Market Salaries, Peer Productivity Ratings, Rank and the Academic Gender Wage Gap

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Abstract:

The paper examines the decomposition of the gender wage gap for a sample of academics within a mid-sized US University. After controlling for a standard set of human capital characteristics, the residual gender wage gap may largely be explained by a variable reflecting a market salary factor which varies across rank and academic discipline. This points towards the potential importance of both rank and sorting across discipline along gender lines. Adding objective measures of productivity has little effect on the decomposition; adding peer ratings of productivity has a slightly larger impact but in the direction of increasing the unexplained portion of the gap. Regardless of specification used, a gap of three to six percent remains unexplained. Assuming atomistic competition and acknowledging the pivotal role of the market salary factor suggests that the university in question can do little to narrow the gender wage gap. However, one possible route is to revise the promotion process. JEL codes: J3, J7.

1. **Introduction**

Recent studies by Ginther (2004), Ginther and Kahn (2003), Ginther and Hayes (2003), Geisler and Oaxaca (2005) and Booth, Frank and Blackaby (2002) among others examine the issue of academic pay. The focus is on both wage determination per se as well as male-female wage differentials within the academic labor market. The current study utilizes data from one large U.S. public urban comprehensive university. The raw data suggests that in the 1996-97 academic year, male faculty members received annual salaries on average twenty percent higher than their female counterparts. The key question we address is the extent to which the pay gap may be justified by market or pre-market factors leading to different characteristics and choices by gender rather than discriminatory practices by the university in question.

Focusing on academics employed by a single institution allows one to abstract from the usual industry and occupational differences. However, there are substantial difficulties in adequately controlling for gender differences in productivity and allowing for potentially important differences by discipline. All tenured and tenure track faculty engage in a combination of research, service and teaching to further the mission of the university. The goal is to examine the role of these various factors in wage determination within an academic setting and the extent to which the gender gap in salary may be attributable to productivity-related characteristics rather than discriminatory practice. What factors might justify different salaries?

There would be general agreement that factors associated with longevity and productivity legitimately affect earnings. Other factors such as rank, administrative appointment and market salary differentials by field are somewhat more controversial, as they may reflect discriminatory practice, whether intentional or not. We employ the Oaxaca and Ransom (1994) decomposition of the gender wage gap, which distinguishes between the role of gender differences in productive characteristics (commonly labeled the explained component) and an unexplained portion that *may* be attributable to discrimination. The focus is on the sensitivity of this decomposition to the assumed form of wage specification and underlying measurement of productivity.

Which factors to include as legitimate determinants of salary differences is a critical issue in wage gap decompositions. The data set utilized in the current study includes a rich array of human capital and productivity measures. We first examine the decomposition in the context of a rather narrow, uncontroversial list of human capital variables. We then examine the impact of various additional controls and productivity related variables including; a measure of market determined outside average earnings by discipline and rank, a measure of peer rating, together with a set of measures reflecting volume of research, teaching and service awards and successful grant funding.

While most wage gap studies in the economics literature have been carried out at the economy-wide level, the findings here should be of interest because most wage discrimination cases are conducted at the firm level. Extensive cleaning of the data in cooperation with the faculty records office of the university ensures less measurement error and superior measurement of productivity than in a typical industry level study. The university in question is in good standing with the AAUP, has not had any discrimination cases go to court and views itself as a progressive institution of higher education in these regards. One should be careful about generalizing from a single firm's experience but there is good reason to think that understanding the experience of this one university provides important insight into gender wage gap issues in higher education as a whole.

2. **Empirical Model**

Building on Oaxaca [1973] we employ the decomposition suggested by Neumark [1988] and Oaxaca and Ransom (1994). Oaxaca and Ransom (1994) define the gross gender wage differential $G_{mf} = \frac{\overline{W}_m - \overline{W}_f}{\overline{W}_f}$. Then, taking the natural logarithm gives $\ln\left(G_{mf} + 1\right) = \ln \overline{W}_m - \ln \overline{W}_f$, which may in turn may be decomposed into three distinct components attributable to male over-payment $\left(\delta_{m0}\right)$, female under-payment $\left(\delta_{f0}\right)$, and a 'legitimate' productivity component, $\left(Q_{mf}\right)$:

(1) $\ln(G_{mf} + 1) = \ln(\delta_{m0} + 1) + \ln(\delta_{f0} + 1) + \ln(Q_{mf} + 1)$

The decomposition may be implemented via estimation of distinct human capital based wage equations for males and females together with an assumed form for the wage specification in the absence of discrimination. Assume a standard semi-logarithmic wage specification $\ln(W_i) = Z_i^{'}\beta + u_i$; then the Oaxaca and Ransom (1994) decomposition may be written as,

(2) $\ln(G_{mf} + 1) = \overline{Z}_m^{'}(\hat{\beta}_m - \hat{\beta}_*) + \overline{Z}_f^{'}(\hat{\beta}_* - \hat{\beta}_f) - (\overline{Z}_m^{'} - \overline{Z}_f^{'})\hat{\beta}_*$.

Following Neumark and Oaxaca and Ransom we assume the wage structure in the absence of discrimination may be represented by the parameters of the pooled male-female specification $\hat{\beta}_*$. The first term reflects favoritism towards males (over-payment relative to productivity), the second discrimination against females (under-payment) and the final term due to male-female differences in productivity.

3. **Data**

The data for this analysis come from the records of a large public, urban university in the Midwestern United States for the 1996-97 academic year. A comprehensive university, it includes the usual arts and science disciplines, as well as numerous professional schools including allied health, business, dentistry, education, engineering, fine arts, journalism, law, library, medicine, music, nursing, physical education, public affairs and social work. We exclude all faculty with administrative appointments at the dean level and above, as well as librarians, scientists and the clinical supervisors of medical students (due to the difficulty in separating clinical income from university compensation). The selected sample of 851 regular faculty members, comprise 574 males and 277 females. All variable definitions are provided in Table 1,

(Place Table 1 about here.)

with descriptive statistics by gender included in Table 2.

[Place Table 2 about here.]

The logarithm of the monthly salary is 8.43 for female faculty relative to 8.63 for male faculty; these equate to $4,572 per month for women versus $5,571 per month for men.[3] The conventional wage gap, G_{mf}, to be explained is approximately $1,000 per month, i.e. a 22 percentage point difference.

In principle salary differences by gender may be due to productivity differences. In an innovative study of Israeli private sector firms Hellerstein and Neumark (1999) conclude that once productivity is properly measured, gender differences explain the majority of the wage gap. The measurement of academic productivity within a given field, never mind across fields, is problematic. However, at least one court has found in favor of the plaintiffs in a reverse discrimination suit, citing among other things, a failure to control for productivity (U.S. Court of Appeals [1995]). Thus it is essential to attempt to measure productivity in any decomposition exercise.

In terms of productivity measurement of faculty the data set is unusually rich, including a peer-review productivity rating, a market salary factor for each faculty member, together with indicators of numbers of publications, grant success and teaching and service awards. The market salary factor merits further discussion. Each individual was matched by rank and discipline (undifferentiated by gender) with national salary factors provided by the College and University Personnel Association or by other reputable national associations. The university in question is hiring from the market and thus as an atomistic player must take market-determined wages as given. Thus on the surface it is reasonable to treat this variable as exogenous. The employer hires from different fields as needed, consistent with the market conditions for that field. Alternatively one could argue the variable may be tainted by endogeneity via two separate mechanisms. First individuals may sort themselves into fields, at least in part due to perceived or real discrimination within the field. Second, if the university in question discriminates in terms of promotion policy by gender then once again treating the market salary factor as exogenous would be inappropriate, at least for ranks above assistant professor.

Evaluating the gender difference in average market salary within the current sample reveals a difference of around $10,000 per year, which is of a similar order of magnitude to the observed gender gap in actual salary, i.e. approximately $1000 per month. Recall the former measure is undifferentiated by gender, implying that gender differences in field and rank are potentially important contributors to the gender wage gap. Table 2 documents clear concentration of gender by disciplinary group (i.e.

school). Similarly, faculty rank also differs significantly by gender, with fewer female full-professors and a greater proportion of assistant professors.

We choose to ignore the former issue, treating discipline as exogenously given. However we attempt to model rank as potentially manipulable by the university in question. In order to investigate this issue we examine the sensitivity of the impact of the market salary factor (and accompanying Oaxaca decomposition) to the derivation of the variable. In the first instance we derive the market salary factor on the basis of observed discipline and rank. Then as an alternative to using actual rank, we use the pooled sample of males and females to estimate an ordered probit to predict each faculty member's rank. The maximum probability across rank is then selected and a revised market factor derived on that basis. This provides an indirect method of controlling for the role of rank, absenting from any potential institutional discrimination.

We begin with an uncontroversial wage specification incorporating basic measures of human capital. We then explore the role of market salary and peer review weightings; we conclude with a specification incorporating objective measures of academic performance including publications, grant money and teaching and service awards.

To be explicit the basic specification incorporates the following; geographic location, academic qualifications and various aspects of time relating to the academic appointment. The first of these is a control variable, *remote campus appointment.* This incorporates appointments at a branch campus offering primarily the first two years of arts and science disciplines and remote sites for the medical school. Even though, in principle, faculty meet the same tenure and promotion standards as at the main campus, there is likely to be some difference in the market in which such faculty are recruited in addition to self-selection elements leading to different initial and subsequent salaries. From Table 2 we see that approximately 3 percent of female faculty versus 9 percent of male faculty are located on a remote campus. Most of this differential is attributable to the smaller proportion of women in the medical school.

The variables labeled *holds doctorate* and *holds terminal degree* (both in the field), are measures of academic qualification. As it typically takes longer to earn a doctorate, other things equal, those fields that require it as a minimum standard tend to pay higher wages due to the restricted entry. The same argument applies to the *terminal degree* variable; if it is not standard to obtain a doctorate to join the professoriate, the rewards to a lesser degree that is recognized as the acceptable standard (terminal) for the discipline should be substantial. Table 2 shows that male faculty are more likely to hold both doctorates and terminal degrees for their disciplines; this differential is expected to contribute to the explanation of the observed gender wage gap.

Four *time/longevity* variables capture various aspects of work experience and tenure. *Years since highest degree obtained* measures the number of years in the profession after completed training, whereas *Age in years* reflects general work experience. Controlling for the former, a higher age implies more years of work or other experience prior to earning the degree. This in turn may be associated with higher/lower earnings depending upon whether prior general human capital is valued in academic settings. A later start may also imply a depreciation of research capability in some fields and act as a signal of lesser academic ability on average. *Years since joining current university* has an ambivalent expected effect. To the extent that universities reward years of service to the university, this variable should be positively related to earnings; the more market-driven salaries are, the more this will be a measure of distance from market premia and hence tend to be negatively related to salary. The existing literature provides mixed evidence on this issue. Length in service at the university in question differs only by a year across gender but female faculty typically earn their final degree at an older age than the male faculty--five years on average. This suggests less accumulation of academic-specific human capital at any age, on average, and thus should contribute to the explanation of lower salaries for women. *Leave of absence taken* indicates whether formal time was taken out of the academic career. Leaves for sabbatical and other professional reasons are not included in this category.[4] The need to take formal leave may be an indicator of unusual family responsibilities or poor health, either of which would tend to be associated with lower cumulative productivity. In our sample almost twice as many women as men have taken such leave.

Having discussed inclusion of all variables underlying the baseline specification, we now turn to a discussion of the additional variables included in the extended specifications. We have already discussed the variable capturing the market salary factor, observed for our entire sample. Unfortunately many of the remaining variables of interest are available only for a subset of the sample. As part of a salary review process, the university in question engaged in a productivity rating exercise for all faculty. Each discipline/department was asked to identify senior raters who had not directly participated in salary setting determinations for the past year. To avoid divisive discussion and comparison, each rater was asked to privately rate all colleagues on a scale of 1 to 5 with 1 being poor and 5 outstanding. No one self rated. The ratings were to be based upon research, service and teaching, weights did not have to be equal if the discipline had a written policy indicating alternative weights. Each faculty member who was rated had several rating scores; these were averaged and the resulting number rounded to the nearest integer. Only these integers are in the current data set. Those rated as 4-5 are assigned to the *High productivity* group; those with a 3 are assigned to the *Medium productivity* group; those with a 1-2 rating are assigned to the low productivity group which is the reference case in the statistical analysis.[5]

The advantage of such a peer-review discipline-specific exercise is it functions across disciplines and schools with differing standards. The publication of a peer reviewed article may be much more important in one discipline than another; the relative weighting of research, service and teaching may also vary across discipline. Raters can take these differences into consideration. Disadvantages of peer review include potential subjectivity and the need to obtain the cooperation of all disciplines in the campus in a rather sensitive process. Participation in the exercise was encouraged but not mandated by central administration. As a result there are productivity ratings for a subset of 625 of our original sample of 851 faculty, i.e. approximately three-quarters of the initial sample.

In general the sub-sample with productivity ratings is similar to the full sample with one exception (results available upon request). Perhaps understandably, those with *remote* appointments are in units that are substantially under-represented in the productivity rating sub-sample. There are some differences in the productivity rating sample by gender. Table 2 shows a greater (lower) percentage of males in the *High (Medium) productivity* group. The percentage in the low productivity group is almost identical across gender. This suggests a potential for productivity ratings to help explain the differences in salaries for female academics.

Results

Table 3 contains the econometric results for specifications estimated over male and female samples separately. The first two columns show the base-line earnings regression results for the male and female samples. The second two columns illustrate the impact of adding the quadratic capturing the market salary factor. Comparison of the goodness- of-fit measure, R^2, jumps significantly for both genders, supporting the

[Place Table 3 about here.]

notion that the market salary factor has a strong influence on the salaries paid by an individual institution. Both the linear and quadratic term are statistically significant at the most conservative levels, suggesting an important positive (but declining) contribution of market salary up to approximately $85,000. Working on a remote campus has a significant negative earnings effect for both genders. As a priori expected a doctorate and terminal degree both positively affect earnings. Significance however fades with the addition of the market salary factor. Years since highest degree is positive and significant for both genders. Tenure, or years with the current university is negative and significant for men, but insignificant for women. The a priori expected sign is unclear, since longer tenure may imply greater service and institution specific skills or alternatively lack of competing outside offers. This is also consistent with Mincer's [1978] findings on tied movers and stayers as female faculty are historically more likely to be tied than male faculty.

Turning to the productivity sample results in Table 4. The sample size declines from 574/277 to 418/207 for male/females respectively. As in Table 3, the first 2 columns exclude the market salary factor. The productivity rating variables, medium and high as measured by peer review are positive and significant for men, and increasing as expected, (recall the default is low peer review). However, somewhat surprisingly, the female estimated coefficients are very small and statistically insignificant at conventional levels. Apparently female faculty are not rewarded according to perceived productivity.

We can only speculate on the insignificant effect of the peer productivity ratings on female faculty salaries. The directive given to the productivity raters to apply equal weights to research, service and teaching except in the presence of written policies that specify other weights may have encouraged higher ratings for individuals who are doing things other than research. But research, which is more important for national market factors, tends to bring the highest salary rewards. If women faculty disproportionately take on service and teaching tasks that are less rewarded in terms of salary but are viewed as important for the mission of the department, school and campus, then the productivity variables could have these minimal effects for female faculty. There is some casual evidence consistent with this interpretation; in 1999 only 32 percent of the faculty were female but 38 percent of the university's administrative and governance committees were chaired by women.

There is an alternative explanation. If women in the lower paid disciplines tend to be viewed as productive and women in the better paid (relative to market) disciplines tend to be viewed as relatively low productivity faculty, then the approximately zero effect of the productivity ratings in the female sub-sample would be explained. There is some weak support for this view. Two of the high-paying school groups are *business, journalism, law, public affairs* (*bjlpa*) and *engineering, science (es)*; in *bjlpa*, only 20% of the women were rated as highly productive (compared to the mean of 45.9% for all women in the sample) and in *es* only 33% of the women faculty were rated as highly productive. This was not true of the other highly paid field, *dental*, however where the percentage rated highly productive was well above the mean. Similarly in two of the low paying fields (relative to market) a higher percentage of women were rated as highly productive. In the *medical school*, 60% of the women faculty were rated highly and in *liberal arts, fine arts, library science, continuing studies,* 56% were rated as highly productive. Again, however, a lower percentage was rated highly productive in the other low paying grouping, *allied health, nursing, social work*.[4]

A third explanation might focus on the possibility that men and women have systematically different weightings of research, service, and teaching in the evaluation of colleagues and are dispersed differently across disciplines. Sixty-five percent of women faculty are in the two school groupings, *allied health, nursing, social work* and *liberal arts, fine arts, library science, continuing studies*. It seems reasonable to suppose that women will, therefore, on average, have more women rating them than will men. Suppose women tend to weight service and teaching achievement more heavily in the rating of faculty. If salaries within these disciplines are still set primarily by national markets which tend to emphasize research accomplishments, the salaries of women would tend to be largely orthogonal to their productivity ratings. Unfortunately we lack the data to provide evidence on this supposition. No information was collected on the characteristics of raters and the rating forms themselves were destroyed to protect the confidentiality of the raters. And there were no ratings breakdowns by research, service and teaching, which might have facilitated further parsing of the data.

Turning to a discussion of columns 3 and 4 in Table 4- overall results are similar. The quadratic in market salary factor once again has a strong and statistically significant effect on faculty salaries. This is despite the inclusion of the peer review productivity ratings. Thus external validation appears more important than internal assessment, especially for female faculty.

The final set of regression results, included in table 5, focus on including alternative measures of academic productivity, namely the number of refereed articles, and books, as well as measures of teaching and service awards and grant money. Unfortunately given the voluntary nature of the request, these measures are only available for a sub-sample of 169 male and 115 female faculty for the full-sample or 161 and 91 for the productivity sample. Results across the two samples are once again very similar, Table 5 documents the results from the larger sample. The key influence of the market salary factor is maintained on this sub-sample. Interestingly the objective productivity measures are in general insignificant; in fact none of the productivity measures even approach conventional significance levels for females. In summary the number of refereed articles is positive but insignificant for both genders. The number of books is also positive and significant for men, insignificant for women. Similarly the log of grant money is positive and once again only significant for men. Finally the variable capturing the number of teaching awards is once again positive and significant only for men. Awards acknowledging university service are insignificant for both genders.

One plausible reason behind the insignificant role of these objective productivity measures is the inability to control for the quality dimension. This is particularly true for the number of refereed articles- controlling for quality is difficult within discipline; the difficulties are magnified across disciplines. Similarly, we do not observe whether the articles are joint authored. However, despite the problems associated with objective measures of productivity, there is little reason to believe that the accuracy of the measures differ by gender. Thus, once again, just as in the case of peer review, objective measures of productivity including published books, research grant success and teaching awards appear to play a positive and significant role in male wage determination but are insignificant for females. This is a striking result.

The Oaxaca and Ransom decomposition results are contained in Table 6; all estimates are significant at the 5 percent level. All the decompositions assume that the wage specification in the absence of discrimination would be represented by the pooled male-female coefficients. The first specification is the basic human capital model underlying Table 3. The first two columns sum to the gross male-female logarithmic differential of .197, equivalent to an unadjusted wage gap of approximately 21.8%. The third column provides an estimate of the market discrimination coefficient, which is decomposed into male over-payment and female under-payment in columns four and five. The last column contains estimates of Q_{mf}, the productivity component of the wage gap. The results in row I suggest that productivity differences due to basic human capital differences explain much of the gender wage gap. Even with the narrowest set of characteristics the specification does a pretty good job of explaining the gender wage gap of female faculty. Seventy-five percent of the overall gap (sum of columns 3 and 6) is explained by these productivity factors, leaving only 25 percent unexplained.

The decomposition of the remaining pay gap into male over-payment and female under-payment is given in columns 4 and 5 of Table 6. In general the female under-payment is about twice as large as the male over-payment, suggesting that remedies which raise the pay of female faculty would close much, if not all, of the remaining unexplained pay gap. Depending on specification, male overpayment ranges from 1% to 2%; female underpayment ranges from 2% to 4%.

We next discuss the effect of four possible adjustments on the basic wage gap decomposition.

1. Market Salary Factor. The second row results employ precisely the same sample but the wage specification also includes the additional variables capturing a quadratic in the market salary factor. The market discrimination coefficient is almost halved in magnitude, with the unexplained portion of the gap falling from 25 percent to about 12 percent. As the basic unadjusted wage gap for our sample is about 21 percent, this implies that less than 3 percent of female-male faculty wage differences remain unexplained after accounting for basic human capital characteristics and market determined wages**2. Peer Productivity Ratings.** Rows 3 through 5 of Table 6 display the summary information from the decomposition on the productivity peer rated sub-sample of 418 male and 207 female faculty. The gross male-female logarithmic differential for this sample is slightly larger at .22, equivalent to an unadjusted wage gap of approximately 24%. Comparison of results of row III with row I suggests a strong similarity of the full sample with that of the productivity subset. When we control for basic human capital variables, the remaining unexplained portion is about 31.4 percent. In row 4 peer ratings are addedand the unexplained portion of the gap rises slightly to 33.2 percent. The increase in the unexplained portion of the gap suggests that the pay differential slightly exceeds the productivity difference perceived by peers. Adding the market salary factor to the peer rating and human capital specification still drops the unexplained portion substantially although now only from 33.2 percent (Row IV) to 18 percent (Row V). In this case, the final unexplained portion of the wage gap is still small, but slightly larger, at 4.3 percent.

3. Rank. The final two rows of Table 7 replicate the results of the earlier specifications of models II and V. The only difference is that in these final two rows, the market salary factor is derived from predicted rank (via an ordered probit specification pooled across genders) rather than actual rank. Thus rather than observed academic rank, individuals are assigned the rank with the highest probability given their personal characteristics. This maximal rank is then used to assign the market factor. This allows for the possibility of discrimination in promotion affecting the market salary factor. If a given faculty member was inappropriately denied promotion from Associate Professor to Professor, the market salary factor for that individual would be too low, implying, incorrectly, that a low salary would be justified by market conditions. For the purposes of this paper we ignore sorting into discipline. Interestingly the decomposition II* lies between the decomposition for the basic model and the specification including the market salary factor, with the result closer to the latter. Thus productivity as measured plays an extremely important role even when the market salary is based on predicted rather than actual observed rank. The unexplained portion of the salary gap has fallen to about 16.6 percent (Row II*) compared to the result with the actual salary factor – 12.2 percent (Row II). This would leave about 3.7 percent of the overall salary gap unexplained.

When we examine the peer rating sub-sample, including the revised market salary factor results in an unexplained wage gap of about 23.3 percent (Row V*) instead of 18 percent (Row V). Thus the conclusion appears to be that if males/females are allocated across academic ranks via the same mechanism then the market factor has somewhat less explanatory power. This reinforces the view that an important part of the reason behind the overall gender wage gap is the differential treatment in promotion. In this specification about 5.6 percent of the overall male-female faculty wage gap remains unexplained. Although still small, this is the largest of the unexplained wage gaps identified here; the overall range of unexplained pay gaps, when the outside average salary factor is controlled for, runs from 2.5 percent to 5.5 percent.

4. Quantitative Productivity Measures. We considered, for a sub-sample of 169 male and 115 female faculty, an alternative objective measure of productivity in place of peer review. Despite the difficulty of finding accurate objective measures of productivity, such measures have the advantage of avoiding subjective evaluations. We included counts of refereed articles, books, teaching awards and service awards and the logarithm of research grant dollars obtained as explanatory variables. For this sub-sample, controlling for basic human capital factors, the actual market salary factor and quantitative productivity measures, results in an unexplained portion of the wage gap close to the bottom of our range at 2.80 percent.

When we control for market salary factors and include either an objective or peer review measure of faculty productivity, there appears to be an unexplained wage gap of three to four percent. If we also adjust the rank before assigning the market salary factor, to control for potential discrepancies in promotion rate by gender, the resulting unexplained wage gap could be as high as 5.5 percent. The two highest figures, 7.5 and 8 percent, include no controls for average outside salary and hence, if the university in question is an atomistic competitor, results from misspecification.

Conclusions

The results here, that the unexplained equilibrium wage gap between female and male faculty may be as low as three percentage points and almost surely below seven percentage points, are similar in spirit to the results of Hellerstein and Neumark. They found, using an innovative production function approach, that the difference between the wage gap and the productivity gap between women and men at Israeli manufacturing firms was small (two to eight percentage points) and statistically insignificant. Our results suggest a pivotal role for themarket salary factor by discipline and rank. Taking the university in question as an atomistic competitor- there would appear little the individual university can do to address the gender wage gap. However, the results are suggestive of an important role for promotion, this remains an important source of gender differentials.

Notes

[1] If the decomposition exercise is also intended to provide a quantitative estimate for an across-the-board nominal wage hike for female faculty then the nominal wage gap approach should be used rather than the equilibrium wage gap approach we propose here.

[2] An alternative decomposition of the nominal wage gap based on the pooled sample is given by Ogloblin [1999]. He divides the nominal wage gap into an explained portion (the productivity differential) and two unexplained portions (the male advantage relative to the entire group and the female disadvantage relative to the entire group). This alternative method gives results that are generally less than one percentage point away from the method employed in this paper. Specific differences for a subset of the results are given in the results section below.

[3] At the university in question, appointments are considered either ten-month (for the academic year) or twelve-month for the calendar year. We therefore divide by 10 or 12, as appropriate, to arrive at a comparable monthly salary for all faculty. In some other universities, an academic year appointment would be counted as nine months. Dividing by ten may be viewed as imparting a small downward bias to the salaries of academic year appointees; 66% of female faculty are academic year appointees while only 53% of male faculty are academic year appointees.

[4] We did some experimentation with the duration of leave; it appears that leave taken which totals up to about two years is associated with lower earnings but leave that totals up to more than two years is associated with somewhat higher earnings. We

have no explanation for this effect. A variable that combines the shorter and longer leaves typically has no impact in the earnings regression. The *leave of absence* variable we employ here is for leave totaling less than 24 months.

[5] Because of concerns about the confidentiality of the ratings, the forms were destroyed after the ratings were entered in the data base.

[6] Even if a satisfactory explanation cannot be found for the lack of correlation between productivity and female salaries, this does not necessarily imply discrimination against female faculty. What the results says is that, among the female faculty, whether you are more productive than average or less productive than average makes little difference to your salary. A discrimination story would have to explain not only why productive women were underpaid but why unproductive women were overpaid. The story about the productivity ratings varying across schools fits the facts more easily than a simple discrimination story would.

[7] In regressions and decompositions which are not reported here, involving all of the different sets of characteristics, the productivity rating variables never contributed appreciably to our ability to explain the wage gap of female faculty.

[8] This leaves the identification of predicted rank resting on functional form. While this is less desirable than having different variables to identify the equations, it is hard to imagine a variable that would emphasize rank without emphasizing salary.

[9] Recall that we have already excluded all faculty with administrative appointment at the Dean level and above.

[10] At least one court case for reverse discrimination at another university successfully overturned an across-the-board salary increase for female faculty on the basis that their multiple regression model had left out key variables, including productivity and administrative appointment (U.S. Court of Appeals [1995]). This would be another powerful argument for universities to include such variables in their salary models.

[11] There are at least 15 faculty members in each cell for both the male and female sub-samples.

[12] This salary problem at the School of Medicine is well understood at the university in question and is of relatively recent origin connected to changes in the health care sector and adjustments to the provision of clinical care.

[13] If actual rank is used, the percentage of the gap explained for the basic set plus the salary factor quadratic specification in Table 7, left-hand column, falls from 90% to 86%. If we control for market salaries, predicted rank actually outperforms actual rank in explaining the wage gap. Recall that the percentage of the gap explained is not monotonically related to the size of the adjusted R-square in the separate regressions. A particular added variable could increase the adjusted R-square in both regressions because it is an important factor in wage determination but would not affect the percentage of the wage gap explained if it was equally important for both male and female wages.

[14] Of course, the *amount* of the gap left unexplained will be different because the Ogloblin decomposition is applied to the gross wage gap between men and women while our decomposition is applied to the gross equilibrium wage gap between female salaries and *all* salaries. For example, in the less controversial specification, 13 percent of the gap remains unexplained for both methods. That is 1.4 percentage points of the equilibrium wage gap between women's salaries and all salaries (our decomposition) but 2.9 percentage points of the gap between women's and men's salaries (Ogloblin decomposition).

[15] It is also possible that a productivity rating exercise resulting in *separate* ratings for research, service and teaching would have helped sort out some of the remaining unexplained wage gap between female and male faculty.

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Table 1. Variable definitions.

I. Basic set of explanatory variables

Location
Remote. A dummy variable equal to 1 if the faculty member holds appointment at other than the main campus, and 0 otherwise.

Qualification
Holds doctorate. A dummy variable equal to 1 if the faculty member holds a doctorate as highest qualification, and 0 otherwise.

Holds terminal degree. A dummy variable equal to 1 if the faculty member holds the terminal degree for the field whether a doctorate or other degree, and 0 otherwise.

Time/longevity
Age. The faculty member's age in years.

Leave of absence. A dummy variable equal to 1 if the faculty member has taken formal leave time apart from sabbatical of 1 to 24 months, and 0 otherwise.

Years since highest degree obtained. The number of years since the faculty member obtained the qualifying degree.

Years with current university. The number of years the faculty member has spent with the current university.

School (reference case is liberal arts, fine arts, continuing studies and library science)
Allied health, nursing, social work. A dummy variable equal to 1 if the faculty member has an appointment in one of these schools, and 0 otherwise.

Business, journalism, law, public affairs. A dummy variable equal to 1 if the faculty member has an appointment in one of these schools, and 0 otherwise.

Dental. A dummy variable equal to 1 if the faculty member has an appointment in this school, and 0 otherwise.

Education, physical education. A dummy variable equal to 1 if the faculty member has an appointment in one of these schools, and 0 otherwise.

Engineering, science. A dummy variable equal to 1 if the faculty member has an appointment in one of these schools, and 0 otherwise.

Medical. A dummy variable equal to 1 if the faculty member has an appointment in this school, and 0 otherwise.

Productivity ratings (reference case is the low productivity group-those receiving average ratings of 1 or 2)

Medium productivity. A dummy variable equal to 1 if the faculty member received an average rating of 3 which represented a satisfactory, and 0 otherwise.

High productivity. A dummy variable equal to 1 if the faculty member received an average rating of 4 or 5, which represented an outstanding rating, and 0 otherwise

Market Salary factor

Average salary. The average academic year salary reported for the faculty member's rank and discipline in a published national salary survey.

Logarithm of monthly salary. The natural logarithm of the faculty member's monthly salary, with monthly salary obtained by dividing annual salary by 12 months for those with year round appointments and by 10 months for academic year appointments.

Awards

Teaching award, University service award, Log (grant funding).

Table 2. Variable means for regular faculty sample, all variables.

Dependent Variable	Female Sample Mean	Male Sample Mean
Logarithm of monthly salary	8.4278	8.6253
Independent Variables		
Administrative Appointment		
Assistant or associate dean	0.069	0.042
Chair or program director	0.069	0.099
Hired as chair or program Director	0.032	0.064
Previous chair or director	0.087	0.115
Location		
Remote campus appointment	0.032	0.094
Qualification		
Holds doctorate in field	0.704	0.896
Holds terminal degree in field	0.834	0.957
(predicted) Rank		
Assistant professor	0.310	0.208
Associate professor	0.495	0.333
Professor +	0.116	0.432
Salary Factor		
Average academic year salary for given discipline and rank	48,018.69	58,818.99
School (reference case is liberal arts, fine arts, continuing studies, library science)		
Allied health, nursing, social work	0.397	0.042
Business, journalism, law, public affairs	0.087	0.123
Dental	0.061	0.120
Education, physical education	0.072	0.042
Engineering, science	0.076	0.285
Medical	0.058	0.193

Table 2 (continued)

Independent Variables	Female Sample Mean	Male Sample Mean
Time/Longevity		
Age in years)	48.70	48.74
Leave of absence	0.134	0.076
Years in rank	9.38	9.90
Years since highest degree obtained	15.33	20.13
Years at current university	13.65	14.71
Productivity ratings*		
Medium productivity	0.435	0.390
High productivity	0.420	0.471
Sample size	277	574
Productivity rating sample*	207	418

Table 3: Semi-logarithmic earnings regression results for the basic specification (I).

Explanatory Variable	Basic Set (I)		Basic Set (I) + Salary	
	Male	Female	Male	Female
Intercept	**7.504**[a]	**7.759**[a]	**7.011**[a]	**7.378**[a]
	(0.315)	**(0.321)**	**(0.231)**	**(0.223)**
Location				
Remote campus appointment	**-0.140**[a]	**-0.174**[a]	**-0.198**[a]	**-0.183**[a]
	(0.033)	**(0.030)**	**(0.028)**	**(0.042)**
Qualification				
Holds doctorate	**0.217**[a]	**0.261**[a]	**0.066**	**0.141**[a]
	(0.040)	**(0.036)**	**(0.043)**	**(0.034)**
Holds terminal degree	**0.228**[a]	**0.173**[a]	**0.053**	**0.040**
	(0.066)	**(0.042)**	**(0.053)**	**(0.034)**
Salary Factor				
Average academic year salary			**0.256**[a]	**0.257**[a]
			(0.030)	**(0.036)**
Square of average salary			**-1.17E-04**[a]	**-1.36E-04**[a]
			(2.31E-05)	**(3.12E-05)**
Time/Longevity				
Age	**0.022**	**3.54E-04**	**0.018**[b]	**-0.005**
	(0.015)	**(0.014)**	**(0.010)**	**(0.008)**
Square of age	**-2.97E-04**[b]	**7.68E-06**	**-1.92E-04**[b]	**7.61E-05**
	(1.62E-04)	**(1.38E-04)**	**(1.10E-04)**	**(8.49E-05)**
Leave of absence	**-0.010**	**-2.64E-03**	**0.023**	**-9.54E-04**
	(0.027)	**(0.021)**	**(0.022)**	**(0.013)**

Table 3 (continued)

Years since highest degree obtained	**0.025**[a]	**0.027**[a]	**2.16E-03**	**0.014**[a]
	(0.006)	**(0.006)**	**(0.005)**	**(4.02E-03)**
Square of years since highest degree	**-6.04E-05**	**-4.90E-04**[a]	**1.16E-04**	**-2.60E-04**[a]
	(1.51E-04)	**(1.46E-04)**	**(1.17E-04)**	**(1.04E-04)**
Years with current university	**-0.011**[b]	**9.83E-04**	**-0.009**[a]	**-3.89E-03**
	(0.006)	**(0.006)**	**(4.47E-03)**	**(4.28E-03)**
Square of years with current university	**2.28E-04**	**9.36E-05**	**1.86E-04**	**1.06E-04**
	(1.81E-04)	**(1.59E-04)**	**(1.37E-04)**	**(1.09E-04)**
R^2	**0.3685**	**0.4971**	**0.6273**	**0.7174**
N	**574**	**277**	**574**	**277**

[a] Statistically significant at 0.05 level. [b] Statistically significant at 0.10 level.
(heteroscedastic consistent standard errors in parentheses)

Table 4: Semi-logarithmic earnings regression results for the basic specification (I), productivity rating sample.

	Basic Set (I) + Productivity		**Basic Set (I) + Productivity + Salary**	
Explanatory Variable	Male	Female	Male	Female
Intercept	**7.179[a]**	**7.306[a]**	**6.727[a]**	**7.336[a]**
	(0.383)	**(0.387)**	**(0.268)**	**(0.287)**
Location				
Remote campus appointment	**-0.195[a]**	**-0.216[a]**	**-0.019**	**-0.062[b]**
	(0.070)	**(0.045)**	**(0.049)**	**(0.032)**
Productivity ratings				
Medium productivity	**0.116[a]**	**0.034**	**0.067[a]**	**0.032**
	(0.036)	**(0.041)**	**(0.029)**	**(0.031)**
High productivity	**0.205[a]**	**-1.80E-03**	**0.120[a]**	**4.78E-03**
	(0.035)	**(0.042)**	**(0.028)**	**(0.032)**
Qualification				
Holds doctorate	**0.202[a]**	**0.255[a]**	**0.046**	**0.143[a]**
	(0.042)	**(0.037)**	**(0.041)**	**(0.039)**
Holds terminal degree	**0.227[a]**	**0.196[a]**	**0.031**	**0.045**
	(0.059)	**(0.048)**	**(0.049)**	**(0.043)**
Salary Factor				
Average academic year salary			**0.269[a]**	**0.279[a]**
			(0.033)	**(0.041)**
Square of average salary			**-1.27E-04[a]**	**-1.58E-04[a]**
			(2.50E-05)	**(3.39E-05)**

Table 4 (continued)

Time/Longevity				
Age	**0.030**	**0.020**	**0.026**[a]	**-0.007**
	(0.019)	**(0.017)**	**(0.012)**	**(0.012)**
Square of age	**-3.92E-04**[b]	**-2.05E-04**	**-2.70E-04**[a]	**9.72E-05**
	(2.00E-04)	**(1.80E-04)**	**(1.26E-04)**	**(1.22E-04)**
Leave of absence	**0.011**	**0.006**	**0.036**[b]	**0.005**
	(0.030)	**(0.055)**	**(0.019)**	**(0.039)**
Years since highest degree obtained	**0.027**[a]	**0.026**[a]	**4.61E-03**	**0.014**[a]
	(0.007)	**(0.006)**	**(0.005)**	**(4.66E-03)**
Square of years since highest degree	**-7.98E-05**	**-4.31E-04**[a]	**4.59E-05**	**-2.63E-04**[a]
	(1.73E-04)	**(1.65E-04)**	**(1.27E-04)**	**(1.15E-04)**
Years with current university	**-9.76E-03**	**-3.32E-03**	**-0.008**[b]	**-0.007**
	(0.007)	**(0.007)**	**(4.82E-03)**	**(0.005)**
Square of years with current university	**1.97E-04**	**2.04E-04**	**1.80E-04**	**1.54E-04**
	(1.94E-04)	**(1.89E-04)**	**(1.50E-04)**	**(1.34E-04)**
R^2	**0.4225**	**0.5131**	**0.6675**	**0.7182**
N	**418**	**207**	**418**	**207**

[a] Statistically significant at 0.05 level. [b] Statistically significant at 0.10 level.
(heteroscedastic consistent standard errors in parentheses)

Table 5: Semi-logarithmic earnings regression results for the basic specification (I) + salary + research refereed +number of books + log of grant dollars + teaching awards + service awards

	Basic Set (I) + Salary + Objective Productivity Measures	
Explanatory Variable	Male	Female
Intercept	**6.405[a]** **(0.399)**	**7.139[a]** **(0.292)**
Qualification		
Holds doctorate	**0.041** **(0.032)**	**0.014** **(0.101)**
Holds terminal degree	**-0.085[b]** **(0.044)**	**0.078** **(0.076)**
Salary Factor		
Average academic year salary	**0.375[a]** **(0.054)**	**0.400[a]** **(0.073)**
Square of average salary	**-1.82E-04[a]** **(4.61E-05)**	**-2.55E-04[a]** **(6.40E-05)**
Time/Longevity		
Age	**0.035[a]** **(0.018)**	**-0.009** **(0.010)**
Square of Age	**-3.66E-04[b]** **(1.91E-04)**	**1.04E-04** **(1.07E04)**
Leave of absence	**0.068[a]** **(0.014)**	**-0.005** **(0.017)**
Years since highest degree obtained	**-0.013[b]** **(0.007)**	**0.012[a]** **(0.005)**
Square of years since highest degree	**2.96E-04[b]** **(1.72E-04)**	**-2.72E-04[a]** **(1.29E-04)**
Years with current university	**-3.01E-03** **(0.006)**	**-3.95E-03** **(0.007)**

Table 5 *(continued)*

Explanatory Variable	Male	Female
Square of years with current university	**5.01E-05** (1.74E-04)	**1.56E-04** (1.82E-04)
Objective Productivity Measures		
Number of articles refereed	**1.37E-03** (1.37E-03)	**6.19E-04** (1.53E-03)
Number of books published	**0.010**[a] (4.52E-03)	**0.007** (0.007)
Log of research grant dollars	**4.33E-03**[a] (1.88E-03)	**4.46E-03** (2.74E-03)
Number of teaching awards	**0.007**[b] (3.69E-03)	**-4.70E-03** (0.008)
Number of service awards	**-8.96E-04** (4.68E-03)	**-3.24E-03** (0.006)
R^2	**.773**	**.802**
N	**169**	**115**

[a] Statistically significant at 0.05 level. [b] Statistically significant at 0.10 level.
(heteroscedastic consistent standard errors in parentheses)

Table 6: Oaxaca and Ransom (1994) Decomposition

	Decomposition Elements					
	(1)	(2)	(3)	(4)	(5)	(6)
Model (*specification summary)*	$Ln(D_{mf} + 1)$	$Ln(Q_{mf} + 1)$	D_{mf}	δ_{m0}	δ_{f0}	Q_{mf}
I. (*basic human capital, full sample)*	0.051 (.014)	0.146 (.007)	0.052 (.014)	0.018 (.005)	0.037 (.010)	0.157 (.008)
II. (*plus outside avg. salary index by discipline/rank)*	0.026 (.010)	0.171 (.006)	0.026 (.010)	0.009 (.003)	0.020 (.007)	0.187 (.007)
III. *basic human capital, productivity rated sample*	0.069 (.016)	0.146 (.008)	0.072 (.017)	0.020 (.005)	0.041 (.011)	0.157 (.009)
IV. *plus peer rating index*	0.069 (.017)	0.146 (.008)	0.078 (.018)	0.021 (.006)	0.043 (.012)	0.157 (.009)
V. *plus outside avg. salary index by discipline/rank*	0.041 (.011)	0.175 (.006)	0.042 (.011)	0.014 (.004)	0.029 (.008)	0.191 (.007)
VI. *basic hc, objective measures sample, salary index, obj. measures*	0.026 (.013)	0.156 (.009)	0.027 (.013)	0.011 (.005)	0.016 (.008)	0.168 (.011)
II*. *with manipulated rank on outside avg. salary index*	0.0345 (.012)	0.162 (.007)	0.035 (.013)	0.011 (.004)	0.023 (.009)	0.176 (.008)
V*.*with manipulated rank on outside avg. salary index*	0.053 (.015)	0.163 (.007)	0.054 (.016)	0.018 (.005)	0.036 (.010)	0.178 (.008)

All decomposition elements in table are significant at the .05 level.
(standard errors [bootstrapped] in parentheses)