10 Procedures for the Detection and Correction of Salary Inequities

Michael H. Birnbaum

This chapter presents criticisms of the usual regression analysis, as exemplified in the other chapters. A statistical paradox implies that in the absence of discrimination, women are expected to earn less than men with the same qualifications (years of experience, scholarly record, teaching performance) and simultaneously to be underqualified relative to men of the same salary. Therefore, before one can charge systematic discrimination, women must be shown not only to be underpaid relative to men of the same qualifications but also to have higher qualifications than men of the same salary. Hypothetical data, constructed without assuming any discrimination, were analyzed to show how the standard multiple regression analysis could yield the inappropriate conclusion of systematic sex bias. Two studies that had found sex bias on the basis of multiple regression were reanalyzed to show that there was no evidence of discrimination in one case and evidence of discrimination in the other.

In the second part of the chapter Birnbaum argues that an equation predicting existing salaries as a function of criteria such as years, rank, and publications may yield an unfair measure of merit by perpetuating past inequities. As a solution, he suggests that the merit equation should predict salaries that are judged equitable. In the third part of the chapter Birnbaum discusses methods for distributing raises and shows that three common methods increase or leave unchanged group and individual salary inequities. He proposes a new method which can eliminate both group and individual inequities in a few years. The proposed method eliminates group differences in salary (for the same merit) and merit (for the same salary) without requiring that individuals be identified by group.

In recent years scholars have shown increased interest in how the meager funds appropriated for higher education are distributed. This chapter discusses problems with methods recently advocated for detecting and correcting salary inequities. I will show that the only way to satisfy the Equal Pay Act of 1963 is to pay everyone according to merit. It follows that merit must be measured with great precision; accordingly methods for improving this measurement are

Thanks are due Lloyd Humphreys, Lawrence Jones, Michael Levine, Barbara Mellers, and Ledyard Tucker for suggestions.

Birnbaum, M. H. (1979). Procedures for the detection and correction of salary inequities. In T. R. Pezzullo and B. E. Brittingham (Eds.), *Salary Equity: Detecting and Estimating Sex Bias in Salaries Among College and University Professors*. Lexington, Mass.: Lexington Books, p. 121-144.

suggested. I demonstrate that raises computed as percentage increases based on merit actually increase group differences and individual inequities and present a superior algorithm for assigning salary increases according to merit. This method eliminates sex differentials and individual inequities without violating the Equal Pay Act or psychological considerations of equity.

Analysis of Group-Related Inequities

Most investigators agree that it would be inappropriate to argue for the existence of sex discrimination in university salaries if men make more money on the average than women, since men tend to have published more, have greater seniority and experience, and score higher on other objective merit criteria. Multiple regression promises to allow comparisons between groups that statistically hold constant the differences on measurable merit variables.

Typical Regression Analysis

Current uses of multiple regression for investigating salaries may be misleading, and actions based on the results of such analyses may be misguided or even illegal. A typical application is as follows. First, a regression equation is developed to predict the salaries of white males from a linear composite of measurable merit indices such as number of journal articles published, number of books, ratings of teaching, and years of experience. Then the salaries of females (or other groups) are computed from the equation and compared with their actual salaries. Some have suggested that if the actual salary of a female is far below its predicted value, the salary should be increased (Nevill, 1975; Scott, 1977; Braskamp, Muffo, and Langston, 1978).

The typical finding is that women are lower in both salary and indices of merit than men. Even after regression analyses are performed, the average salary of women is found to be lower than that of comparable men. In other words, sex is still a predictor of salary after multiple merit variables have been used (Bayer and Astin, 1975; Bergman and Maxfield, 1975; Braskamp, Muffo, and Langston, 1976; Ferber and Loeb, 1977; Gordon, Morton, and Braden, 1974; Johnson and Stafford, 1974; Katz, 1973; Koch and Chizmar, 1976; Malkiel and Malkiel, 1973; Reagan and Maynard, 1974; Scott, 1977; Tuckman and Tuckman, 1976).

The regression coefficient for group membership, the average difference in salary between groups holding merit constant, is generally interpreted to represent inequity. Various substantive interpretations have been given, including sex discrimination, differential mobility (hence differential use of counteroffers to raise salary), market factors, differential criteria of evaluation for different groups, and so forth.

Another Type of Analysis

Another analysis studies people of the same salary and compares their indices of merit. People of the same salary should be of equal merit, according to this paradigm. Suppose that with salary held constant, women were lower in merit than men? This might generally be believed to indicate reverse discrimination, possibly arising from affirmative action. Neither of these analyses can be interpreted so simply. It may be possible that with merit held constant, women earn less; yet for the same data women may have fewer publications and less experience than men of the same salary.

Galton's Paradox

The reader who is puzzled by this possibility is in good company. Legend has it that no less a genius than Francis Galton was puzzled by a similar problem when he compared the heights of children and their parents (Miller, 1962). Galton found that the sons of tall fathers were taller than average but shorter than their fathers; he first thought perhaps people were getting smaller. Then he found that the sons of short fathers were shorter than average but taller than their fathers and thought that perhaps everyone was approaching the same height, regressing to the mean. Then he found that the fathers of short sons were taller than the sons and that the fathers of tall sons were shorter than their sons. How can it be that fathers of tall sons are shorter than their sons and, simultaneously, that sons of tall fathers are shorter than their fathers? Galton was as puzzled about this seeming contradiction as people are today when they study salary inequities. How can it be that with qualifications held constant women receive less salary than men and that with salary held constant women are less qualified?

The answer to both questions lies in part in understanding that when correlations between variables are less than perfect, the least-squares prediction of one variable based on another is always close to the mean of the predicted variable. One cannot simply invert the regression equation for predicting fathers from sons to obtain the equation for predicting sons from fathers. The relevance of these arguments to the study of salaries can be made explicit by considering the implications of a one-factor theory of salary and merit that assumes no sex discrimination.

A Null Hypothesis for Equity Research

An individual's salary is said to be equitable if it has the same standing in the distribution of salaries as the individual's quality relative to the distribution of quality. If two people have the same quality they should have the same pay; if two people differ in quality, the person with the greater quality should receive greater pay.

Before one charges group-related inequity, one should show that the data permit rejection of the null hypothesis that groups are treated equivalently. I will show that multiple regression outcomes taken as evidence of inequity are predicted by the theory that salaries depend only on quality.

Suppose that there are three variables, sex (*X*), salary ($), and a weighted composite of measured merit indices, called merit (*M*) for short. (The nature of the merit variable is not crucial to this argument. It may be defined by armchair considerations, derived from multiple regression analysis of the majority group, or bootstrapped from judgments of hypothetical faculty.) Suppose that one factor, quality (*Q*), underlies all the intercorrelations among these three variables. In other words, the same equations predict salary and merit from quality, $\hat{\$} = f(Q)$, $\hat{M} = g(Q)$, independent of sex. Suppose for simplicity, that the equations are linear.

$$\begin{aligned} z(\$_i) &= q_\$ z(Q_i) + s_i \\ z(M_i) &= q_m z(Q_i) + m_i \end{aligned} \tag{10.1}$$

where $z(\$_i)$ and $z(M_i)$ are standard scores of salary and merit for case *i*; that is,

$$\begin{aligned} z(\$_i) &= (\$_i - \mu_\$)/\sigma_\$ \\ z(M_i) &= (M_i - \mu_M)/\sigma_M \end{aligned}$$

μ and σ represent mean and standard deviation; $z(Q_i)$ is the standard score of quality for case *i;* $q_\$$ is the correlation between merit and quality. The residuals s_i and m_i are uncorrelated with quality.

If the residuals *s* and *m* are uncorrelated with each other and are uncorrelated with sex, a theory of discrimination would not be required in order to reproduce the correlations among the observed variables. It follows that the intercorrelation between each pair of variables can be expressed as the product of the correlations between the variables and quality. That is, for $k \neq j$ the correlation, ρ_{kj}, is given by the product

$$\rho_{kj} = q_k q_j \tag{10.2}$$

We can represent the three variables in the following arrangement.

$$\begin{bmatrix} q_\$ \\ q_M \\ q_X \end{bmatrix} \begin{bmatrix} q_\$ & q_M & q_X \end{bmatrix} = \begin{array}{cc} \begin{array}{ccc} \$ & M & X \end{array} & \\ \begin{bmatrix} - & q_\$ q_M & q_\$ q_X \\ - & - & q_X q_M \\ - & - & - \end{bmatrix} & \begin{array}{c} \$ \\ M \\ X \end{array} \end{array}$$

where the diagonal and the lower triangular portion of the matrix have been left blank for clarity.

If the correlations among the variables can be accounted for by the extent to which the variables correlate with quality, one would not need to postulate a discrimination or inequity factor to account for the correlation between salary and sex. The model does not require the assumption or denial of any causal relationships among the variables. Sex differences in quality may be due to social or biological causes or may represent chance differences not worthy of causal interpretation; the statistical analysis requires no causal assumptions, nor does it test them. Unless the variables have been experimentally manipulated, it is premature to make causal interpretations of regression equations.

Implications. The null hypothesis of equity makes specific predictions for multiple regression analyses. The least-squares regression coefficient for sex in predicting salary (in standardized scores) is given by the equation

$$\beta_{\$X \cdot M} = \frac{\rho_{\$X} - \rho_{XM}\,\rho_{M\$}}{1 - \rho^2_{XM}} \tag{10.3}$$

where $\beta_{\$X \cdot M}$ denotes the beta weight for sex (X) in a standardized multiple equation predicting salary (\$), where merit (M) is included in the prediction equation. This coefficient, $\beta_{\$X \cdot M}$, is directly proportional to the difference in salary between males and females, with merit held constant. Using substitutions from equation 10.2, which assumes that quality is the only factor, we have

$$\beta_{\$X \cdot M} = \frac{q_\$ q_X - q_X q_M q_M q_\$}{1 - (q_X q_M)^2} = \frac{q_\$ q_X (1 - q_M{}^2)}{1 - (q_X q_M)^2} = \frac{\rho_{\$X}(1 - q_M{}^2)}{1 - q_X{}^2 q_M{}^2} \tag{10.4}$$

Equation 10.4, which assumes no discrimination, implies the following conclusions.

1. If there is no correlation between sex and quality, then the coefficient for sex will be zero; that is, if $q_X = 0$, then $\beta_{\$X \cdot M} = 0$. Under this model, ρ_{XM} would also be zero, as would $\rho_{X\$}$.
2. If the relationship between measured merit and quality is perfect, then the regression coefficient for sex would be zero; that is, if $q_M = 1$ then $\beta_{\$X \cdot M} = 0$). (The distinction between measured merit M and quality is an important one. Number of publications, for example, would only be moderately correlated with a person's scholarly contribution. Most persons would agree that the number and quality of publications are imperfectly correlated.)
3. The regression coefficient, $\beta_{\$X \cdot M}$, will have the same sign as the correlation between sex and salary. It will be smaller in absolute value if the correlation between measured merit and quality is improved.

Thus *without postulating any sex-related inequity, this simple model predicts that under realistic conditions* (sex differences in merit and imperfect predictions of salary from merit), *the regression coefficient for sex is predicted to be nonzero and of the same sign as the correlation between sex and salary.*[1] Therefore the finding of past researchers that women are paid less than men of equal merit is *not* conclusive evidence against the equity null hypothesis.

The equity null hypothesis has other testable implications that permit a more appropriate analysis in the search for evidence of discrimination. Suppose we look at merit, holding salary constant. The coefficient for sex in this equation, $\beta_{MX \cdot \$}$, can have stronger interpretations when related to $\beta_{\$X \cdot M}$. The equation for this coefficient is as follows.

$$\beta_{MX \cdot \$} = \frac{\rho_{MX} - \rho_{\$M}\rho_{\$X}}{1 - \rho^2_{\$X}} \tag{10.5}$$

According to the equity null hypothesis (equation 10.1),

$$\beta_{MX \cdot \$} = \frac{q_M q_X - q_\$ q_M q_\$ q_X}{1 - (q_\$ q_X)^2} = \frac{q_M q_X\,(1 - q^2_\$)}{1 - (q_\$ q_X)^2} = \frac{\rho_{MX}\,(1 - q^2_\$)}{1 - q^2_\$\, q^2_X} \tag{10.6}$$

Equation 10.6 implies that if quality explains the intercorrelations among the variables, then the regression coefficient for sex in predicting merit with salary in the equation should have the same sign as the correlation between measured merit and sex. Thus, if men have higher merit than women of the same salary, it might appear to constitute evidence of discrimination in favor of females, but it is not necessarily, no more than a positive $\beta_{\$X \cdot M}$ implies discrimination in favor of males.

Equations 10.4 and 10.6 show that the sex differences in regression intercepts depend on the loadings of the predictor variables. The salary differences with merit held constant can be zero only if measured merit correlates perfectly with quality; otherwise it varies inversely with q_M. Ironically *the worse the measurement of merit in a study, if one assumes no discrimination, the greater the apparent discrimination when measured by multiple regression.* The merit difference with salary held constant can be zero only if salary correlates perfectly with quality (if $q_\$ = 1$).

Diagnostic Test for Inequity. Here then is a proper method for establishing the presence of sex-based inequity. If one group is simultaneously paid less than members of the other group with the same merit *and* has greater merit than persons of the other group with the same salary, one can reject the equity model. The equity model implies that the effect of sex in both regressions should have the same sign as the simple correlations with sex. If the signs of these constants reverse, then another factor (such as discrimination) will be needed to account for the correlations.

Numerical Examples

Table 10-1 shows hypothetical values of quality, salary, and merit for males and females generated without assuming any sex-related inequity. Sex is a binary-valued variable (0 = female, 1 = male). The mean value of quality is greater for males than females, but there is considerable overlap in the distributions. The residual scores for salary and merit, E_1 (0 or 1) and E_2 (0, 1, or 2), are factorially combined with each other and with each value of quality. Thus E_1 and E_2 are uncorrelated with each other, with quality, and with sex. These error scores are analogous to m and s in equation 10.1, except they are not in a standard score equation. The values of salary ($) and merit ($M$) are generated by raw-score forms of equation 10.1.

$$\begin{aligned} \$_i &= 13 + 2(Q_i + E_{1i}) \\ M_i &= 10 + 10(Q_i + E_{2i}) \end{aligned} \tag{10.7}$$

where salary is in thousands of dollars and merit is a composite [such as 2 X (years of experience) + (publications in excellent journals), for example].

The correlation between sex and salary is 0.46, between sex and merit 0.40, and between salary and merit 0.67. These correlations can be reproduced by the products of the correlations of the variables with quality: 0.52, 0.88, and 0.76 for sex, salary, and merit, respectively.

Since there is no discrimination, one might have supposed that with merit held constant there would be no difference in salary. Instead, the difference is as expected on the basis of regression. For example, consider the salaries of persons of merit equal to 30. For females, these would include case numbers 3, 6, 8, 11, 13, 16, with salaries of $13,000, $15,000, $15,000, $17,000, $17,000, and $19,000. The average salary for these females is $16,000. Males with merit equal to 30 include cases numbered 20, 23, 25, and 28, with salaries of $15,000, $17,000, $17,000, and $19,000, respectively, with a mean of $17,000. Thus with merit held constant at 30, males are paid $1,000 more than females on the average.

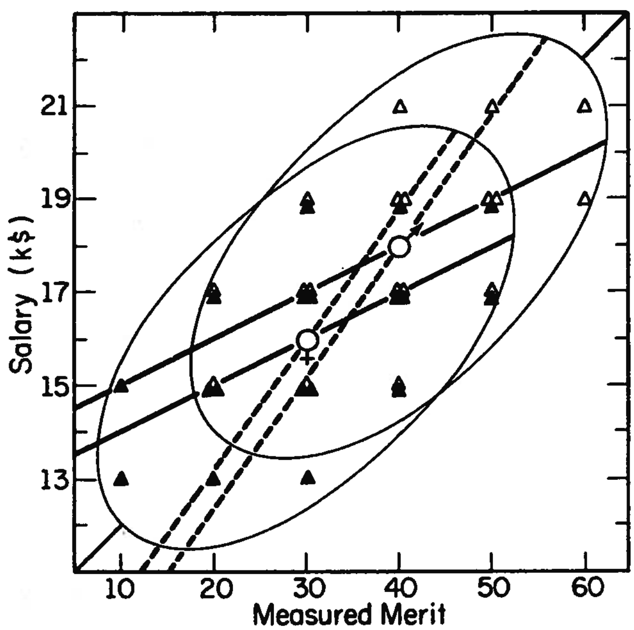
Paradoxically, a similar analysis of merit yields the seemingly contradictory conclusion that females have less merit than males of the same salary. For example, the mean merit of females earning $15,000 is only 25, compared with 30 for the males. The mean merit of women earning $19,000 is only 40, compared with 45 for the men.

Figure 10-1 plots the hypothetical data of table 10-1. Salaries are plotted

Table 10-1
Hypothetical Values of Quality, Salary, and Merit for Females and Males

Females							Males						
Case	*Sex*	*Quality*	*Errors*		*Salary*	*Merit*	*Case*	*Sex*	*Quality*	*Errors*		*Salary*	*Merit*
i	*X*	*Q*	E_1	E_2	$[a]	*M*[b]	*i*	*X*	*Q*	E_1	E_2	$[a]	*M*[b]
1	0	0	0	0	13	10	19	1	1	0	0	15	20
2	0	0	0	1	13	20	20	1	1	0	1	15	30
3	0	0	0	2	13	30	21	1	1	0	2	15	40
4	0	0	1	0	15	10	22	1	1	1	0	17	20
5	0	0	1	1	15	20	23	1	1	1	1	17	30
6	0	0	1	2	15	30	24	1	1	1	2	17	40
7	0	1	0	0	15	20	25	1	2	0	0	17	30
8	0	1	0	1	15	30	26	1	2	0	1	17	40
9	0	1	0	2	15	40	27	1	2	0	2	17	50
10	0	1	1	0	17	20	28	1	2	1	0	19	30
11	0	1	1	1	17	30	29	1	2	1	1	19	40
12	0	1	1	2	17	40	30	1	2	1	2	19	50
13	0	2	0	0	17	30	31	1	3	0	0	19	40
14	0	2	0	1	17	40	32	1	3	0	1	19	50
15	0	2	0	2	17	50	33	1	3	0	2	19	60
16	0	2	1	0	19	30	34	1	3	1	0	21	40
17	0	2	1	1	19	40	35	1	3	1	1	21	50
18	0	2	1	2	19	50	36	1	3	1	2	21	60
Mean		1	0.5	1	16	30			2	0.5	1	18	40

[a]$ = 13 + 2 × (quality + E_1).
[b]M = 10 + 10 × (quality + E_2).



Note: Solid triangles represent females; open triangles represent males. Points that would have coincided have been shifted slightly. Centroids for the two groups are represented by the sex symbols. Solid lines represent the least-squares regression equation predicting salary from sex and merit. Dashed lines show least-squares regression lines predicting merit from salary and sex. The ellipses are drawn for artistic purposes, to help distinguish the scatter of points for the two groups.

Figure 10-1. Salary Plotted against Merit for Hypothetical Data of Table 10-1.

against merit, with solid triangles for females and open triangles for males. The sex symbols represent the centroids for the two groups. Ellipses have been drawn to help identify the two groups. Note that the male scatter plot can be produced by shifting the female scatter plot up along the 45° diagonal axis in figure 10-1. The solid regression lines represent the least-squares equation for predicting salary from merit and sex. In raw-score form the equation is

$$\hat{\$}_i = 13 + 1X_i + 0.1M_i \tag{10.8}$$

where $\hat{\$}_i$, X_i, and M_i are raw scores for case i, with predicted salary $\hat{\$}_i$ measured in thousands of dollars. Note that females ($X = 0$) are paid \$1,000 less on the average than males ($X = 1$).

The dashed lines in figure 10-1 show the least-squares predictions of merit from sex and salary. The equation is as follows.

$$\hat{M}_i = -28.18 + 2.73X_i + 3.64\$_i \tag{10.9}$$

where $\hat{M}_i$ is predicted merit. Note that women ($X = 0$) have less merit (2.73 less) than men of the same salary. This example shows that it would have been inappropriate to argue for sex-related inequity on the basis of a difference in salary between women and men of the same merit.

Figure 10-1, representing a situation without a sex-related inequity, shows what can happen when salaries are adjusted on the assumption that females should be paid the same as the average male of the same merit. Eleven females fall below the males' regression line for salary (upper solid line). Presumably these eleven could have their salaries adjusted upward. However, note that four of these eleven cases have less merit than the average male of the same salary. To adjust their salaries and not those of the corresponding males would not be fair or legal.

A more appropriate method for adjusting inequitable salaries would be to identify persons of both sexes who are underpaid relative to colleagues of the same merit *and* have greater merit than colleagues of the same salary. Cases 3, 9, 15, 21, 27, and 33 satisfy these criteria (lowest and rightmost points in figure 10-1). Note that in this example, which assumed no discrimination, an equal proportion of males and females are identified as deserving salary adjustments.

To understand how a sex inequity would be detected, add $1,000 to all the men's salaries in table 10-1 and figure 10-1. The males' centroid in figure 10-1 would move above the dashed line representing the females' merit line. Thus males would now have less merit than females of the same salary—clear evidence against the equity null hypothesis. Indeed the least-squares regression equation for merit becomes

$$\hat{M}_i = -28.18 - 0.91X_i + 3.64\$_i \tag{10.10}$$

The coefficient for sex is now negative, showing that women have greater merit than men of the same salary. Therefore equation 10.1 could be rejected. Under these conditions nine females would be identified as both high in merit and underpaid, cases 2, 3, 6, 8, 9, 12, 14, 15, and 18. The same three males as before (21, 27, and 33) would be underpaid by the same standard.

As a final point, consider the effects of adding $1,000 to the salaries of all the women in table 10-1 and figure 10-1. Multiple regression would detect no difference in intercepts between males and females, predicting salary from merit. However, examination of figure 10-1 shows that the difference in merit for persons of the same salary would approximately double! Of persons who have the same salary, the average male will have 3.18 additional years of experience (or 6.36 additional publications) than the average female of the same salary. The elimination of a sex differential in salary in this way has the unfortunate effect of increasing the sex differential in merit for persons of the same salary.

Table 10-2 shows a hypothetical correlation matrix consistent with the absence of sex-based inequality. Notice that each off-diagonal intercorrelation can be expressed as a product of loadings of the variables on quality (sex (X) is defined so that males have a higher score). Note that the two regression analyses

Table 10-2
Hypothetical Intercorrelations and Quality Loadings for Equitable Example

Quality Model		*Off-Diagonal Correlation Matrix*
$$\begin{array}{c} \\ \$ \\ M \\ X \end{array}\begin{array}{c} \\ \begin{bmatrix} 0.8 \\ 0.9 \\ 0.3 \end{bmatrix} \end{array}\begin{array}{ccc} \$ & M & X \\ [0.8 & 0.9 & 0.3] \\ & & \\ & & \end{array}$$	$=$	$$\begin{array}{ccc} \$ & M & X \\ \end{array}\begin{bmatrix} & 0.72 & 0.24 \\ & & 0.27 \\ & & \end{bmatrix}\begin{array}{c} \$ \\ M \\ X \end{array}$$

would lead to the seemingly paradoxical conclusions that women are paid less than equally qualified males ($\beta_{\$X \cdot M} = 0.05$) but are less qualified than equally paid males ($\beta_{MX \cdot \$} = 0.05$).

Table 10-3 shows a hypothetical correlation matrix in which two of the three entries are the same as in table 10-2, yet discrimination exists. The second factor represents discrimination. Note that the 0.24 correlation between sex and salary cannot be explained in terms of quality but depends on discrimination as well. In this case women are paid less than men of the same merit ($\beta_{\$X \cdot M} = 0.18$), but women have greater merit than men of the same salary ($\beta_{MX \cdot \$} = -0.10$).

The one-factor model implies that the ratio of the correlation between sex and salary to the correlation between sex and merit is bounded by the correlation between salary and merit and its reciprocal. The relationship is as follows.

$$\rho_{M\$} \leqslant \frac{\rho_{X\$}}{\rho_{XM}} \leqslant \frac{1}{\rho_{M\$}} \tag{10.11}$$

since

$$q_M q_\$ \leqslant \frac{q_\$}{q_M} \leqslant \frac{1}{q_M q_\$}$$

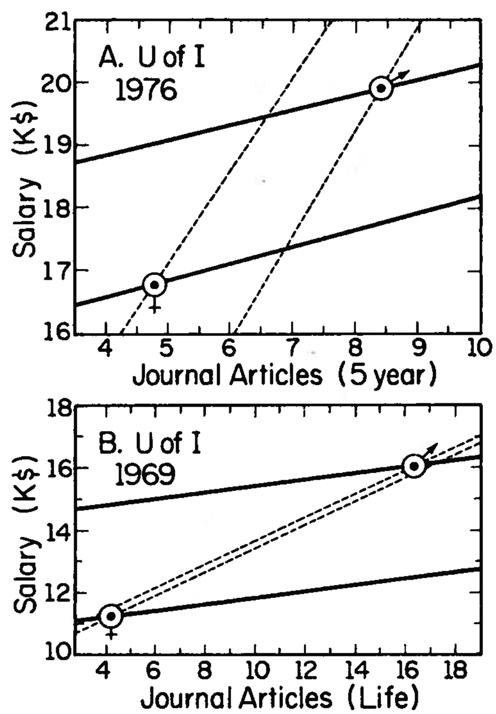
Table 10-3
Example of Evidence for Inequity

Two-Factor Model		*Off-Diagonal Correlation Matrix*
$$\begin{array}{c} \$ \\ M \\ X \end{array}\begin{bmatrix} 0.8 & 0.4 \\ 0.9 & 0 \\ 0.1 & 0.4 \end{bmatrix}\begin{bmatrix} 0.8 & 0.9 & 0.1 \\ 0.4 & 0 & 0.4 \end{bmatrix}$$	$=$	$$\begin{array}{ccc} \$ & M & X \end{array}\begin{bmatrix} & 0.72 & 0.24 \\ & & 0.09 \\ & & \end{bmatrix}\begin{array}{c} \$ \\ M \\ X \end{array}$$

When the ratio equals $\rho_{M\$}$, then $q_M = 1$; when it equals $1/\rho_{M\$}$, then $q_\$ = 1$. The greater the correlation between merit and salary, the smaller the region in which the one-factor model would be acceptable. In table 10-3, $\rho_{\$X}/\rho_{MX} = 2.67$, which is outside the region from 0.72 to 1.39; therefore the one-factor model cannot describe the data of table 10-3.

Illustrative Empirical Examples

Figure 10-2 shows reanalyses of two studies conducted seven years apart at the University of Illinois. The raw data for these studies are not available, and some ingenuity was required to recover the information in figure 10-2 from the limited statistics presented in the original reports. Figure 10-2A shows 1976 salaries for 153 females and 119 males "matched" by department (Braskamp, Muffo, and Langston, 1976). The solid lines are the regression lines predicting



Note: (A) Solid lines for 1976 salaries show that males are paid more than females with equal number of publications in five years. Dashed lines show that males have published more articles per five years than females of equal pay. Based on statistics reported by Braskamp, Muffo, and Langston (1976). There is no evidence in panel A to reject the equity null hypothesis. (B) 1969 salaries are inconsistent with the one-factor hypothesis. Based on statistics reported by Katz (1971).

Figure 10-2. Reanalyses of Two Salary Studies at the University of Illinois, 1976 and 1969.

salary from number of publications with a separate line for each sex. The vertical spread between the curves shows that on the average males are paid about $2,000 more than females with the same number of publications. The dashed lines predict number of publications (per five years) from salary—the horizontal spread between the curves shows that females publish about two fewer articles per five years than males who receive the same salary. One would expect women in a discriminatory situation to have published more than men with the same salaries. Figure 10-2A thus shows no evidence to reject the one-factor null hypothesis; there is no evidence for group-related inequity. Similar conclusions were reached using a composite index that included linear and nonlinear functions of eleven indices of merit, including years of professional experience and grant dollars.

Ironically the University of Illinois decided on the basis of the typical but incomplete analysis to provide special funds as equity adjustments for females only. This action, even had the data shown evidence of discrimination, would apparently violate the Equal Pay Act of 1963, since underpaid males were not eligible for the equity review.

Figure 10-2B plots a reanalysis of data presented by Katz (1971), a portion of which were published later (Katz, 1973). If the regression lines for males and females are assumed to be linear and parallel, these 1969 salaries are inconsistent with the equity null hypothesis. Extrapolation of the dashed curves shows that the merit line for females lies to the right of that for males. Thus females published half an article more than males of comparable salary in 1969. Analyses of compositics including other merit variables yielded similar conclusions.

In sum, when data of two studies were reanalyzed using the diagnostic test, the conclusions changed in one case and not in the other. Thus there is a real danger that studies claiming to have demonstrated systematic sex bias could have their conclusions altered by the appropriate reanalysis.

Group versus Individual Inequity

The preceding arguments show that in the absence of sex discrimination, one should expect men to receive higher average salaries than women of the same merit. Similarly one should expect men to have greater merit than women of the same salary. Most persons feel that such results (as in figure 10-2A) are evidence of inequity—and they are right. Individual inequities, produced by a lack of perfect correlation between salary and merit, produce these paradoxical group differences. There is no way to eliminate these paradoxical group differentials in merit and salary without either eliminating group differences in both merit and salary (fire women of low merit or men of high merit until there is no sex difference in merit?) or produce a perfect correlation between measured merit and salary.

If the Equal Pay Act of 1963 requires that men and women of identical merit receive equal pay and also that men and women of equal pay have equal merit, then the law requires a perfect monotonic relationship between salary and merit. Otherwise individual inequities within sex will result in apparent evidence of sex discrimination. Administrators must face the challenge of measuring merit in a precise way and of paying everyone, regardless of group membership, according to the same standards. If the universities do not establish academically sound definitions of merit, the government may force its own definitions on the universities.

If salaries and measured merit are to be perfectly correlated, then the measurement of merit will have to be improved. The next section describes how merit can be measured, and the third section shows how to raise salaries to eliminate both group and individual inequities.

Improving Measures of Merit

Modeling Existing Salaries

Multiple regression of existing salaries may be used to identify persons of both sexes who fall short of the regression equation, for possible correction. This proposal asks that everyone be paid according to whatever equation best predicts existing salaries. It is reasonable to suspect that a multiple linear combination of merit indices has a higher correlation with quality than does salary, so this proposal has some appeal.

By deriving the definition of merit from existing salaries, however, multiple regression may perpetuate past inequities. For example, if "good old boys" earn more and publish less, publications may turn out to have a negative weight in predicting salaries if scholars and good old boys are mixed together in the analysis.[2] Yet most people feel that it would not be equitable to define merit with a negative weight for publications, so that a person receives less for publishing more.

Katz (1971) found that psychologists at the University of Illinois received $209 per year more for each article published in an excellent journal and $33 less per year for each article in a less-than-excellent journal, although both types of publications were positively correlated with salary. Such an effect may represent a "correction" for quality of publications: faculty who have a low threshold for submitting papers for publication may have large numbers of both types of articles, and the quality of their excellent journal publications may be uneven. It may also represent one of the mysterious ways that multiple regression can select weights when variables are highly correlated.

It does not seem appropriate to allow the multiple regression equation to select optimal weights for predicting current salaries if the weights cannot be defended as leading to psychologically "just" measures of merit for all cases.[3]

Clinically Judged versus Statistically Computed Merit

It could be argued that intuitive ratings of quality made by a committee or by a department chairman should be used instead of computations based on measured merit. One may think that a person could take into account quality differences that are difficult to measure. However, when clinical judgments and objective calculations are compared, objective calculations have been found to be superior in reliability and validity (Sawyer, 1966; Dawes, 1976).

What makes a department head think that he or she can arrive at a better assessment of someone's scholarly contribution by reading a vita and letters of evaluation than by counting the number of publications in refereed journals? Editors and reviewers spend many hours studying each paper before accepting it. By taking a journal's reputation into account, as Katz did (1973), the objective formula can process the previous judgments of others who are usually more suited to make the evaluation in a reliable fashion. Dawes (1976) has called the judge's (in this case, the head's) confidence in his or her own information-processing capacities a "cognitive conceit." As bad as objective indices of merit are for measuring quality, more than sixty studies suggest that clinical judgments would be worse (Dawes, 1976; Sawyer, 1966).

Assessments of merit based on functions of objective criteria have, in addition to their greater reliability and validity, four other advantages over clinical evaluations. First, the employee will not feel that the assessments are affected by the personal biases of his colleagues. Second, the employee will not be surprised by the assessment. Third, the employee will understand how to raise the assessment. Fourth, objective measures are easier to document in lawsuits or government actions in connection with the Equal Pay Act.

Bootstrapping Subjective Judgments of Equitable Salaries

A system that uses judges to derive merit measures that are fair and uses an objective formula to measure merit for individuals seems to combine the best of both worlds. Such a system can be achieved by means of a variation of what has been termed bootstrapping in the judgment literature.

The procedure would be as follows. First a committee would meet to discuss merit and decide which variables should contribute to the definition of merit. Then a number of hypothetical faculty profiles would be constructed from a factorial design of merit values, and faculty judges would propose fair salaries for these hypothetical faculty. These judges would have to ask themselves questions such as, Should a person with one year of experience and five excellent publications earn more than a person with five years of experience and one excellent publication? Of course, different judges would be expected to have different opinions. For each hypothetical faculty member, the median salary judgment should be calculated. (Galton pointed out that the median is a good number to use for such purposes, since half the judges advocate paying the person more and half say less.)

Then procedures for model diagnosis can be used to define a function F to best predict the median judgments,

$$\hat{M} = F(X_1, X_2, X_3, \ldots, X_p) \tag{10.12}$$

where $\hat{M}$ is the calculated merit from merit variables $X_1, X_2, X_3, \ldots, X_p$ that best predicts the median "fair salary" judgments; F is the function that transforms, weights, and combines the merit variables.

Three Faces of Equity

The function F relating median judged salary to components of merit can be profitably decomposed into three psychological processes (see, for example, Birnbaum, 1974a, 1974b), as follows.

$$M = J[I(H_1(X_1), H_2(X_2), \ldots)] \tag{10.13}$$

where $\hat{M}$ is the predicted judged value, J is an equity judgment function that matches salary to merit, I is an integration function that combines measures of merit to form an overall assessment of merit, and the H_i functions are transformations relating subjective merit to each of the objective measures of merit.

Each of these processes can be illustrated by the following examples:

1. The question of the linearity of H for publications is illustrated by the question, Should the effect of the difference between five publications and ten be equivalent to the difference between ten and fifteen?
2. The I function, which combines the (transformed) measures of merit can be illustrated by questions involving trade-offs of values among sets of variables, for example, Should the difference in merit between five and ten publications be the same for all levels of experience? Should a person with one year of experience and five publications be paid more than a person with five years of experience and one publication?
3. Once merit is defined, there remains the problem of establishing an equitable distribution of salaries. The assignment of salaries to merit is accomplished by means of J. Most persons would agree that J should be a monotonic increasing function, and many would also argue that differences in salary should be proportional to differences in merit. But many J

functions are compatible with these ideas, even subject to the constraints that J be linear and that the total of salaries is fixed by the budget. For example, everyone could be paid the mean salary plus αZ_M where α is any constant and Z_M is the Z-score for merit. With α close to zero, however, it would seem unfair that large changes in merit would not be rewarded by large changes in salary. The cross-modality matching of salary to merit is a complicated process worthy of empirical investigation. For example, should a person with ten publications and two years of experience be paid twice as much as someone with five publications and one year of experience?

Example

Table 10-4 shows a simple example of the type of analysis that can be performed in order to measure merit. Entries in table 10-4 represent judgments of a single faculty member who named a fair salary for each of twenty-five hypothetical new faculty members described by years of experience and publication rate. It was then discovered that the equation

$$\text{Merit} = 14 + 0.25 \text{ years} \times (1 + \text{publication rate}) \tag{10.14}$$

described the judgments well, except for the person with twenty years of experience and 3.0 publications per year, where a "mistake" of \$10,000 was made. For this case the equation seems better than the judge.

According to this judge, it is better to have published forty articles with ten years of experience than to have published fifteen articles in thirty years. A person with ninety publications and thirty years of experience "deserves" to earn about twice as much as a person with twenty publications and ten years of experience, even though the objective indices are more than three times as great.

This approach could be extended to include all the relevant variables such as service and teaching. This problem will not be an easy one to solve, but its

Table 10-4
Judged Salaries "Deserved"

Average Publications per Year	*Years of Experience*				
	1	*5*	*10*	*20*	*30*
0.5	14	15	17	21	25
1.0	14.5	16	19	24	29
2.0	14.8	18	22	29	36
3.0	15.0	19	24	24	44
4.0	15.2	20	27	39	51
5.0	15.5	22	29	44	60

solution is long overdue, on the basis of both equity considerations and legal requirements.

Once the equation for merit has been developed, it is possible to calculate the salary deserved for each individual. The problem then is how to distribute salary increases according to merit to achieve equity.

Methods for Salary Increment to Achieve Equity

This section describes three general models for distributing salary according to merit. The three models have different implications for the growth of salary as a function of time, for considerations of equity, and for the Equal Pay Act.

Salary equity is defined as follows. Equity exists in a community if for all members of the community, salary is a perfect monotone function of merit. The present definition is a more general and weaker statement than previous definitions considered by psychologists (Adams, 1965; Anderson, 1976; Harris, 1976; Walster, Bersheid, and Walster, 1973), which assert that salary should be proportional to merit.

Merit is an inclusive term that is presumed to depend on a variety of factors including years of professional experience, quality of scholarly contribution, service, impact, and recognition.

Inequity is said to exist if two individuals of identical merit receive different salaries, if two individuals of different merit receive the same salary, or if a person with lower merit receives a higher salary than a person of higher merit. Inequities are produced not only when an individual's salary jumps because an offer from an outside institution is matched but also when someone increases in merit. The person who started with higher merit and stopped working will tend to have a higher salary under most systems than a person of equal merit who increased his merit slowly. Inequities are also produced by hiring persons of lower merit at higher salaries.

In all the following models let M_i = merit for individual i, $\$_i$ = salary for individual i for the present year, and Δ_i = the salary increment to be given this year (next year's salary = $\$_i + \Delta_i$).

Absolute Increment System

The absolute increment is a monotone function g of merit.

$$\Delta_i = g(M_i) \tag{10.15}$$

Present salary has no effect on the raise, except inasmuch as merit and salary are correlated. Two people with the same merit (even with different salaries) receive the same raises. This system neither removes nor inflates differences in salary between two persons of the same merit.

Relative Merit System

In the widely used relative merit system the percentage increase depends on merit, where $p(M_i)$ is the percentage raise.

$$\Delta_i = p(M_i)\$_i \tag{10.16}$$

Note that the increase is the product of merit and salary. If two people have the same merit but different salaries, the relative system gives a larger raise to the person with the higher salary. This system tends to inflate inequitable differences in salary between persons of equal merit.

An Equitable System

The following system can reduce and eventually eliminate inequities. The equation is as follows.

$$\Delta_i = a[f(M_i) - \$_i] + g(M_i) \tag{10.17}$$

where f and g are monotonic functions; a is a constant (the ratio of new budget money divided by total inequities). The expression $a[f(M_i) - \$_i]$ has the effect of reducing inequities in salary. If two people have equal merit but different salaries, the person with the lower salary receives the greater raise in this system. If two people have equal salaries and different merits, the person with the greater merit receives the greater raise. The expression $g(M_i)$ gives an additional increment due to merit only. When $f(M_i) = \$_i$ for all individuals, the system becomes formally equivalent to both absolute and relative merit systems, and equity is achieved. The advantage of equation 10.17 is that it can reduce inequities over time and can eventually eliminate inequities.

A simple version of equation 10.17 would let g be a linear function, that is, $g(M_i) = bM_i$. The values of a and b can then be specified as follows.

$$a = \mathrm{A}/\Sigma[f(M_i) - \$_i] \tag{10.18}$$

$$b = \mathrm{B}/\Sigma M_i \tag{10.19}$$

where A = total new budget money available for equity reduction, B is the total to be used for purely merit raises, and $\Sigma[f(M_i) - \$_i]$ is the total amount of money required to give each person a salary equal to $f(M_i)$.

Comparison of the Systems

Table 10-5 shows a comparison of the three systems for the hypothetical employees of table 10-1. For this example assume that merit has been measured precisely and is very close to the concept of quality discussed in the first two parts of this chapter. The present salaries and merits are from table 10-1, with $g(M_i) = M_i/35$. The future salaries represent salaries three years later with budget increases of 8 percent per year. For the equity method the initial equity line was defined as follows : $f(M_i) = 13{,}500 + 205M_i$. The original salaries showed considerable evidence of individual inequities, since persons of equal merit receive different salaries (cases 9 and 34) and persons of lower merit (case 34) receive higher salaries than persons of greater merit (case 15). The initial correlation between salary and merit is only 0.67.

The relative system increases inequities. In three years the difference in salary between cases 34 and 9, who are equal in merit, has grown from \$6,000 to \$7,700. Since case 9 is female, she could contend that discrimination caused the salary difference to increase. Indeed the relative system increased the average sex difference in salary, holding merit constant at 1.14, from \$1,000 to \$1,300. Procedures such as those described by Braskamp, Muffo, and Langston (1976) would perhaps raise her salary by means of a special equity payment. Unfortunately case 21, who is equal in merit to cases 9 and 34 but who is male, would not be considered for an equity increase under a system like that at Illinois. Of course case 21 could sue the university for raising the salaries for females only, in violation of the Equal Pay Act, and he would probably win (see the case of *Regents* v. *Dawes*, 1975).

The absolute system is preferable to the relative system, since differences in salary between persons of equal merit are not increased. Absolute raises do not reduce inequities, however. The \$6,000 difference between cases 34 and 9 (not to mention case 21) would remain constant under the absolute system.

The equity system eliminates all inequities in three years without lowering anyone's salary. Note that persons of the same merit have identical salaries at the end of three years. For example, cases 9, 12, 14, 17, 21, 24, 26, 29, 31, and 34, who are equal in merit, now receive \$22,400 per year, irrespective of their starting salaries. Were new faculty of lower merit hired at high salaries, were outside offers to be matched, or were some faculty to raise their merit, it would take longer than three years to achieve equity.

To study the power of the equity system, a very inequitable hypothetical department was used. In this department salaries for persons of the lowest merit ranged from \$14,000 to \$26,000; for persons of the highest merit, they ranged from \$17,000 to \$47,000. Using 60 percent of the new budget for A in equation 10.18, 40 percent for pure merit (B in equation 10.18), and assuming 8 percent budget increases per year eliminated all inequities in six years. Thus the equity method is a procedure that can realistically correct an unfair salary distribution.

Table 10-5
Comparison of Methods for Adjusting Salaries

Females						Males					
			Future Salary[a]						Future Salary[a]		
Case	*Merit g(M)*	*Present Salary*	*Relative*	*Absolute*	*Equity*[b]	*Case*	*Merit g(M)*	*Present Salary*	*Relative*	*Absolute*	*Equity*[b]
1	0.28	13	13.9	14.2	16.1	19	0.57	15	17.1	17.5	18.3
2	0.57	13	14.8	15.5	18.3	20	0.86	15	18.2	18.8	20.4
3	0.86	13	15.8	16.8	20.4	21	1.14	15	19.3	20.0	22.4
4	0.28	15	16.0	16.2	16.1	22	0.57	17	19.3	19.5	18.3
5	0.57	15	17.1	17.5	18.3	23	0.86	17	20.6	20.8	20.4
6	0.86	15	18.2	18.8	20.4	24	1.14	17	21.9	22.0	22.4
7	0.57	15	17.1	17.5	18.3	25	0.86	17	20.6	20.8	20.4
8	0.86	15	18.2	18.8	20.4	26	1.14	17	21.9	22.0	22.4
9	1.14	15	19.3	20.0	22.4	27	1.43	17	23.2	23.3	24.6
10	0.57	17	19.3	19.5	18.3	28	0.86	19	23.0	22.8	20.4
11	0.86	17	20.6	20.8	20.4	29	1.14	19	24.4	24.0	22.4
12	1.14	17	21.9	22.0	22.4	30	1.43	19	26.0	25.3	24.6
13	0.86	17	20.6	20.8	20.4	31	1.14	19	24.4	24.0	22.4
14	1.14	17	21.9	22.0	22.4	32	1.43	19	26.0	25.3	24.6
15	1.43	17	23.2	23.3	24.6	33	1.72	19	27.6	26.6	26.7
16	0.86	19	23.0	22.8	20.4	34	1.14	21	27.0	26.0	22.4
17	1.14	19	24.4	24.0	22.4	35	1.43	21	28.7	27.3	24.6
18	1.43	19	26.0	25.3	24.6	36	1.72	21	30.5	28.6	26.7
Mean		16	19.5	19.8	20.4			18.0	23.3	23.0	22.4

[a]Future salaries assume 8 percent budget increases for three years.

[b]Equity values computed using 60 percent of budget for equity and assuming initial equity line: $f(M) = 13500 + 7143g(M)$.

Affirmative Action or Reverse Discrimination?

Recent papers have advocated procedures to be applied only to certain members of specified groups. Such procedures violate both the commonsense concept of justice and the Equal Pay Act. Such procedures are doomed to failure in any case. The procedures advocated elsewhere cannot adjust salaries in table 10-1 so that males and females of the same merit have the same mean salary *and* persons of the same salary have the same mean merit unless all individual inequities are eliminated.

The equity method described here seems vastly preferable to such discriminatory affirmative action techniques, because it treats members of all groups equally yet eliminates group differences in salary (for fixed merit) and merit (for fixed salary). Table 10-5 shows that one can eliminate group differences without discriminating. This method may prove extremely useful for calculating timetables for affirmative action goals that can be realized without injustice. Unless salaries are raised on the basis of equity considerations for all individuals, however, nondiscriminatory mechanisms such as percentage merit increases will inflate individual inequities and paradoxical group differences.

Summary

If one group scores lower on both salary and measurable merit and if regression analysis indicates that members of this group have lower salaries than predicted from measured merit variables, one should not automatically infer group-related inequity. Any individual whose salary falls short of that of colleagues with equal merit *and* whose merit exceeds that of colleagues with equal salary seems most deserving of an equity adjustment. It is not possible to eliminate paradoxical group differences in salary (holding merit constant) and merit (holding salary constant) without eliminating all individual inequities, that is, without producing a perfect monotone relationship between merit and salary.

The following procedures are suggested for salary equity studies. First, establish a measure of merit. Merit should be based on a composite of such indices as years of experience and publication record. Although merit could be the clinical judgment of a department head or the result of a computation based on a multiple regression equation designed to model existing salaries, merit should be defined by the formula that best reproduces judgments of equitable salaries for hypothetical cases. Second, to detect group bias, study both the difference in merit between the groups holding salary constant and the difference in salary holding merit constant. Third, to remove inequities, one should distribute raises on the basis of both merit and the difference between salary deserved on the basis of merit and actual salary. If applied to all individuals, this method eliminates both individual and group-related inequities in a reasonable time period.

Notes

1. Lord (1967) pointed out a similar paradox, in which analysis of covariance showed that boys' weights exceeded girls' weights even though there was no average weight gain for either group and initial weight was used as a covariate to adjust final weights. In figure 1 of Lord (1967) both correlation ellipses fall on the same principal axis, consistent with equation 10.1. Therefore equation 10.3 shows why analysis of covariance could not remove Lord's group difference.

2. "Good old boy" refers to a person who can succeed on the basis of factors unrelated to merit or quality of performance.

3. The statistical arguments presented here have relevance for other applications of multiple regression. For example, the one-factor hypothesis would be an attractive definition of test fairness because it resolves the apparent contradictions among the four models considered by Darlington (1971), which are unnecessarily restrictive special cases of equation 10.1. Multiple regression has frequently been misused to argue for multiple causation, without testing the one-factor model (Brewer, Campbell, and Crano, 1970). Unless all the variables have been independently experimentally manipulated, it is inappropriate to argue for multiple causes.

References

Adams, J.S. "Inequity in Social Exchange." In *Advances in Experimental Social* mbmbmbmbmbmbmbmbmbmbm

Anderson, N.H. "Equity Judgments as Information Integration." *Journal of Personality and Social Psychology* 33 (1976):291-299.

Bayer, A.E., and Astin, H.S. "Sex Differentials in the Academic Reward System." *Science* 188 (1975):796-802.

Bergmann, B.R., and Maxfield, M. "How to Analyze the Fairness of Faculty Women's Salaries on Your Own Campus." *AAUP Bulletin* 61 (1975):262-265.

Birnbaum, M.H. (a) "The Nonadditivity of Personality Impressions." *Journal of Experimental Psychology* 102 (1974):537-539.

Birnbaum, M.H. (b) "Reply to the Devil's Advocates: Don't Confound Model Testing and Measurement." *Psychological Bulletin* 81 (1974):854-859.

Braskamp, L.A., Muffo, J.A., and Langston, I.W. "1976 Salary Equity Study University of Illinois at Urbana-Champaign," 1976.

Braskamp, L.A., Muffo, J.A., Langston, I.W. "Determining Salary Equity: Policies, Procedures, and Problems. *Journal of Higher Education* 49 (1978):231-246.

Brewer, M.B., Campbell, D.T., and Crano, W.D. "Testing a Single-Factor Model as an alternative to the Misuse of Partial Correlations in Hypothesis-Testing Research." *Sociometry* 33 (1970):1-11.

Darlington, R.B. "Another Look at 'Cultural Fairness.' " *Journal of Educational Measurement* 8 (1971):71-82.

Dawes, R.M. "Shallow Psychology." In *Cognition and Social Behavior,* ed. J.S. Carroll and J.W. Payne. Hillsdale, N.J.: Erlbaum, 1976.

Ferber, M., and Loeb, J. "Rank, Pay, and Representation of Women on the Faculty at the Urbana-Champaign Campus at the University of Illinois : A Reappraisal," 1977.

Gordon, N.M., Morton, T.E., and Braden, I.C. "Faculty Salaries : Is There Discrimination by Sex, Race, and Discipline?" *American Economic Review* 64 (1974):419-427.

Harris, R.J. "Handling Negative Inputs : On the Plausible Equity Formulae." *Journal of Experimental Social Psychology* 12 (1976):194-209.

Johnson, G.E., and Stafford, F.P. "The Earning and Promotion of Women Faculty." *American Economic Review* 64 (1974):888-903.

Katz, D.A. "The Determinants of Faculty Salaries and Rates of Promotion at a Large University." Doctoral Dissertation, University of Illinois, Urbana-Champaign, 1971.

Katz, D.A. Faculty Salaries, Promotions, and Productivity at a Large University. *American Economic Review* 63 (1973):469-477.

Koch, J.V., and Chizmar, J.F. *The Economics of Affirmative Action.* Lexington, Mass.: Lexington Books, D.C. Heath and Company, 1976.

Lord, F.M. "A Paradox in the Interpretation of Group Comparisons." *Psychological Bulletin* 68 (1967):304-305.

Malkiel, B.G., and Malkiel, J.A. "Male-Female Pay Differentials in Professional Employment." *American Economic Review* 63 (1973):693-705.

Miller, G.A. *Psychology: The Science of Mental Life.* New York: Harper & Row, 1962, pp. 129-146.

Nevill, D.D. "Achieving Salary Equity." *Educational Record* 56 (1975):226-270.

Reagan, B.B., and Maynard, B.J. "Sex Discrimination in Universities: An Approach through Internal Labor Market Analysis." *AAUP Bulletin* 60 (1974):13-21.

Sawyer, J. "Measurement and Prediction, Clinical and Statistical," *Psychological Bulletin* 66 (1966):178-200.

Scott, E.L. *Higher Education Salary Evaluation Kit.* Washington, D.C.: American Association of University Professors, 1977.

Tuckman, B.H., and Tuckman, H.P. "The Structure of Salaries at American Universities." *Journal of Higher Education* 47 (1976):51-64.

Walster, E., Berscheid, E., and Walster, G.W. "New Directions in Equity Research." *Journal of Personality and Social Psychology* 25 (1973):151-176.