Robert K. Toutkoushian
Marcia L. Bellas
John V. Moore

The Interaction Effects of Gender, Race, and Marital Status on Faculty Salaries

The question of whether employees receive equal pay for equal work in American society can be traced back to the women's movement at the turn of the 20th century and the civil rights movement in the 1960s. The Equal Pay legislation and Affirmative Action policies that emerged from these movements led to significant interest in measuring the extent of pay inequities within labor markets. The vast majority of studies of the general labor market have examined three major forms of pay discrimination: by gender, race/ethnicity, and marital status. Many studies have documented that in the general labor market, women tend to be paid less than men with similar characteistics, Blacks and Hispanics tend to be paid less than Whites, and unmarried workers tend to earn less than their married counterparts (Antecol & Bedard, 2004; Duncan, 1996; Korenman & Neumark, 1992; Loh, 1996; Neal & Johnson, 1996; U.S. General Accounting Office, 2003; Verdugo, 1992; Weinberger, 1998).

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Robert K. Toutkoushian is an associate professor in the Department of Educational Leadership and Policy Studies at Indiana University. Marcia L. Bellas is a research associate at the Vermont Center for Justice Research in Montpelier, Vermont. John V. Moore is a graduate assistant at the Center for Postsecondary Research at Indiana University.

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Those employed in academic labor markets have likewise been interested in whether unexplained wage gaps exist among faculty, and numerous studies have been conducted using national as well as institution-specific data. Unlike studies of the general labor market, studies in academia have primarily focused on gender. Studies by Barbezat (1991), Bellas (1993, 1994), Ransom and Megdal (1993), Toutkoushian and Conley (2005), and others have found that female faculty members earn less than male faculty members with comparable levels of measurable characteristics, such as experience, education, and research productivity. Studies of faculty salaries have paid much less attention to possible pay discrimination by race/ethnicity (Barbezat, 2002; Hearn, 1999). This omission is often attributed to the relatively small number of faculty members of color at most institutions, which may result in unreliable estimates of pay differentials. Similarly, pay disparities by marital status have not been widely studied in academia. Bellas (1992, 1993, 1994) and Toutkoushian (1998) are among the few researchers who have analyzed the effects of marital status on faculty salaries. Their findings show that, as in the general labor market, there is a positive "return on marriage" in academia (i.e., married faculty earn more than unmarried faculty), at least for men. The relative scarcity of studies in this area is due in large part to the lack of available information concerning marital status in institution-specific databases.

When studies of academic salaries have considered gender, race, and marital status, little attention has been paid to possible interaction effects among personal characteristics or social categories. Various theories and conjectures have been offered in the literature to suggest that these interactions may be more complex than is typically assumed in empirical studies (Collins, Maldonado, Takagi, Thorne, Weber, & Winant, 1995; Epstein, 1973; West & Fenstermaker, 1995). If the advantages and disadvantages associated with membership in any one group are not uniform for those who differ along other dimensions, faculty salaries may also vary simultaneously by gender, race/ethnicity, and marital status (and perhaps other factors). However, salary studies in academia typically restrict pay differences by race/ethnicity and marital status to be uniform for an entire sample, or for all men and women if regression equations are estimated separately for the sexes. Studies that use separate regression models for men and women allow the effects of race/ethnicity and marital status to vary by gender, but these effects are restricted to be the same for women or men of the same race/ethnicity and marital status, when in fact any effects of race/ethnicity may depend on marital status and vice versa.

Large national surveys of faculty afford analysts the opportunity to examine differences in faculty salary based on combinations of all three

dimensions—gender, race/ethnicity, and marital status—as well as the possible interactive effects among them. In this study, we used data from the 1999 National Study of Postsecondary Faculty (NSOPF:99) to examine the different ways in which a faculty member's gender, race/ethnicity, and marital status can interact to influence compensation. We begin by reviewing the literature on the effects of these variables on faculty salaries and then discuss empirical approaches to measuring differences in faculty salary. The next section provides a description of the data, followed by the results of our analyses. We conclude with some thoughts on the implications of our findings and future directions for research.

Literature Review

Results from empirical studies have consistently shown a substantial unexplained wage gap in favor of men in both the general labor market and in academia. Between 1969 and 1993, estimates of the unexplained wage gap ranged from 1% to 16.3%, with most falling between 6% and 8% (Barbezat, 2002, p. 20). Differences in estimates are attributable to variation in sample size, selection and definition of variables, and other sampling and analytical techniques. Toutkoushian and Conley (2005) reported that the unexplained wage gap between male and female faculty started to decline during the 1990s, from a difference of 6–10% in 1993 (depending on the regression model used) to 4–6% in 1999.

Although researchers generally agree that a wage penalty is associated with being female in academia, there is less agreement about the factors responsible for it. Some argue that the lower average pay of female faculty may be due to choices women make to invest less in human capital and acquire education and skills that lead to higher pay (Antecol & Bedard, 2004; Johnson & Stafford, 1974). While women and men do differ on measures of human capital, on average, studies of faculty salaries find an unexplained wage gap even after controlling for these factors.

Others point to cultural ideologies and beliefs about the appropriate roles of men and women as accounting for at least part of the unexplained wage gap. Ferber and Loeb were among the first to argue that colleges may pay female faculty less than male faculty because they assume that women "do not need an income as badly as men because they do not have a family to support" (1974, p. 69). This ideology may explain why single men earn less than married men (Bellas, 1992; Toutkoushian, 1998), but it does not explain why single men earn more than single women, suggesting that broader forms of male privilege are at work.

Offering a "family wage" to married men is no longer legal, but associated ideologies may linger and manifest themselves in less overt ways, such as in evaluations linked to merit increases or decisions about who is most fit for administrative duties and associated salary increases. Interactions between gender and marital status are clearly evident in the "family wage" since only men appear to have benefited from it. Such interactions may also occur with regard to assumptions about mobility—an important way of increasing faculty salaries. Traditional gender role ideologies dictate that a man's career take primacy in a marriage because of patriarchal beliefs about breadwinner roles. These beliefs are reinforced by data from the general labor market showing the economic reality that a husband's salary likely exceeds his wife's.[1] Therefore, the family unit is more likely to invest in a husband's career to maximize the family's income (Frank, 1978).

Although female professors are less likely to be married than male professors, they are far more likely to be married to another professional, often another faculty member (Astin & Milem, 1997). This difference may restrict voluntary geographic mobility to a greater extent for women than for men, or employers may assume this to be the case (Hagedorn, 1996). Employers may offer lower salaries to women because they assume that a husband's career takes priority within the family, and therefore married women will be more likely than married men to accept lower wages (Bielby & Bielby, 1992; Deitch & Sanderson, 1987).

Gender may also interact with marital status to influence faculty salaries because of the support that wives traditionally provide to husbands. Even when both spouses are employed full-time, women spend more time in household labor and child care than men, on average, which frees men to devote more time to paid labor (Bianchi, Milkie, Sayer, & Robinson, 2002). Wives also provide emotional support and other forms of care giving—indirect forms of support that may be supplemented by more direct contributions to a husband's career. Fowlkes (1980) documented some forms of direct assistance that may be provided by professors' wives, such as help with research, grading papers, and discussing ideas.

While the prevalence of the "two-person career" (Papenek, 1973) has no doubt lessened as more women have entered the labor force, more recent quantitative studies continue to show a positive effect of marriage on faculty salaries for men, after controlling for other factors (Barbezat, 1989; Bellas, 1992; Toutkoushian, 1998). Researchers have also observed a positive effect of marriage on earnings for males and/or females in nonacademic labor markets, after controlling for work-related characteristics (Korenman & Neumark, 1991; Loh, 1996).

With regard to salary disparities by race/ethnicity, evidence from nonacademic labor markets shows that, with the exception of Asians, workers in traditionally underrepresented racial/ethnic groups earn less than their non-Hispanic White counterparts, after controlling for work-related factors (Reimers, 1983; Verdugo, 1992; Verdugo & Verdugo, 1984). Interestingly, the relatively few studies that have examined pay differences by race/ethnicity in academia have failed to find strong evidence that minority faculty are paid less than their nonminority counterparts (Ashraf, 1996; Barbezat, 1989; 1991; Bellas, 1993; Riggs & Dwyer, 1995).

Most studies using national data have found that Blacks or "non-Whites" earn more than Whites, on average, although differences are not always statistically significant. Estimates of this difference range from a salary advantage for Blacks or "non-Whites" of 1–9% (Barbezat, 2002, p. 30). Researchers and others tend to interpret any salary advantage for Blacks or "non-Whites" as reflecting competition among institutions for the relatively small number of minority PhDs. Affirmative action policies likely increased competition, as have pressures from students, faculty, and administrators interested in diversifying their faculties.

Because of the small number of racial/ethnic minorities in most samples, previous studies typically divided samples into Blacks and "non-Blacks" or Whites and "non-Whites." However, Toutkoushian (1998) used NSOPF:93 data to compare the salaries of four different racial/ethnic groups to Whites: Blacks, Asians, Hispanics, and "other" racial identities. Findings from a pooled sample of faculty showed a significant negative effect of race on earnings only for faculty from the "other" race category, after controlling for other factors. Importantly, Toutkoushian (1998) then estimated salary equations for men and women separately, finding that the negative effect of "other" race on pay held for men but not for women and that Hispanic male faculty also earned significantly less than White males. In contrast, among women, the only statistically significant effect was a positive pay difference for being Black relative to being White. Studies by Barbezat (1989, 1991) also found evidence of gender differences in the effects on salaries of being Black or "non-White."

We are not aware of any studies that specifically examine the ways in which marriage may affect White and minority faculty differently. However, interest in this possibility dates back over 40 years to Cain (1966), who argued that married Black women might experience certain advantages in the labor market due to the support they receive from extended families. Presumably, his assertion reflects higher unemployment rates for Black men relative to White men and higher employment rates for

Black women relative to White women. While these differences in employment rates are still evident in the population, the extent to which they might advantage Black women who pursue academic careers (akin to advantages associated with marriage for some men) is unknown.

Although many of the studies described suggest that gender, martial status, and/or race/ethnicity at times interact in their effects on faculty salaries, studies have not systematically examined these potentially complex interactions. Existing empirical studies, as well as theoretical work on the intersection of race, class, gender, and other social characteristics, point to a need to further examine interrelationships between the effects of social categories on measures of opportunities, achievements, and rewards. The NSOPF:99 data provides a national database of sufficient size with which to explore the interaction effects of gender, race/ethnicity, and marital status on faculty salaries and to move discussions about the implications of such interactions forward.

Measuring Pay Disparities by Gender, Race, and Marital Status

Studies of pay equity typically rely on some form of regression analysis to determine if inequitable treatment of faculty based on selected demographic characteristics, such as gender and race, is evident. The standard approach to measuring the unexplained wage gap begins with the specification of an earnings equation of the form

$$\ln Y_i = \mathbf{X}_i\beta + \varepsilon_i \quad (1)$$

where $\ln Y_i$ = natural log of salary for the i-th individual, $\mathbf{X}$ = matrix of nondemographic ("control") variables that are posited to affect earnings with weights β, and ε = random error term. Throughout the paper, we use boldface symbols and letters to denote vectors of coefficients and matrices of variables, and roman symbols and letters to represent single parameters and variables. The variables in $\mathbf{X}$ can be thought of as work-related factors such as experience, educational attainment, and field that, according to human capital theory, should have an effect on faculty pay (Ferber & Loeb, 2002; Mincer, 1974). Accordingly, faculty salary studies typically control for each individual's highest degree, years of experience, academic discipline, and research publications.

Several approaches have been offered in the literature for measuring pay disparities by demographic characteristics. The most direct method is the single-equation approach, where dichotomous ("dummy") variables are added to the earnings equation as in:

$$\ln Y_i = \mathbf{X}_i\beta + G_i\gamma + \varepsilon_i \quad (2)$$

$$\ln Y_i = \mathbf{X}_i\beta + \mathbf{R}_i\delta + \varepsilon_i \quad (3)$$

$$\ln Y_i = \mathbf{X}_i\beta + \mathbf{M}_i\alpha + \varepsilon_i \quad (4)$$

where G = dummy variable for gender, **R** = set of dummy variables for race/ethnicity, and **M** = set of dummy variables for a faculty member's marital status (denoted **M**). The parameters associated with these variables—γ, δ, and α—represent the unexplained wage gaps, or the effects on earnings of gender, race/ethnicity, and marital status, respectively, after controlling for the variables in **X**. Analysts can also test for the joint significance of multiple variables via an F-test of the form:

$$F(m, n, -k) = \frac{(SSR_1 - SSR_2) / m}{SSR_2 /(n-k)} \quad (5)$$

where SSR_1 = sum of squared residuals from the salary model with only control variables, SSR_2 = sum of squared residuals from the salary model when the variables for one demographic characteristic are added to the model, m = number of variables for the demographic characteristics G, **R**, or **M**, k = number of control variables in **X**, and n = total number of observations.

Because salaries may be affected by multiple characteristics, some analysts advocate for adding variables for these demographic characteristics to the same earnings equation, as in:

$$\ln Y_i = \mathbf{X}_i\beta + G_i\gamma + \mathbf{R}_i\delta + \mathbf{M}_i\alpha + \varepsilon_i \quad (6)$$

The coefficients for each demographic variable now represent the unexplained wage gap associated with this factor after controlling for the direct effects of the other demographic factors on salary. The same F-test described above can be used to determine if each set of demographic characteristics affects earnings after accounting for the effects of other characteristics.

The single-equation analysis described above imposes restrictions on the way in which faculty salary is determined. First, the model requires the control variables in **X** to have the same effect on earnings for all faculty members regardless of their gender, race/ethnicity, and marital status. The single-equation formulation in Equation 6 also does not capture possible interactive effects among the demographic characteristics. In this model, the unexplained pay difference between White and Black

faculty, for example, is restricted to be the same for males and females and for married and single faculty. Accordingly, some analysts have used a multiple-equation approach to measure pay disparities. In this instance, the earnings equation (Equation 1) is estimated separately for faculty based on the characteristic in question. It is now possible to measure separate unexplained wage gaps by race/ethnicity (δ_m and δ_f) and marital status (α_m and α_f) for male and female faculty.

Salary equity studies of the academic labor market have used all of these approaches to measure the unexplained wage gaps by personal characteristics such as gender, race/ethnicity, and marital status. Some studies, such as those by Bellas (1994), Loeb and Ferber (1971), Hoffman (1976), Perna (2001), and Toumanoff (2005), have relied on only the single-equation model. Other studies have opted for the two-equation approach, stratifying the sample by gender (Barbezat, 1987a; Bellas, 1993; Ferber & Loeb, 1974; Fox, 1981). Finally, another group of studies have reported both single-equation and two-equation results, stratifying the sample by gender (Ashraf, 1996; Barbezat, 1987b, 1989, 1991; Gordon Morton, & Braden, 1974; Riggs & Dwyer, 1995; Toutkoushian & Conley, 2005). Interestingly, it is more common for salary equity studies in the general labor market to estimate separate equations by race/ethnicity than by gender (Antecol & Bedard, 2004; Cotton, 1993a; Reimers, 1983). This is because there are often higher percentages of workers in underrepresented racial/ethnic groups in the general labor market than in academia.

There are, however, several limitations with estimating separate salary models by each demographic characteristic for faculty. Perhaps the largest impediment is that sufficient numbers of observations are needed to reliably estimate the coefficients in separate models for each group. As sample size decreases, not only do the standard errors become larger, but there is also an increasing likelihood that one or more of the regressors will no longer have any variation within the subgroup under consideration. These problems make it very difficult to estimate separate earnings equations by gender, marital status, and race/ethnicity, let alone for combinations such as single Asian females, in most single-institution and even national studies.

A second problem is that it is more difficult to take the results from multiple equations and use them to measure the unexplained wage gaps between groups of faculty members. Although Oaxaca (1973), Reimers (1983), Neumark (1988), and others have shown how this might be accomplished for two groups of faculty, these calculations are more cumbersome and are subject to uncertainty regarding the nature of pay discrimination. Furthermore, it is not clear how these same calculations

would be performed when there are more than two groups of faculty under consideration, such as single, married, and separated faculty. Another complicating factor with any of these approaches is that the effects of gender, race/ethnicity, and marital status on earnings are restricted to be independent of each other. Even in a single-gender equation, it is assumed that the unexplained wage gap between White and Black male faculty is the same for married and single men, and so on. If this is not the case, then uniform policies to address pay inequities by gender, race/ethnicity, and marital status would be less effective than differentiated policies.

Several approaches are available to test for the presence of joint, or interaction, effects among demographic characteristics. First, the multiple-equation method can be extended by estimating separate wage equations based on the possible combinations of factors. For example, Cotton (1993b) estimated four separate regression equations for non-Hispanic Whites, non-Hispanic Blacks, Hispanic Whites, and Hispanic Blacks (also see Blau & Beller, 1992; Corcoran & Duncan, 1979; Duncan, 1996). However, this would require sufficient numbers of faculty with each combination of demographic characteristics. An alternative is to use interaction terms within the single-equation approach. The interactions are new variables created by multiplying all of the possible combinations of demographic variables of interest. For example, the gender, race/ethnicity, and marital status variables could be interacted and added to the salary model:

$$\ln Y_i = \mathbf{X}_i\beta + G_i\gamma + \mathbf{R}_i\delta + \mathbf{M}_i\alpha + \mathbf{GxR}_i\theta + \mathbf{GxM}_i\eta + \mathbf{RxM}_i\lambda + \mathbf{GxRxM}_i\mu + \varepsilon_i \quad (7)$$

where $\mathbf{GxR}_i$, $\mathbf{GxM}_i$, and $\mathbf{RxM}_i$ = two-way interactions between gender, race/ethnicity, and marital status, and $\mathbf{GxRxM}_i$ = three-way interactions between gender, race/ethnicity, and marital status. An F-test could then be conducted based on the sum of squared residuals from Equations 6 and 7 to determine whether a faculty member's salary varies based on the two-way and/or three-way interactions between gender and race/ethnicity. This approach offers a more direct way to test for the presence of interactions among demographic characteristics than can be accomplished with separate regression equations for each combination of characteristics.

However, the interaction option is not without its limitations. This single-equation approach restricts the control variables in **X** to have the same effect on earnings across all groups of faculty, with any differences in the effects being subsumed into the coefficient estimates for the personal characteristics and their interactions. Furthermore, the interpretation of interaction terms becomes more difficult as higher numbers and

levels of interactions are added to the model because the net effect of each factor depends on all of the interactions that include the factor in question. It may be challenging to relate particular findings back to theory, much less translate them into policy recommendations. Nonetheless, this approach is a useful starting place for determining whether commonly held assumptions about the nature of faculty salaries are accurate.

Data and Methods

This study used the 1999 National Survey of Postsecondary Faculty (NSOPF:99), a nationally representative sample of instructional staff conducted by the National Center for Education Statistics (NCES). The survey gathered information about the backgrounds, responsibilities, workloads, salaries, attitudes, and future plans of both full- and part-time faculty. NSOPF:99 used a two-stage stratified, clustered probability sampling design. The first stage consisted of selecting a stratified random sample of institutions from the 3,396 postsecondary institutions in IPEDS that were public or private not-for-profit Title IV participating institutions. Institutions were stratified based on public/private status and on the Carnegie Foundation's classification system. A total of 960 institutions were included in the study. Of these, 819 provided the information necessary for the second sampling stage.

The second stage of sampling was developed from lists of faculty provided by the institutions selected in the first stage. Faculty were grouped into strata based on a faculty member's race/ethnicity (Hispanic, non-Hispanic Black, Asian, and Pacific Islander), gender, and full-time status. This sampling strategy permitted oversampling of faculty from traditionally underrepresented subpopulations to increase the precision of the estimates for these groups. Finally, within each institution and stratum, faculty members were sorted by academic program area or discipline. The initial sample consisted of about 28,600 faculty and instructional staff, from which a subsample of 19,813 individuals was drawn for additional follow-up. Approximately 18,000 faculty members responded to the survey, and the weighted response rate for the survey was 83%. Given the sampling strategy and our interest in focusing specifically on intergroup differences in salaries, we weighted all data prior to analysis. NCES computed the weights to take into account the different probabilities of individuals being selected for the study and of responding to the survey. Weighting yields representation in the sample equal to or closely approximating representation in the entire population of faculty. We also adjusted the weights to take into account the average design effect (DEFF) identified by NCES (Thomas & Heck, 2002; U.S. Department of Education, 2002).[2]

We limited our analysis to full-time faculty with the rank of full, associate, or assistant professor at institutions with the Carnegie Foundation designations of Doctoral-Extensive, Doctoral-Intensive, Master's I or II, Baccalaureate-Liberal Arts, and Baccalaureate-General. To address concerns about possible outliers, we excluded 19 individuals who reported annual base salaries in excess of $250,000. This left a final unweighted sample size of 5,988 faculty and a weighted sample size of 5,848.

We created a number of variables similar to those used by Toutkoushian and Conley (2005) in their study of NSOPF:99 data. Measures of experience include a faculty member's years at current institution ("seniority"), total years teaching at higher education institutions, and age. We constructed variables for institutional type using the 1994 Carnegie classification scheme of Research, Doctorate, Comprehensive, and Liberal Arts, and an institution's public/private status. We created four variables to represent highest degree attained (doctorate, first professional, master's, other) based on categories supplied by NCES.[3] Measures of research productivity include number of career articles in peer-reviewed journals, books (including textbooks), book chapters, and patents. We also controlled for eight geographic regions categorized by the Bureau of Economic Analysis (BEA) and precoded in the NSOPF data, as well as academic field or discipline (41 variables). Other control variables include the number of months of a faculty member's appointment and whether he or she is a chairperson. All variables have been used in previous national studies of faculty compensation.[4]

The main demographic variables in this study are gender, race/ethnicity, and marital status. A dummy variable represents gender (1 if female; 0 otherwise). Four variables represent race/ethnicity: Hispanic, non-Hispanic White ("White"), non-Hispanic Black ("Black"), and non-Hispanic Asian ("Asian"). Although the NSOPF:99 contains more detailed racial/ethnic categories for faculty, the numbers of observations in some categories were so small that some degree of aggregation was necessary. We categorized faculty members with the designation of "other" race as missing because their numbers were too small to make valid comparisons. Finally, we created three variables for a faculty member's current marital status: married/cohabiting, single, and divorced/separated/widowed.

Results

Sample Description

Table 1 provides descriptive statistics for selected variables for our sample (weighted data). The sample consists of 71% men and 29% women. Approximately 86% of faculty members were White, followed by Asian

(7%), Black (5%), and Hispanic (3%). Seventy-eight percent of respondents were married/cohabiting, 11% were divorced/separated/widowed, and 11% were single.[5] Faculty members averaged nearly 49 years of age, and had a total of almost 18 years of academic experience, with 12 years of seniority at their current institution. Seventy-nine percent held a doctoral degree, 13% a master's degree, and nearly 8% held a professional degree. The research productivity measures for respondents show that, on average, faculty had published close to 23 articles in academic journals, 5.5 book chapters, and 4 books/textbooks, and held less than one patent.

When we disaggregated the sample by gender, race, and marital status, we found that the average salaries for men generally appear to be higher than the average salaries for women within most of the race/ethnicity and marital status categories. Means vary from a low of $47,200 for single, Black females to a high of $90,826 for Asian male faculty who were divorced/separated/widowed. In contrast, there is no clear pattern of average salary differences by race/ethnicity when faculty members are grouped by gender and marital status. Analyses also show that even with a relatively large sample of faculty, the number of faculty members in some cells is very small. Of the twenty-four possible combinations of gender, race/ethnicity, and marital status, eight categories have fewer than 30 faculty members.[6]

Single-Equation Salary Models

Table 2 contains selected unstandardized coefficients from a single-equation regression model predicting faculty salary. The dependent variable in all equations is the natural log of salary. The single-equation approach measures pay disparities by gender, race/ethnicity, and marital status after taking into account selected work-related characteristics. Model 1 of Table 2 (baseline model) controls for a faculty member's experience (years of experience in academia, years of seniority at current institution, and age), highest degree, academic discipline/field, 1994 Carnegie classification of employing institution, whether private or public institution, geographic region, length of appointment, whether a chairperson, and measures of research productivity. Model 2 uses these same regressors but adds three dummy variables for race/ethnicity. Similarly, Model 3 adds two dummy variables for current marital status to Model 1, and Model 4 adds a single dummy variable for gender to Model 1. Model 5 adds all variables to the earnings equation simultaneously. The last row of Table 2 provides the results from an F-test comparing the fit of each model to the baseline model. This test indicates whether each set of demographic characteristics significantly improves the explanatory power of the model.

TABLE 1

Selected Descriptive Statistics from NSOPF:99.

Variable	Mean	Standard Deviation
Log (annual salary)	10.9529	.40917
1 if Male	0.7106	——-
1 if Female	0.2894	——-
1 if non-Hispanic White	0.8593	——-
1 if non-Hispanic Black	0.0469	——-
1 if Asian	0.0674	——-
1 if Hispanic	0.0293	——-
1 if Married/Cohabiting	0.7810	——-
1 if Divorced/Separated/Widowed	0.1088	——-
1 if Single	0.1102	——-
Number of Career Articles	22.5814	34.80244
Number of Career Book Chapters	5.4991	11.24844
Number of Career Books and Textbooks	3.6870	9.37645
Number of Career Patents	0.5718	2.08940
1 if Research I or II Institution	0.4643	——-
1 if Doctoral I or II Institution	0.1376	——-
1 if Comprehensive I or II Institution	0.2856	——-
1 if Liberal Arts I or II Institution	0.1134	——-
1 if Private Institution	0.3008	——-
Years of Total Academic Experience	17.9325	10.54711
Years of Seniority	12.3394	10.09823
Age (Years)	48.8457	9.61786
1 if Departmental Chairperson	0.1359	——-
1 if Highest Degree Doctoral	0.7903	——-
1 if Highest Degree Masters	0.1275	——-
1 if Highest Degree Professional	0.0774	——-
1 if New England (BEA code)	0.0582	——-
1 if Mid East (BEA code)	0.1767	——-
1 if Great Lakes (BEA code)	0.1834	——-
1 if Plains (BEA code)	0.0864	——-
1 if Southeast (BEA code)	0.2523	——-
1 if Southwest (BEA code)	0.0797	——-
1 if Rocky Mountain (BEA code)	0.0391	——-
1 if Far West (BEA code)	0.1242	——-
1 if 8-Month Appointment	0.0083	——-
1 if 9-Month Appointment	0.5803	——-
1 if 10-Month Appointment	0.1233	——-
1 if 11-Month Appointment	0.0278	——-
1 if 12-Month Appointment	0.2602	——-

NOTES: Sample represents only full-time faculty with the rank of assistant, associate, or full professor at institutions with the Carnegie Foundation designations of Doctoral-Extensive, Doctoral-Intensive, Master's I or II, Baccalaureate-Liberal Arts, and Baccalaureate-General, and with salaries of $250,000 or less. Years of seniority represents years employed at the faculty member's current institution. Data were weighted to take into account the stratified sampling design and design effects used by NCES. The final number of unweighted cases is 5,988.

TABLE 2
Main Effects of Race, Marital Status, and Gender on Faculty Salaries, NSOPF:99.

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Experience:					
Years of Experience	0.007***	0.007***	0.007***	0.007***	0.008***
	(.002)	(.002)	(.002)	(.002)	(.002)
Experience Squared	6.5e-05	6.1e-05	6.6e-05	5.5e-05	5.3e-05
	(5.2e-05)	(5.2e-05)	(5.2e-05)	(5.2e-05)	(5.2e-05)
Years of Seniority	0.012***	0.012***	0.012***	0.012***	0.012***
	(.002)	(.002)	(.002)	(.002)	(.002)
Seniority Squared	–3.3e-04***	–3.3e-04***	–3.3e-04***	–3.3e-04***	–3.3e-04***
	(5.6e-05)	(5.6e-05)	(5.6e-05)	(5.6e-05)	(5.6e-05)
Age	0.013***	0.013***	0.012***	0.013***	0.012***
	(.005)	(.005)	(.005)	(.005)	(.005)
Age Squared	–1.2e-04**	–1.2e-04**	–1.1e-04**	–1.1e-04**	–1.1e04**
	(4.7e-05)	(4.7e-05)	(4.7e-05)	(4.7e-05)	(4.7e-05)
Highest Degree:[a]					
Doctorate	0.07	0.067	0.071	0.061	0.061
	(.060)	(.060)	(.060)	(.060)	(.060)
Masters	–0.104*	–0.105*	–0.103*	–0.109*	–0.109*
	(.061)	(.061)	(.060)	(.060)	(.060)
Professional	0.177***	0.173***	0.175***	0.160**	0.158**
	(.062)	(.062)	(.062)	(.062)	(.062)
Carnegie Classification:[b]					
Research I or II	0.204***	0.204***	0.203***	0.203***	0.204***
	(.016)	(.016)	(.016)	(.016)	(.016)
Doctoral I or II	0.118***	0.119***	0.118***	0.119***	0.119***
	(.018)	(.018)	(.018)	(.018)	(.018)
Comprehensive I or II	0.072***	0.072***	0.072***	0.074***	0.074***
	(.015)	(.015)	(.015)	(.015)	(.015)
Private Institution	–0.024**	–0.023**	–0.024**	–0.024**	–0.023**
	(.010)	(.010)	(.010)	(.010)	(.010)
Region of Country:[c]					
New England	0.012	0.012	0.011	0.013	0.014
	(.019)	(.019)	(.019)	(.019)	(.019)
Mid East	0.052***	0.051***	0.055***	0.054***	0.055***
	(.013)	(.013)	(.013)	(.013)	(.013)
Great Lakes	0.016	0.017	0.015	0.017	0.018
	(.013)	(.013)	(.013)	(.013)	(.013)
Plains	0.007	0.008	0.006	0.007	0.008
	(.016)	(.016)	(.016)	(.016)	(.016)
Southwest	–0.033*	–0.031*	–0.031*	–0.034**	–0.030*
	(.017)	(.017)	(.017)	(.017)	(.017)

TABLE 2 (*Continued*)

Main Effects of Race, Marital Status, and Gender on Faculty Salaries, NSOPF:99.

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Rocky Mountain	0.010	0.012	0.007	0.007	0.008
	(.022)	(.022)	(.022)	(.022)	(.022)
Far West	0.032**	0.031**	0.034**	0.032**	0.033**
	(.014)	(.014)	(.014)	(.014)	(.014)
Chairperson	0.098***	0.098***	0.094***	0.097***	0.094***
	(.012)	(.012)	(.012)	(.012)	(.012)
Length of Appointment:[d]					
8-Month Appointment	0.060	0.061	0.059	0.059	0.060
	(.045)	(.045)	(.045)	(.045)	(.045)
10-Month Appointment	–0.014	–0.013	–0.014	–0.013	–0.014
	(.013)	(.013)	(.013)	(.013)	(.013)
11-Month Appointment	0.155***	0.157***	0.158***	0.155***	0.159***
	(.025)	(.025)	(.025)	(.025)	(.025)
12-Month Appointment	0.100***	0.100***	0.099***	0.098***	0.098***
	(.010)	(.010)	(.010)	(.010)	(.010)
Discipline:[e]					
Agriculture	0.070**	0.072**	0.067**	0.059**	0.061**
	(.030)	(.030)	(.030)	(.030)	(.030)
Anthropology	0.064	0.063	0.063	0.066	0.064
	(.047)	(.047)	(.047)	(.047)	(.047)
Archeology	0.113	0.114	0.121	0.124	0.127
	(.161)	(.161)	(.161)	(.161)	(.161)
Architecture	0.178***	0.180***	0.178***	0.168***	0.172***
	(.042)	(.042)	(.042)	(.042)	(.042)
Area and Ethnic Studies	0.041	0.038	0.047	0.039	0.042
	(.073)	(.073)	(.073)	(.073)	(.073)
Art	0.056**	0.057**	0.059**	0.049**	0.053**
	(.023)	(.023)	(.023)	(.023)	(.023)
Biological Sciences	0.094***	0.095***	0.090***	0.089***	0.088***
	(.021)	(.021)	(.021)	(.021)	(.021)
Business	0.326***	0.325***	0.320***	0.318***	0.313***
	(.022)	(.022)	(.022)	(.022)	(.022)
Communications	0.011	0.011	0.014	0.004	0.008
	(.032)	(.032)	(.032)	(.032)	(.032)
Computers	0.312***	0.310***	0.310***	0.299***	0.298***
	(.029)	(.029)	(.029)	(.029)	(.029)
Construction Trades	0.192	0.183	0.179	0.169	0.153
	(.254)	(.254)	(.253)	(.253)	(.253)
Consumer Services	0.374**	0.375**	0.370**	0.367**	0.365**
	(.149)	(.149)	(.149)	(.149)	(.149)

TABLE 2 (*Continued*)
Main Effects of Race, Marital Status, and Gender on Faculty Salaries, NSOPF:99.

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Demography	0.049	0.052	0.046	0.042	0.042
	(.143)	(.143)	(.143)	(.143)	(.143)
Economics	0.296***	0.295***	0.291***	0.286***	0.282***
	(.031)	(.031)	(.031)	(.031)	(.031)
Education	0.105***	0.106***	0.105***	0.107***	0.108***
	(.021)	(.021)	(.021)	(.021)	(.021)
Engineering	0.262***	0.258***	0.256***	0.248***	0.242***
	(.023)	(.023)	(.023)	(.023)	(.023)
Foreign Languages	0.025	0.021	0.029	0.026	0.025
	(.029)	(.029)	(.029)	(.029)	(.029)
Geography	0.051	0.048	0.043	0.038	0.031
	(.052)	(.052)	(.052)	(.052)	(.052)
Health Sciences	0.238***	0.239***	0.235***	0.243***	0.240***
	(.021)	(.021)	(.021)	(.021)	(.021)
History	0.104***	0.105***	0.107***	0.102***	0.105***
	(.029)	(.029)	(.029)	(.029)	(.029)
Home Economics	–0.037	–0.038	–0.035	–0.021	–0.023
	(.070)	(.070)	(.070)	(.070)	(.070)
Industrial Arts	0.142	0.141	0.129	0.124	0.112
	(.190)	(.190)	(.190)	(.190)	(.190)
International Relations	0.173*	0.171*	0.177*	0.171*	0.174*
	(.091)	(.091)	(.091)	(.091)	(.091)
Law	0.391***	0.393***	0.388***	0.392***	0.391***
	(.040)	(.040)	(.040)	(.040)	(.040)
Library Science	0.102**	0.102**	0.103**	0.112**	0.113**
	(.045)	(.045)	(.045)	(.045)	(.045)
Math and Statistics	0.095***	0.092***	0.090***	0.084***	0.078***
	(.025)	(.025)	(.025)	(.025)	(.025)
Mechanics	0.098	0.060	0.088	0.113	0.065
	(.249)	(.249)	(.248)	(.248)	(.248)
Parks and Recreation	0.049	0.053	0.047	0.034	0.038
	(.126)	(.126)	(.126)	(.126)	(.125)
Philosophy, Religion and Theology	0.034	0.034	0.032	0.024	0.024
	(.030)	(.030)	(.030)	(.030)	(.030)
Physical Sciences	0.125***	0.126***	0.122***	0.114***	0.115***
	(.022)	(.022)	(.022)	(.022)	(.022)
Political Science	0.121***	0.124***	0.115**	0.112***	0.111***
	(.034)	(.034)	(.034)	(.034)	(.034)
Precision Production	0.139	0.140	0.131	0.120	0.118
	(.098)	(.098)	(.098)	(.098)	(.098)

TABLE 2 (*Continued*)

Main Effects of Race, Marital Status, and Gender on Faculty Salaries, NSOPF:99.

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Protective Services	0.105*	0.106*	0.108*	0.099	0.104*
	(.061)	(.061)	(.061)	(.061)	(.061)
Psychology	0.123***	0.124***	0.122***	0.119***	0.121***
	(.025)	(.025)	(.025)	(.025)	(.025)
Public Affairs	0.155***	0.156***	0.156***	0.155***	0.156***
	(.041)	(.041)	(.041)	(.041)	(.041)
Science Technologies	0.095	0.071	0.093	0.090	0.067
	(.096)	(.097)	(.096)	(.096)	(.097)
Social Sciences,	0.119**	0.118**	0.121**	0.127**	0.125**
(general or other)	(.053)	(.054)	(.053)	(.053)	(.053)
Sociology	0.088***	0.090***	0.087***	0.086***	0.086***
	(.032)	(.032)	(.032)	(.032)	(.032)
Transportation	0.112	0.117	0.117	0.102	0.112
	(.110)	(.110)	(.110)	(.110)	(.110)
Other Field	0.081	0.081	0.079	0.083*	0.082
	(.050)	(.050)	(.050)	(.050)	(.050)
Scholarly Achievements:					
Career Articles	0.003***	0.002***	0.002***	0.002***	0.002***
	(1.5e-04)	(1.5e-04)	(1.5e-04)	(1.5e-04)	(1.5e-05)
Career Books/Textbooks	0.001***	0.001***	0.001***	0.001**	0.001**
	(4.6e-04)	(4.6e-04)	(4.6e-04)	(4.6e-04)	(4.6e-04)
Career Book Chapters	0.001***	0.002***	0.001***	0.001***	0.002***
	(4.2e-04)	(4.2e-04)	(4.2e-04)	(4.2e-04)	(4.2e-04)
Career Patents	3.3e-04	4.6e-04	1.8e-04	–6.1e-05	9.7e-05
	(.002)	(.002)	(.002)	(.002)	(.002)
Race/Ethnicity:[f]					
Black	——-	0.019	——-	——-	0.028
		(.020)			(.020)
Asian	——-	0.045***	——-	——-	0.043**
		(.017)			(.017)
Hispanic	——-	0.016	——-	——-	0.018
		(.025)			(.025)
Marital Status:[g]					
Married/Cohabiting	——-	——-	0.047***	——-	0.040***
			(.013)		(.014)
Divorced/Separated/	——-	——-	0.006	——-	0.006
Widowed			(.018)		(.018)
Female	——-	——-	——-	-0.046***	–0.039***
				(.010)	(.010)

TABLE 2 (*Continued*)
Main Effects of Race, Marital Status, and Gender on Faculty Salaries, NSOPF:99.

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Constant	9.932*** (.122)	9.920*** (.123)	9.916*** (.122)	9.976*** (.123)	9.944*** (.123)
R-Squared	0.433	0.434	0.435	0.436	0.438
F-Test (main effects)	——-	2.68	9.23***	22.23***	7.12***

NOTES: Dependent variable in all models is the natural log of annual salary. Standard errors are shown in parentheses. ***p < .01, **p < .05, *p < .10 (two-tailed test). Critical F-ratios are 6.64 (1 df), 4.60 (2 df), 3.78 (3 df), and 2.80 (6 df) for p < .01, and 3.84 (1 df), 2.99 (2 df), 2.60 (3 df), and 2.80 (6 df) at p < .05. The F-tests for Models 6–8 are conducted relative to Model 1 plus the corresponding own effects for gender, race, and marital status as appropriate. The F-test for Model 9 is conducted relative to Model 5. [a] Compared to other degree. [b] Compared to Liberal Arts institution. [c] Compared to Southeast region. [d] Compared to 9-month appointment. [e] Compared to English. [f] Compared to white. [g] Compared to single.

Results for variables other than gender, race/ethnicity, and marital status show that, as expected, a faculty member's salary increases with all three measures of experience, although seniority at current institution and age have curvilinear relationships with salary, indicating that the positive effect of these variables on salary slows with more years of seniority and greater age. Holding a professional degree is also associated with higher salaries relative to the reference category of "other" degree, while holding a master's is associated with lower salaries (a doctoral degree did not differ significantly from other degrees in its effect). Being employed at a research, doctoral, or comprehensive institution is associated with higher salaries relative to being employed at a liberal arts institution. Employment at a private institution significantly reduced salaries relative to employment at a public institution. Employment in Mid East and Far West states is associated with higher salaries relative to the Southeast, and employment in the Southwest with lower salaries. Being a chairperson is associated with higher salaries, as is holding an 11- or 12-month appointment relative to a 9-month appointment. As would be expected, a faculty member's academic field or discipline affects salary. While no disciplines were associated with significantly lower salaries than those in English, the reference category, the following fields showed significantly higher salaries: agriculture, architecture, art, biological sciences, business, computers, consumer services, economics, education, engineering, health sciences, history, industrial arts, international relations, law, library science, math and statistics, physical

sciences, political sciences, protective services, psychology, public affairs, social sciences, and sociology.[7] Finally, three measures of scholarly achievement—career journal articles, career books/textbooks, and career book chapters—positively influenced salary.

Taken together, these variables account for approximately 43% of the total variation in faculty salaries. Their effects on salary change very little in Models 2 through 5 as controls for demographic characteristics are added. As Model 2 shows, Asian faculty earned 4.5% more than comparable White faculty (the reference group), while the salaries of Hispanic and Black faculty do not differ significantly from Whites. However, the F-ratio of 2.68 indicates that the race/ethnicity variables did not significantly increase the fit of the salary model. Model 3 shows that married/cohabiting faculty earned 4.7% more than single faculty and that the marital status variables contributed significantly to the salary model. Likewise, as seen in Model 4, female faculty members earned 4.6% less than comparable males, a statistically significant difference. Model 5 demonstrates that the collective partial effects of race/ethnicity, marital status, and gender increase the explained variance from 43.3 to 43.8, a statistically significant increase.

Disaggregated Salary Models

We began our investigation into possible interaction effects by estimating separate salary models for each gender, race, and marital status category. We found that the effects on salary of the various control variables appear to be fairly similar for male and female faculty, with the exception of years of academic experience and seniority, which show higher returns for men (table not shown). Men also show higher returns for being married/cohabiting relative to being single, as do women—a finding inconsistent with several previous studies (Bellas, 1992; Toutkoushian, 1998). Although the coefficient for Asian is positive for both women and men, it achieves statistical significance only for men. The coefficients for Hispanic, Black, and divorced/separated/widowed are considerably larger for men than for women, but they are not statistically significant for either sex. Asian faculty who are divorced/separated/widowed earned about 15% more than White faculty who are divorced/separated/widowed, while single Hispanic faculty earned approximately 13% more than single White faculty. Similarly, females who are divorced/separated/widowed earned almost 7% less than comparable males, and married/cohabiting females earned about 4% less than married/cohabiting males. There are no discernable pay differences between single female and male faculty members. Only married/cohabiting White faculty and Asians who are divorced/separated/widowed

earned significantly more than their single counterparts. White and Black females earned significantly less than comparable male faculty.[8]

Salary Models with Interactions

While visual inspection of the differences in the estimated coefficients for the demographic variables from the disaggregated models suggests that interaction effects exist between these variables, a more rigorous statistical test is required to determine if this is in fact the case. Accordingly, in Table 3, we used a single equation to test for two-way and three-way interaction effects between race/ethnicity, gender, and marital status. Model 6 adds four interaction variables for gender and race/ethnicity, plus the main effects of gender and race/ethnicity, to the baseline model (Model 1 of Table 2). Gender is then interacted with marital status in Model 7 (and the marital status variables added), and race/ethnicity is interacted with marital status in Model 8. Finally, Model 9 provides the results from the three-way interactions between race/ethnicity, gender, and marital status. The F-tests for Models 6 through 8 indicate whether the two-way interactions between variables have a collective impact on earnings beyond their separate effects, and the F-test for Model 9 captures the joint contribution of the two-way and three-way interactions on faculty salaries. Due to space constraints, only the unstandardized coefficients for the demographic variables and their interactions are reported in Table 3.

None of the two-way interactions between gender and race/ethnicity are significant in Model 6, nor are any of the two-way interactions between gender and marital status in Model 7. The lack of significant interaction effects between gender and any of the race/ethnicity categories differs from Toutkoushian's (1998) findings using 1993 NSOPF data. And, as previously noted, insignificant interaction effects between gender and the marital status categories also differ from Toutkoushian's (1998) earlier findings, as well as those of Bellas (1992, 1993), who analyzed 1984 Carnegie data. Not surprisingly, the F-tests show that the two-way interaction terms do not add significant explanatory power to the salary model. Model 8 does show a significant two-way interaction effect for Asian faculty who are divorced/separated/widowed (+0.156), as well as for married/cohabiting Hispanic faculty (-.110). Despite these findings, the two-way interaction terms for race/ethnicity and marital status collectively do not add significantly to the overall fit of the salary model, as reflected in the insignificant F-test and the small changes in R^2.

Model 9 shows that only one of the six three-way interactions differs significantly from zero. Married/cohabiting Black female faculty members earn approximately 24% more than comparable faculty, after taking

TABLE 3
Interaction Effects of Race/Ethnicity, Marital Status, and Gender on Faculty Salaries, NSOPF:99.

Interactions	Model 6	Model 7	Model 8	Model 9
Main Effects				
Black	0.039	——-	0.015	0.133*
Asian	0.038**	——-	0.008	0.016
Hispanic	0.017	——-	0.112**	0.070
Married/Cohabiting	——-	0.052***	0.049***	0.062***
Divorce/Separated/Widowed	——-	0.023	0.004	0.014
Female	–0.044***	–0.015	——-	–0.001
Two-Way Interactions				
Female*Black	–0.040	——-	——-	–0.192**
Female*Asian	0.021	——-	——-	–0.029
Female*Hispanic	–0.005	——-	——-	0.123
Female*Married/Cohabiting	——-	–0.027	——-	–0.045
Female*Divorced/Sep./Widowed	——-	–0.033	——-	–0.021
Married/Cohabiting*Black	——-	——-	0.019	–0.111
Married/Cohabiting*Asian	——-	——-	0.031	0.011
Married/Cohabiting*Hispanic	——-	——-	–0.110*	–0.065
Divorced/Sep./Widowed*Black	——-	——-	0.006	–0.038
Divorced/Sep./Widowed*Asian	——-	——-	0.156**	0.301***
Divorced/Sep./Widowed*Hispanic	——-	——-	–0.132	–0.001
Three-Way Interactions				
Female*Married/Cohabiting*Black	——-	——-	——-	0.235**
Female*Married/Cohabiting*Asian	——-	——-	——-	0.089
Female*Married/Cohabiting*Hispanic	——-	——-	——-	–0.134
Female*Divorced/Sep./Widowed*Black	——-	——-	——-	0.078
Female*Divorced/Sep./Widowed*Asian	——-	——-	——-	–0.264
Female*Divorced/Sep./Widowed*Hispanic	——-	——-	——-	–0.283
R-squared	0.437	0.437	0.437	0.440
F-Tests (two-way interactions)	0.47	0.58	1.39	——-
F-Tests (two- and three-way interactions)	——-	——-	——-	1.48

NOTES: Dependent variable in all models is the natural log of annual salary. Each model includes the following additional variables (coefficients not shown): highest degree (four variables), whether chairperson, departmental affiliation (41 variables), whether employed by a private institution, age and age squared, years of experience and years of experience squared, seniority and seniority squared, geographic region (eight variables), career articles, career book chapters, career papers, career books, career textbooks, career patents, Carnegie classification of institution (four variables), and length of appointment (five variables). The F-tests for Models 6–9 are conducted relative to Model 5, Table 2, plus the corresponding own effects for gender, race, or marital status when appropriate. ***p < .01, **p < .05, *p < .10 (two-tailed test). Critical F-ratios are 3.84 and 6.64 (1 df), 2.99 and 4.60 (2 df), 2.60 and 3.78 (3 df), 2.09 and 2.80 (6 df), 1.64 and 1.99 (17 df).

into account both the main effects of race, gender, and marital status and their two-way interactions. Although the coefficient suggests that female Hispanic faculty who are divorced/separated/widowed earn 30% less than comparable faculty and female Asian faculty members who are divorced/separated/widowed earn 23% less, these differences are not

statistically significant.[9] Collectively, the three-way interaction variables have no impact on faculty salary, as indicated by the insignificant F-test.

Interaction coefficients cannot be interpreted in isolation. To interpret a three-way interaction, one must take into account both the main effects and the interaction effects of all variables (some of which may be negative and at least partially offset any positive effects). Because of this difficulty, in Table 4 we provide the estimated unexplained pay differences for faculty in each group relative to single, White males, the reference group. The column labeled "no interactions" shows the estimated percentage pay differences when only the main effects of the demographic variables are included in the salary model. The column labeled "with interactions" reports the estimated percentage pay differences after taking into account the interactions among gender, race, and marital status. These estimates can be obtained by solving the salary equation for each group using the coefficients in the full interaction model (Model 9, Table 3), or by adding 23 dummy variables to Model 1.[10] A dummy variable represents each gender/race/marital status combination, with single, White males being the reference group. The advantage of the latter approach is that standard errors can be obtained for each of the 23 combinations of variables to determine if the estimated pay differences achieve statistical significance. Note that the same statistics (standard errors and significance levels) cannot be obtained for the "no interaction" results.

Three important results emerge from the information shown in Table 4. First, the estimated pay disparities across groups vary considerably more when gender, race, and marital status are allowed to interact with each other than when they are constrained by salary models without interactions. Estimates derived from interactions range from -10.9% to +32.1% (although not all estimates are significantly different from zero), compared to -3.9% to 8.3% when estimates are derived only from main effects. One interpretation of this increased variation in pay disparities is that the failure to allow for interaction effects restricts the unexplained wage gaps across groups of faculty, which may mask some areas of concern. Second, 7 of the 23 groups have positive unexplained wage gaps relative to single, White males that are statistically significant at the 10% or higher level. Of these seven groups, three are married/cohabiting males and one is married/cohabiting females. Six groups are racial/ethnic minorities, three of them Asian. The salary advantage for these groups relative to single, White males ranges from 5.2% (married/cohabiting, white males) to 32.1% (Asian males who are divorced/separated/widowed). Note that the coefficient for married/

TABLE 4

Estimated Pay Disparities for Combined Personal Factors, NSOPF:99.

Gender	Marital Status	Race/Ethnicity	No Interactions	With Interactions
Male	Single	Black	0.028	0.123* (.072)
Male	Single	Asian	0.043	0.006 (.059)
Male	Single	Hispanic	0.018	0.059 (.069)
Male	Divorced/Sep./Widowed	White	0.006	0.004 (.027)
Male	Divorced/Sep./Widowed	Black	0.034	0.099 (.070)
Male	Divorced/Sep./Widowed	Asian	0.049	0.321*** (.089)
Male	Divorced/Sep./Widowed	Hispanic	0.024	0.072 (.103)
Male	Married/Cohabiting	White	0.040	0.051*** (.019)
Male	Married/Cohabiting	Black	0.068	0.069* (.034)
Male	Married/Cohabiting	Asian	0.083	0.077*** (.026)
Male	Married/Cohabiting	Hispanic	0.058	0.056 (.039)
Female	Single	White	–0.039	–0.011 (.027)
Female	Single	Black	–0.011	–0.070 (.057)
Female	Single	Asian	0.004	–0.024 (.085)
Female	Single	Hispanic	–0.021	0.181* (.100)
Female	Divorced/Sep./Widowed	White	–0.033	–0.020 (.028)
Female	Divorced/Sep./Widowed	Black	–0.005	–0.037 (.053)
Female	Divorced/Sep./Widowed	Asian	0.010	0.006 (.086)
Female	Divorced/Sep./Widowed	Hispanic	–0.015	–0.109 (.093)
Female	Married/Cohabiting	White	0.001	0.004 (.021)
Female	Married/Cohabiting	Black	0.029	0.070 (.048)
Female	Married/Cohabiting	Asian	0.044	0.092** (.047)
Female	Married/Cohabiting	Hispanic	0.019	–0.001 (.055)

NOTES: Standard errors in parentheses. Reference category is single, white males. Results for no interaction model are taken from Model 5, Table 2 (significance level and standard errors cannot be calculated). Results for interaction model were obtained by adding 23 dummy variables for each combination of gender/race/marital status to Model 1, Table 2. Effects differ by 0.010 from Model 9, Table 3 because 14 respondents reported multiple race/ethnicities.

*** $p < .01$, ** $p < .05$, * $p < .10$ (two-tailed tests).

cohabiting, Black females is not significant in Table 4, although it was significant in Table 3. Finally, the NSOPF:99 weighting scheme, together with the fact that there are relatively few faculty in particular groups, can lead to substantially large standard errors in the range of 0.08 to 0.10. As a result, the estimated pay difference would have to exceed 16% to 20% in some cases before reaching statistical significance. Thus, even for the interaction approach, small numbers of faculty within specific groups reduce the power of the procedure to identify significant pay differences for some groups. Despite this limitation, some interaction effects did achieve statistical significance in the full interaction model. However, collectively the interaction effects did not significantly add to the explained variance, indicating that the more parsimonious base model using only direct effects is preferred.

Summary and Discussion

Whether unexplained pay differences exist by gender, race/ethnicity, and marital status remains an important issue in academe. Overall, our analyses illustrate that gender, race/ethnicity, and marital status still matter in determining faculty salary. The main effects salary model shows evidence of a negative effect of being female and a positive effect of being married/cohabiting, findings consistent with previous research. Being Asian also significantly increased salary relative to Whites. Although coefficients for other racial/ethnic groups were positive, none achieved statistical significance. This finding is consistent with the interpretation that, in general, faculty of color appear to have at least achieved parity with White faculty and may enjoy a salary advantage.

As our findings demonstrate, it can be extremely challenging to estimate the precise nature and extent of possible differences in faculty salaries based on the demographic characteristics of interest and their interrelationships. Salary models disaggregated by gender, race/ethnicity, and marital status continue to show evidence of advantages for some groups, although not uniformly. For example, disaggregating the sample by race/ethnicity shows a significant salary advantage for White married/cohabiting males but not for married/cohabiting males of other racial/ethnic groups. As previously indicated, statistical insignificance may in some cases reflect the relatively small number of faculty in minority groups. As the interactions among groups become more complex, results become more difficult to interpret and policy recommendations more difficult to prescribe. This is particularly problematic for institution-specific studies, where the number of faculty in various groups may not be large enough to yield reliable estimates.

As new theories emerge regarding the nature and causes of pay inequities, it is essential that analysts have a reliable way of testing these theories with available data. The interaction approach that we use here provides a way to test theoretical models and conjectures concerning possible interactive effects of personal characteristics on income. It also allows researchers to examine the significance of observed effects across strata while taking advantage of the larger sample size from pooling data across all demographic groups. This approach is of particular value to research on faculty salary inequities because of persistent unexplained salary gaps across demographic groups and because of the failure of empirical and theoretical research to explain how these gaps have emerged and why they have continued since the passage of Equal Pay legislation more than 40 years ago. When significant interaction effects are detected, they can alert policymakers to possible areas of concern that merit monitoring or further study. If interaction effects are limited or associated equity policies too difficult to implement, however, attention should focus on designing procedures to address any inequities based on gender, race/ethnicity, and marital status separately rather than creating policies for combinations of these factors.

In our study using a large national database of faculty, the evidence of significant interaction effects in the single-equation models is somewhat limited, suggesting that unexplained pay differences across groups are fairly uniform and attention should focus primarily on any direct effects of personal characteristics on salaries. In the full interaction model, only 2 two-way interactions (of 11) and one three-way interaction (of six) achieved statistical significance. Using interaction (and control) coefficients to calculate unexplained wage gaps showed that 7 (of 23) groups experienced higher than predicted salaries relative to single, White males. That three of these groups are married/cohabiting men and three groups are Asian suggest that these interactions may be driven by being married/cohabiting and being Asian, respectively, and therefore may not truly represent seven different interactions. It should also be noted that although none of the groups of women appear to be significantly underpaid relative to single, White males, had we used a different reference group (e.g., married, White males), significant differences between selected groups might have emerged. The choice of reference group, however, would not affect the overall significance of gender, race, and marital status and their interactions on faculty salaries.

With regard to future directions for research, more attention (both empirical and theoretical) should be given to the possible origins of pay inequities in academe. Much of the existing literature focuses on measuring the extent of pay disparities across demographic groups and how

they have changed over time. Unless attention is also given to the underlying causes of pay inequities, it will be difficult to design policies that can eliminate salary inequities and prevent them from occurring in the future. Because many possible explanations may involve complex interactions of personal and other characteristics, we hope that the interaction approach we describe here will play a role in assessing these explanations.

While large-scale studies are important for identifying salary trends and apparent inequities within academia, inequities evident in national data are not likely to disappear until inequities at individual institutions are corrected. More institutional-level studies are needed to better understand the mechanisms by which inequities are perpetuated. We suggest that administrators who are serious about equity issues compile and examine salary data for their own institutions (or allow a committee of interested faculty to do so) and construct a database that contains key predictors of faculty salaries. Should unexplained salary gaps become evident, examination of institutional and departmental policies and practices will be required to determine whether and how they contribute to inequities. Greater attention to the subtle mechanisms that perpetuate salary inequities is needed to discover why unexplained gaps continue in academia and what might be done to eliminate them.

Notes

[1]The Bureau of Labor Statistics (2006) reports that in 2001, only 30% of wives earned more than their husbands in the general labor market.

[2]See the *1999 National Study of Postsecondary Faculty (NSOPF:99) Methodology Report* for additional details about the NSOPF:99 sampling design and weight construction (U.S. Department of Education, 2002, pp.25–40).

[3]NCES grouped degrees into doctoral, first professional, and master's. First professional degrees include MD, DO, DDS, DMD, LLB, JD, DC, DCM, DPar, PodD, DP, DVM, OD, MDiv, HHL, and BD, and doctoral degrees include PhD, EdD, and other doctoral degrees.

[4]Analysts disagree on whether salary regressions should control for current academic rank. Ransom and Megdal (1993), Barbezat (1991), and others advocate for excluding rank because the promotion process may incorporate discrimination, which will reduce estimates of unexplained wage gaps between faculty members. At the same time, Boudreau et al. (1997) and others contend that rank should be included because it is a good predictor of salaries and captures the quality of faculty members' work. We elected not to control for a faculty member's current academic rank, but we did run our regression models with dummy variables for full and associate professors, and results were similar. The primary difference was that the experience variable became insignificant, and the coefficient for gender decreased by .01, while the coefficient for Blacks increased by about .015.

[5]While arguments can be made for grouping marital categories differently, we grouped the 3% of cohabiting faculty with married faculty because of their similar lifestyles. We ran all analyses after grouping cohabitating faculty with divorced/sepa-

rated/widowed faculty, and the results did not differ from those reported. The divorced/separated/widowed category was one response category on the survey, so the percentages of respondents in each subcategory cannot be reported.

[6]Descriptive statistics from the disaggregated sample are available from the authors.

[7]Although the effects of discipline (as well as some other control variables) on salary may be influenced by the gender, race, and marital status of faculty members, testing for these interactions is beyond the scope of this research and would require a much greater number of degrees of freedom (see Bellas, 1994, for a study of the effects of the sex composition of disciplines on faculty salaries).

[8]Complete results are available from the authors.

[9]Had we included the 19 faculty members with salaries greater than $250,000, the coefficient for Hispanic females who are divorced/separated/widowed would be significant. This difference is due to one Hispanic male who was divorced/separated/widowed and reported a salary of $250,000. The individual reported having 50 published journal articles and 40 books at the age of 36. NSOPF:99's weighting scheme allocated more weight to this individual than to others of the same gender, race, and marital status because of his institutional affiliation. We concluded that the outlier status of this one individual would probably unduly influence the effects of Hispanic faculty who are divorced/separated/widowed and the corresponding interaction coefficients on earnings, and chose to omit faculty with salaries of $250,000 or more from the sample. With this exception, the results were virtually identical when we included all faculty members regardless of income.

[10] The results in Table 4 differ slightly from what would be obtained using the coefficients in Model 9, Table 3, because 14 faculty members reported multiple races/ethnicities. The estimated effects varied by approximately 0.010 from what are shown in Table 4.

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