended it, to develop and implement affirmative employment programs to eliminate the historical underrepresentation of women and minorities in the workforce. Identifying and removing barriers to the entry and progression of women and minorities in the federal workforce are part of affirmative employment efforts. Conducting affirmative recruitment for those specific occupations and grades in the federal workforce in which women and minorities are underrepresented has been required since the Civil Service Reform Act of 1978.

The Office of Personnel Management (OPM) is responsible for overseeing and assisting agencies in their affirmative recruitment efforts. The Equal Employment Opportunity Commission (EEOC) is to provide agencies with guidance on their affirmative employment programs and also to approve agency plans for those programs. Agencies are required to analyze their workforces and compare the representation of women and minorities in them with the representation of these groups in the civilian workforce. EEOC also requires agencies to examine the representation of women and minority employees at the different pay grades and in key jobs. Key jobs

[1]Federal Affirmative Employment: Status of Women and Minority Representation in the Federal Workforce (GAO/T-GGD-92-2, Oct. 23, 1991).

[2]In our analyses, we included permanent hires, voluntary and involuntary separations, and permanent and temporary, or term promotions. Expanded definitions of these personnel events are given in appendix I.

are defined by EEOC as nonclerical jobs held by 100 or more employees that have advancement potential to senior-level positions.

In May 1991, we issued a report and presented testimony to the Senate Committee on Governmental Affairs on the need for better EEOC guidance and agency analysis of women and minority representation.[3] In our October 1991 testimony, we said that the representation levels of women and minorities in the federal workforce had improved overall between 1982 and 1990 and that their representation in the government's middle and upper management levels had also improved.[4] However, we noted that in 1990, white women and all minorities were still less well represented at the upper grades (i.e., grades 11 to 15) of the federal workforce. These groups also were often underrepresented in the key jobs that can lead to middle and upper management positions.

Results in Brief

Women and minorities in key jobs have made substantial progress in their relative levels of representation, particularly in the upper pay grades.[5] All of the groups of minority men and women we looked at, except for Native American women, were better represented among key job workers in 1990 than they were in 1984. All of these groups, including Native American women, were better represented at upper grades in 1990 than they were in 1984.

Increases in the relative representation of women and minorities in the federal workforce resulted in some but not all cases from the hiring of women and minorities at levels that exceeded their separation levels. In upper grades, increased representation of women and minorities resulted from the favorable relative rates at which these groups were promoted. In spite of these favorable trends, women and minorities in key jobs were, like women and minorities in the workforce in general, relatively better represented at lower grades than at upper grades. In addition, while the relative numbers of minority men and women at grade 15 were quite low, the relative numbers promoted to that grade, both in 1984 and in 1990, were lower than the relative numbers employed at that grade. Further, minority women, in general, and black women, in particular, were

[3]Federal Affirmative Action: Better EEOC Guidance and Agency Analysis of Underrepresentation Needed (GAO/GGD-91-86, May 10, 1991) and Federal Affirmative Action: Better EEOC Guidance and Agency Analysis of Underrepresentation Needed (GAO/T-GGD-91-32, May 16, 1991).

[4]GAO/T-GGD-92-2, Oct. 23, 1991.

[5]The term relative means relative to white men, which is the benchmark we used for comparison purposes.

separating in higher relative numbers than those at which they were employed. This latter finding could have deleterious effects on the affirmative employment of minority women in key jobs in the federal workforce, in general, were it to continue in years in which separations greatly exceeded hires.

EEOC reviewed a draft of this report and disagreed with our approach to data analysis, which involved computing the ratios of women and minorities to white men. EEOC also believed the approach would be too costly and burdensome for it and other agencies to use. Because we believe the approach is sound and practical and can provide valuable information, we are asking the Committee to consider requiring the periodic application of this analytic technique to affirmative employment data.

Objectives, Scope, and Methodology

In keeping with the agreement in our October 1991 testimony, our objective was to analyze, by grade, how much change has occurred over recent years in the key job workforce of 25 executive agencies. Specifically, we sought to (1) analyze the equal employment opportunity (EEO) profile of the key job workforce in fiscal years 1984 and 1990 to determine the size and direction of change in the relative numbers of women and minorities in key jobs and (2) compare the relative hiring, promotion, and separation levels of women and minorities with their existing employment levels in key jobs in each of these years to determine the influence of such personnel actions on the composition of the key job workforce.[6]

The data for this report, like those for the October 1991 testimony, are from OPM's Central Personnel Data File (CPDF). The workforce data that we used to develop the EEO profile of key job workers provided "snapshots" of the key job workforce as of September 30, 1984, and September 30, 1990. The personnel events data that we used to analyze key job hirings, promotions, and separations provided information on these events for all of fiscal years 1984 and 1990. When we began our review, fiscal year 1990 data were the most recent data available for a full fiscal year. We selected fiscal year 1984 as the comparison year because it was the most distant year for which we had data in which separations were identified in CPDF the same way as they were in 1990.

[6]We identify the 25 agencies and how we selected them in appendix I.

To determine how much change occurred in representation levels between 1984 and 1990 for particular EEO groups, we divided the number of key job workers in a particular EEO group by the number of white men in each year and then took ratios of those numbers across years. When we examined changes by grade level, we divided the number of women and minority key job workers at a given grade level by the number of white men in that same grade in the same year. White men were selected as the benchmark because they have historically dominated the management levels of the white-collar workforce and because it seemed reasonable to consider how the numbers of women and minorities had changed over time relative to them. Throughout the text, the term relative numbers refers to how many women and minority workers there were per 1,000 white men in a particular category of the key job workforce.

We used a ratio-based technique to estimate the relative numbers of women and minorities in key jobs and involved in certain personnel events in each year. The technique, which involves comparing ratios of numbers in differing categories or EEO groups, enabled us to perform analyses that were more sensitive to changes in the relative numbers of women and minorities than traditional descriptive statistics. Appendixes II and III provide detailed results obtained from the analyses. Appendix IV provides an expanded discussion of the advantages of measuring change in terms of ratios rather than percentages.

As an example of how relative numbers were computed, in 1984, there were 86,879 white women and 242,731 white men in key jobs in the 25 agencies we reviewed. The resulting ratio of .358 (86,879/242,731) can be interpreted to mean that in 1984 there were 358 white women for every 1,000 white men in key jobs. In 1990, there were 438 white women for every 1,000 white men in key jobs. The magnitude of the increase over time was then computed by taking ratios of the relative numbers. So, the increase in the number of white women relative to white men can be calculated to be 1.22 (438/358). In other words, the relative numbers of white women increased by a factor of 1.22, or 22 percent, between 1984 and 1990.

The analyses presented in this report are useful for depicting the direction and magnitude of changes over time, and they are especially well suited to comparing the relative changes in workforce representation across groups of very different sizes. These analyses must be interpreted with caution, however. They do not permit us to draw definitive conclusions about the net effect of personnel actions on the composition of the key job

workforce.[7] Nor do they enable us to determine whether affirmative action, as opposed to other factors, caused the observed changes. Data and resource limitations did not allow us to track cases over time, to determine who was not promoted, to ascertain who was not hired, or to know who was converted to permanent positions. We also did not verify the workforce data obtained from OPM's CPDF nor the bases of each key job designation by the agencies.

Our review was performed in accordance with generally accepted government auditing standards from January to October 1992.

Relative Standing of Women and Minorities in Key Jobs

In the key job workforce of the 25 agencies, the relative numbers of white women and minority men and women increased between 1984 and 1990 at all grades.[8] Increases in the relative numbers of minority women in key jobs were greater, overall, than increases in the relative numbers of white women and minority men. The relative numbers of minority women increased by approximately 34 percent compared to a 22-percent increase among white women and minority men.

Among minority women, the largest gains were made by Asian and Hispanic women, whose relative numbers in key jobs increased over the 6-year period by 73 percent and 63 percent, respectively. Among men, Asians and Hispanics were also the EEO groups with the largest relative gains. The relative numbers of Asian and Hispanic men in key jobs increased by 41 percent and 33 percent, respectively. Black men and women, by comparison, increased in relative numbers by 11 percent and 29 percent, respectively. With 11 Native American women per 1,000 men in key jobs in both 1984 and 1990, this was the only EEO group to exhibit no change relative to white men.

Increases that occurred over time in the relative numbers of women and minorities were generally as large and sometimes larger at grades 11 and above as they were at the lower grades. These greater increases in the relative numbers of women and minorities at upper grades diminished somewhat the disparity in the relative numbers of women and minorities

[7]In meetings with OPM officials, we learned that there are typically large numbers of conversions from temporary to permanent positions. This fact may explain why the workforce as a whole grew between 1984 and 1990, despite the fact that the number of separations from the workforce exceeded the number of hires into the workforce.

[8]We combined grades 1 through 10 in these analyses. Statements in the report about what happened at lower grades should be understood to imply the aggregated grouping of employees in grades below 11. Upper grades refer to each of grades 11, 12, 13, 14, and 15.

at lower grades versus upper grades, though a pronounced disparity persisted in 1990.

Our analysis of the data on specific personnel events revealed that hirings, separations, and promotions variably affected women and minority representation across the pay grades. In both 1984 and 1990, white women and minority men, with the exception of Native American men, were hired into key jobs at relatively higher levels than those at which they were already employed in those jobs. In general, therefore, the EEO composition of new hires helped improve the relative numbers of white women and minority men in key jobs. In contrast, minority women were hired into key jobs in generally lower relative numbers than those at which they were employed, although the difference in the relative numbers hired and employed was smaller in 1990 than in 1984.

In both 1984 and 1990, both white and minority women were hired into pay grades below 11 at lower relative numbers than those at which they were employed. Among minority women, it was primarily blacks who accounted for this finding. In upper grades, on the other hand, white and minority women, like minority men, were hired at much higher levels than the level at which they were employed. In 1990, white women at grade 12 and up, minority men at grades 14 and 15, and minority women at grades 13 and up were hired at roughly twice the relative number at which they were employed.

With respect to separations, white women and minority men and women were separating in 1990 at relatively higher levels than those at which they were already employed in key jobs. For example, among key job workers in 1990, 438 white women were employed for every 1,000 white men employed, but white women were separating at a rate of 522 per 1,000 white men separating. Among minorities, it was blacks who primarily accounted for the finding that relative separation levels exceeded relative employment levels. Further, the relatively higher levels of separation occurred primarily at grades 11 and under. In 1984, minority men and women, overall, separated at levels that were lower than the relative numbers already in key jobs.

With respect to promotions, white women in grades 11 and above in 1984 and 1990 were promoted to key jobs at levels that exceeded their prevailing employment levels at those grades. For example, the relative numbers of white women promoted to grade 15 were 57 percent higher in 1984 and 61 percent higher in 1990 than the relative number of white

women already employed in that grade. The promotion levels of minority men were less favorable. At grade 15 in 1984 and 1990, there were fewer minority men promoted per 1,000 white men than the relative number employed at that grade. Minority women were also promoted to grade 15 in lower relative numbers than the number already employed at that grade, but the relative numbers of minority women promoted to grades 12, 13, and 14 were higher than the relative numbers already employed at those grades in both years.

Notwithstanding the general improvement in the relative numbers of women and minorities in key jobs in the federal workforce, certain disparities remain. Women and minorities are still less well represented in key jobs at the upper grade levels than at grade 10 or below. For example, for every 1,000 white men working in key jobs at grade 10 or below in 1990, there were 1,390 women and minorities similarly employed. At grade 15 in the same year, for every 1,000 white men working in key jobs, there were 300 women and minorities. These numbers are useful in clarifying where disparities persist and where affirmative employment and recruitment efforts can be appropriately focused.

Further Application of Ratio-Based Techniques for Affirmative Planning

EEOC issues directives to agencies on affirmative employment planning. In our 1991 work for the Senate Committee on Governmental Affairs, we recommended ways in which EEOC could improve the government's affirmative employment planning.[9] We believe that the ratio-based approach we have used in this report provides a further means for improving affirmative employment planning.

In accordance with EEOC instructions, agencies commonly compare their workforces for the current year with their workforces for the previous year. Agencies also compare their workforces in a given year with the civilian workforce. These comparisons are undertaken to discern whether EEO groups (e.g., black males or Hispanic females) are underrepresented in the workforce as a whole, in certain occupational categories, or at certain grades, and/or whether EEO groups are decreasing or increasing. Usually these comparisons involve simply looking at whether the percentages of an agency's workforce in the various EEO groups have changed over time or are greater or smaller than in the comparable civilian workforce.

The disadvantage of assessing EEO progress by looking at percentage differences in representation is that it is difficult to see whether EEO

[9]GAO/GGD-91-86, May 10, 1991, and GAO/T-GGD-91-32, May 16, 1991.

groups that constitute a smaller percentage of the workforce are making the same progress as those that constitute a larger percentage of it. We show in appendix IV, for example, that changes in the percentages of key job workers who were white women or minority men or women between 1984 and 1990 would produce the conclusion that white women exhibited greater progress over that period than minority men or women. In fact, we show, using our ratio-based approach, that minority women increased in relative number more than white women and minority men and that the increases in the relative numbers in these latter two groups were virtually identical.

The ratio-based approach also has the advantage of directly comparing the numbers of each EEO group relative to a benchmark, in this case, white men. The percentage of black women may increase from one year to the next, either at the expense of other women and/or other minorities or at the expense of white men. From an affirmative employment perspective, knowing which type of change occurred is of considerable importance. Percentage differences do not reveal which was the case, while ratios do. As we show in appendix IV, ratios derived from relative numbers and ratios derived from percentages are of equal value in describing and comparing representation levels across groups and over time. We therefore believe there is a benefit in using ratios rather than percentage differences when comparing the relative progress (or change in representation) of groups that are very different in size.

Conclusion

All of the EEO groups we considered, except for Native American women, were better represented in key jobs in the federal workforce in 1990 than in 1984. Further, all of the groups were better represented in key jobs at upper grades in 1990 than in 1984. This increased representation at upper grades was both the result of favorable hiring rates for women and minorities at upper grades and the fact that most were promoted to upper grades in greater numbers, relatively speaking, than those at which they were already employed in those grades.[10]

As we have noted, however, women and minorities do remain less well represented in key jobs at upper grades than at lower grades, and agencies will need to pay close attention to whether the progress we have reported here continues. In monitoring such progress, we think ratio-based techniques, using one of the EEO groups as a benchmark, are a better tool

[10]The only exception to this pattern was at grade 15. Minority men and women were promoted to that grade in both years in lesser relative numbers than the relative number at which they were already employed.

than percentage differences with no benchmark for discerning change in the representation levels of different EEO groups. The ratio-based approach ensures that when groups of widely varying size are compared, the results are interpreted consistently. In other words, similar differences will appear similar regardless of whether the group is large or small. For example, a gain in representation in a small group from 1 percent to 2 percent is a doubling, just as a gain from 10 percent to 20 percent is in a large group.

In addition, by stating a ratio relative to a benchmark, another dimension of change is simultaneously controlled. In the present study, we used white men as a benchmark because white men have historically dominated management levels of the white-collar workforce and because we wanted to control for the possibility that an increase in the representation level of one minority group occurred at the expense of another minority group. In the absence of such a benchmark, it would have been difficult to discern whether real EEO progress had occurred or whether there may have been a redistribution in representation levels such that some minority groups gained while others lost. In other representation studies, it may be preferable to use a group other than white men as the appropriate benchmark. For example, if black women were overrepresented in the secretarial ranks of a particular agency, they might be an appropriate benchmark for assessing change in the representation of various EEO groups among secretaries.

In this report, we have focused on changes over time in the numbers of women and minorities relative to white men and on differences in those relative numbers in upper and lower grades among workers in key jobs in the federal workforce. We think these analyses impart useful information for agency management to discern whether and among which EEO groups progress has been made. However, these analyses are not intended to supplant or diminish the need for making comparisons with the appropriate civilian workforce. The ratio-based techniques used here to examine changes over time and across grades would also be appropriate for comparing EEO group representation in the federal workforce with the civilian workforce. Moreover, they are just as useful in addressing more general questions about the representation levels of various groups. For example, they can examine differences between the representation levels of men and women or minorities and whites as well as more specific differences between EEO groups relative to white men.

In advocating the use of ratio-based techniques, we are not suggesting that comparisons be made on different groups than in the past. Rather, we are advocating that comparisons be made differently, by computing ratios of relative numbers or ratios of percentages rather than differences in percentages. This method will provide a better management tool for discerning how much and among which EEO groups progress has occurred. In turn, affirmative employment planning could more specifically identify areas needing greater attention and on which EEO efforts should be focused.

EEOC Comments and Our Evaluation

Because of EEOC's responsibility for directing the government's affirmative employment program, we provided EEOC officials with a draft of this report for review and comment. The draft contained a proposed recommendation to EEOC that it use ratio-based techniques to assess representational changes and differences.

The Chairman of EEOC commented on that draft in a January 19, 1993, letter. He expressed the view that our ratio-based approach is grounded in incorrect assumptions and would be burdensome and costly for EEOC to implement.

According to the Chairman, it is inappropriate to use white male employees as a benchmark because the appropriate comparison for affirmative employment purposes and the comparison EEOC employs is the civilian workforce. The Chairman said that our ratio-based comparisons make the unrealistic assumption that all groups of differing race, ethnicity, and gender should have the same occupational patterns in the federal government as white men and that they have the same qualifications and interest. Because most jobs in the government have specific experience or education requirements, a simple comparison to the pattern of white men is inappropriate.

We agree with the Chairman that affirmative employment progress in the federal government should be compared with that in the civilian workforce. However, the civilian workforce data that EEOC requires agencies to use are not always current.[11] In addition, when studying the

[11]There are different approaches to determining the appropriate civilian workforce. The approach most widely used in the federal government relies on decennial census data, and EEOC has required agencies to use those data even when they became outdated. For that reason, we recommended to EEOC in our October 1991 testimony (see footnote 1) that it develop, in cooperation with certain other agencies, an inventory of databases that agencies may draw from and apply in appropriate circumstances to assess the representation of their workforces (e.g., using Bureau of Labor Statistics data to update decennial census information). EEOC agreed with the recommendation.

distribution of women and minorities across federal pay grades, civilian workforce data have not been available at all.

More importantly, however, we believe that the Chairman may not have understood that our use of white males as a benchmark was intended to standardize the analyses and not to serve as a replacement for civilian workforce comparisons. The focus in our analyses was on key job workers in the federal government, particularly those at the upper grade levels. Our rationale for using white men as a benchmark in these analyses was to discern whether and to what extent groups that had been historically underrepresented relative to white men had made progress. As we indicate in this report, the group which is used as a benchmark may differ in different studies, depending on the research questions and what makes sense.

Contrary to the Chairman's claim, we make no assumption that all EEO groups should have the same qualifications, education, or occupational patterns as white men. Our analyses were designed to determine where disparities in the relative numbers of different EEO groups existed in a particular year or where they persisted over time. Our comparisons did not permit us to say why they existed or persisted. Explanations of why representation levels stand as they do and the extent to which education, experience, or discriminatory practices account for existing representation levels would require additional data and other types of analysis.

We feel that this ratio-based approach is superior to computing raw percentage differences in representation levels because the results it produces, unlike percentage differences, are unaffected by the size of the groups being compared. In appendix IV, we provide a concrete example of how looking at differences in proportions, as EEOC typically does, can result in misleading interpretations of results when group sizes vary substantially.

The Chairman of EEOC also noted the types of analyses we proposed would be too costly to EEOC in terms of dollars and staff time and would detract from the time EEOC spends on essential functions it is already performing. He noted that the task of training EEO staffs at federal agencies would be much more difficult and time-consuming than we seemingly suggest. He said the agency staffs have differing degrees of experience and that experience may not always be sufficient to thoroughly understand the types of analyses recommended. He believed that substantial funds would

be required to develop a computer program and that EEOC personnel would spend substantial time learning to use the program, enter data, and interpret the results. He also said that EEOC staff would have to devote much of their time and effort to correcting the resultant errors in agency reports to EEOC.

In our draft recommendation, we expressed the view that agencies should adopt over time the ratio-based technique as a standard part of their affirmative employment analyses. Our belief that the adoption of the ratio-based approach would not be costly or burdensome is based on the fact that it would require no new data collection or data entry efforts. In this regard, EEOC prepares annual reports to Congress on the employment of women and minorities in the federal workforce, and these annual reports contain raw data to which the ratio-based approach we suggest can be applied. The source of the data used in this report is OPM's CPDF, which also contains data on promotions, hires, and separations. These computerized data are available to EEOC.

We also believe that our suggestion for taking a ratio-based approach would not be costly or burdensome because it is as computationally simple as the procedures that agencies and EEOC are already using. Because EEOC has access to CPDF data and because our proposal involves nothing more than dividing certain numbers by one another, we do not believe that funding for other significant EEOC enforcement activities would have to be cut to implement our proposal. Computing the ratios we suggest can be accomplished via a simple computer program. We would be willing to assist EEOC in developing this computer program.

Moreover, we believe it is worthwhile for EEOC and agencies to adopt the ratio-based approach because of its computational simplicity, its strength as an analytic tool for assessing the relative status of women and minorities, and its potential for contributing to EEOC's efforts to systematically track progress in federal affirmative employment.

Appendix VI contains a copy of EEOC's January 19, 1993, letter and our additional discussion of its comments.

Matter for Consideration by the Senate Committee on Governmental Affairs

Because of EEOC's opposition to our draft, we have made no recommendation to EEOC in this report. However, we continue to believe that the ratio-based approach provides the opportunity to gain greater understanding of the status and progress of federal affirmative employment efforts. As such, the Committee may wish to require EEOC to use the technique when providing its annual report to Congress on the employment of women and minorities in the federal government. Because progress is incremental, we believe it would be sufficient to perform ratio-based analyses on a periodic basis, such as every 3 to 5 years. In time, as more use is made of the technique, agencies may wish to adopt it on their own to analyze federal workforce information.

As arranged with the Committee, unless you publicly release its contents earlier, we plan no further distribution of this report until 30 days from the date of this letter. At that time, we will send copies to the Chairman of EEOC, the Director of OPM, and other interested parties. We will also make copies available to others upon request.

The major contributors to this report are listed in appendix VII. If you have any questions, please contact me at (202) 512-5074.

Sincerely yours,

Bernard L. Ungar
Director, Federal Human Resource
Management Issues

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Abbreviations

CPDF	Central Personnel Data File
EEO	Equal Employment Opportunity
EEOC	Equal Employment Opportunity Commission
OPM	Office of Personnel Management

Identification of Agencies and Definition of Personnel Events Included in the Study

The purpose of this appendix is to identify which 25 agencies were included in our review and how we selected them and to explain our definitions of the three personnel events we examined—hires, separations, and promotions.

Agencies Reviewed

We reviewed the gender, race, and ethnic origin of people in 262 key jobs at 25 federal agencies. During the phase of our work that resulted in our May 1991 testimony, we reviewed the most recent multiyear affirmative employment plans, covering fiscal years 1988 through 1992, for the 34 largest federal agencies.[1] These agencies, in fiscal year 1988, collectively employed about 98 percent of the federal workforce. At the request of the Senate Committee on Governmental Affairs, we also included the National Archives and Records Administration's affirmative employment plan in our review.

Twenty-seven of the 35 agencies complied with EEOC requirements and identified major occupations in their multiyear affirmative employment plans. Eight did not. For this phase of our review, we categorized the major occupations into key jobs using a definition approved by EEOC. This definition eliminated clerical jobs and jobs with less than 100 employees. The EEOC described key jobs as those with 100 or more employees that offer advancement potential to senior level positions.

CPDF data were available to analyze the key jobs of 25 of the 27 agencies. The data were unavailable for the remaining two agencies. The names of the 25 agencies whose key jobs we reviewed follow.[2]

Department of Agriculture
Agency for International Development
Department of Commerce
Defense Logistics Agency
Defense Contract Audit Agency
Defense Mapping Agency
Defense Investigative Service
Department of Justice
Department of Energy
Department of Education

[1]GAO/T-GGD-91-32, May 16, 1991.

[2]One of the largest federal agencies, the U.S. Postal Service, is not among the 25 agencies. The Postal Service's affirmative employment plan was among the plans we reviewed, but the Postal Service did not identify major occupations and does not report data to CPDF.

Equal Employment Opportunity Commission
Environmental Protection Agency
General Services Administration
Department of Health and Human Services
Department of Housing and Urban Development
United States Information Agency
Department of the Interior
National Archives and Records Administration
Nuclear Regulatory Commission
Department of the Navy
Office of Personnel Management
Small Business Administration
Department of Transportation
Department of the Treasury
Department of Veterans Affairs

Personnel Events

All of our analyses of personnel events were restricted to those involving full-time permanent federal employees who held key jobs in the 50 United States in 1984 and 1990. CPDF contains multiple codes that identify various types of hires, separations, and promotions. Because we exercised some judgment in determining which codes to use to define the population of employees who were hired, separated, and promoted, we present here a full explanation of the categories included in our definitions.

Hires

In our definition of permanent hires, we included only the following types of appointments: career, career-conditional, excepted, reinstatement-career, and reinstatement-career-conditional.

Separations

We included both voluntary and involuntary separations from federal employment. Involuntary separations comprised the following categories: mandatory retirement, retirement due to disability, retirement in lieu of involuntary action, resignation in lieu of involuntary action, removal, termination due to disability, expiration of appointment, involuntary termination, termination, discharge during probation/trial period, and discharge. Voluntary separations comprised voluntary retirement, special option retirement, resignation, termination due to sponsor relocating, and termination due to military service. Termination due to transfer from one agency to another and separation due to death were not included in our definition of separation.

Promotions

Promotions included permanent promotions and temporary or term promotions. They also included promotions obtained competitively and promotions obtained noncompetitively.

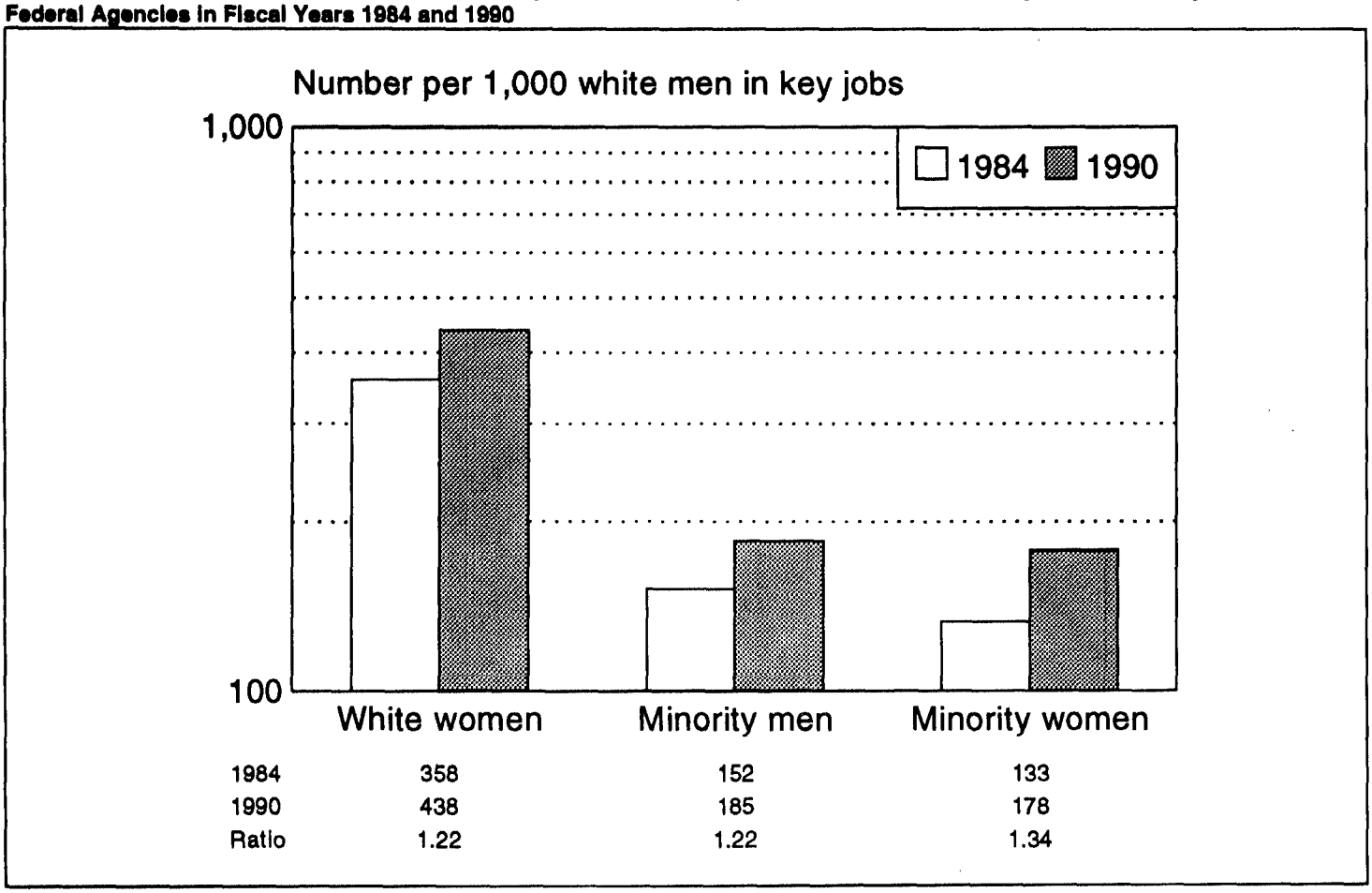
Key Job Profile for 1984 and 1990

Figure II.1 indicates that the relative numbers of white women and minority men and women in key jobs increased between 1984 and 1990.[1] The relative number of minority women (i.e., the number of minority women relative to white men) increased by a factor of 1.34, or by 34 percent. The relative numbers of white women and minority men both increased by 22 percent.[2]

[1]Graphically, results from loglinear analyses, which involve comparing ratios of numbers in differing categories or EEO groups, are depicted using a multiplicative scale. A chart with a multiplicative scale has no fixed zero point at its base, and the bars on the chart are interpreted only relative to their height on the scale. On a multiplicative scale, distances between two sets of points are equal when their ratios are equal. So a change from 10 per 1,000 to 20 per 1,000 will appear similar in size to a change from 100 per 1,000 to 200 per 1,000. Both involve a doubling, or an increase in magnitude, by a factor of 2.

[2]The change over time in relative numbers is obtained by dividing the relative number in 1990 by the relative number in 1984. From figure II.1, the change in relative numbers of white women is calculated as 438/358 = 1.22, which is interpreted to be a 22-percent change. For minority men, the 1990 to 1984 ratio is 185/152 = 1.22, also a 22-percent change. For minority women, the ratio is 178/133 = 1.34, a 34-percent change.

Figure II.1: Numbers of White Women and Minority Men and Women per 1,000 White Men Among Workers in Key Jobs at 25 Federal Agencies in Fiscal Years 1984 and 1990

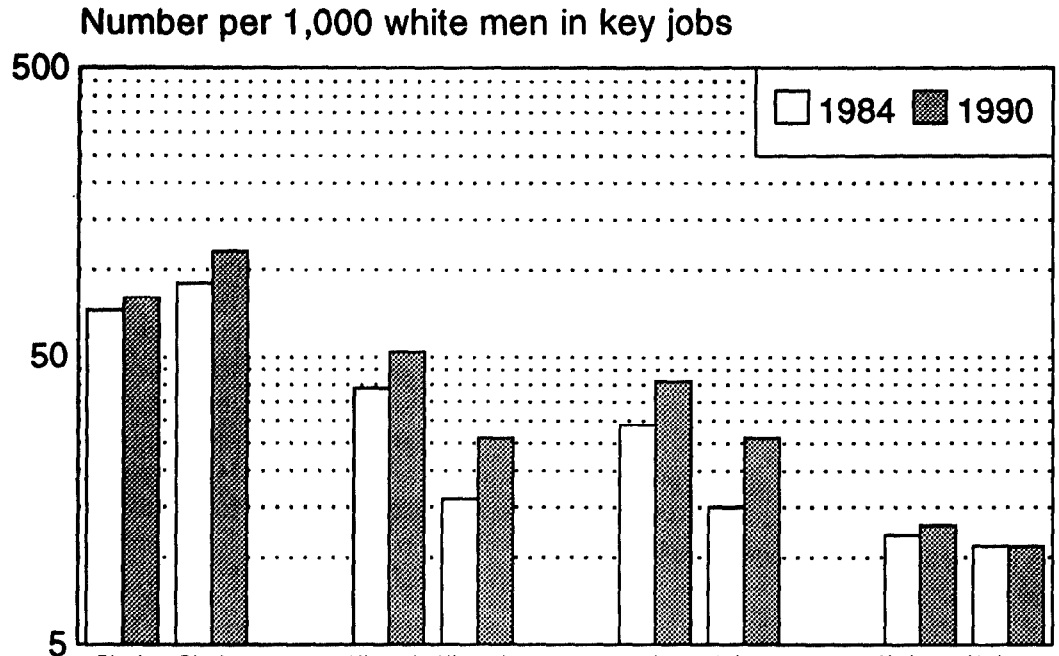


Source: OPM data.

Figure II.2 shows changes in the relative numbers for each of the specific categories of minority men and women. All EEO groups except for Native American women showed increases in relative numbers in key jobs between 1984 and 1990. Increases for Native American men and black men were slight, involving increases of 8 percent and 11 percent, respectively. The relative numbers of Hispanic and Asian men showed more sizable increases over time, involving gains of 33 percent and 41 percent, respectively. The relative numbers of black, Hispanic, and Asian women all increased more than their male counterparts. Increases for Hispanic

and Asian women were largest, involving gains of 63 percent and 73 percent, respectively.

Figure II.2: Numbers of Specific Minority Men and Women per 1,000 White Men Among Workers in Key Jobs at 25 Federal Agencies in Fiscal Years 1984 and 1990



	Black men	Black women	Hispanic men	Hispanic women	Asian men	Asian women	Native American men	Native American women
1984	72	90	39	16	29	15	12	11
1990	80	116	52	26	41	26	13	11
Ratio	1.11	1.29	1.33	1.63	1.41	1.73	1.08	1

Source: OPM data.

The relative numbers of minority men and women shown in figure II.2 also imply that blacks were the only group in which the number of women in key jobs exceeded the number of men. Furthermore, the difference was even greater in 1990 than in 1984. There were 1,250 black women for every

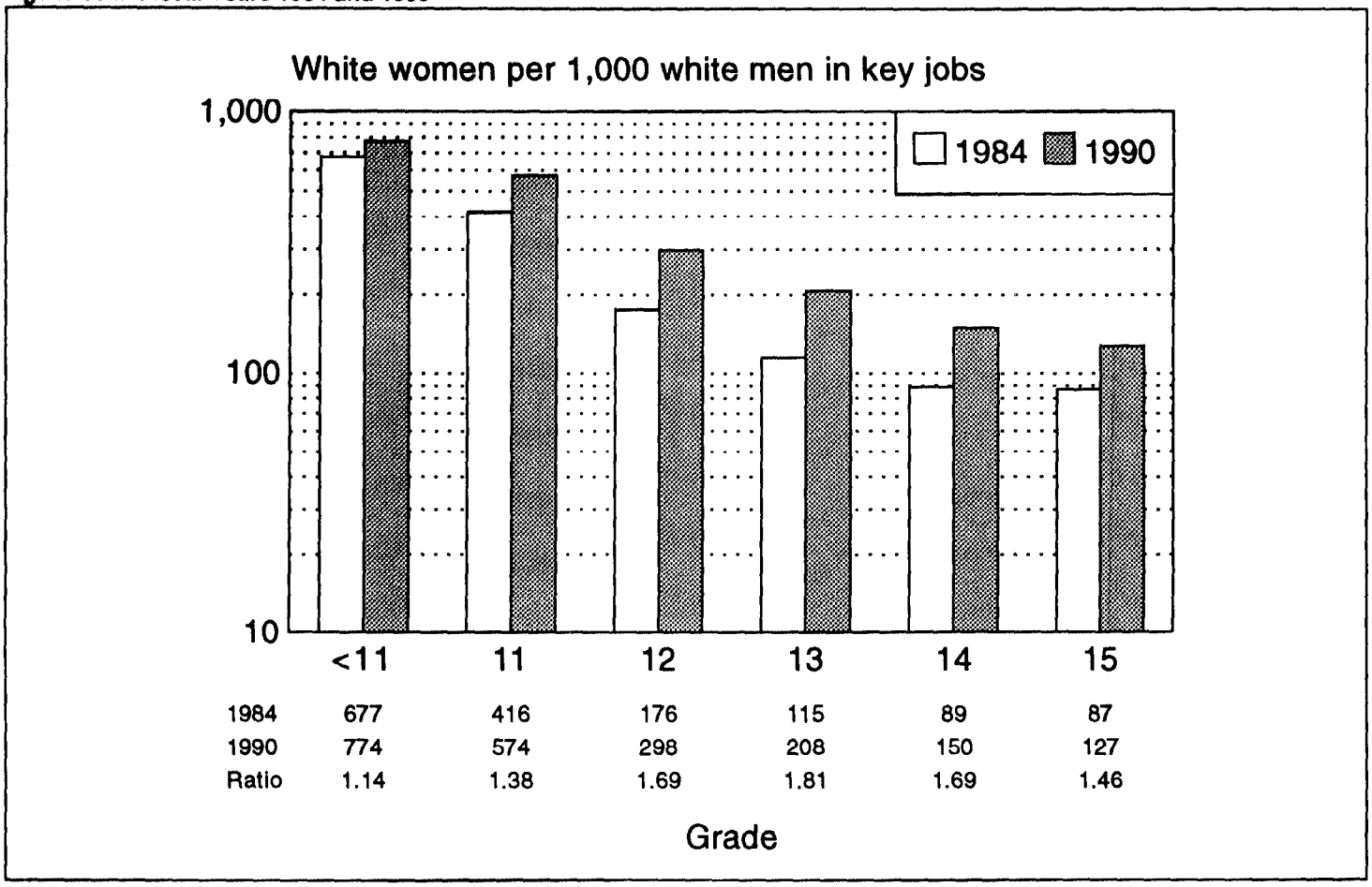
1,000 black men in key jobs in 1984.[3] In that same year, there were roughly 2,400 Hispanic men for every 1,000 Hispanic women and 1,900 Asian men for every 1,000 Asian women. The fact that the relative number of women in key jobs grew more than the relative number of men in all three of these minority categories implies that the disproportion in the number of women among blacks increased, while the disproportion in the number of males among Hispanics and Asians decreased. In 1990, there were 1,450 black women in key jobs for every 1,000 black men, 2,000 Hispanic men for every 1,000 Hispanic women, and 1,600 Asian men for every 1,000 Asian women. The numbers of men and women among Native Americans were fairly comparable in both years.

Figures II.3, II.4, and II.5 show that the relative numbers of white women and minority men and women in key jobs increased at every grade level between 1984 and 1990. Further, increases in the relative numbers for all three groups were greater at virtually all grades at or above grade 11 than below it.[4] At grades 12 and above, the gains in key jobs made by white and minority women exceeded considerably the gains made by minority men. At grade 13, for example, there were 81-percent, 90-percent, and 31-percent increases, respectively, in the relative numbers of white women and minority men and women. At grade 14, the relative gains were 69 percent for white women, 65 percent for minority women, and 11 percent for minority men.

[3]The number of black women per 1,000 black men is obtained by taking the number of black women per 1,000 white men, divided by the number of black men per 1,000 white men, and multiplying that ratio by 1,000 (i.e., 90/72 X 1,000 = 1,250).

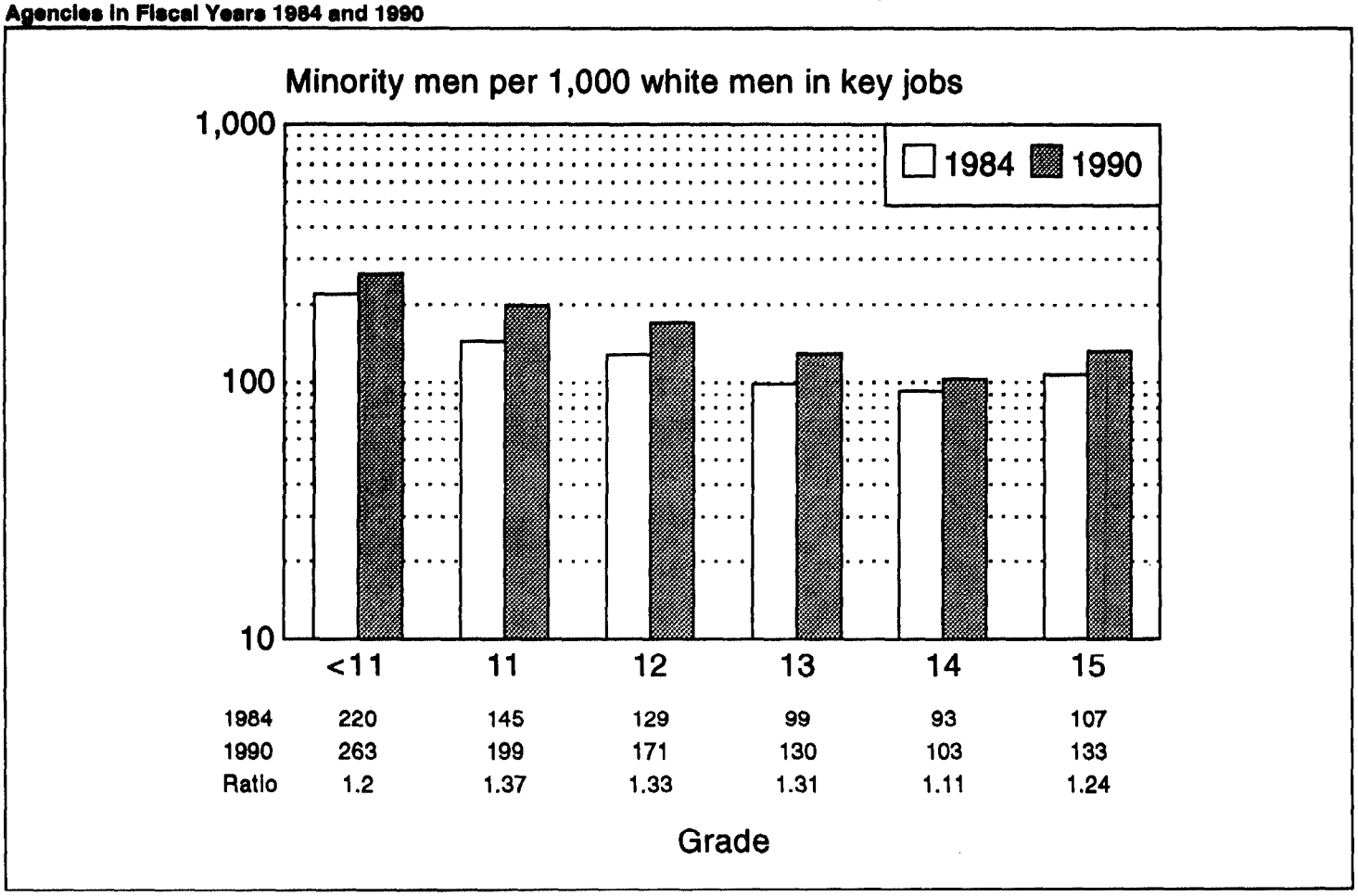
[4]The only clear exception to this involved the 11-percent increase in the relative number of minority men at grade 14, which was less than the 20-percent increase in the relative number of minority men below grade 11.

Figure II.3: Number of White Women per 1,000 White Men at Different Grades Among Key Job Workers at 25 Federal Agencies in Fiscal Years 1984 and 1990



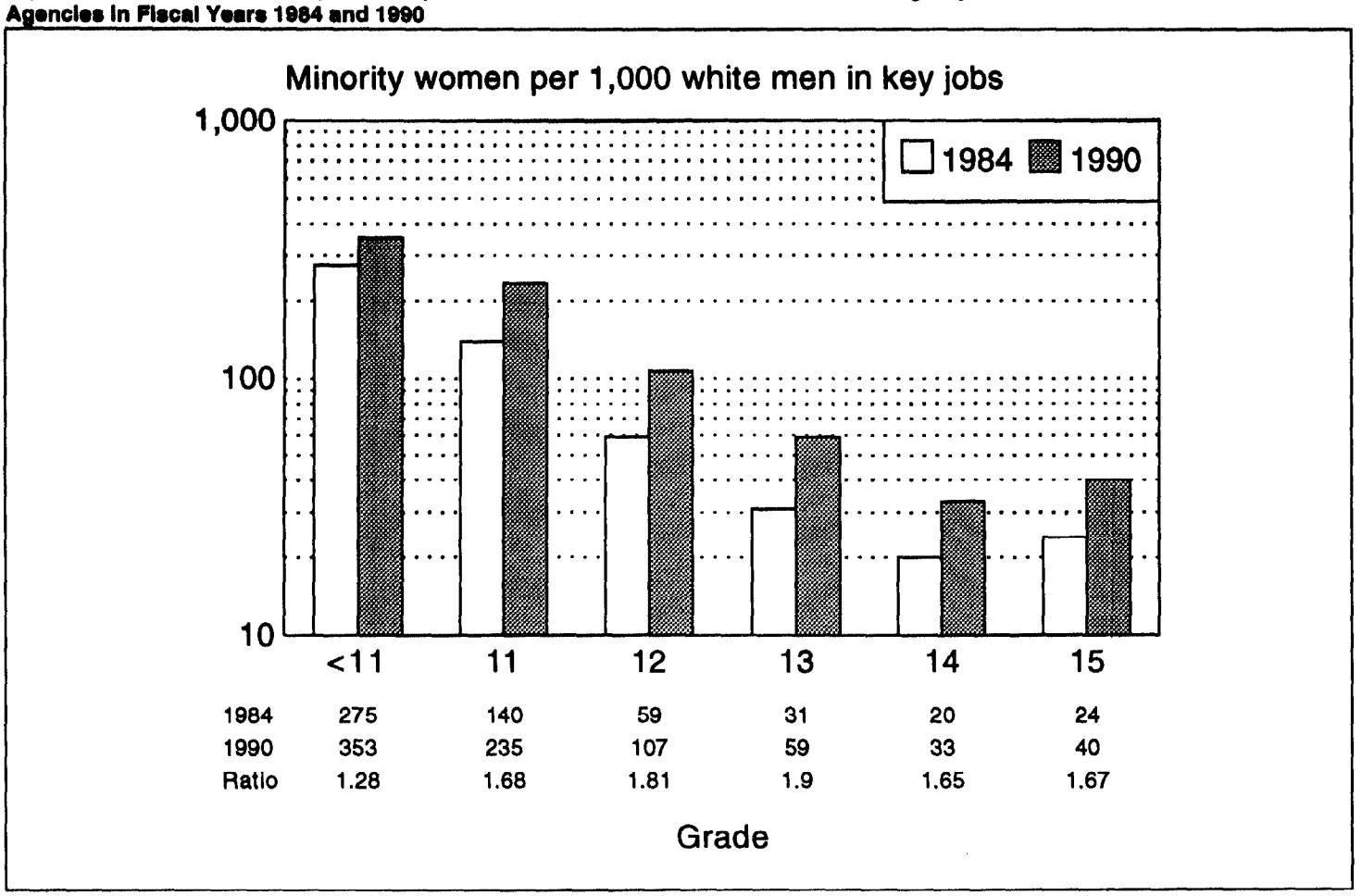
Source: OPM data.

Figure II.4: Number of Minority Men per 1,000 White Men at Different Grades Among Key Job Workers at 25 Federal Agencies in Fiscal Years 1984 and 1990



Source: OPM data.

Figure II.5: Number of Minority Women per 1,000 White Men at Different Grades Among Key Job Workers at 25 Federal Agencies in Fiscal Years 1984 and 1990



Source: OPM data.

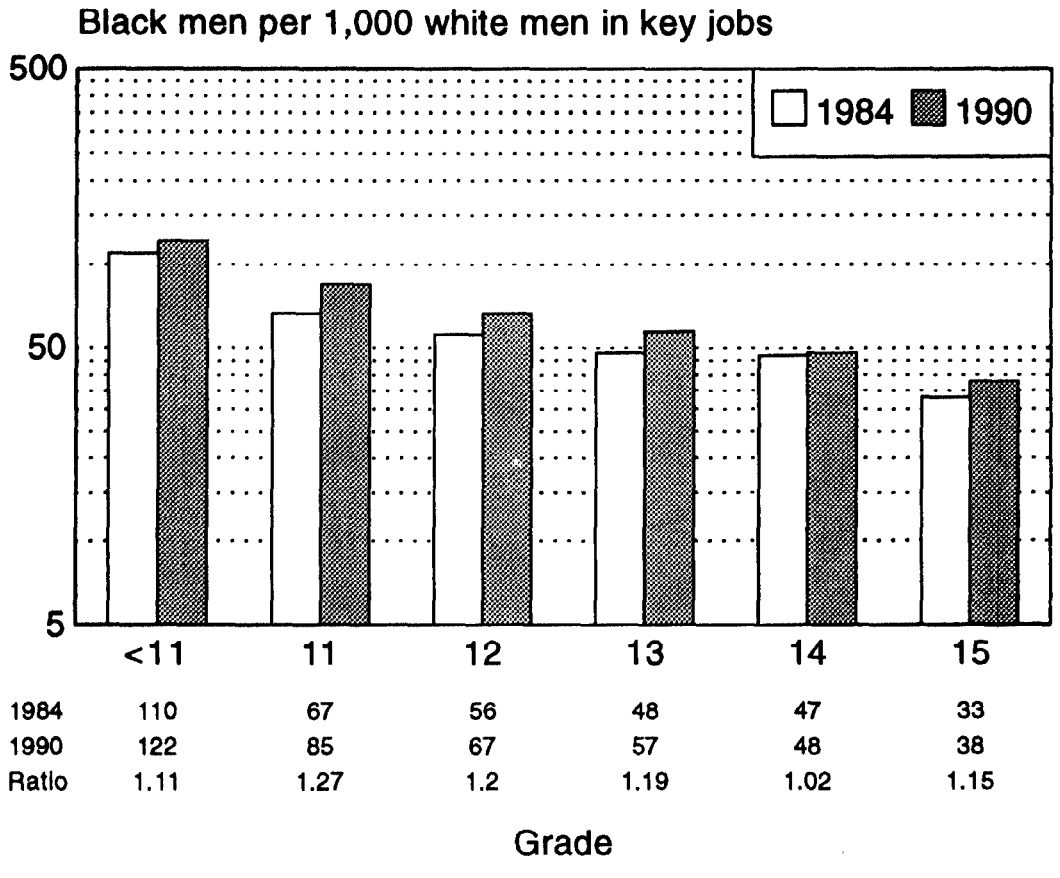
Figures II.3, II.4, and II.5 also show that the relative numbers of women and minorities in key jobs at upper grades were much smaller than those at lower grades. The greater increases over time in relative numbers at upper grades diminished these differences across grades somewhat. Nonetheless, even in 1990, the lower relative numbers at upper grades of each group, and especially of the two groups of women, remained pronounced. In 1984, the relative numbers of white women and minority men and women in key jobs were higher below grade 11 than at grade 15

by factors of 7.8, 2.1, and 11.5, respectively.[5] In 1990, the corresponding numbers for these three groups were 6.1, 2.0, and 8.8, respectively.

In figures II.6 through II.13, in which minorities are separated into specific subgroups, we can more closely examine where changes occurred among key job workers. At virtually all grades, relative numbers of minorities among key job workers increased between 1984 and 1990, with women generally showing greater increases than men. Indeed, at many grades above 10, the relative numbers of black, Hispanic, Asian, and Native American women nearly doubled or more than doubled. Among men, increases by a factor of 1.5 were the highest, and these occurred among Hispanic men and women in grades 11, 12, and 13 and Asian men and women in grade 11.

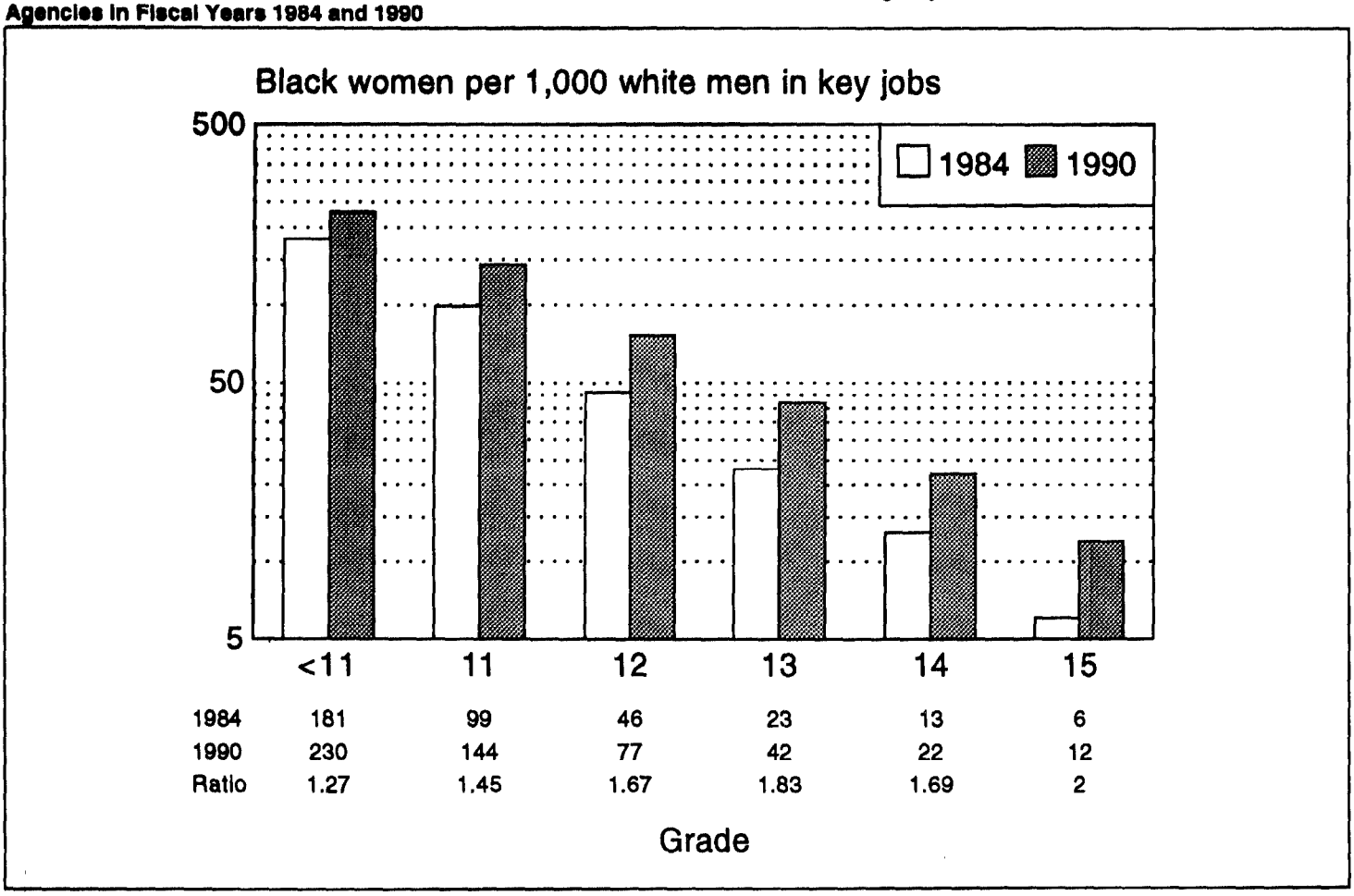
[5]These numbers are obtained by computing the ratio of the relative numbers below grade 11 and those at grade 15. The 1984 ratio for white women is computed from figure II.3 as 677/87 = 7.8. The ratio for minority men is computed from figure II.4 as 220/107 = 2.1. The ratio for minority women is computed from figure II.5 as 275/24 = 11.5.

Figure II.6: Number of Black Men per 1,000 White Men at Different Grades Among Key Job Workers at 25 Federal Agencies in Fiscal Years 1984 and 1990



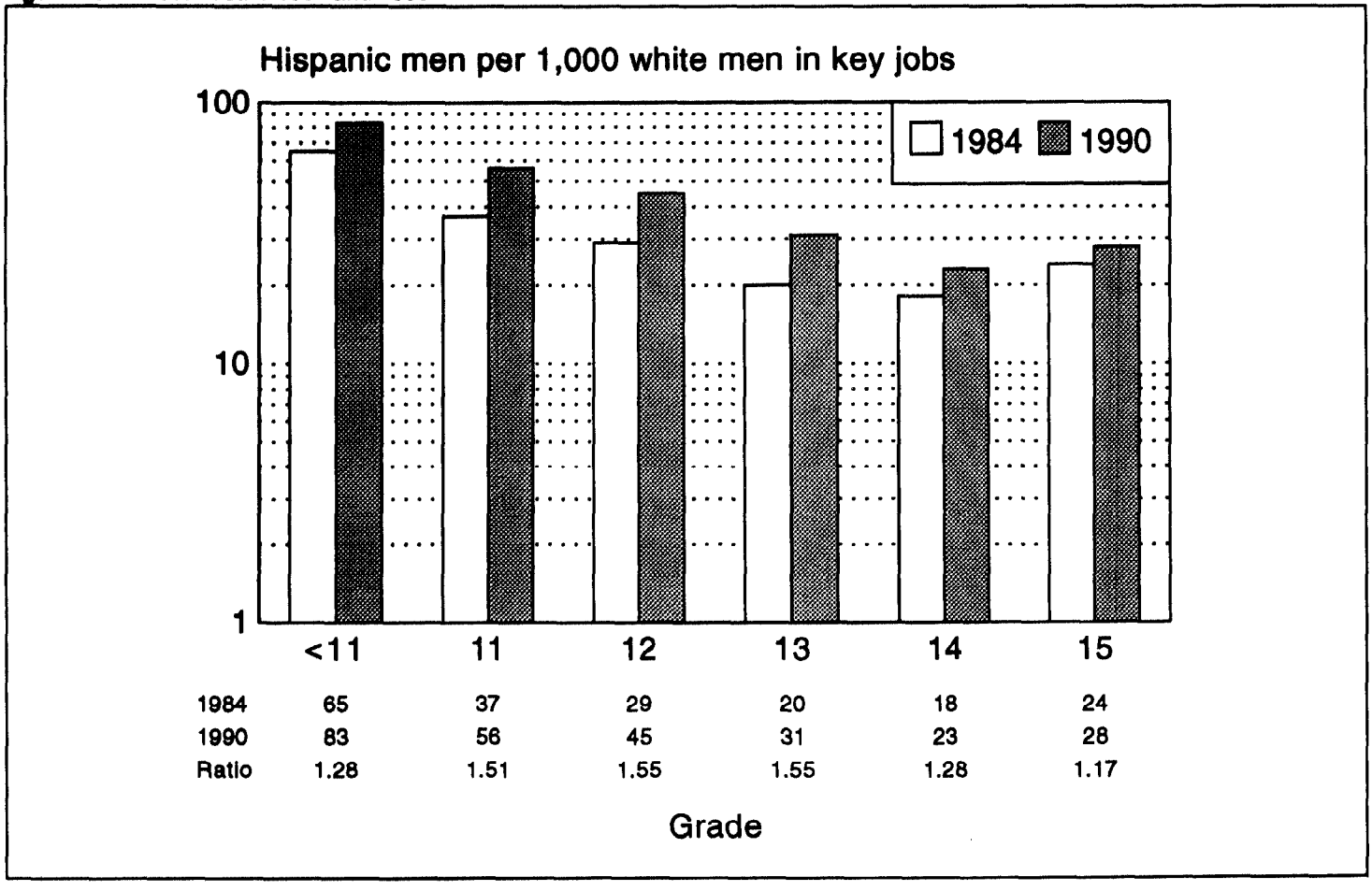
Source: OPM data.

Figure II.7: Number of Black Women per 1,000 White Men at Different Grades Among Key Job Workers at 25 Federal Agencies in Fiscal Years 1984 and 1990



Source: OPM data.

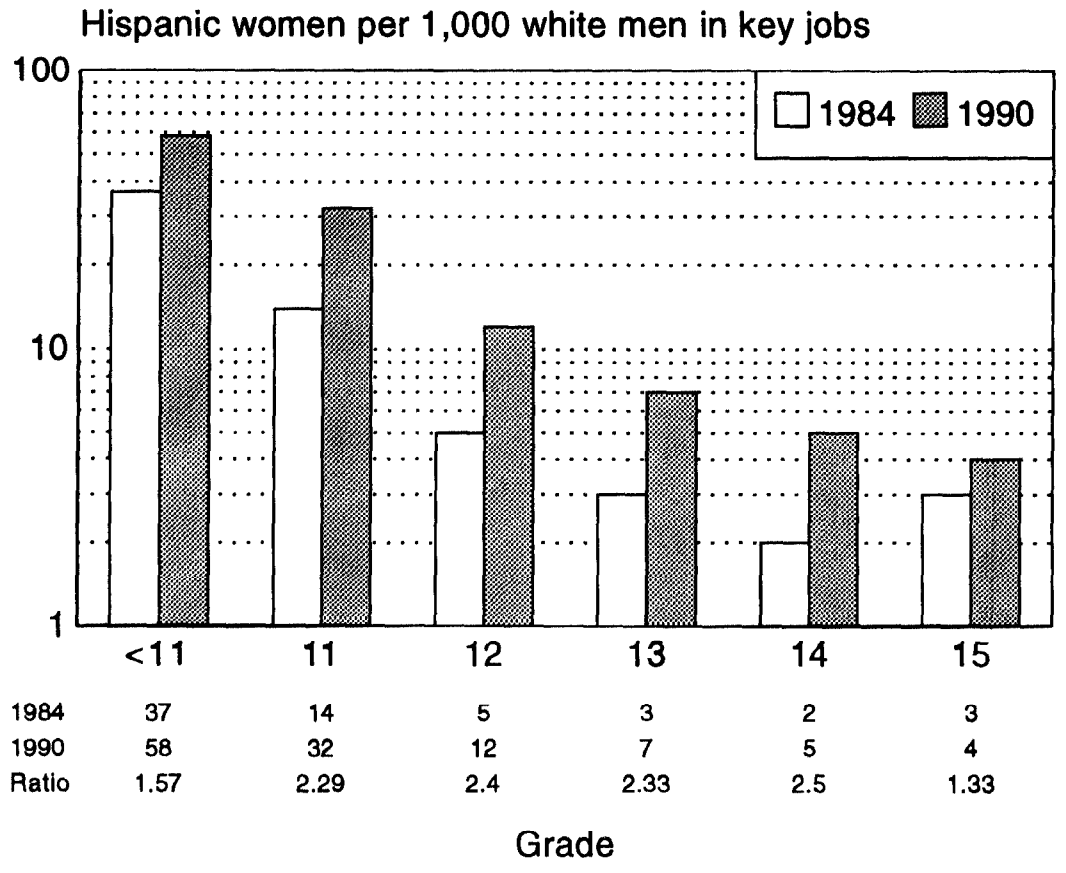
Figure II.8: Number of Hispanic Men per 1,000 White Men at Different Grades Among Key Job Workers at 25 Federal Agencies in Fiscal Years 1984 and 1990



	<11	11	12	13	14	15
1984	65	37	29	20	18	24
1990	83	56	45	31	23	28
Ratio	1.28	1.51	1.55	1.55	1.28	1.17

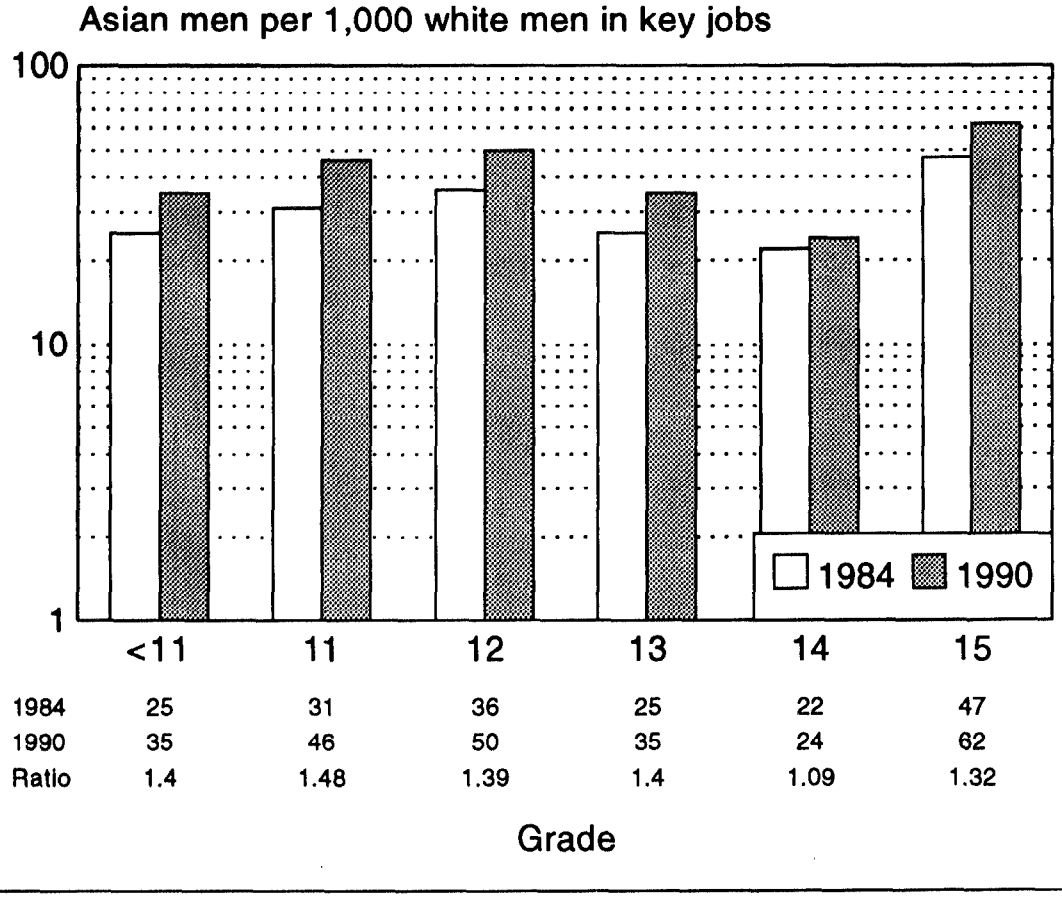
Source: OPM data.

Figure II.9: Number of Hispanic Women per 1,000 White Men at Different Grades Among Key Job Workers at 25 Federal Agencies in Fiscal Years 1984 and 1990



Source: OPM data.

Figure II.10: Number of Asian Men per 1,000 White Men at Different Grades Among Key Job Workers at 25 Federal Agencies in Fiscal Years 1984 and 1990



	<11	11	12	13	14	15
1984	25	31	36	25	22	47
1990	35	46	50	35	24	62
Ratio	1.4	1.48	1.39	1.4	1.09	1.32

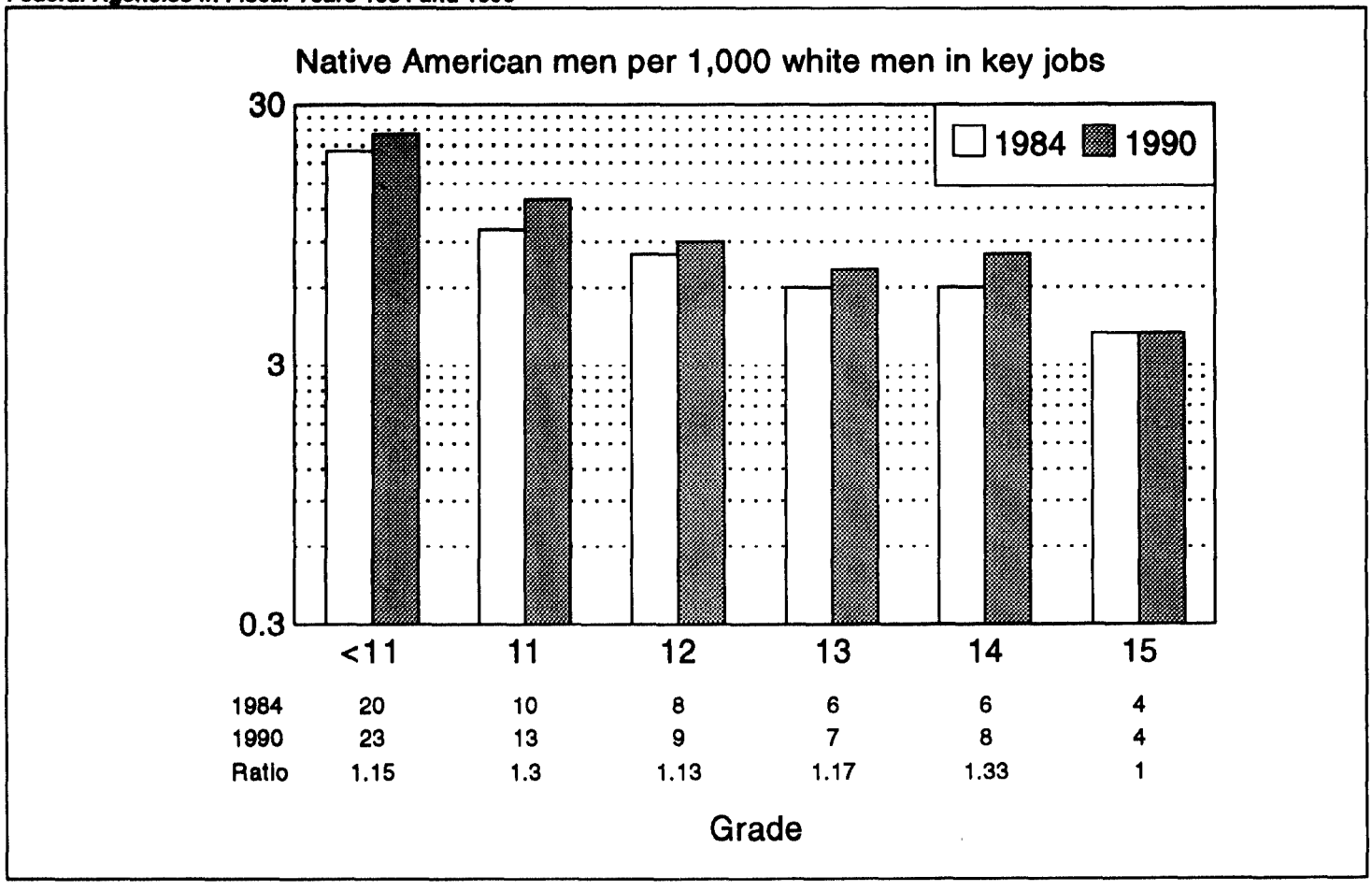
Source: OPM data.

Figure II.11: Number of Asian Women per 1,000 White Men at Different Grades Among Key Job Workers at 25 Federal Agencies in Fiscal Years 1984 and 1990

	<11	11	12	13	14	15
1984	27	21	6	4	4	14
1990	37	49	15	8	5	23
Ratio	1.37	2.33	2.5	2	1.25	1.64

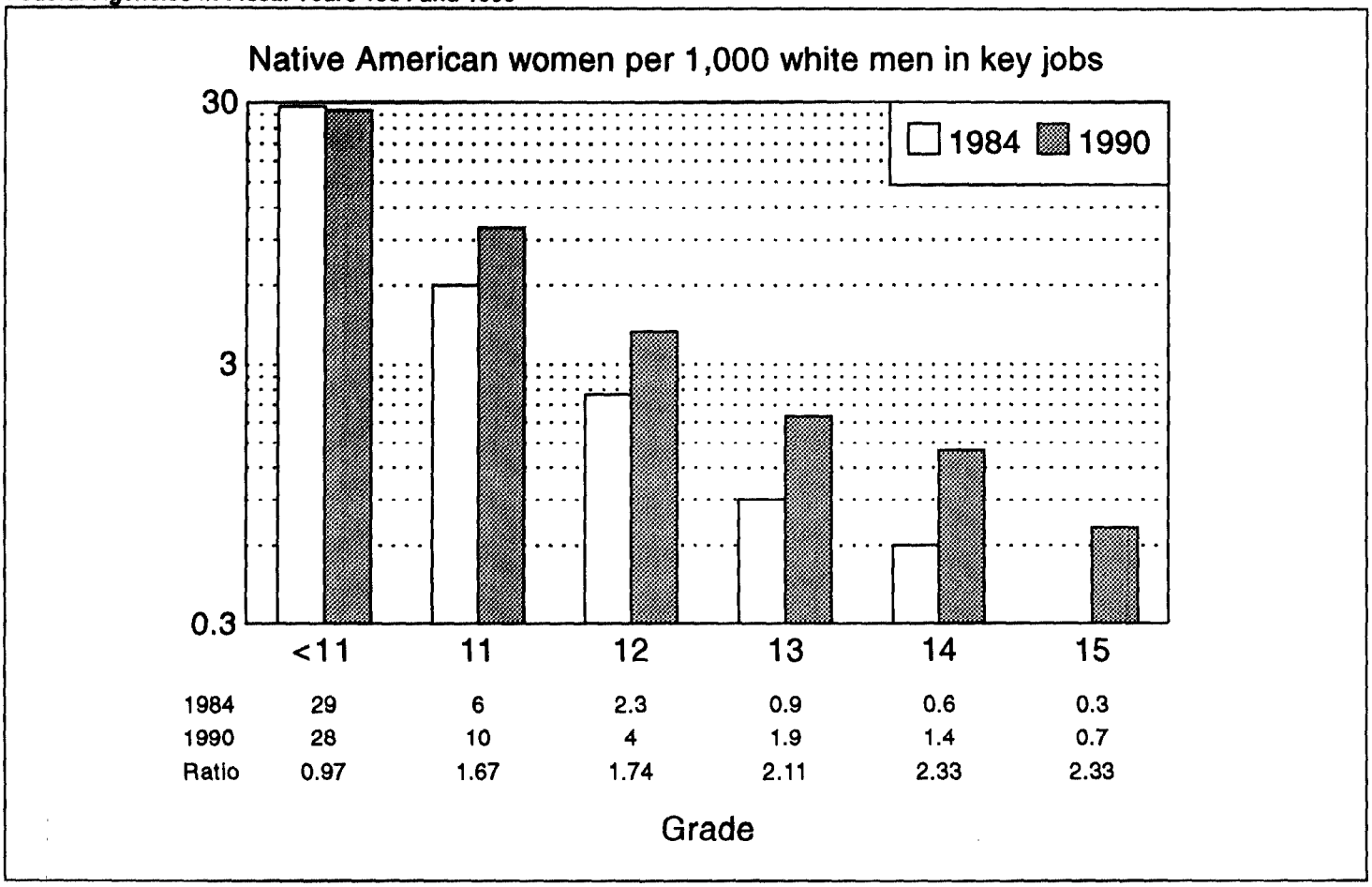
Source: OPM data.

Figure II.12: Number of Native American Men per 1,000 White Men at Different Grades Among Key Job Workers at 25 Federal Agencies in Fiscal Years 1984 and 1990



Source: OPM data.

Figure II.13: Number of Native American Women per 1,000 White Men at Different Grades Among Key Job Workers at 25 Federal Agencies in Fiscal Years 1984 and 1990



Source: OPM data.

With the exception of Asian men and women, we again found substantial differences across grades in the relative numbers of women and minorities occupying key jobs. These disparities were particularly large for women. Comparing the relative numbers of black, Hispanic, and Native American women below grade 11 with those at grade 15 revealed the extent of this disparity. The relative numbers of black, Hispanic, and Native American women below grade 11 exceeded those at grade 15 by factors of 30, 12, and 96, respectively, in 1984. The comparable numbers for 1990 were 19,

14, and 40, respectively. The differences in the relative numbers of black and Native American women at the bottom and top of the grade distribution have diminished somewhat between 1984 and 1990, again because of the larger increases over time in relative numbers of these groups at upper grades than at lower grades. However, the differences in the relative numbers of women at the bottom and top of the grade distribution have hardly disappeared.

In both 1984 and 1990, there were relatively more Asian men at grade 15 than at any grade below 15, and there were relatively more Asian women at grade 15 than at grades 12, 13, or 14. There were relatively three times as many black and Hispanic men below grade 11 as at grade 15 in both years, while the relative number of Native American men was roughly five times as great in 1984 and six times as great in 1990 at grades below 11 as at grade 15.

Personnel Events in 1984 and 1990

Our second set of analyses focused on the involvement of various EEO groups in certain critical personnel events that affect the composition of the workforce and the distribution of these groups across the various grades of the workforce. We looked at the relative numbers of each group that were hired to key jobs in 1984 and 1990, at the relative numbers that were separated in both years, and at the relative numbers that were promoted.[1]

It is important to note that these analyses cannot directly account for the overall changes that took place in the composition of the key job workforce over the 1984 to 1990 period. Accounting for those changes would require, at a minimum, year-by-year calculations of numbers of each EEO group added and subtracted through hires and separations, and we did not have data for all years. Additionally, data on hires and separations alone do not account for changes in the numbers in the full-time federal workforce, in general, or in the key job segment of that workforce. Many workers are converted from part-time or temporary positions to full-time; we had no data on such conversions.

Despite data limitations, analyses of hires and separations data can nonetheless yield useful information about factors that affect the composition of the workforce. Such analyses help ascertain whether the relative numbers hired or separated differed in 1990 from 1984 or whether they vary across EEO groups or across grades in ways that might, favorably or unfavorably, affect the attempt to improve the numbers of women and minorities in the workforce. Similarly, these analyses can help to suggest whether the relative numbers of the different EEO groups promoted have affected, favorably or unfavorably, the distribution of these groups across grades.

Hires

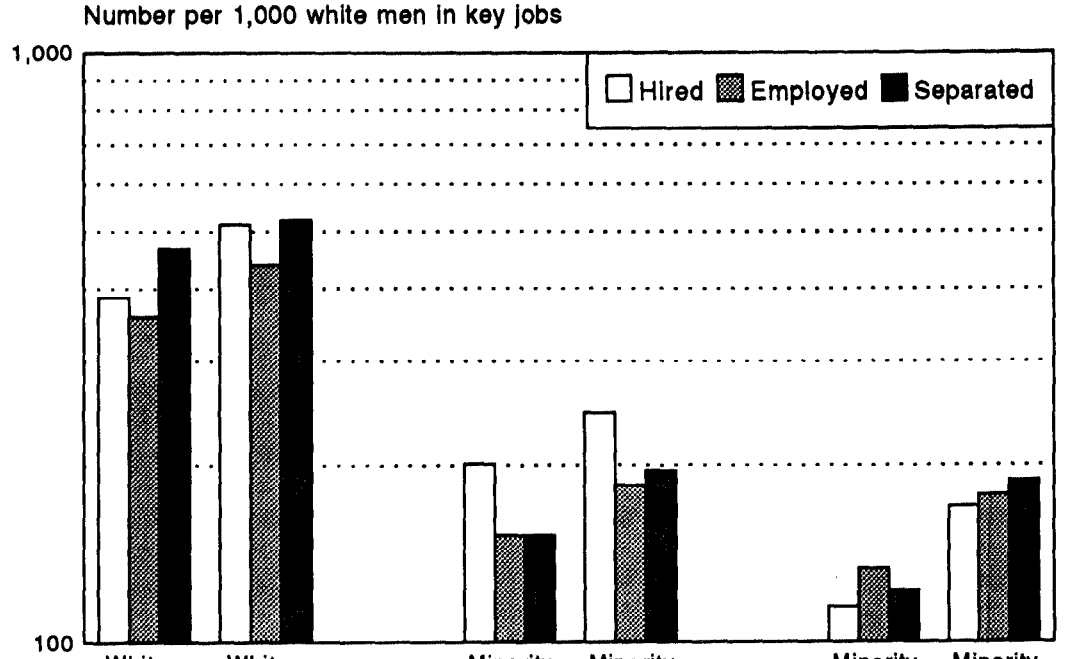
White women and minority men and women were all hired to key jobs at relatively higher levels in 1990 than in 1984 (see fig. III.1).[2] Moreover, the relative numbers of white women and minority men hired in both years exceeded the relative numbers of white women and minority men employed in key jobs. In 1990, for example, there were 246 minority men hired to key jobs for every 1,000 white men hired at a time when there were 185 minority men working in key jobs for every 1,000 white men so

[1]In appendix I, we explain how we defined hires, promotions, and separations for the purposes of this study.

[2]We do not report the relative numbers of specific minority groups hired at each grade level because the numbers of employees at some grades were very small.

employed. Minority women, by comparison, were in both years employed in key jobs in higher relative numbers than they were hired to key jobs. In both of these years, in other words, white women and minority men were hired at rates that would (disregarding separations and conversions) have increased their relative numbers in the workforce, while minority women were not.

Figure III.1: Numbers of White Women and Minority Men and Women per 1,000 White Men Employed In, Hired to, and Separated From Key Jobs in Fiscal Years 1984 and 1990

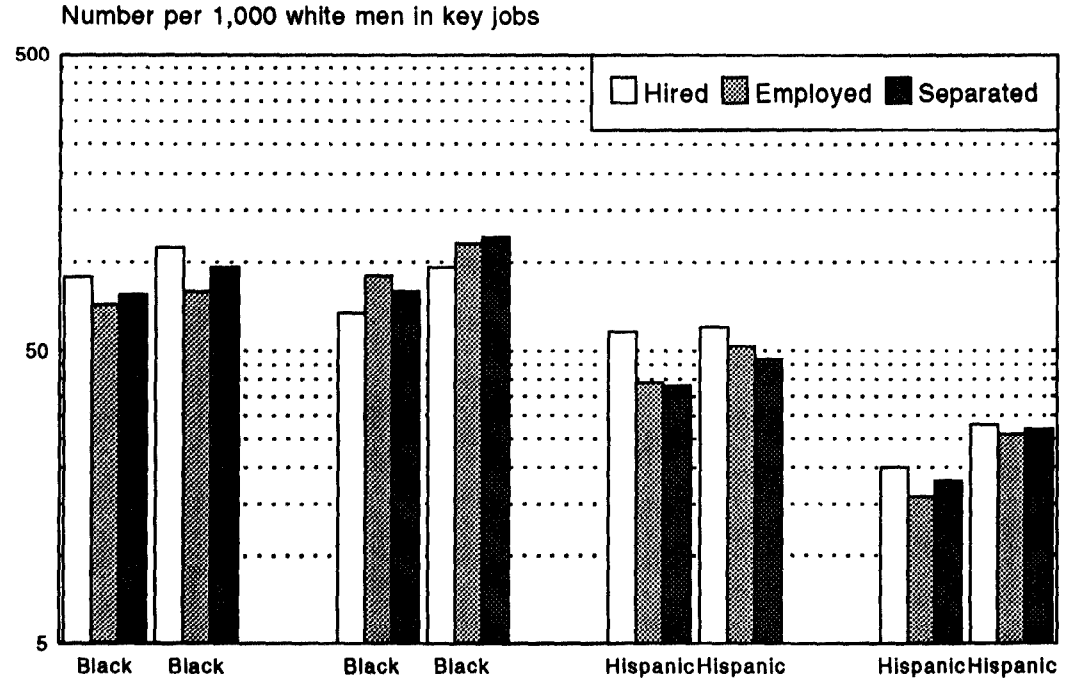


	White women 1984	White women 1990	Minority men 1984	Minority men 1990	Minority women 1984	Minority women 1990
Hired	386	514	201	246	115	170
Employed	358	438	152	185	133	178
Separated	467	522	152	196	122	189

Source: OPM data.

Figures III.2 and III.3 indicate that each of the specific categories of minority men and women were hired to key jobs in relatively higher numbers in 1990 than in 1984. While black men and Hispanic and Asian men and women were hired in both years at relatively higher levels than those at which they were employed, the relative number of black women hired in both years was lower than the relative numbers employed. In 1990, for example, when there were 116 black women employed for every 1,000 white men employed in key jobs, there were only 96 black women hired to key jobs for every 1,000 white men hired. For black women, then, new hires would not—disregarding separations and conversions—have increased their relative numbers in the key job workforce in either year. The same was true for Native American men in both years and for Native American women in 1984 but not in 1990.

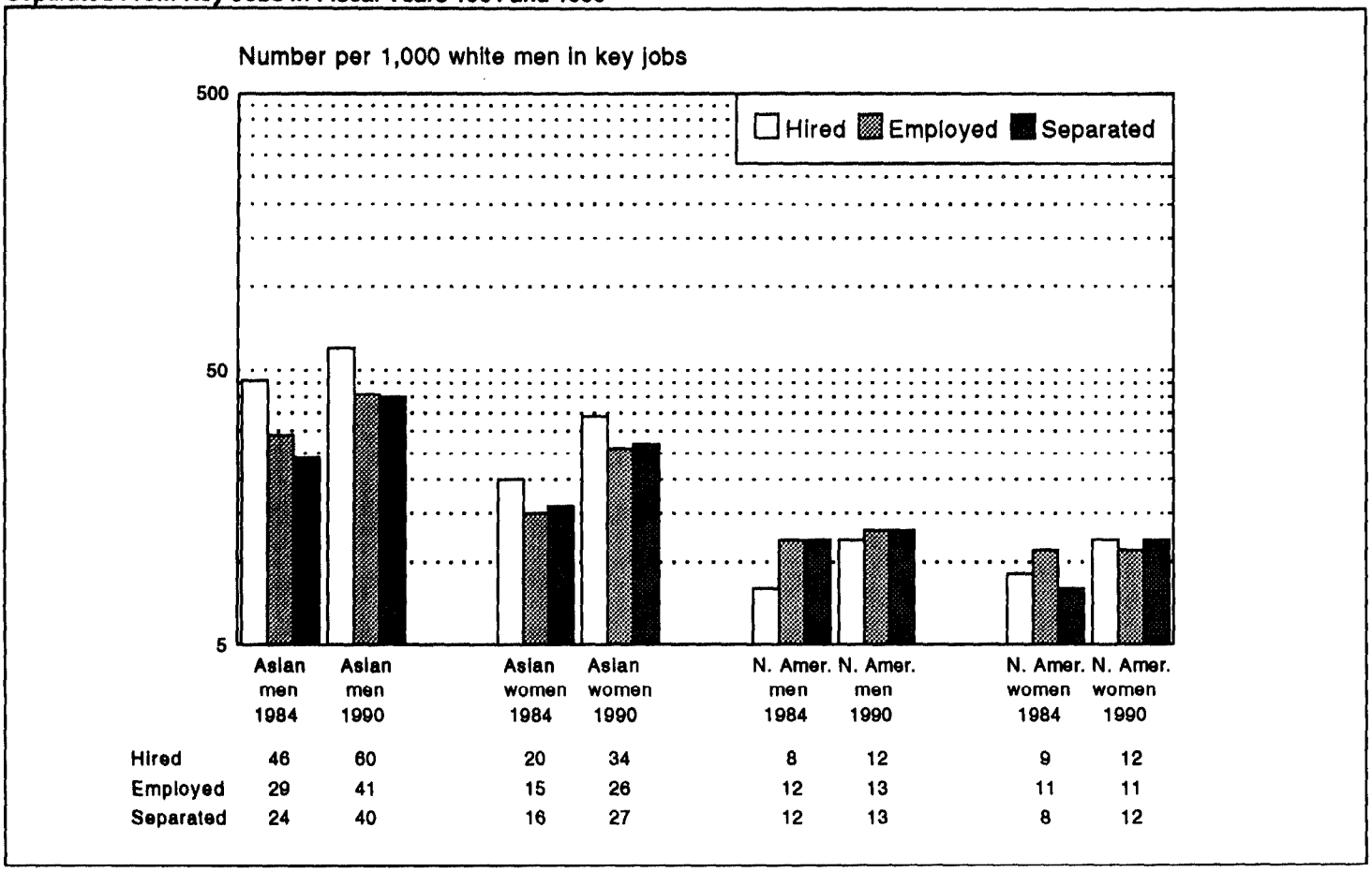
Figure III.2: Numbers of Black and Hispanic Men and Women per 1,000 White Men Employed in, Hired to, and Separated From Key Jobs in Fiscal Years 1984 and 1990



	Black men 1984	Black men 1990	Black women 1984	Black women 1990	Hispanic men 1984	Hispanic men 1990	Hispanic women 1984	Hispanic women 1990
Hired	89	113	67	96	58	60	20	28
Employed	72	80	90	116	39	52	16	26
Separated	78	96	80	122	38	47	18	27

Source: OPM data.

Figure III.3: Numbers of Asian and Native American Men and Women per 1,000 White Men Employed in, Hired to, and Separated From Key Jobs in Fiscal Years 1984 and 1990

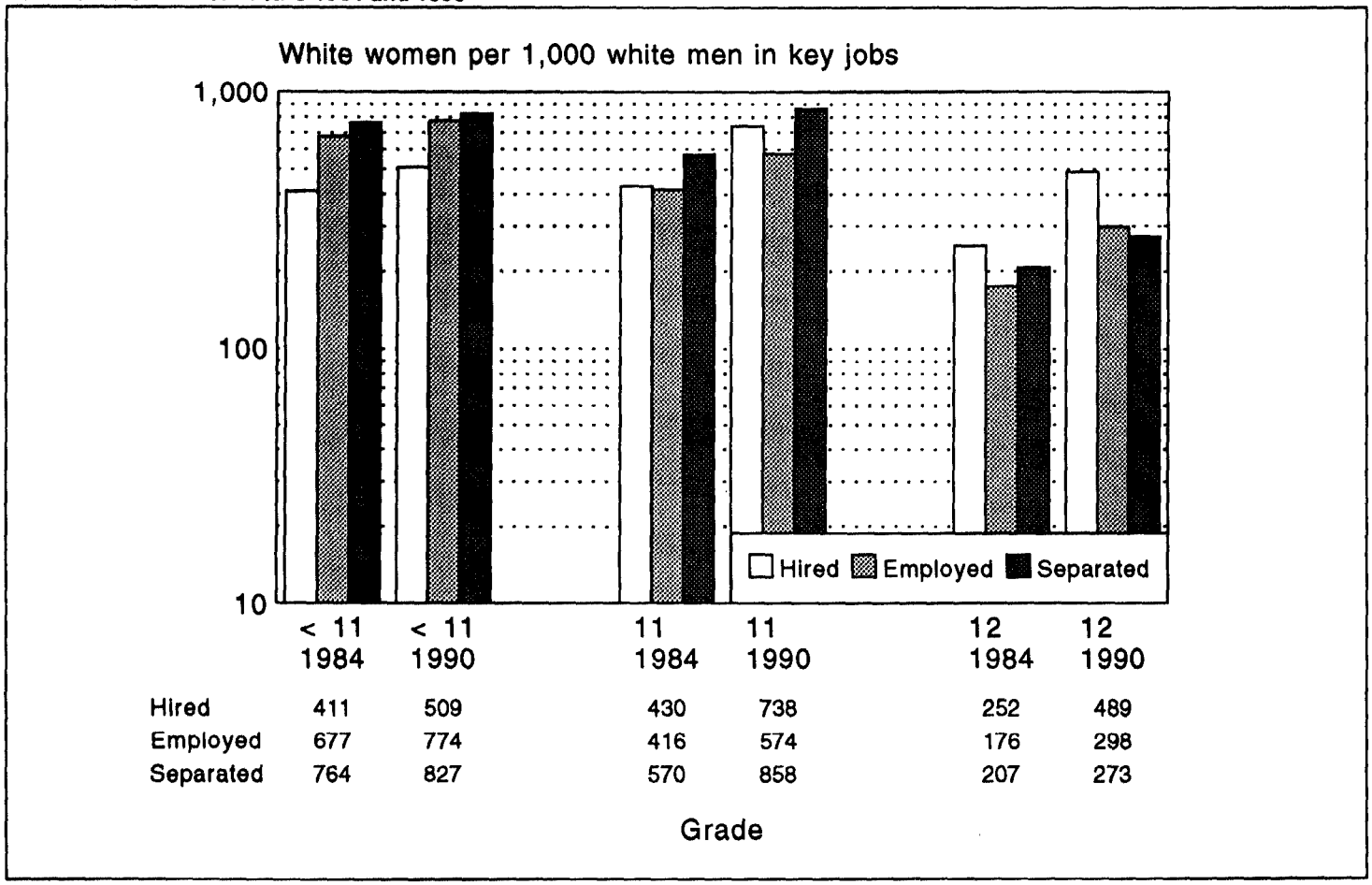


Source: OPM data.

Figures III.4 through III.9 show that increases between 1984 and 1990 in the relative hiring of white women, minority men, and minority women occurred at virtually all grades. The only exception involved the relative number of minority men hired at grade 11. One pattern that emerges fairly consistently from these six figures is that at the lowest grades, in which each of the three groups was employed in the largest relative numbers, none of the groups was hired in relative numbers that greatly exceeded the relative numbers in which they were employed. In fact, in both years, white and minority women were hired in considerably smaller relative

numbers than those at which they were employed below grade 11. At the highest grades, however, where these groups were employed in the lowest relative numbers, their relative hiring levels greatly exceeded in both years the relative numbers at which they were working. At grade 15 in 1990, for example, 127 white women, 133 minority men, and 40 minority women were working in key jobs for every 1,000 white men working in key jobs. In that same year and grade, 266 white women, 246 minority men, and 78 minority women were hired for every 1,000 white men hired to key jobs. The latter numbers were, in all cases, nearly double or more than double the former.

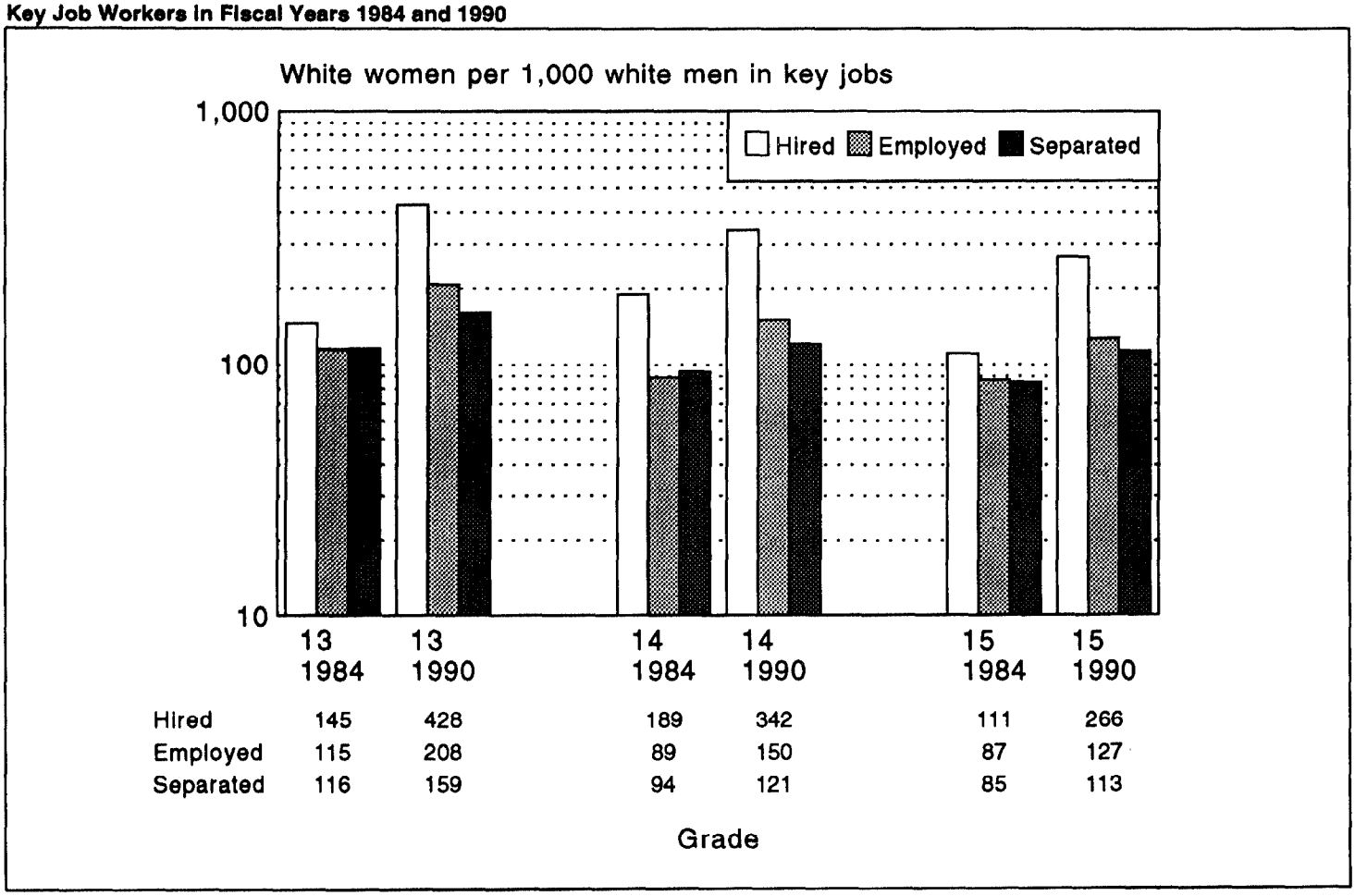
Figure III.4: Numbers of White Women per 1,000 White Men Employed, Hired, and Separated Below Grade 13 Among Key Job Workers in Fiscal Years 1984 and 1990



	< 11 1984	< 11 1990	11 1984	11 1990	12 1984	12 1990
Hired	411	509	430	738	252	489
Employed	677	774	416	574	176	298
Separated	764	827	570	858	207	273

Source: OPM data.

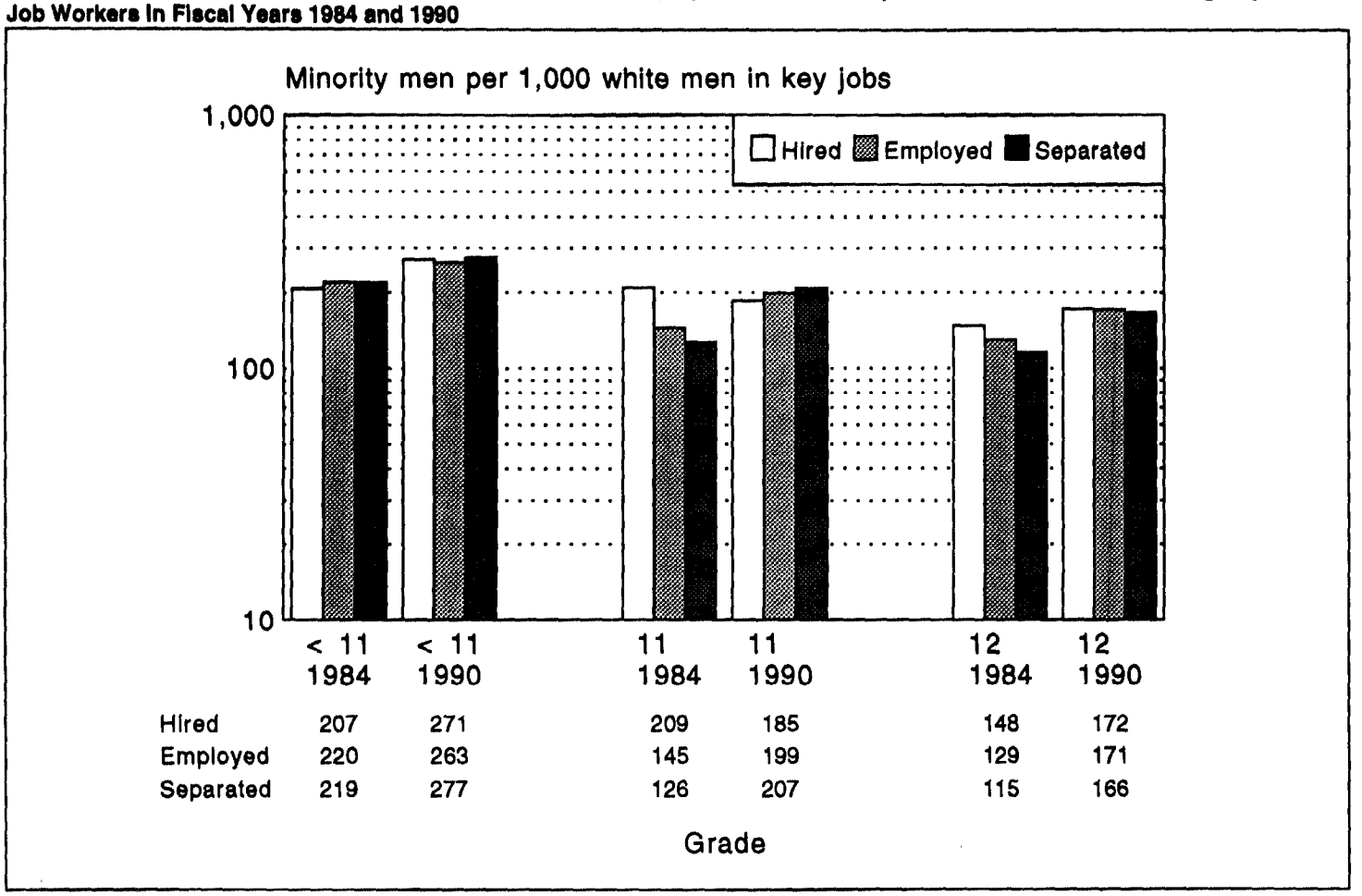
Figure III.5: Numbers of White Women per 1,000 White Men Employed, Hired, and Separated at Grade 13 and Above Among Key Job Workers in Fiscal Years 1984 and 1990



	13 1984	13 1990	14 1984	14 1990	15 1984	15 1990
Hired	145	428	189	342	111	266
Employed	115	208	89	150	87	127
Separated	116	159	94	121	85	113

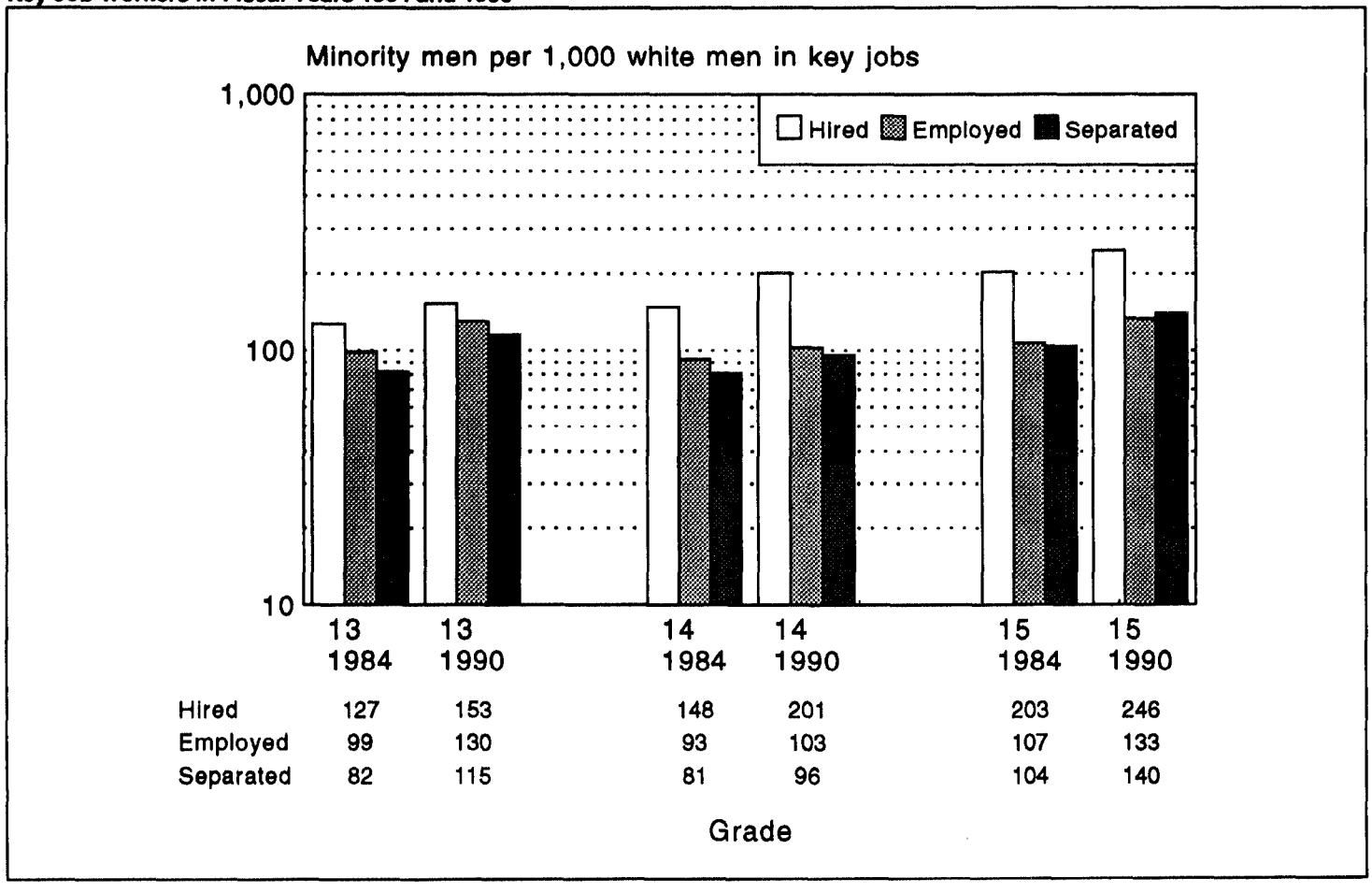
Source: OPM data.

Figure III.6: Numbers of Minority Men per 1,000 White Men Employed, Hired, and Separated Below Grade 13 Among Key Job Workers in Fiscal Years 1984 and 1990



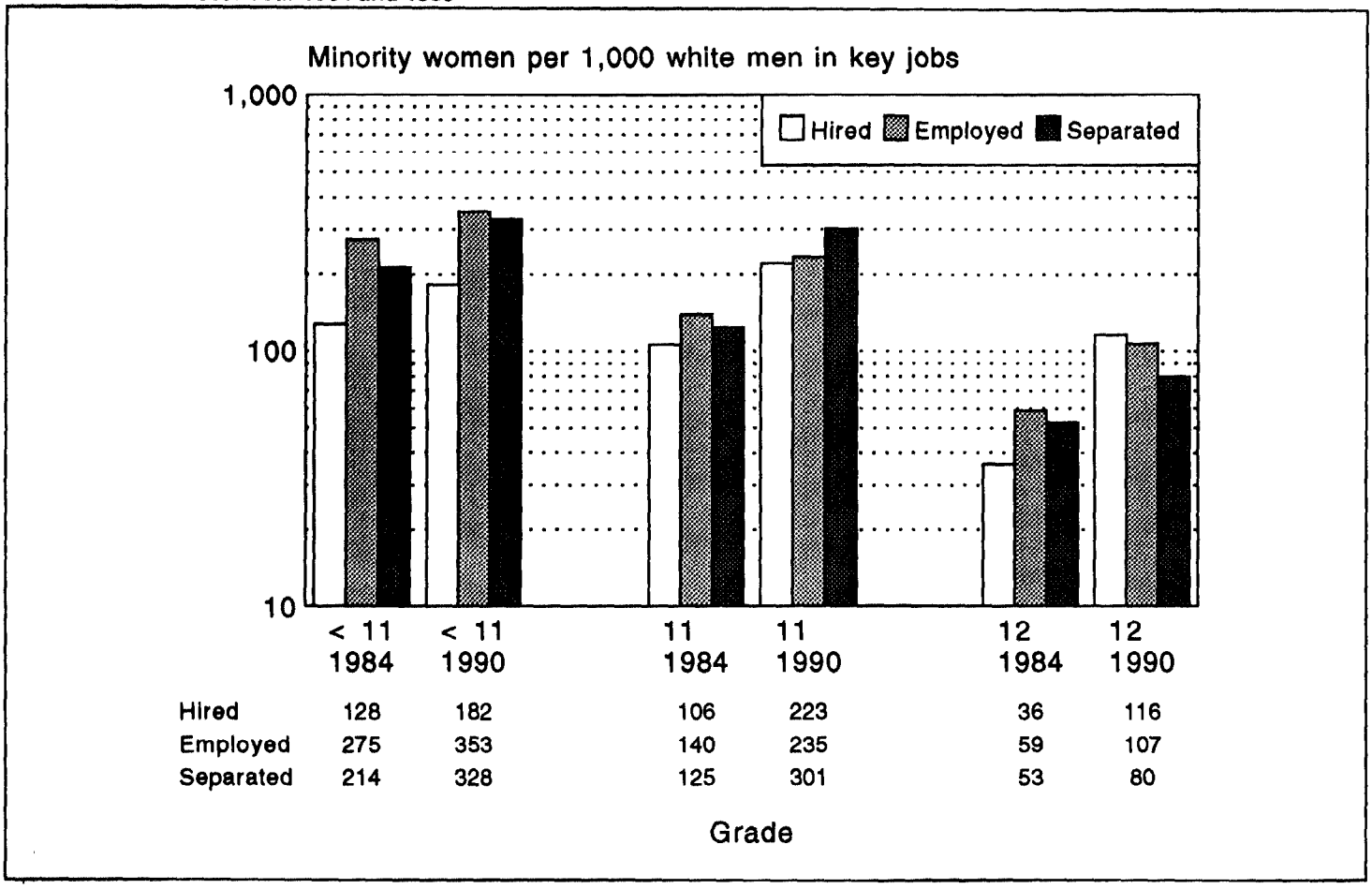
Source: OPM data.

Figure III.7: Numbers of Minority Men per 1,000 White Men Employed, Hired, and Separated at Grade 13 and Above Among Key Job Workers in Fiscal Years 1984 and 1990



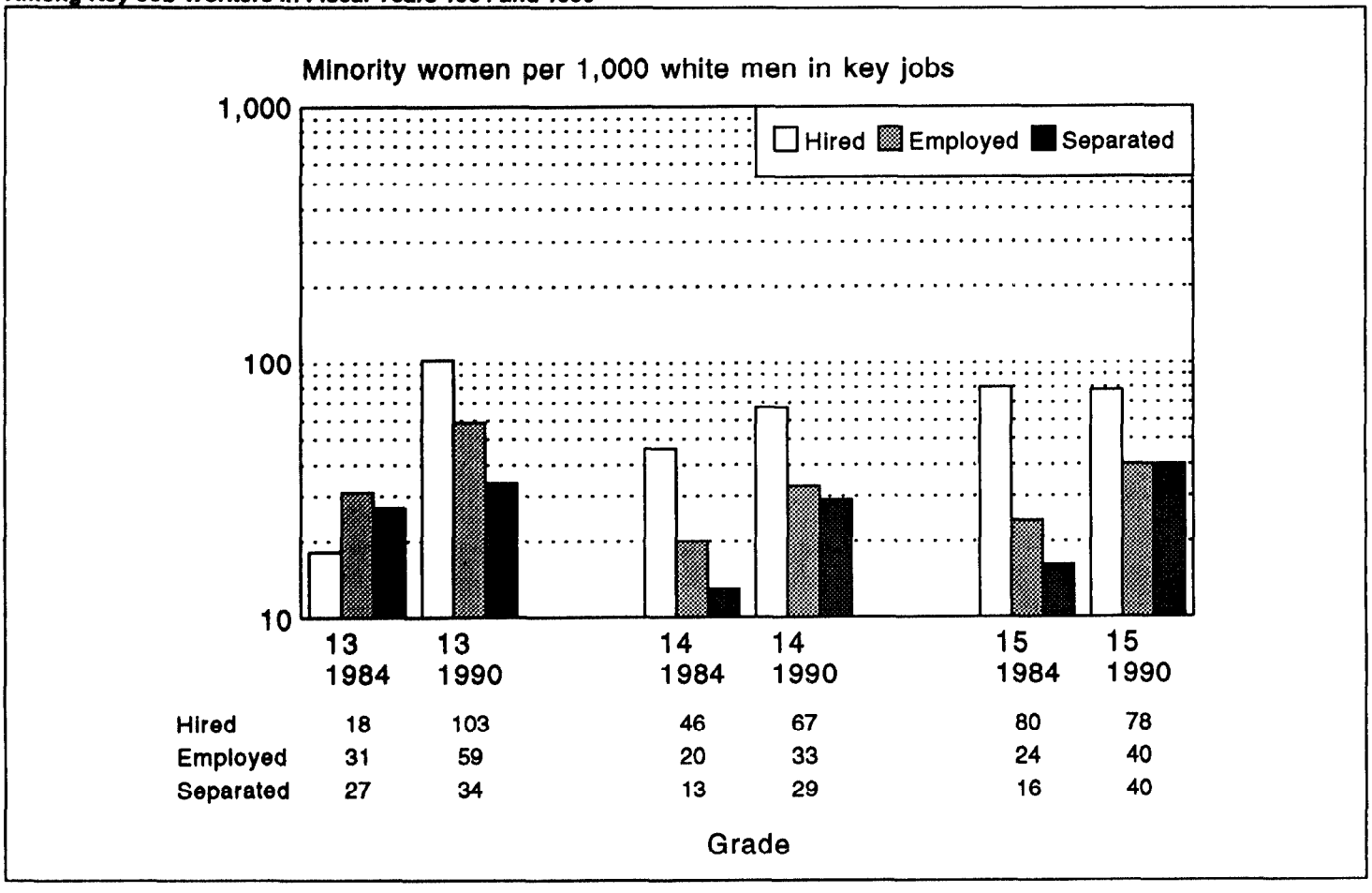
Source: OPM data.

Figure III.8: Numbers of Minority Women per 1,000 White Men Employed, Hired, and Separated Below Grade 13 Among Key Job Workers in Fiscal Year 1984 and 1990



Source: OPM data.

Figure III.9: Numbers of Minority Women per 1,000 White Men Employed, Hired, and Separated at Grade 13 and Above Among Key Job Workers in Fiscal Years 1984 and 1990



Source: OPM data.

Separations

The relative numbers of white women, minority men, and minority women separating from key jobs were greater in 1990 than in 1984 (see fig. III.1).[3] Furthermore, the relative numbers of white and minority women separating were somewhat greater than the relative numbers hired in both years, while the relative number of minority men separating was considerably lower than the relative number hired in each year. This was true of all groups of minority men except Native American men (see figs. III.2 and III.3).

[3]We do not report the relative numbers of specific minority groups separating at each grade level because the numbers of employees at some grades were very small.

The data for black women were the primary reason for the finding that minority women separated at relatively higher levels than they were hired. Among Hispanic, Asian, and Native American women, the relative numbers hired in both years were as large or larger than the relative numbers separating.

Figures III.4 through III.9 indicate that the relative numbers hired compared to those separating were quite different at different grades for white women and minority men and minority women. The one clearly discernable pattern in these figures is that in both years at grades below 11, the relative numbers of white women and minority men and women hired to key jobs were smaller than the relative numbers separating from key jobs. At grades 14 and 15, however, in which each of these groups has been historically less well represented, the relative numbers hired greatly exceed the relative numbers separating.

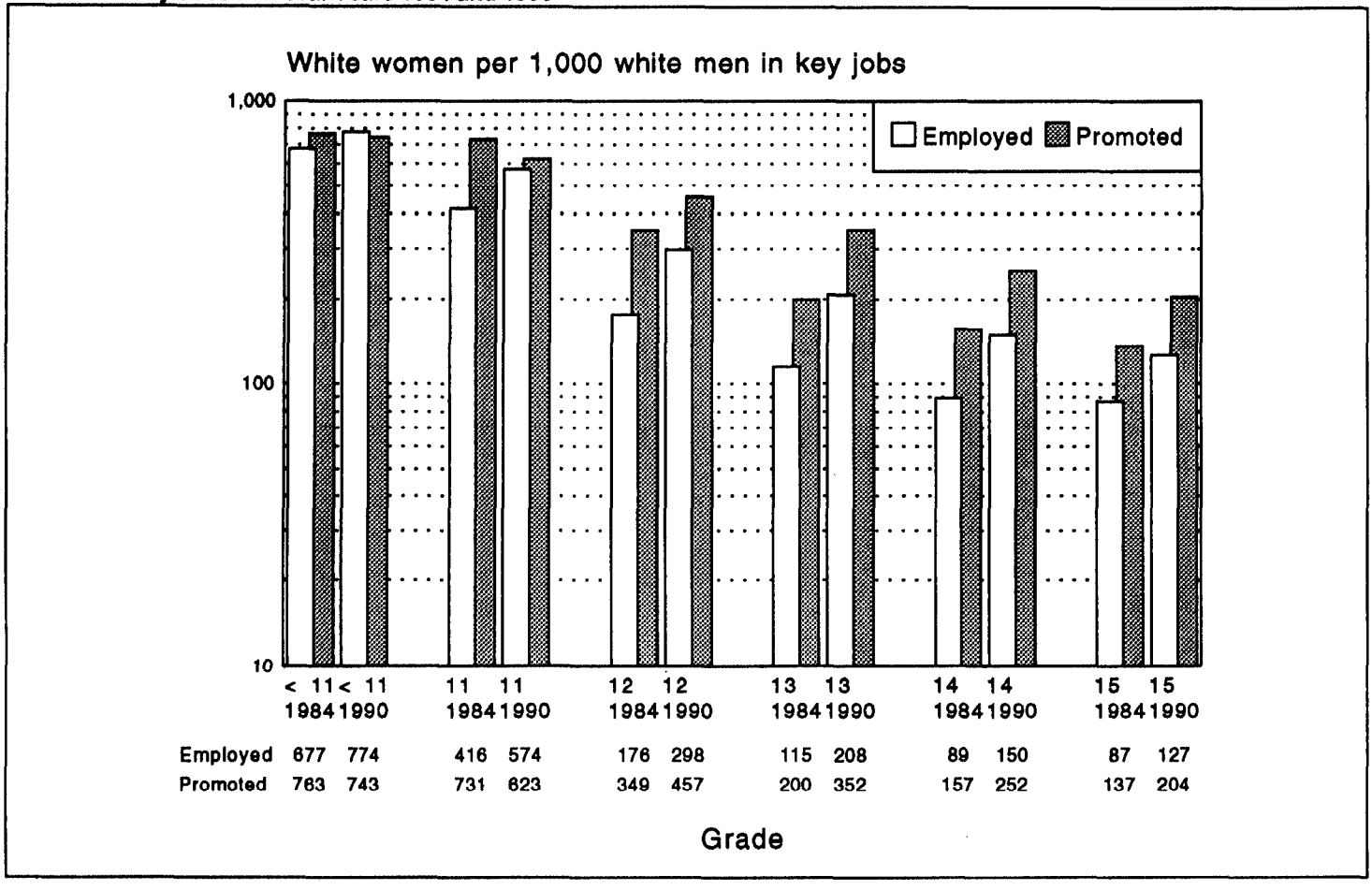
Promotions

Unlike hires and separations, promotions do not affect the composition of the federal workforce, inasmuch as promotions neither add to nor subtract from the workforce population. At the same time, promotions can affect the distribution of different groups across the various grades in the federal workforce, since it is through promotions that workers move from one grade to another. In fact, because considerably larger segments of the workforce are promoted in a given year than are hired or separated, promotions have the potential to make a considerably greater impact on the distribution of women and minorities than do either hires or separations.[4]

Figure III.10 shows that white women were promoted to grades 12 and up in 1990 in relative numbers that exceeded by more than 50 percent the relative numbers of white women already employed in those grades. The same was true in 1984 for white women promoted to grades 11 and up. The relative numbers of white women promoted to grade 15 were 57 percent higher in 1984 and 61 percent higher in 1990 than the number of white women already employed in that grade.

[4]In 1984 and 1990, the numbers hired to key jobs involved roughly 5 percent of the workforce in key jobs, while the numbers separating represented a slightly higher percentage (5.5 to 6 percent). By comparison, the numbers promoted were roughly 17 and 19 percent of key job workers, respectively.

Figure III.10: Numbers of White Women per 1,000 White Men Employed in and Promoted to Different Grades Among Workers in Key Jobs in Fiscal Years 1984 and 1990

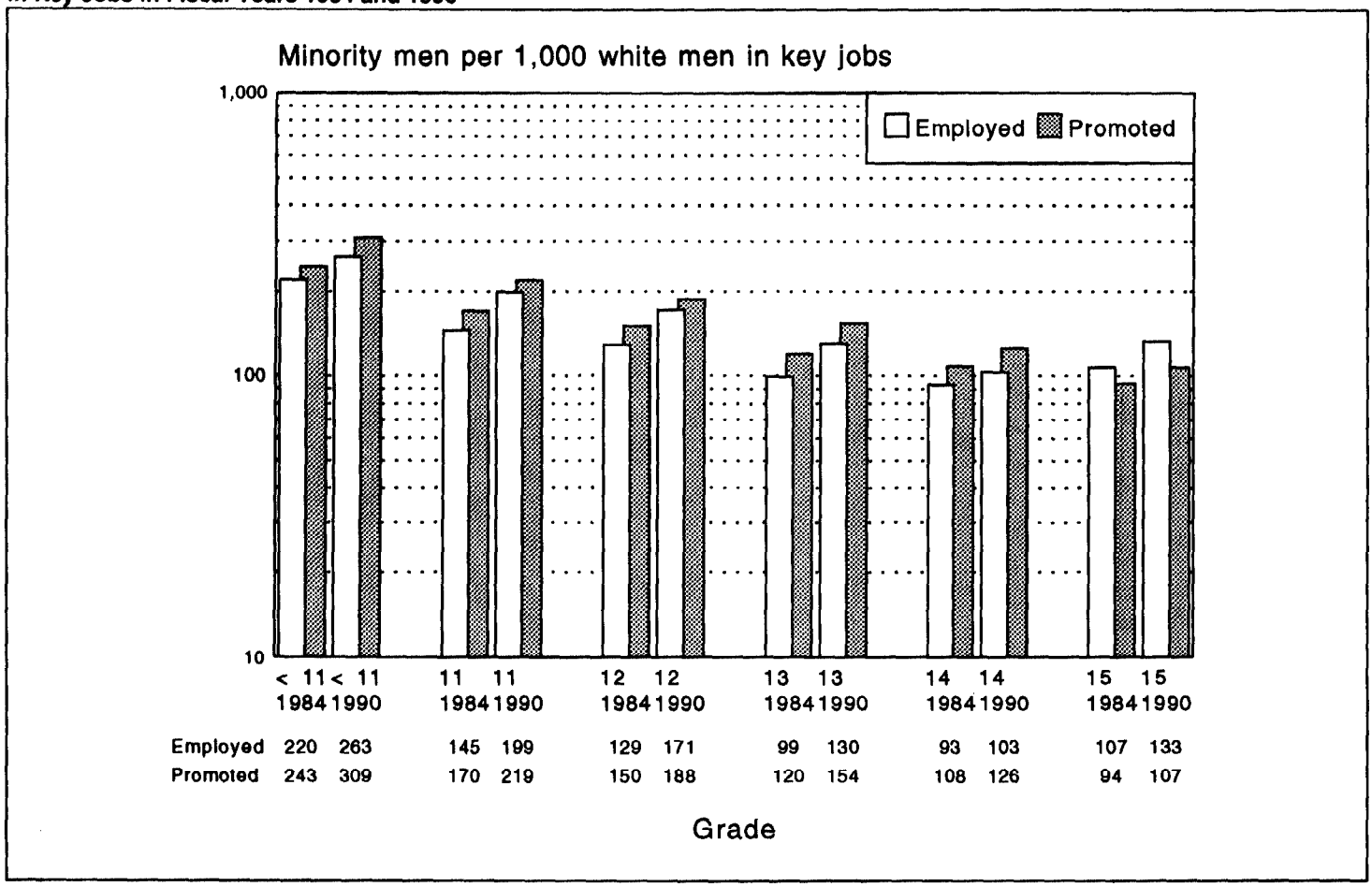


Source: OPM data.

Figure III.11 reveals that the promotion levels of minority men were less favorable than those of white women. Both in 1984 and 1990, the relative numbers of minority men promoted to grade 15 per 1,000 white men promoted were lower than the relative numbers employed at that grade. As indicated in figure III.12, minority women were also promoted to grade 15 at lower levels in 1984 than their relative employment level at grade 15. In 1990, the relative number of minority women promoted to grade 15 was roughly equal to the relative number employed at that grade. However, the

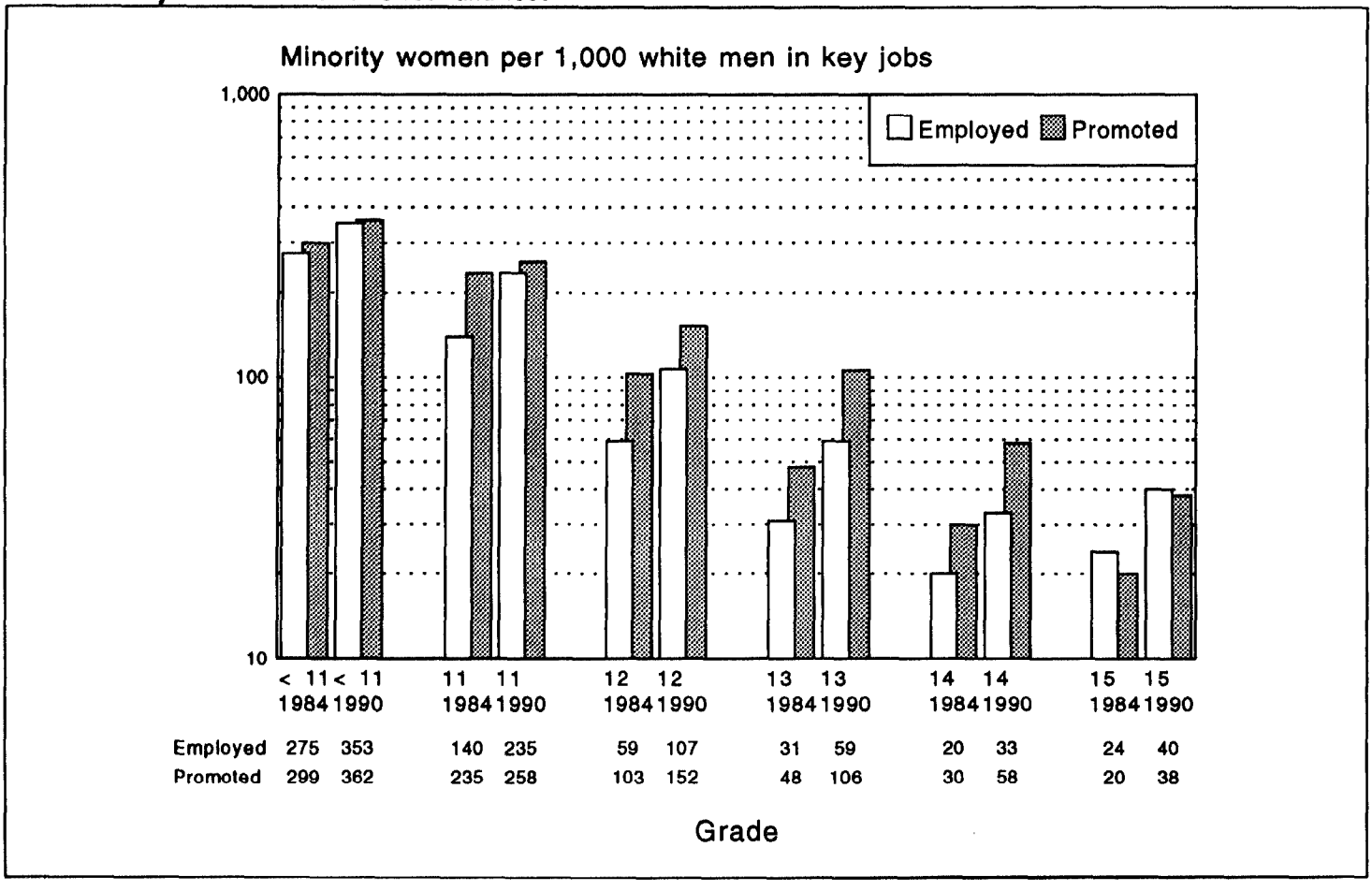
relative numbers of minority women promoted to grades 12, 13, and 14 were considerably higher than the relative numbers of minority women already employed at those grades in both years.

Figure III.11: Numbers of Minority Men per 1,000 White Men Employed in and Promoted to Different Grades Among Workers in Key Jobs in Fiscal Years 1984 and 1990



Source: OPM data.

Figure III.12: Numbers of Minority Women per 1,000 White Men Employed in and Promoted to Different Grades Among Workers in Key Jobs in Fiscal Years 1984 and 1990



Source: OPM data.

Figures III.10 through III.12 indicate that at virtually all grades, in both years, the relative numbers of white women and minority men and women promoted to a given grade exceeded the relative numbers that were employed at that grade. The only exception involved white women below grade 11 in 1990 and minority men and women at grade 15 in both years. Differences between the relative numbers promoted to and employed in grades 11 through 14 are somewhat greater among white and minority women than among minority men. Again, however, all three groups

appeared, in general, to be promoted in higher relative numbers than those at which they were employed. Although this does not imply that women and minorities were favored over white men in terms of promotions or promoted out of a given grade at a higher rate than white men, it does imply that the relative numbers of women and minorities would increase in the various grades that women and minorities were promoted to as a result of promotions alone.

Computing Representation Levels Using Relative Numbers: Ratios With Benchmarks Compared With Percentages Without Benchmarks

The purpose of this appendix is to provide an understanding of our rationale for using loglinear techniques to analyze the key job workforce data. Results from loglinear techniques, which rely on ratios to indicate the relative number of workers in various EEO groups, are interpreted differently from results based on percentage differences. The following discussion illustrates differences between the two techniques and describes the advantages provided by loglinear methods to discerning change or difference when groups vary greatly in size.

The conventional method for determining the relative representation of EEO groups in the key job workforce would involve dividing the number of key job workers in a particular EEO group by the total number of key job workers in the workforce. The result would indicate the percentage that each group represents of the total key job workforce. Table IV.1 shows the percentages of the key job workforce that were white men and women and minority men and women. The table shows that the percentage of white men among key job workers declined between 1984 and 1990 from roughly 61 percent of key job workers to 55.5 percent. The percentage of white women, minority men, and minority women increased slightly between the 2 years.

Table IV.1: Numbers and Percentages of Key Job Workers in 1984 and 1990 in Different EEO Groups

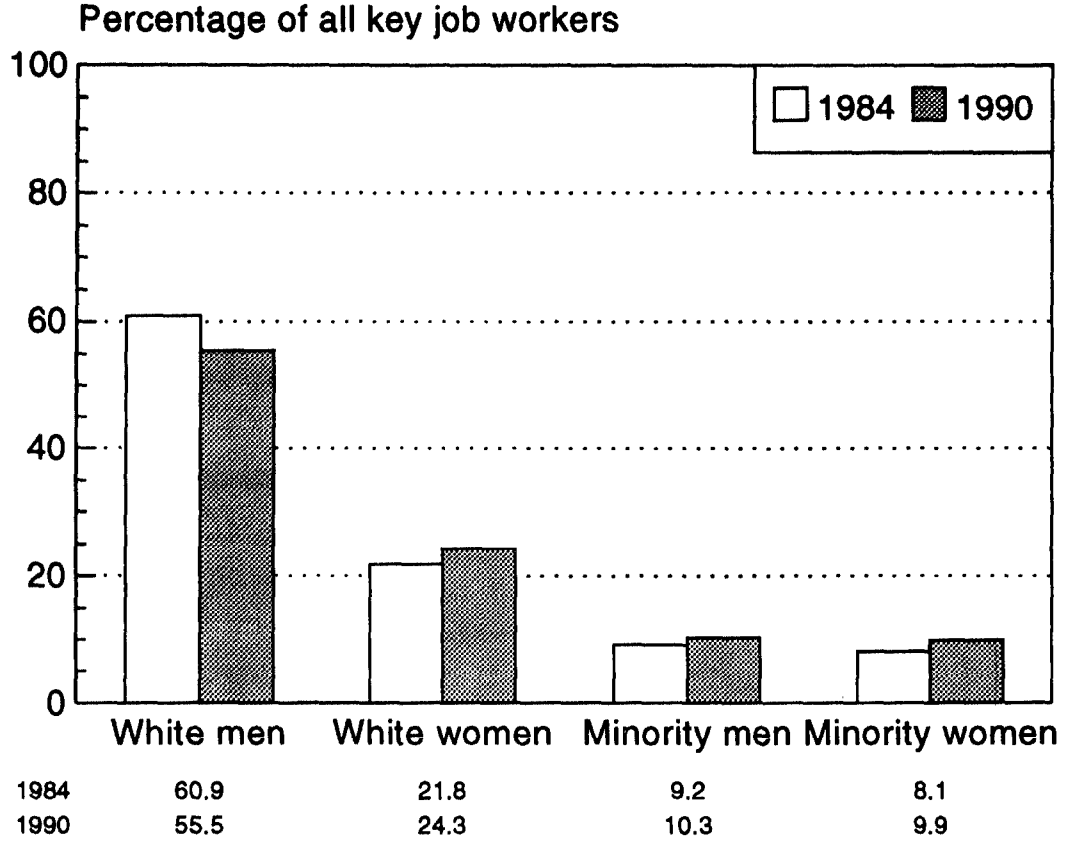
Fiscal year	White men	White women	Minority men	Minority women	Total
1984	242,731	86,879	36,836	32,218	**398,664**
	60.9%	21.8%	9.2%	8.1%	**100.0%**
1990	251,724	110,180	46,591	44,778	**453,273**
	55.5%	24.3%	10.3%	9.9%	**100.0%**

Although there is nothing technically erroneous in these results, this type of presentation has two disadvantages. First, the slight increases in the percentages of white women and minority men and women do not convey directly how little or how much these groups have gained relative to white men, whose percentage in the workforce declined over time. Second, the absolute differences in these percentages, which reflect change over time, are constrained in the following two ways: (1) the percentages are bounded in that they cannot be smaller than 0 or greater than 100 and (2) changes that are proportionally the same will appear different in large versus small subgroups in the workforce. Groups that comprise a small percentage of the population will appear to change less over time than groups that undergo a similar change but comprise a larger percentage of

the population.[1] Figure IV.1, which graphically depicts the data in table IV.1, illustrates the situation when group sizes are very different.

Figure IV.I: Representation Levels of Different EEO Groups in Key Jobs at 25 Federal Agencies in 1984 and 1990

In percentages



	White men	White women	Minority men	Minority women
1984	60.9	21.8	9.2	8.1
1990	55.5	24.3	10.3	9.9

Source: OPM data.

On the basis of figure IV.1, we would conclude that the 1984 to 1990 increase in the percentage of white women, while small, nonetheless

[1]Statisticians refer to the general problem involved in using such percentage differences to convey the magnitude of the change over time as "marginal dependence."

exceeded the even smaller increases in the percentages of minority men and women. Such a conclusion, which considers only a single group's change over time, is technically correct. However, the ratio-based approach of loglinear analysis enables us to not only compare change over time but concomitantly to assess change in one group relative to change in another group. With this approach, our conclusion concerning which group made the greater gains between 1984 and 1990 would be quite different.

To use a ratio-based approach, the following steps were taken. Using the data in table IV.1, we divided the numbers of white women and minority men and women employed in key jobs in each year by the number of white men similarly employed in each year. In 1984, the ratio of white women to white men was 86,879/242,731 = .358, while in 1990 this ratio was 110,180/251,724 = .438. In similar fashion, the ratios of minority men to white men were .152 and .185 in 1984 and 1990, respectively, while the ratios of minority women to white men were .133 and .178 in those 2 years.[2] Then we divided the 1990 ratio by the 1984 ratio to determine the relative magnitude of change between the 2 years. Thus, the amount of change in the relative number of white women was .438/.358 = 1.22; in the relative number of minority men, it was .185/.152 = 1.22; and in the relative number of minority women, it was .178/.133 = 1.34. These two sets of divisions enabled us to examine change over time relative to white men. These calculations also produced the conclusion that the relative number of minority women increased by a factor of 1.34 (or by 34 percent), whereas the relative numbers of minority men and white women both increased by a factor of 1.22.

As opposed to the conclusion based on percentages that the representation level of white women increased more than that of minority men and women, the conclusion from the ratio-based calculations is that relative to white men, the representation level of minority women increased more than that of white women and minority men. The greater the difference between the sizes of groups being compared (for example, white women and Native American women), the greater the difference between estimates of change derived from percentage differences versus ratios.

[2]Multiplying these numbers by 1,000 enabled us to make the following interpretation: In 1984, 358 white women were employed in key jobs for every 1,000 white men employed in key jobs, while in 1990, 438 white women per 1,000 white men were so employed. Per 1,000 white men, respectively, 152 minority men in 1984 and 185 minority men in 1990 were employed, and 133 minority women in 1984 and 178 minority women in 1990 were employed.

In Figure II.1, we presented, on a multiplicative scale, the findings obtained when ratios or relative numbers are calculated from the data.[3] The figure depicts visually the same pattern we described mathematically.

Adopting a ratio-based approach for making comparisons does not require altogether abandoning the use of percentages, with which most analysts are more familiar. The same results we report using relative numbers and their ratios can be obtained by computing the ratios of percentages rather than percentage differences. Calculating the ratio of percentages using the data in table IV.1, for example, reveals increases in the percentages of white women and minority men and women by factors of 1.11 (i.e., 24.3/21.8), 1.12 (i.e., 10.3/9.2), and 1.22 (i.e., 9.9/8.1), respectively, and a decrease in the percentage of white men by a factor of 0.91 (i.e., 55.5/60.9). Taking the ratios of white women and minority men and women to that of white men, we find, as before, that relative to white men, the percentages of white women, minority men, and minority women increased by factors of 1.22 (i.e., 1.11/0.91), 1.23 (i.e., 1.12/0.91), and 1.34 (i.e., 1.22/0.91), respectively.

Because the results we achieved by using percentages differ from those using relative numbers only as a result of rounding error, it makes little difference, mathematically speaking, whether we take one approach or the other. Taking ratios of relative numbers is somewhat more efficient, however, because raw numbers need not be converted to percentages before they are compared. Moreover, the plotting of relative numbers to convey changes graphically does, we believe, provide a clearer understanding of how the representation levels of certain groups have changed in relation to other groups.

[3]There are two primary differences between the additive scale in figure IV.1 and the multiplicative scale in figure II.1. First, while the additive scale has a fixed zero point at its base, the multiplicative scale does not. Because the base for multiplicative scales is arbitrary, the height of a given bar above that base (or above the horizontal axis) is not in itself meaningful. What is meaningful is the level of that bar in relation to the vertical axis, which is scaled multiplicatively. That is the second primary difference. Whereas distances between two pairs of points on the additive scale are equal when the additive differences between them are equal (e.g., 80 - 60 = 40 - 20 = 20), the distances between two sets of points on the multiplicative scale are equal when the multiplicative differences or ratios between them are equal (e.g., 400/200 = 200/100 = 2). On a multiplicative scale, a change from 10 per 1,000 to 20 per 1,000 will appear similar in size to a change from 100 per 1,000 to 200 per 1,000. Both involve a doubling, or an increase in magnitude by a factor of 2.

Data Tables

In table V.1, we provide the numbers of key job workers in each of the 10 EEO groups we considered as of September 30, 1984, and September 30, 1990. In tables V.2, V.3, and V.4, we provide the numbers in the 10 EEO groups who were hired, separated, and promoted, respectively, in fiscal years 1984 and 1990.

Table V.1: Numbers of White and Minority Men and Women Employed in Key Jobs at Different Grades at 25 Federal Agencies in 1984 and 1990

Year	Grade	White men	White women	Black men	Black women	Hispanic men	Hispanic women	Asian men	Asian women	Native American men	Native American women
1984	<11	76,469	51,791	8,384	13,857	4,967	2,867	1,882	2,029	1,558	2,254
	11	46,159	19,208	3,085	4,556	1,705	644	1,430	983	456	282
	12	49,518	8,728	2,788	2,260	1,423	243	1,792	281	375	115
	13	35,414	4,060	1,697	805	721	118	873	134	228	32
	14	21,001	1,861	991	275	369	47	464	84	127	12
	15	14,170	1,231	463	92	336	42	671	202	51	4
Total		**242,731**	**86,879**	**17,408**	**21,845**	**9,521**	**3,961**	**7,112**	**3,713**	**2,795**	**2,699**
1990	<11	68,174	52,800	8,290	15,665	5,670	3,952	2,407	2,490	1,589	1,932
	11	47,132	27,033	3,991	6,810	2,641	1,495	2,173	2,315	590	459
	12	53,598	15,954	3,581	4,134	2,391	639	2,668	783	503	204
	13	40,404	8,399	2,304	1,716	1,261	266	1,394	337	281	78
	14	26,359	3,950	1,265	570	618	119	638	135	203	37
	15	16,057	2,044	615	196	454	68	997	366	67	12
Total		**251,724**	**110,180**	**20,046**	**29,091**	**13,035**	**6,539**	**10,277**	**6,426**	**3,233**	**2,722**

Table V.2: Numbers of White and Minority Men and Women Hired to Key Jobs at Different Grades at 25 Federal Agencies in 1984 and 1990

Year	Grade	White men	White women	Black men	Black women	Hispanic men	Hispanic women	Asian men	Asian women	Native American men	Native American women
1984	<11	9,436	3,881	944	721	586	212	350	179	73	92
	11	1,006	433	60	59	55	16	83	25	12	7
	12	640	161	22	9	22	6	45	6	6	2
	13	339	49	12	1	8	0	18	3	5	2
	14	196	37	8	4	4	0	15	5	2	0
	15	261	29	8	3	13	3	32	15	0	0
Total		**11,878**	**4,590**	**1,054**	**797**	**688**	**237**	**543**	**233**	**98**	**103**
1990	<11	7,905	4,022	1,040	830	547	247	462	247	97	113
	11	1,091	805	79	124	47	38	63	66	13	15
	12	924	452	73	67	27	15	47	23	12	2
	13	600	257	34	36	13	7	39	15	6	4
	14	313	107	19	8	15	5	23	8	6	0
	15	293	78	17	5	15	1	39	17	1	0
Total		**11,126**	**5,721**	**1,262**	**1,070**	**664**	**313**	**673**	**376**	**135**	**134**

Table V.3: Numbers of White and Minority Men and Women Separated From Key Jobs at Different Grades at 25 Federal Agencies in 1984 and 1990

Year	Grade	White men	White women	Black men	Black women	Hispanic men	Hispanic women	Asian men	Asian women	Native American men	Native American women
1984	<11	5,295	4,043	642	728	316	175	123	134	80	98
	11	2,264	1,291	123	199	75	38	60	40	28	7
	12	2,110	437	112	77	49	12	54	17	27	6
	13	1,539	178	81	32	17	4	22	5	6	0
	14	1,070	101	41	9	16	2	17	3	13	0
	15	816	69	24	5	22	3	35	5	4	0
Total		**13,094**	**6,119**	**1,023**	**1,050**	**495**	**234**	**311**	**204**	**158**	**111**
1990	<11	4,497	3,719	671	972	318	221	193	177	64	107
	11	2,093	1,795	195	398	122	92	81	114	35	25
	12	2,308	631	185	131	74	17	93	23	31	13
	13	1,847	293	89	36	47	11	61	10	15	5
	14	1,206	146	52	16	22	7	30	11	12	1
	15	860	97	39	14	21	2	52	17	8	1
Total		**12,811**	**6,681**	**1,231**	**1,567**	**604**	**350**	**510**	**352**	**165**	**152**

Table V.4: Numbers of White and Minority Men and Women Promoted in Key Jobs to Different Grades at 25 Federal Agencies in 1984 and 1990

Year	Grade	White men	White women	Black men	Black women	Hispanic men	Hispanic women	Asian men	Asian women	Native American men	Native American women
1984	<11	15,010	11,448	1,731	3,133	1,125	749	614	412	174	201
	11	7,211	5,271	549	1,163	336	206	291	282	51	41
	12	5,750	2,006	351	416	247	64	226	87	41	24
	13	4,062	811	214	143	135	28	113	20	25	6
	14	2,370	371	120	41	72	15	46	15	17	1
	15	935	128	33	7	24	2	25	10	6	0
Total		**35,338**	**20,035**	**2,998**	**4,903**	**1,939**	**1,064**	**1,315**	**826**	**314**	**273**
1990	<11	15,477	11,496	2,244	3,620	1,537	1,136	742	529	259	310
	11	8,767	5,459	865	1,396	527	388	442	407	88	75
	12	8,240	3,762	639	825	446	182	382	189	86	55
	13	5,617	1,975	372	408	260	83	179	82	53	20
	14	3,425	864	226	136	99	30	77	24	28	9
	15	1,404	286	64	26	34	6	42	18	10	4
Total		**42,930**	**23,842**	**4,410**	**6,411**	**2,903**	**1,825**	**1,864**	**1,249**	**524**	**473**

Comments From the Equal Employment Opportunity Commission

Note: GAO comments supplementing those in the report text appear at the end of this appendix.

EQUAL EMPLOYMENT OPPORTUNITY COMMISSION
WASHINGTON, D.C. 20507

OFFICE OF THE CHAIRMAN

JAN 19 1993

Mr. Bernard L. Ungar
Director, Federal Human Resource
Management Issues
U.S. General Accounting Office
441 G Street, N.W.
Washington, D.C. 20548

Dear Mr. Ungar:

The Equal Employment Opportunity Commission (EEOC) was asked to comment on a draft report prepared by your staff entitled "Progress of Women and Minorities in Key Federal Jobs". While I appreciate the time and effort it took to prepare this report, its findings and recommendations were developed without regard to some fundamental concerns of this agency.

See pp. 11-12.

First, the EEOC does not have the funds available to develop computer programs and conduct extensive training for Federal agency staff, governmentwide, on the use of the type of analysis your report recommends without reducing funding for other significant enforcement activities. Second, EEOC's staff is small. Any time that they might devote to the additional analyses suggested by the GAO would detract from time spent on essential functions that they are already performing.

See comment 1.

Third, the types of analyses currently performed by the EEOC when reviewing Federal agency affirmative employment programs are the standards currently used by the courts, including the Supreme Court, experts in this field and all of the Federal government. Finally, because EEO staff at Federal agencies possess differing degrees of experience, which may not always be sufficient to understand thoroughly the analysis your report recommends, the EEOC believes that the task of training those staff would be much more difficult and time-consuming than the GAO appears to believe.

The GAO draft was reviewed by the EEOC's Research and Analytical Services staff and by Office of Federal Operations staff who are very experienced with the analytical techniques used to measure affirmative employment. Our comments follow.

EEOC believes the GAO's determination that the use of a ratio-based approach to our analysis of Federal agency workforce data using Federal white male employees as a benchmark is inappropriate, for the following reasons:

See comment 2.

- In an analysis of Federal hiring, the appropriate comparison is the distribution of the various race/ethnic/sex groups in the Civilian Labor Force. The objective of an affirmative employment analysis should be the comparison of hiring and promotion actions with the pool of persons who are qualified for and interested in the jobs being analyzed. The proposed ratio comparisons assume that all race/ethnic/sex groups should have the same occupational patterns in the Federal government as white men and that they have the same relative qualifications and interest. This is simply not realistic. Most jobs in the Federal government have specific experience or education requirements and the number of persons who possess this experience and education varies widely by race, ethnic group, and sex. A simple comparison to the pattern of white men is often very misleading.

See comment 2.

  For example, in an analysis of hiring of electrical engineers, the appropriate comparative group for Hispanic women is the proportion of Hispanic women among persons who are electrical engineers or, possibly, persons who have recently graduated with degrees in electrical engineering. In either case, the availability of Hispanic women for electrical engineering positions is much lower than their availability for many other positions, as there are relatively few Hispanic women with experience or degrees in electrical engineering. Since the vast majority of electrical engineers are white men, a ratio comparison of female Hispanic and white male electrical engineers in a Federal agency would not help EEOC evaluate the agency's affirmative employment efforts. While the differences may not be so extreme in all Federal jobs, in the vast majority of jobs, relative differences persist among race/ethnic/sex groups in their Civilian Labor Force representation.

See comment 3.

- Similarly, a ratio analysis of employees at different levels within the Federal workforce often has little meaning. Comparison of persons below grade 11 with those above grade 11 again ignores the qualifications of the higher level jobs. The vast majority of persons below grade 11 possess neither the experience nor the education

to qualify for grade 11 positions. Even a comparison of persons in grades 11 to 13 with those in grades 14 and 15 may have no meaning if the higher grades require experience and education that the persons in the lower grades do not possess. Moreover, to the extent that persons in grades 14 and 15 are hired from outside the Federal government, the appropriate comparative group would be persons with the necessary experience and education.

See comment 4.

- It is not necessary to use a ratio-based analysis comparing groups of minorities and women to white males to discern the proportionality differences that arise from within-group comparisons over time of small versus large groups. Such differences in proportionate increases are taken into account when the affirmative employment progress reports of Federal agencies are evaluated. Thus, for the purpose of recruiting efforts, requesting agencies and EEOC to perform an additional analysis that does not support this objective results in unnecessary use of scarce resources.

See comment 2.

- In many cases, ratio-based or any other comparisons of women and minority groups to white males in the Federal government, rather than to the Civilian Labor Force, are inappropriate for measuring progress in affirmative employment. The most significant comparison for affirmative employment purposes is to the Civilian Labor Force, and not to the representation of the same group at an earlier time. For example, Hispanic representation in an agency may have doubled in the Professional category of PATCOB between 1984 and 1990 and still be well below their Professional representation in the Civilian Labor Force, while representation of Professional women may increase by 10 percent during the same period and also be well below their Civilian Labor Force representation at the time the analysis is made. The smaller group, Hispanics, shows a larger proportional increase. Are we to say, then, that the agency should concentrate more on recruiting Professional women than Professional Hispanics, because the proportional increase of women was less? Rather, the alternative is to instruct the agency to put their efforts into recruiting Professional Hispanics and women, since both groups are underrepresented as compared to their Civilian Labor Force availability. The relevant and appropriate benchmark is the Civilian Labor Force at the time each comparison is made.

3

Statement was deleted as noted in comment 5. No new page number exists.

- Apart from the essential question of appropriate comparative measures, GAO states that the work of creating and analyzing the ratios is not difficult and is easily performed. The GAO report states on page 18 that a simple computer program can help ensure that the correct ratios are accurately computed. We have estimated that the development of a computer program to calculate the ratios requires considerably more computer knowledge than implied by this statement. In EEOC, the preparation of a computer program in a programming language or an application for a software package such as Quattro Pro would require substantial personnel resources. To implement it governmentwide is even more complicated given the variety of automated systems and the lack of technical expertise in this area of the EEO staffs.

- In addition, GAO does not account for the number and complexity of the analyses currently performed by OFO in reviewing affirmative action plans. OFO personnel would spend substantial time learning to use the computer program, entering data into the program, and interpreting results. Even more worrisome, EEO staff in Federal agencies would spend a significant amount of time calculating ratio-based analyses if the reporting responsibility were placed upon them, as GAO suggests, and OFO staff would have to devote much of their time and effort to correcting the resultant errors in agency reports to EEOC.

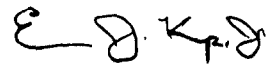
See pp. 11-12.

EEOC is concerned that agency reporting requirements should not become so burdensome that they detract from agency efforts to develop and operate good affirmative employment programs. The function of EEOC's Affirmative Employment Division is to improve the quality of affirmative employment programs in federal agencies. That function can be exercised more effectively by identifying and providing technical assistance to agencies with severe problems in the area of affirmative employment than by performing additional arithmetic calculations that have marginal analytic value.

4

Thank you for providing this opportunity to comment on your staff's draft report. As you can see from our preceeding comments, EEOC is hesitant to implement a new system as set forth in your staff's draft report.

Sincerely,



Evan J. Kemp, Jr.
Chairman

5

GAO Comments

1. We do not believe that the use of ratio-based techniques alters or affects the standards currently used by the courts. Nor do we think they defy the standards used by experts in the field. Because the calculations we advocate are a more refined way of analyzing data rather than a replacement for the analyses typically done, they do not violate existing standards.

2. Nothing about the ratio-based approach questions or challenges the appropriateness of making comparisons with the civilian workforce in analyzing hiring or any other personnel event. We made such comparisons in our October 1991 testimony. We were unable in this report to make the kinds of civilian workforce comparisons that we agree would be useful because there are no data that we or EEOC are aware of that would permit such comparisons by grade levels.

Our focus on key job workers and special interest in upper grades resulted from findings we reported in our October 1991 testimony, which indicated that white women and all minorities were less well represented at the upper grades of the federal government than at lower grades, particularly in key jobs. Because of the historical predominance of white men in the upper grades, it made sense in this report for us to choose white men as the benchmark for assessing change in the other groups. From a mathematical standpoint, which group serves as a benchmark is completely arbitrary and involves no more assumptions than the calculation of percentages. Dividing the number of employees in one EEO group by that of another group tells us simply what the ratio is and not, as EEOC suggests, what it should be.

We agree with EEOC that there can be legitimate reasons, such as limited availability of applicants, for differences between the representation levels of white males versus women and minorities in different federal occupations. Our purpose in this report, however, was not to determine why disparities existed in the representation levels of women and minorities across the pay grades of the federal government.

EEOC's example of hiring Hispanic women electrical engineers is an appropriate one for demonstrating that computing relative numbers using white men as a benchmark would, in fact, be useful for tracking the affirmative employment progress of agencies. As a hypothetical example, assume that for every 1,000 white male electrical engineers in a particular agency, the agency employed 100 Hispanic women electrical engineers in 1984 and 200 Hispanic women electrical engineers in 1990. Suppose,

further, that for every 1,000 white male electrical engineers, the civilian workforce employed 150 Hispanic women electrical engineers in 1984 and 600 in 1990. From such relative numbers, the following information can be gained: (1) In 1990, the relative number of Hispanic women electrical engineers in the agency was double that in 1984. (2) In 1990, the relative number of Hispanic women electrical engineers in the civilian workforce was quadruple that in 1984. (3) In 1984, the relative number of Hispanic women electrical engineers in the civilian workforce was 50 percent greater than that in the agency. (4) In 1990, the relative number of Hispanic women electrical engineers in the civilian labor force was three times greater than that in the agency. (5) Hispanic women electrical engineers increased in representation in both the agency and the civilian workforce, but the gain in the civilian workforce was twice as great as that in the agency.

It is logical to make these kinds of inferences using ratio-based techniques. The technique is equally appropriate for comparing federal government data with civilian workforce data as it is for comparing EEO groups with one another. In both instances, we believe that EEOC's ability to evaluate the affirmative employment programs of agencies would be enhanced.

3. We noted on pages 7 and 8 that comparisons across grades allow us to determine where disparities in the relative numbers of different EEO groups existed in a particular year or where they have persisted over time. Those comparisons, however, do not permit us to say why they existed or persisted. Certainly, they may result from differences in experience or education or from discrimination, but our analyses were not designed to address these issues.

Ultimately, answering the "why" question will require estimating differences across grade levels after statistically controlling for differences in qualifications, education, and experience. Our ratio-based technique can be extended to undertake analyses of that sort, whereas looking at proportionate differences, as EEOC does, cannot. Making comparisons across grades as a prelude to those more sophisticated analyses is nevertheless appropriate and useful for establishing status and progress in representation levels.

4. EEOC has informed us that while it does not, in its annual reports, make the explicit kinds of comparisons we advocate, it does consider proportionate increases made by different EEO groups relative to their representation in the civilian workforce. We believe that more precise

analyses involving the computation of ratios should be done explicitly and systematically.

5. The statement EEOC cited from page 18 of the draft it reviewed has been deleted. It was part of the proposed recommendation to EEOC that we no longer make. However, we still believe that a simple computer program can help ensure that the correct ratios are computed. We are willing to help EEOC write the program.

In our draft report, we asked EEOC to use ratio-based techniques to analyze affirmative employment data reported to it by federal agencies. Much of the data, EEOC has informed us, are provided by agencies as tables printed on paper rather than in automated form. This may be why EEOC believes the ratio-based technique would be costly to implement. However, EEOC can obtain computerized data from CPDF. EEOC already does so for its annual report to Congress on the federal employment of women and minorities. The annual report contains raw data to which the ratio-based approach we suggest can be applied. In addition, CPDF contains data on promotions, hires, and separations. We have changed our report to clarify that EEOC need not automate the reports submitted to it by agencies but instead can apply the ratio-based technique to CPDF data.

Major Contributors to This Report

General Government Division, Washington, D.C.

Eva L. Rezmovic, Assistant Director
Douglas Sloane, Analyst-in-Charge
Anthony Assia, Senior Evaluator
Kiki Theodoropoulos, Writer-Editor
Pamela Curry, Editorial Assistant
Tracy Harris, Editorial Assistant

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