equilibrium wages to retain employees, reduce labor turnover, and insure a ready supply of potential workers.

NOTES

1. Casual evidence tends to support this claim, though it may be too sparse to support the proposed presumption, among occupations for which skill requirements are low and occupational mobility is low between.


3. The omitted category for the dummy variables having more than two categories are as follows: region—North Central, marital status—never married, major occupation—service workers, and major industry—agriculture. The values for the other dummy variables are as follows: men status—1 if a man, 0 if unmarried, spouse, or part-time dummy—1 if part-time, 0 if full-time; race—1 if white, 0 if black, and gender—1 if male, 0 if female.

4. The inclusion or exclusion of particular occupations does not affect the any conscious selection bias on the part of BLS, as was the fear of its anonymous referees. BLS does not examine the attitudinal in occupations having extreme values of income, as demonstrated in a subsequent table (only 3.5 percent of the wages had an EIXDEM value of 1, and only 1.42 percent had an EIXDEM value of 5, leaving 70 percent of the sample with values 2, 3, and 4). On the other hand, the resulting subsample could, as you'll see, be less representative than the full CPS sample from which it is drawn. So that the reader may be aware of the differences in sample and subsample characteristics, they have been presented in Appendix Table 3 along with an indication of which values differ from one another. At the 10 percent level, significant differences exist for the proportions of males (underrepresented in the first set used in the analysis) as well as the means of education and experience (the subsampling has more experience). Through the sample is perfectly representative of the CPS sample, due to the inability to assign EIXDEM values to all occupations, the data are probably the best that exist on such a broad basis. It is hoped that the present analysis will contribute the need for more comprehensive and carefully measured data on labor market conditions that will be available for analysis, not simply tabular presentation by BLS.

5. We are thankful to Lisa Einblich Daudt for helpful discussions on this point.

6. The approximation is worse the further the coefficient value is from zero. To obtain the actual rather than approximated estimate, exponentiate the coefficient and subtract one.

REFERENCES


INTRODUCTION

Aside from their value to academics as evidence regarding the existence and extent of discrimination in labor markets, empirical analyses of sex-based salary differentials at particular institutions can be used both internally to adjust salaries and by the courts to aid in settling disputes. In fact, the use of statistical analysis (usually regression) in the courtroom to test for the presence of salary inequities is becoming commonplace. One problem with these uses is that there has been little consideration given to the appropriate level of analysis of the data. Statistical tests for the presence of sex, race, or ethnic based earnings discrimination within a large organization can obscure discrimination within individual sectors of that organization, especially if the sectors have relatively few members of the minority group. As a result, if a large organization has units which operate at least semi-autonomously, testing for discrimination in the organization as a whole may be neither appropriate nor sufficient. If, however, statistical tests permit the rejection of a null hypothesis that there are no differences in the treatment of different groups for any independent units within an organization, these units still should be examined closely to determine if discrimination is actually present. Such an examination is necessary because the results may be due to unavoidable measurement error or a questionable model specification.

In a recent study of gender based salary differences at Kent State University, Raymond et al. (1988) rejected the hypothesis that sex was a determinant of 1983-84 salary. Using the two equation Oaxaca method, it was found that women faculty earned almost 3% more than men when market forces and productivity variables, including academic rank, were controlled. When rank was excluded from the productivity controls, male and female salaries were virtually identical. In general, both academic studies and analyses presented in evidence in court have concentrated upon the institution as a whole. This tendency may have produced misleading results. When investigating salary discrimination within any organization, the statistical sample used should reflect to the highest level of real control in the salary setting process. Unfortunately, the determination of the appropriate control level may require a heavy dose of judgment. For instance, at Kent State the central administration (the university level) allocates merit salary funds to the College Deans who then distribute part of their allotments to the Department Chairpersons. The chairpersons recommend individual salaries which are adjusted by the college Deans through the use of the funds which were not distributed to the departments. The central administration may alter the recommendations it receives from college Deans, but, in practice, this is a rare occurrence.

Given this procedure, "the highest level of real control" cannot clearly be identified. The college level might be judged most appropriate because the vast majority of salaries are actually set at this level. However, the central administration exercises control through its initial allocations to the colleges and also retains the seldom exercised power to alter individual salary recommendations before they become final. In addition, the central administration is ultimately responsible for decisions made by all units of the
University. Nevertheless, because in practice so much control is exercised at the college level, this is where we focus in this paper. The data base and methodology from the earlier Kent State Study are used to estimate sex-biased differences within the College of University in order to determine if the seemingly equal treatment of the sexes is consistent across colleges. The results demonstrate that the conclusions emerging from a discrimination study may depend on whether the entire organization or its separate components are audited. Specifically, it appears that evidence of discrimination may exist within individual colleges while no such evidence is present when the university as a whole is considered.

**MODEL SPECIFICATION**

The models employed in this study are identical to those used in the earlier study. The mean values of the characteristics of females are entered into male salary equations in order to obtain predicted salaries for females. The difference between the actual and predicted female salaries expressed as a percentage of mean male salary is taken as the measure of sex discrimination. As in the earlier study, results are reported for a hierarchy of different model specifications. This is done because there is often disagreement about what should be included as control variables in a discrimination study of this type. Using the natural log of academic-year salary as the dependent variable, Model I contains two controls for experience in quadratic form.

Model II adds dummy variables identifying possession of the appropriate terminal degree in the discipline. Differences in market forces are accounted for in Model III by including a national index of starting salaries by academic discipline. In Model IV, productivity variables are added. These variables control for differences in publications and grant support. Because of the differences in the nature of publications and grants by discipline, these productivity variables are standardized by department. No attempt to differentiate publications by quality was made.

The four models described above contain controls that would probably cause little controversy. All the models contain variables that are objective measures of productivity and market forces. In model V, additional productivity variables are added in an effort to capture quality differences in both teaching and research. Specifically, variables are added for associate and full membership on the Graduate Faculty. Because this status is achieved by appointment, it is possible that it is itself the result of discriminatory behavior. If this is the case, it represents an inappropriate control. Indeed, in discrimination cases some courts have prohibited the use of variables that may themselves be determined by discrimination (Melani, 1983). If this were the case, Model IV would represent the final Model that could be used as evidence in a legal denial of discrimination charges.

In Model VI a dummy variable reflecting a former administrative appointment is added to the set of controls. This variable will be an important determinant of salary if administrators retain some or all of their administrative responsibilities when they return to the faculty. If women were overlooked in making former administrative appointments, this variable would also represent an important control.

In the 7th and final model academic rank is added to the form of dummy variables identifying full and associate professor status with assistant professor serving as the reference category. If the other variables included capture all relevant differences in productivity, there would be no need to control for rank. The other variables, however, fail to control adequately for quality differences in teaching, research, and service. On the other hand, if rank itself is determined in a discriminatory fashion, its inclusion will lead to an understatement of measured discrimination.

**DATABASE**

The sample consists of full-time tenure track faculty (at the rank of Assistant Professor or higher/employed on nine-month contracts on the campus of Kent State University during the 1983-84 academic year. The total sample, consisting of 457 males and 132 females, is disaggregated into four subsamples: the College of Arts & Sciences (M = 236, F = 28), Education (M = 42, F = 29), and Fine and Professional Arts (M = 106, F = 22) and a residual category consisting of the College of Business Administration (M = 52, F = 2) and the Schools of Nursing (M = 1, F = 38), Library Science

**TABLE 1**

<table>
<thead>
<tr>
<th>Variable</th>
<th>College of Education</th>
<th>College of Fine and Professional Arts</th>
<th>College of Arts and Sciences</th>
<th>Resid.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male Females</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income ($)</td>
<td>31,168</td>
<td>28,629</td>
<td>28,126</td>
<td>24,227</td>
</tr>
<tr>
<td>(10,000)</td>
<td>(3897)</td>
<td>(4353)</td>
<td>(7702)</td>
<td>(5970)</td>
</tr>
<tr>
<td>Index</td>
<td>20,745</td>
<td>20,387</td>
<td>20,798</td>
<td>21,324</td>
</tr>
<tr>
<td>(10,000)</td>
<td>(1902)</td>
<td>(1993)</td>
<td>(1847)</td>
<td>(1707)</td>
</tr>
<tr>
<td>Exp. (yr)</td>
<td>15.60</td>
<td>12.35</td>
<td>14.83</td>
<td>12.91</td>
</tr>
<tr>
<td>% PHD</td>
<td>59.3</td>
<td>69.0</td>
<td>58.6</td>
<td>48.9</td>
</tr>
<tr>
<td>% TMAS</td>
<td>0</td>
<td>0.0</td>
<td>27.9</td>
<td>18.2</td>
</tr>
<tr>
<td>% RFIGS</td>
<td>1.2</td>
<td>0.74</td>
<td>1.06</td>
<td>0.89</td>
</tr>
<tr>
<td>% RDPY</td>
<td>1.07</td>
<td>1.03</td>
<td>1.13</td>
<td>0.94</td>
</tr>
<tr>
<td>% ADMIN</td>
<td>1.04</td>
<td>1.11</td>
<td>1.22</td>
<td>1.14</td>
</tr>
<tr>
<td>% AGRAD</td>
<td>1.04</td>
<td>1.11</td>
<td>1.22</td>
<td>1.14</td>
</tr>
<tr>
<td>% FGRAD</td>
<td>0.83</td>
<td>1.11</td>
<td>1.03</td>
<td>0.89</td>
</tr>
<tr>
<td>% ASSO</td>
<td>0.83</td>
<td>1.11</td>
<td>1.03</td>
<td>0.89</td>
</tr>
<tr>
<td>CMU</td>
<td>4.13</td>
<td>4.72</td>
<td>4.88</td>
<td>5.43</td>
</tr>
<tr>
<td>CLB</td>
<td>2.55</td>
<td>2.75</td>
<td>2.55</td>
<td>2.75</td>
</tr>
<tr>
<td>CRBS</td>
<td>3.27</td>
<td>3.27</td>
<td>3.27</td>
<td>3.27</td>
</tr>
<tr>
<td>CPE</td>
<td>2.19</td>
<td>2.19</td>
<td>2.19</td>
<td>2.19</td>
</tr>
</tbody>
</table>
served in administrative posts, hold full status on the graduate faculty, and are full professors. With the exception of the College of Fine and Professional Arts, males tend to be in higher paying disciplines. In the next section of the paper we examine the ability of the differences in the mean values of these variables to explain the earnings differentials.

RESULTS

The results for the entire sample are reported in column 1 of Table II.1 The salary differential (expressed as a percentage of mean male earnings) of 14.7 percent, or $4613, quickly disappears as the control variables are added. The addition of the non-controversial productivity and market force variables in model IV reduces the differential to less than 1 percent ($250). When all control variables are included women earn 1 percent more ($315) than their male counterparts.6

<table>
<thead>
<tr>
<th>TABLE II</th>
<th>Discrimination as a Percent of Male Earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
</tr>
<tr>
<td>Raw Difference</td>
<td></td>
</tr>
<tr>
<td>EXP, EXP SQ</td>
<td>14.7</td>
</tr>
<tr>
<td>MODEL 2</td>
<td>7.0</td>
</tr>
<tr>
<td>MODEL 3</td>
<td>3.6</td>
</tr>
<tr>
<td>MODEL 4</td>
<td>1.5</td>
</tr>
<tr>
<td>MODEL 5</td>
<td>0</td>
</tr>
<tr>
<td>MODEL 6</td>
<td>0</td>
</tr>
<tr>
<td>MODEL 7</td>
<td>0.07</td>
</tr>
<tr>
<td>MODEL 8</td>
<td>0.08</td>
</tr>
<tr>
<td>MODEL 9</td>
<td>-1.0</td>
</tr>
<tr>
<td>MODEL 10</td>
<td>(45)</td>
</tr>
<tr>
<td>MODEL 11</td>
<td>(122)</td>
</tr>
</tbody>
</table>

The results for the separate units, however, demonstrate how sensitive the findings are to the exact unit studied. The raw male/female salary differentials in Fine & Professional Arts and Education are only 6.4 percent ($1899) and 8.7 percent ($2739), respectively. The corresponding figure for the Arts and Sciences sample is 18.8 percent, or $5998.

The addition of the control variables fails to eliminate the differences between the three separate colleges regardless of the model used. Measured discrimination is greater in Arts and Sciences than in either Education or Fine and Professional Arts. For instance, the Model IV results show females earning 2.5 percent more than males in Education and 1.4 percent less than males in Fine and Professional Arts, while the corresponding figure for Arts and Sciences has females earning 3.5 percent ($1725) less than males. Thus, the results from the entire sample have masked the statistical evidence of discrimination within the College of Arts and Sciences.

However, the existence of sex discrimination should not be accepted without further investigation. A number of the control variables used are subject to potential measurement error. The experience variable does not capture breaks in service which may be more important for females than for males, and there is no indicator of quality present in the research or scholarship variable. Finally, none of the models contain direct measures of teaching or service performance. A detailed examination of individual cases in Arts and Sciences would have to be undertaken to determine if discrimination actually exists or if the statistical models are flawed.

However, the importance of the Table II figures lies not in the demonstration that sex discrimination does or does not exist at Kent State University. Of far more general significance is the demonstration that the results of a discrimination study may be very sensitive to whether the entire organization or its separate components are studied. If we adopt the generally accepted procedure which involves an examination of the entire university, then there appears to be no cause for concern at Kent State. Measured discrimination is of little practical significance. However, if the individual colleges are singled out for investigation, then the possibility that discrimination exists is clearly present in one of these colleges. The two different approaches will obviously suggest different conclusions to the academic community, different courses of action to the University, and, possibly, different decisions in court cases. It is of critical importance, therefore, that we give extensive consideration to the choice of the relevant unit when we conduct these studies, regardless of their intended use.

NOTES

1. The acceptance of econometric measurements of discrimination by the Supreme Court is likely to lead to an increase in its use by lower courts. For a discussion of recent supreme court decisions relying on such measures, see Author and Author, 1987.

2. This method is described in chapter 1. Advocates in court generally use a single equation in which the measure of discrimination is the coefficient on a dummy variable identifying sex. As Laycock has pointed out, the two equation approach utilized in this paper appears preferable but "...is seldom used, perhaps because the resulting estimates are harder to interpret." (p. 128) The basic argument presented in this text would remain unchanged if they were to be coupled in terms of a single equation model.

3. Those findings are in sharp contrast to those from studies conducted with data from other institutions. The earlier studies cover both the pre-1975 period and when efforts to assure equality of treatment for women were minimal, and the more recent period over which efforts were substantial. Studies covering the earlier period include Katz (1976); Gordon et al, 1976; Johnson and Stafford, 1976; Huffman, 1976; Koch and Chimner, 1976; Parker et al., 1976; Brittingham et al., 1979; and Megdal and Ramnoss, 1985. Studies from the latter period include Hunter, 1976; Hinell and Lepper, 1985; Rodgers, 1984; and Megdal and Ramnoss, 1985. The study by Berkefart, 1997, covers both the pre-1975 period and 1977.

4. An argument may, of course, be advanced for the Department level, The Duane, however, does exercise real exercised both in the setting of entry level salaries and salary increments. Moreover, departments are generally too small to allow reliable statistical testing.

5. A detailed description of all variables used in the study can be found in Appendix A. A more complete description of the variables can be found in Raymond, et al., 1988.

6. The earlier study of faculty salaries at KSU included instructors. Their exclusion here is dictated by the fact that two of the units have female but not male instructors. Since it is not possible to estimate a coefficient for the instructor variable in the male equations for these two units, instructors are dropped from the analysis.
REFERENCES


Raymond, Richard, Michael Sausville and Donald Williams, "Does Sex Matter in the Determination of Faculty Salaries?" Economic Inquiry, January 1988, 43-46.