Executive Summary

The Senate Council convened a committee in November, 1997 to review the progress of all eight schools at the University toward carrying out the recommendations of the previous Gender Pay Equity Committee Final Report dated September, 1993.

Many early meetings of this committee were devoted to discussion of methodological issues involved in the appropriate analysis of gender pay equity. We contacted numerous experts on this form of analysis, including people at other universities who have recently undertaken similar studies. The chair of this committee also interviewed a number of chairs or former chairs of departments in Arts and Sciences (from the humanities, social sciences, and sciences) to gather data on criteria and methods by which salaries are determined. Considerable attention was also given to the fact that adjustments in method would have to be made for many of the different schools at Washington University, given the vastly different sizes of the faculties and criteria by which salaries are determined.

The previous assessments of gender-pay equity at Washington University used ordinary least squares regression (OLS) to model the relationship between salary and a small set of independent variables (discipline, years since terminal degree, years at Washington University, and, in some models, rank). This committee determined that it was worth asking whether models that did not include performance variables (particularly: research, teaching, and service) might be under-specified (and thus be in violation of a standard OLS assumption). To test this issue the committee decided to carry out two pilot studies to assess the value of including performance variables. Given the difficulty, time, and expense associated with collecting performance data, the committee agreed to limit the pilot studies to three social science departments (Anthropology, Political Science, and Psychology) in the school of Arts and Sciences and one department in the School of Medicine (Pediatrics). In both cases these entities were selected because sufficient numbers of women - at both the tenured and tenure-track levels - exist for meaningful analysis. A report of the pilot study for the Medical School will be included with the final report of the entire analysis of that school. The Medical School has recently converted to an entirely new salary calculation formula and
the first fiscal year for which data from all departments will have salary broken down this way is FY 2000. These data will not be available until after July 15, 2000. We wish to carry out the analysis of the entire Medical School on these new data, consequently, the Medical School portion of the report is delayed and can be anticipated in the academic year 2000-2001.

The committee broke into three sub-committees for the purpose of data analysis for each of the schools, though we held regular full committee meetings to assess progress and ensure that methods as comparable as were appropriate were being pursued across schools. The sub-committee for Arts and Sciences (Nancy Berg, Jean Ensminger, Chair, and Edward Spitznagel) worked with Lee Epstein, who oversaw the pilot study for Arts and Sciences. The reports for both the pilot study and the full study of Arts and Sciences follow below. The sub-committee that dealt with the Schools of Art, Architecture, Business, Engineering and Applied Science, Law and Social Work (Susan Appleton, Martin Israel, and Joseph O'Sullivan, Chair) produced reports on all of these schools. These reports were shared with the Dean of each school and with the Senate Council. Those reports are not reproduced here because the sample sizes of female faculty are too small to be discussed in such a way that it is possible to completely guarantee the privacy of individuals. The conclusion reached in those reports is summarized in the following paragraph. The sub-committee for the Medical School (Linda Pike, chair, and Brian Suarez) will continue their work in collaboration with a committee appointed by the Dean of the Medical School and chaired by Philip Stahl.

Conclusions

- The following pages describe in detail the findings of our studies for Arts and Sciences. To the extent that sample sizes allowed, we attempted to follow similar methods in the other schools of the university. We conclude that for the Schools of Arts & Sciences, Art, Architecture, Business, Engineering and Applied Science, Law, and Social Work, our analyses give no statistically significant evidence of gender bias in the setting of salaries.

Committee Recommendations

- The Committee is encouraged by the fact that no statistically significant evidence of gender bias in salaries was found in any of the seven schools that were investigated. The Committee suggests that the Deans of each school continue to monitor these data on a regular basis to ensure that no such trend emerges in the future.
Report for Arts and Sciences

Sub-committee: Nancy Berg, Jean Ensminger (chair), Edward Spitznagel

Pilot Study for Arts and Sciences
( Supervisor: Lee Epstein )

The pilot study proceeded as follows.

1. The committee asked chairs of the three departments to seek permission of their faculty for a review of vitae and annual activity reports for the previous two years. The final sample size was 42 (Anthropology 12, Political Science 15, and Psychology 15; 10 of these were women). A codebook was developed that encompassed 49 performance variables; these included numerous measures of research, teaching, and service. (See Appendix A for the final version of the data-collection instrument.)

2. Graduate students in the departments of Anthropology and Political Science coded a sample of the data under the supervision of Lee Epstein. Based on analyses of the results - including standard reliability assessments - the codebook was refined.

3. Using the revised instrument, the graduate students completed the coding task and entered the resulting data into a form readable by data-analytic software.

4. We transmitted the data to Lynn McCloskey in the Dean's office, who merged the performance data with the salary and other independent variables used in the analysis.

Following instructions provided by the committee, Lynn McCloskey constructed the models, ran the analyses, and conducted diagnostic checks. McCloskey's report can be found in Appendix B. Here we summarize the two most pertinent conclusions.

- First, the inclusion of performance variables did not result in any evidence that gender was a statistically significant predictor of salary in the departments of Anthropology, Political Science, and Psychology.
- Second, while models incorporating performance variables explain more of the variance in salary (i.e., yielded higher adjusted R-squares) than those excluding them, the improvement is relatively small (e.g., adjusted R-squares of .72 versus .66). This result suggests that (contrary to our initial intuition) the addition of extremely detailed quantitative measures of performance adds little explanatory power to the model.

Based upon these findings and a similar result from the pilot study in the Medical School, it was determined that we should proceed with an analysis of the entire faculty of Arts and Science based on readily available data that do not include performance measures.

Arts and Sciences Analysis for all Departments

Based upon the committee's research, it was determined that we run our analyses for all of Arts and Sciences using both the Mary Gray regression models used in the prior gender pay equity study at Washington University (see Appendix C), and also using the Blinder-Oaxaca method (see Appendix D), which is regarded by many as the current standard in the field. Lynn McCloskey carried out all of the data analysis under the guidance of the committee and in consultation with the statisticians on the committee.

- Neither method revealed any evidence that gender is a statistically significant predictor of salary for Arts and Sciences faculty at Washington University.
In the first analysis (Appendix C), based on the Mary Gray method used in the 1993 report, only full-time, tenured or tenure-track faculty with prime appointments in Arts and Sciences and ranks of full professor, associate professor, and assistant professor were included (249 males and 72 females). This method involved three steps. First, a regression model predicting male faculty salaries was developed. Second, based on the male model, salaries of both men and women are predicted and compared with actual salaries. Third, both the averages and the distributions of the residuals are compared for men and women. This method was run on eight different models including the following variables: discipline, years since terminal degree, and years at Washington University. In some models rank was also included, and in some it was not. The inclusion of rank as a variable is controversial because rank is itself a variable endogenously determined by the university. In some models salary was scaled linearly, and in some it was scaled logarithmically. Finally, two versions of discipline groupings were tested; the first used the original eleven discipline groups developed by Mary Gray for the earlier analysis, and the second substitutes a new grouping of five discipline clusters. In none of these variations was there evidence that gender is a statistically significant predictor of salary.

The second analysis (Appendix D) begins with traditional regression models using simple dummy variables based on the combined male and female population, then introduces the Blinder-Oaxaca decomposition method with the use of gender interaction variables. This analysis was performed on both the tenure and tenure-track faculty population of 321 persons, and an expanded population of all full-time Arts & Sciences faculty that included 59 non-tenure track lecturers and artists (30 males and 29 females). Methodologically, the main differences between this approach and the earlier method of Mary Gray are that in this analysis the models use the combined male and female population to predict salaries and the independent variables are extended to include gender/rank, gender/discipline, gender/years here, gender/years since degree, and gender/interaction variables. The reason for testing these interactions is to make sure that there are no localized male-female differences that are masked by averaging over the entire sample. For instance, this method would flag a difference between males and females at the full professor level that might otherwise be hidden by the fact that there is no difference between males and females overall.

- The final conclusion of the analysis for all of Arts and Sciences is that none of the variations run in separate models yielded any evidence that gender is a statistically significant predictor of salary.

Respectfully Submitted,

Susan Appleton
Nancy Berg
Jean Ensminger, Chair
Lee Epstein
Martin Israel
Linda Pike
Brian Suarez
Joseph O’Sullivan
Edward Spitznagel
Appendix

Data Collection Sheets-Washington University Arts and Sciences Pilot Study (Summer 1998) (Departments of Anthropology, Political Science, Psychology)

Subject ID # __________
Subject name ___________________________
Coder ID # ___________

The following variables should be coded from the CVs.

Each variable should include a total overall number and a number from the years 1992 through 1997. It also includes any items classified as forthcoming or in press.

Do not count reprinted books or articles more than once for the original. Remember that some CVs may not detail an item as a reprint; check the titles carefully to avoid double counting. Finally, count each edition of a book as a separate item. Remember that later editions may be listed within a book listing or as separate books depending on the organization of the CV.

Total number of refereed journal articles ________ From the 1992-97 period ________

List the refereed journal names from the counts above and in parentheses note the number from each

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Total number of book chapters, scholarly but non-refereed journal articles, and conference proceedings (conference proceedings = non-refereed published works from such a proceeding, not conference papers/participation) _________ From the 1992-97 period ________

Total number of books (vanity presses not counted; also, do not count edited books here-see next variable) ________ From the 1992-97 period ________

Total number of edited books ________ From the 1992-97 period ________

Total number of co-authors across all publications (count each name as one, even repeated names) ________ From the 1992-97 period ________
Total number of grants for which subject is principal investigator (exclude Washington Univ. grants and graduate student dissertation grants) ________ From the 1992-97 period ________

Total number of patents ________ From the 1992-97 period ________

Total number of invited talks to academic institutions or conferences (includes wash u.) ________ From the 1992-97 period ________

Total number of conferences organized (not panels) ________ From the 1992-97 period ________

The remaining variables should be coded from the annual reviews.

These variables should be coded from the annual reviews and only from the last three years, which means 1995, 1996, and 1997 only.

If grant dollar information is not located within a subject’s annual reviews, please check the CV. If located within CV, please note this below.

Grant dollars for which subject is principal investigator (code only once for year granted; exclude wash. u. grants. Also note here after dollar amount if found only on CV)

_________________________________________________

______________________________________________

For the following variables, check only if subject received the award, recognition, or position.

Nobel Prize ______  Int'l Linnaean Society ______

MacArthur Award ______  Nat'l Medal of Science ______

National Academy of Sciences ______  Nat'l Medal of Arts ______

American Academy of Arts and Sciences ______  Nat'l Book Critics Circle Award ______

American Academy and Institute of Arts and Letters ______  Pulitzer Prize ______

Poet Laureate ______

David and Lucille Packard Foundation Fellowship in Science and Engineering ______

Journal editorship (not including assoc. editorship or board membership) ________ Nat'l officer in professional society (Pres, VP, Sect, Treasurer, but not board member) ______

Study panels (NSF, NIH, etc.) ______

Nat'l or int'l level consultancy (such as Council of Economic Advisors) ______

Assoc. editor or member of journal editorial board ______

Society or academic institute board of directors ______

Member of journal board ______
Nat'l or int'l awards or prizes received that are not indicated in the above list (please list the names of these awards)

______________________________________________________________
______________________________________________________________
______________________________________________________________
______________________________________________________________
______________________________________________________________
______________________________________________________________
______________________________________________________________
______________________________________________________________

Enrollment per class per semester (excludes full leave semesters; note if this is the case for a semester. List each class separately. Do not include University College classes).

<table>
<thead>
<tr>
<th></th>
<th>Spring</th>
<th>Fall</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1996</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1997</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Average enrollment per semester (enrollment for all classes / number of semesters) based on above table

________________

Total number of advisees (freshmen and major) ______

Total number of graduate students to which professor is major advisor (not the # of dissertation committees serving on) ______

Number of department and university-wide committees served on (include both wash u. and other universities) ______

For the remaining variables, count the position for each of the three years, 1995, 1996, and 1997. For example, if the person was department chair for 1996 and 1997 this would count as 2.

Department chair ______
Program director ______
Assistant department chair _____
Graduate coordinator ______
Undergraduate coordinator ______
Chair of university committee ______
Chair of faculty recruitment or search committee ______
Appendix B

Report of Lynn McCloskey on the Arts & Sciences Pilot Study

November 1, 1999

This study was designed to help answer questions about whether the addition of quality variables would give significantly better models for predicting faculty salaries than models previously used for testing for gender bias in faculty pay. Traditional models use rank, discipline, terminal degree, years since terminal degree, years at institution and other demographic data to predict faculty salaries.

Data for 49 quality variables were collected for 45 faculty in three Social Sciences departments. (The data collection instrument is attached in Appendix A.) Three subjects were omitted due to insufficient data. After the three omissions, the characteristics of the pilot sample group are as follows:

- n = 42
- Anthropology = 12
- Political Science = 15
- Psychology = 15
- Married = 34
- Female = 10.

Of the 49 quality variables, 46 were aggregated into five groups: recent publications, total publications, honors, service, and teaching, each measured by an aggregate score. The variables for recent number of grants, total number of grants and grant dollars, were used separately and not combined in the aggregate scores. Weights were assigned to each of the variables in consultation with the faculty subcommittee. A full description of variable weights and composition of each index is included at the end of this Appendix.

For the recent and total publications scores, four individual quality variables were dropped before the final analysis: number of coauthors (because of ambiguity about what this measures), patents (because none of the subjects in the pilot study held patents), invited talks (because of frequently missing data), and conferences organized (because of frequently missing data).

For the honors score, there were occasional instances of missing data for 7 of the 19 variables. After consultation with the subcommittee, the instances of missing data for these variables were set to zero, based on the rationale that persons with significant honors would be likely to report them and that missing data were most likely to indicate absence.

The greatest problem with missing data was encountered in the three variables pertaining to grants. Of the 42 subjects, 14 were missing data for grant dollars. For the regression models that used all available variables, missing data for number of grants and grant dollars were set to zero. Models were also tested excluding the grant variables and separately for the 28 subjects with complete grant data. All of these approaches produced similar outcomes in regard to the gender variable and so we are reasonably comfortable that the missing data for grant dollars does not impact our conclusions for the pilot study departments.

The variables were analyzed using multiple regression models. First, all quality and demographic variables were used to predict the dependent variables of total salary, log of total salary and log of 9-month salary.
(excluding chair and director stipend pay). The model predicting log of salary produced a larger R-square value than the model using salary dollars, so we used log transformed salary as the dependent variable for subsequent models.

From the initial model, we identified the weaker independent variables by comparing the standardized parameter estimates (beta values) provided by SAS. The original models included both the aggregate score variables and the log transformations for each of the five scores. Because the score variables did not have normal distributions, we tested using transformed scores which more closely resemble normal distributions. However, comparison of the standardized parameter estimates for the coefficients for transformed scores and for untransformed scores indicated that untransformed scores were slightly stronger predictors, so the five transformed score variables were discarded as the first step in eliminating redundant variables to improve the adjusted R-square. In the second step we eliminated five additional variables selected for omission by their relatively low standardized parameter estimates. These steps resulted in a model with an adjusted R-square value of .72 compared with .59 in the original model using all variables. Other iterations included omitting the grant variables and excluding all quality variables.

An analysis of the regression coefficient for the gender variable for each of the eight models is shown in Table 1. In every case, the female coefficient is less than the standard error. The T-test (the regression coefficient divided by the standard error) values range from .07 to .73 and lead us to conclude that the regression coefficient for female is not significantly different from zero in any of the eight models.

The model excluding all quality variables accounts for 66% of the variance (adjusted R-square) compared with 72% of variance explained in the strongest of the models with quality variables. Information about the female variable provided by the model without quality variables very closely resembles the comparable information in the model with quality variables. Neither indicate a statistically significant difference associated with the female variable.

Another observation of interest concerns the coefficient for the rank variable. In models without quality variables, the rank variable has a statistically significant positive coefficient; that is, rank is a strong predictor of salary. When quality variables are included in the model, the rank coefficient is less than the standard error and not considered statistically significant. This suggests that rank may serve appropriately as a surrogate for quality variables, when quality variables are not present.

In summary, the pilot study suggests the following conclusions.

- Gender is not a statistically significant predictor of salary in these three Arts & Sciences departments.
- Models that included quality variables lead to the same conclusions as those that did not.
- Although the addition of quality variables accounts for more of the salary variance than models without quality variables, the improvement is not large (adjusted R-square of .72 versus .66).
- The coefficients for the rank variable were not significant in any of the models that included quality variables, but were significant when quality variables were omitted.
### Comparison of parameter estimates for variable: Female

| Model  | Dept. variable | Descrip.                  | R-square of model | Adjusted R-square of model | Parameter estimate for var Female | Is parameter estimate significant? | Standard error | T for H0: parameter=0 | prob > |T| |
|--------|---------------|---------------------------|------------------|---------------------------|-----------------------------------|-----------------------------------|----------------|----------------------|---------|
| Model A | total salary  | all variables             | 0.74             | 0.40                      | 5965                              | not signif                      | 29463          | 0.202                | 0.8418  |
| Model B | log total salary | all variables          | 0.82             | 0.0695                    | not signif                        | 0.2896                          | 0.240          | 0.8131               |
| Model C | log 9 mos salary | all variables         | 0.82             | 0.59                      | 0.0673                            | not signif                      | 0.2881         | 0.234                | 0.8178  |
| Model D | log total salary | omitting transformed qual var | 0.81             | 0.66                      | 0.0180                            | not signif                      | 0.2536         | 0.071                | 0.9441  |
| Model E | log total salary | fewer variables       | 0.81             | 0.72                      | 0.0496                            | not signif                      | 0.0802         | 0.618                | 0.5415  |
| Model F | log total salary | fewer variables, omitting grantvar | 0.78             | 0.70                      | 0.0223                            | not signif                      | 0.0789         | 0.282                | 0.7798  |
| Model G | log total salary | excluding all quality variables | 0.73             | 0.66                      | 0.0436                            | not signif                      | 0.0874         | 0.499                | 0.6211  |
| Model H | log total salary | no q-var; add interaction career female | 0.73             | 0.66                      | 0.1215                            | not signif                      | 0.1661         | 0.731                | 0.4699  |

### Appendix C

Report of Lynn McCloskey on the Arts and Sciences Gender Pay Equity Analysis
Using the Mary Gray Method Previously used in the 1993 Analysis
Applied to 1999-2000 Tenure-Track Salary Data

March 15, 2000

Tables 2 and 3 summarize the results of the 99-00 pay equity regression analysis for Arts & Sciences. The results show no statistical evidence of gender bias. The female mean residuals are less than two standard errors in all eight models; for the four best-fit models that include a rank variable the residuals are less than .30 standard error.
The analysis replicated the methodology used for analysis of the 86-87 and 89-90 data supervised by Professor Martin Israel in consultation with the Faculty Senate Council Committee on Pay Equity chaired by Professor Martha Storandt. The following notes from the Committee’s April 16, 1990 report describe the procedure.

"The basic procedure used, both by Dean Israel and in the earlier Gray study, involves three steps. First, a multiple regression model predicting salaries of male faculty members is developed.... Second, using the prediction equation from the model developed on the basis of the data for men, salaries for both men and women are predicted and compared with actual salaries.... A negative residual indicates the person is paid less than the amount predicted on the basis of the multiple regression model; a positive residual indicates the person is paid more. Third, both the averages and distributions of the residuals were compared for men and women. Systematic negative average residuals for women would be consistent with gender bias in salary but could also be obtained for other reasons. The distributions reflect the fact that salary is not predicted perfectly on the basis of the predictor variables included in the models.

Eight analytical models were applied. All models included the following predictors:

1. Discipline
2. Years since terminal degree
3. Years at Washington University.

...Four of the models included additional squared terms for the two predictors involving years to check for curvilinear in addition to linear trends; four did not. Within each of these groups of four models, two also included professorial rank (three categories: assistant, associate, full professor), and two did not. Of each of these two, one used linear scaling for salary (the dependent variable) and the other used logarithmic scaling. The linear scaling addresses the issue of actual dollars, whereas logarithmic scaling addresses percentages."

Two versions of the eight model set were fitted. The first used the traditional eleven discipline groups developed by Mary Gray for the analysis of 1986-87 data. The second version substitutes a new set of five discipline groups. The purposes of the new groupings were to (a) reduce the number of variables and (b) more closely reflect the current character of Washington University A&S departments. Table 3 compares the outcomes.

Notes: Total salaries were defined as nine-month base pay, plus stipends paid to department chairs and program directors adjusted from a 12-month basis to 9-month equivalency. Twelve-month appointment salaries were converted to equivalent nine-month salaries using a factor of .75. Salaries where the Arts & Sciences appointment is less than the total 100% were adjusted based on the FTE value of the Arts and Sciences appointment. For example, for a person 90% in A&S and 10% in Medicine, the A&S appointment salary was divided by .9 to get an equivalent 100% A&S salary. Faculty appointed as Distinguished University Professors were assigned to the department and discipline group in which they work. Only full-time tenured or tenure-track faculty with prime appointment in Arts and Sciences and ranks of full professor, associate professor and assistant professor were included in the study. The 1999-2000 population analyzed contains 249 males and 72 females.
Arts & Sciences Tenure/Track Faculty Salary Analysis

Traditional methodology: model based on male population is applied to female population to predict female salaries. Variables include: discipline groups, years here, years since terminal degree, squared terms, rank dummy variables.

Mean female residuals, standard errors and z-scores Comparison of analyses for 1986-87, 1997-98 and 1999-2000

<table>
<thead>
<tr>
<th></th>
<th>sq terms</th>
<th>rank</th>
<th>log scale</th>
<th>R²</th>
<th>standard error</th>
<th>difference: mean female residual</th>
<th>z-score</th>
<th>R²</th>
<th>standard error</th>
<th>difference: mean female residual</th>
<th>z-score</th>
<th>R²</th>
<th>standard error</th>
<th>difference: mean female residual</th>
<th>z-score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>y</td>
<td>y</td>
<td>y</td>
<td>0.74</td>
<td>2.36%</td>
<td>-0.90%</td>
<td>-0.38</td>
<td>0.61</td>
<td>2.23%</td>
<td>-0.20%</td>
<td>-0.09</td>
<td>0.58</td>
<td>2.41%</td>
<td>-0.11%</td>
<td>-0.05</td>
</tr>
<tr>
<td>2</td>
<td>y</td>
<td>y</td>
<td>n</td>
<td>0.63</td>
<td>995</td>
<td>-291</td>
<td>-0.29</td>
<td>0.51</td>
<td>1,826</td>
<td>-307</td>
<td>-0.17</td>
<td>0.47</td>
<td>2,334</td>
<td>-608</td>
<td>-0.26</td>
</tr>
<tr>
<td>3</td>
<td>n</td>
<td>y</td>
<td>y</td>
<td>0.74</td>
<td>2.31%</td>
<td>-1.12%</td>
<td>-0.48</td>
<td>0.61</td>
<td>2.19%</td>
<td>-0.18%</td>
<td>-0.08</td>
<td>0.57</td>
<td>2.38%</td>
<td>-0.09%</td>
<td>0.04</td>
</tr>
<tr>
<td>4</td>
<td>n</td>
<td>y</td>
<td>n</td>
<td>0.63</td>
<td>956</td>
<td>-345</td>
<td>-0.36</td>
<td>0.51</td>
<td>1,780</td>
<td>-277</td>
<td>-0.16</td>
<td>0.45</td>
<td>2,251</td>
<td>-372</td>
<td>-0.17</td>
</tr>
</tbody>
</table>

models with rank variable

<table>
<thead>
<tr>
<th></th>
<th>sq terms</th>
<th>rank</th>
<th>log scale</th>
<th>R²</th>
<th>standard error</th>
<th>difference: mean female residual</th>
<th>z-score</th>
<th>R²</th>
<th>standard error</th>
<th>difference: mean female residual</th>
<th>z-score</th>
<th>R²</th>
<th>standard error</th>
<th>difference: mean female residual</th>
<th>z-score</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>y</td>
<td>n</td>
<td>y</td>
<td>0.62</td>
<td>2.71%</td>
<td>-3.38%</td>
<td>-1.25</td>
<td>0.47</td>
<td>2.69%</td>
<td>-2.84%</td>
<td>-1.06</td>
<td>0.45</td>
<td>2.93%</td>
<td>-0.89%</td>
<td>-0.30</td>
</tr>
<tr>
<td>6</td>
<td>y</td>
<td>n</td>
<td>n</td>
<td>0.53</td>
<td>1,164</td>
<td>-1,313</td>
<td>-1.13</td>
<td>0.40</td>
<td>2,086</td>
<td>-1,726</td>
<td>-0.82</td>
<td>0.38</td>
<td>2,673</td>
<td>-925</td>
<td>-0.35</td>
</tr>
<tr>
<td>7</td>
<td>n</td>
<td>n</td>
<td>y</td>
<td>0.58</td>
<td>2.92%</td>
<td>-5.83%</td>
<td>-2.00</td>
<td>0.43</td>
<td>2.82%</td>
<td>-4.93%</td>
<td>-1.75</td>
<td>0.38</td>
<td>3.11%</td>
<td>-3.96%</td>
<td>-1.27</td>
</tr>
<tr>
<td>8</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>0.52</td>
<td>1,193</td>
<td>-2,095</td>
<td>-1.76</td>
<td>0.38</td>
<td>2,091</td>
<td>-2,984</td>
<td>-1.43</td>
<td>0.32</td>
<td>2,671</td>
<td>-2,957</td>
<td>-1.11</td>
</tr>
</tbody>
</table>

models without rank variable

Note: All of the above models use the original discipline groups used in the initial Washington University study of 1986-87 data supervised by Mary Gray, Professor of Mathematics and Statistics at American University. The original selection of 11 aggregation groups appears to reflect a perception of national faculty characteristics in the 1980's.

Arts and Sciences Tenure/Track Faculty Salary Analysis 1999-2000

Traditional methodology: model based on male population is applied to female population to predict female salaries. Variables include: discipline groups, years here, years since terminal degree, squared terms, rank dummy variables.
Comparison of two sets of models: using 5 discipline groups versus 11 discipline groups
Mean female residuals, standard errors and z_scores

<table>
<thead>
<tr>
<th>model</th>
<th>sq terms</th>
<th>rank</th>
<th>log scale</th>
<th>1999-00 using traditional discipline groups (11)</th>
<th>1999-00 using new discipline groups (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>R²</td>
<td>standard error</td>
</tr>
<tr>
<td>1</td>
<td>y</td>
<td>y</td>
<td>y</td>
<td>0.58</td>
<td>2.41%</td>
</tr>
<tr>
<td>2</td>
<td>y</td>
<td>y</td>
<td>n</td>
<td>0.47</td>
<td>2,334</td>
</tr>
<tr>
<td>5</td>
<td>n</td>
<td>y</td>
<td>y</td>
<td>0.57</td>
<td>2.38%</td>
</tr>
<tr>
<td>6</td>
<td>n</td>
<td>y</td>
<td>n</td>
<td>0.45</td>
<td>2251</td>
</tr>
<tr>
<td>3</td>
<td>y</td>
<td>n</td>
<td>y</td>
<td>0.45</td>
<td>2.93%</td>
</tr>
<tr>
<td>4</td>
<td>y</td>
<td>n</td>
<td>n</td>
<td>0.38</td>
<td>2,673</td>
</tr>
<tr>
<td>7</td>
<td>n</td>
<td>n</td>
<td>y</td>
<td>0.38</td>
<td>3.11%</td>
</tr>
<tr>
<td>8</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>0.32</td>
<td>2,671</td>
</tr>
</tbody>
</table>

Original discipline groups:
Math
Biology
Chemistry, Physics, Earth & Planetary Science
Psychology
Economics
Education
Anthropology, History, Philosophy, Political Science
English
ANELL, German, Romance Languages, Russian, Classics, Comp Lit, AFAM, Art History, Wom Studies Performing Arts, Music

New discipline groups:
Math, Biology, Chemistry, Physics, EPS, Psychology
English, History Economics
Anthropology, Political Science ANELL, German, Romance Languages, Russian, Classics, Comp Lit, Philosophy, Art History, Music, Performing Arts, AFAM, Wom Studies, Education
Note: the original discipline groups are those used in the initial Washington University study of 1986-87 data supervised by Mary Gray, Professor of Mathematics and Statistics at American University. The original selection of department groups appears to reflect a perception of national faculty characteristics in the 1980’s. The purpose of introducing the new aggregation groups is twofold: (a) to reduce the number of discipline variables and thereby increase adjusted R square and (b) to recognize the character of Washington University Arts & Sciences departments as of 1999-2000.

Appendix D

Report of Lynn McCloskey on the Arts and Sciences Gender Pay Equity Analysis
Using the Blinder-Oaxaca Method Applied to 1999-2000 Full-Time Faculty

April 5, 2000

Arts & Sciences 1999-2000 Gender Pay Equity Analysis
Regression analysis models built on combined male/female population; gender variable tested

Population:
380 full-time A&S faculty, of which 321 are tenured or tenure-track and 59 are non-tenure-track lecturers and artists in residence. Research and visiting faculty were excluded. The tenure-track population includes 249 males and 72 females; the non-tenure-track population includes 30 males and 29 females.

Dependent salary variables used in models:
The natural log of 9-month adjusted total salary (including chair/director stipends); 9-month adjusted total 9-month salary including stipends; and 9-month salary excluding stipends.

Independent variables:
Discipline group, rank, terminal degree, years since degree, years since degree squared, years at Washington University, years at Washington University squared, gender, gender/rank, gender/discipline, gender/years since degree and gender/years here interaction variables.

Method of analysis:
Multivariate regression models were used to predict the dependent salary variables.

Summary findings (see Tables 4 and 5):

- The models are fairly strong; the strongest ones indicate that over 70% of the variance in salaries is accounted for by the independent variables. (Adjusted R-squares range from .59 to .74 for models that include rank. When rank is removed, R-squares range from .46 to .56. Models using the natural log of total salary produce consistently higher R-square values than those using salary dollars.)
- Gender is not a statistically significant predictor of salary for Arts & Sciences departments.

For the models that included rank variables, the ratios of coefficient to standard error (t-values) for the gender variable range from .28 to .41. When rank variables are omitted, the t-values range from -.88 to -1.45. None of the models produced a statistically significant coefficient for the gender variable.
• The variables that were statistically significant (p < .05) were rank, years since degree, and discipline group.
• Four models used gender interaction variables: gender/rank, gender/discipline, gender/years since degree and gender/years here (see Table 5). The F statistic was tested for overall interaction in each model, in addition to the t statistic tests of parameter estimates for individual interaction variables. None were statistically significant.

Notes:
Arts & Sciences departments were originally aggregated into eleven discipline groups developed for the analysis of 1986-87 data by Mary Gray, Professor of Mathematics and Statistics at American University. The same aggregation conventions were applied for the later analysis supervised by Professor Martin Israel for the Committee on Pay Equity chaired by Professor Martha Storandt in 1989-90. In order to reduce the number of discipline variables, we developed new aggregations reducing the number of discipline groups from eleven to five. Models using the five new discipline groups were compared with ones using the original eleven discipline groups and found to give similar outcomes (see Table 4). The condensed aggregations were then used for the models that contain the gender interaction variables.

Other data conventions adopted from the 1989-90 analysis include:

1. All degrees for faculty in Music, Performing Arts and for creative writers were counted as terminal.
2. If no terminal degree, then years since degree = 0.

Adjusted salaries: 12-month salaries were adjusted to 9-month equivalency using a factor of .75. For those faculty with split appointments and less than 100% of FTE in Arts & Sciences, the A&S portion of salary was inflated to 100% equivalency. (Only faculty with an A&S FTE of 50% or greater were included in the population.) Chair/Director stipends have a 12-month salary basis and were converted to 9-month equivalency. Adjusted 9-month stipends were added to 9-month salaries to produce the 9-month total salary variable