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# Dual-Career Couples in Academia: Does Wage Growth Suffer When One's Partner Works for the Same University?

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# Dual-Career Couples in Academia: Does Wage Growth Suffer When One's Partner Works for the Same University?

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James F. Ragan, Jr. and Mushtaq A. Khan<sup>1</sup>

## 1. Introduction

Faculty pay structures have long been of interest to economists.<sup>2</sup> Early studies of academic pay include Siegfried and White (1973); Ferber and Loeb (1974); Gordon, Morton, and Braden (1974); Hoffman (1976); and Tuckman, Gapinski, and Hagemann (1977). Recently, the attention has focused on the issue of monopsonistic discrimination in academia. Ransom (1993) developed a model of monopsonistic discrimination in which faculty with high mobility costs have higher seniority and lower wages than other faculty. Consistent with this model, Ransom found that faculty salaries and seniority are inversely related, both at the University of Arizona and in national data sets.

Hallock (1995) challenged these findings. He showed that the negative seniority profile at the University of Massachusetts at Amherst, which Ransom cited as further evidence of monopsonistic discrimination by universities, was not robust and that for a faculty member's first 14.7 years at UMASS salaries actually rose with seniority. Conceding that his findings might be specific to UMASS and other unionized institutions, Hallock called for analysis of seniority profiles at other universities.

Relying on a broader data base, the 1990 U.S. Census, Penrod (1995) also tested for monopsonistic discrimination in academic labor markets. Using a Herfindahl index to measure local monopsony power, Penrod found that, for faculty in research universities, wages were modestly lower in markets with greater monopsony power, an outcome predicted by Ransom's model.

As Ransom acknowledged, a negative relationship between seniority and salary is also consistent with the models of Harris and Holmstrom (1982) and Lazear (1986), in which worker quality is unknown when the worker is hired. Because only high-quality workers receive outside offers, low-quality workers tend to acquire higher levels of seniority. According to these models, faculty with high seniority receive lower pay not because of monopsonistic discrimination but rather because such faculty tend to be of lower quality. Ransom rejected these models, however, arguing that the relationship between seniority and salary remained negative and significant even when he included variables to standardize for number of books and number of articles published. But Ransom did not control for quality of research even though studies suggest that quality is more important than quantity [Katz (1973); Hamermesh, Johnson, and Weisbrod (1982)]. Nor did Ransom allow for the possibility that faculty with high seniority may have less favorable unmeasured personal characteristics.

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<sup>1</sup>We thank Bernt Bratsberg for insightful comments and suggestions on an earlier draft.

<sup>2</sup>Early studies of academic pay include Siegfried and White (1973); Ferber and Loeb (1974); Gordon, Morton, and Braden (1974); Hoffman (1976); and Tuckman, Gapinski, and Hagemann (1977).

The present study attempts to expand our understanding of monopsonistic wage setting in academia. Responding to Hallock's charge, we examine wage structures at another nonunion university, Kansas State University. Unlike prior studies, which were exclusively cross-sectional, we estimate seniority profiles with both cross-sectional and longitudinal data. The latter data permit us to estimate the effect of seniority net of unmeasured personal characteristics of faculty. If senior faculty are of lower quality, as suggested by the models of Harris/Holmstrom and Lazear, cross-sectional estimates of returns to seniority will be biased negatively. We also include a more detailed set of research variables than Ransom or Hallock.

More important, the present study is apparently the first to examine whether pay of a faculty member rises more slowly, other things equal, when one's partner is also employed by the same university. If monopsony power arises out of mobility costs, as argued by Ransom (1993) and Boal and Ransom (1997), it should be more severe when one's partner also works for the university.<sup>3</sup> To find superior employment opportunities, dual-career academic couples must find two acceptable jobs rather than one. Given the more limited prospects of joint outside offers, the university has the opportunity to exercise greater monopsonistic discrimination against dual-career academic couples. This will be true especially when the university is located in a small university town, as is Kansas State University, because of the likely need of faculty employed there to relocate geographically.

The following section develops cross-sectional and fixed-effects longitudinal models of wage determination when the university exercises monopsony power. This is followed by a discussion of the data sets and by presentation of empirical findings. The results are consistent with the model of monopsonistic discrimination. Faculty salaries are inversely related to seniority even after accounting for unobservable faculty characteristics.

In addition, for dual-career faculty, wage growth is adversely affected by partner's employment with the university, especially when both partners were hired at the same time.

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<sup>3</sup>The analysis could be expanded to include three categories of faculty: those without a working partner, those whose partner is employed outside the university, and those whose partner works for the university. We consider the simpler dichotomous model for three reasons: (1) Because of the difficulty of obtaining two university jobs, monopsonistic discrimination is likely to be most severe when both partners work for the university. (2) For faculty without a partner employed at the university, information on whether or not the faculty member has a partner working off campus is not likely to be readily available to university administrators. (3) We have data on employment of partner only for faculty whose partner works for the university. Suppose, however, that monopsonistic discrimination is greater against faculty whose partner works elsewhere than against faculty without a working partner. Then by including both of these groups in the reference category, we will understate the effect of partner's employment at the university relative to partner's not being employed anywhere, which will bias results against our finding a statistically significant effect.

## 2. Modeling Wage Determination in the Presence of Monopsony Power

Monopsony power depends on a factor's elasticity of supply. As shown by Sullivan (1989), the gap between a factor's wage and its marginal product is proportional to the inverse of the wage elasticity of supply. Because dual-career faculty have a larger inverse elasticity of supply, resulting from their higher mobility costs, the salaries of dual-career faculty will be farther below their marginal product than the salaries of other faculty. Similarly, if mobility costs rise with seniority, salaries of faculty in general will be inversely related to seniority.

In this model, salary depends on both marginal productivity of the faculty member and the degree of monopsony power:

$$\ln w_i = X_i\beta_1 + M_i\beta_2 + \varepsilon_i \quad (1)$$

where  $X_i$  is a vector of productivity characteristics of faculty member  $i$ ,  $M_i$  includes variables designed to capture monopsony power, and  $\varepsilon_i$  is the error term.

In one specification of the model,  $X_i$  contains information on rank of the faculty member.<sup>4</sup> Because promotions are traditionally accompanied by supplemental pay increments, pay is expected to be higher, other things equal, for those with higher rank. But because rank itself is influenced by past productivity, its inclusion can be expected to reduce estimated coefficients of the other productivity variables so that these coefficients now measure the direct effect on wages, conditional on rank, rather than the full effect. Of special relevance to the present study is whether inclusion of rank variables appreciably alters the estimated seniority profile, given the correlation between seniority and rank. Another reason for presenting models with and without rank is that one of the key studies involved in the Ransom/Hallock debate (Hoffman, 1976) includes rank, as does Hallock in two of his regressions.

### The Cross-sectional Model

*Experience* is measured as years since highest degree or years employed at the university, whichever is greater. Other productivity variables in the cross-sectional model include *Experience*<sup>2</sup>, *Citations* (number of first-author citations),<sup>5</sup> *Citations*<sup>2</sup>, and dummy variables to indicate whether or not the faculty member has earned a doctoral degree (*Degree*), is a member of the graduate faculty (*Grad Faculty*), has received a university-wide teaching award (*Teach Award*), and is recipient of a University Distinguished Professor Award (*Disting Prof*). Because faculty at Kansas State

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<sup>4</sup>Among the studies to include rank in salary regressions are Holtmann and Bayer (1970), Cohn (1973), Koch and Chizmar (1973), and Johnson and Stafford (1974).

<sup>5</sup>Although information on secondary authorship is not readily available, Diamond (1986a, 1986b) found that the explanatory power of wage regressions is similar whether or not that information is included.

University must provide evidence of independent research beyond the doctoral degree before they are admitted to the graduate faculty, *Grad Faculty* provides an indication that research productivity has reached a certain threshold. Faculty who receive a University Distinguished Professor Award receive an increase in base pay of at least \$10,000 per year. Although receipt of a teaching award does not increase base pay, it does serve as a proxy for teaching excellence which, if rewarded, should result in higher pay. Also included in the Xi vector is a variable (*Dissertations*) for number of completed doctoral dissertations for which the faculty member has served as major professor, which Katz (1973) argued is a proxy for research ability.

Monopsony power is measured by years at the university in a tenure-track position (*Seniority*), the square of this term, and four separate variables designed to capture employment status of partner with the university. *Continuous* indicates that one's partner has been employed continuously at the university--for as long as the faculty member has. *Intermittent* indicates that one's partner has been employed with the university at least one year but not every year that the faculty member has. *Partner's Years* measures the number of years that the partner has been employed with the university. If wage growth is adversely affected by partner's employment with the university, the coefficient of this variable should be negative. *Faculty Years* measures the number of years the partner has been employed as a faculty member, to allow monopsonistic discrimination, if it exists, to differ depending on whether or not one's partner is on a faculty line.

Equations were estimated with and without rank variables. Because pay varies by department, all equations include a set of dummy variables to indicate the faculty member's academic department. The dependent variable is the natural log of annual salary. Following conventional practice,<sup>6</sup> we converted the academic-year salary to full-year salary by multiplying the salary of those who are employed on an academic-year basis by eleven-ninths. This conversion procedure is consistent with the fact that, on average, faculty on nine-month appointments receive supplemental earned income equal to 23 percent of their base salary (Rees, 1993).

### **The Longitudinal Model**

The fixed-effects longitudinal model differs importantly from the cross-sectional model in the sense that it allows the error term to assume an individual-specific component that captures time-invariant, unmeasured characteristics of faculty.

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<sup>6</sup>See Hamermesh, Johnson, and Weisbrod (1982); Hansen (1985); Rees (1993); and Ragan and Rehman (1996).

Specifically,

$$\ln w_{it} = X_{it}\beta_1 + M_{it}\beta_2 + v_i + \varepsilon'_{it} \quad (2)$$

where  $v_i$  is the component of the error term specific to faculty member  $i$ . If faculty whose partner works for the university have different characteristics than other faculty, as will be argued later, failure to account for the correlation between these characteristics and the productivity and monopsony variables will result in biased parameter estimates.

For the longitudinal model, nominal salary was deflated by the *Consumer Price Index* to convert salaries to real terms. Of necessity, departmental dummies were deleted and the specification of seniority had to be changed. With panel data each additional year of seniority corresponds with an additional year of experience; that is, for a given faculty member, *Seniority* and *Experience* are perfectly correlated. To deal with this problem, we specified seniority in terms of intervals. Using two years or less as the base group, we included dummy variables to indicate whether or not seniority was in each of the following intervals: more than two years but less than or equal to five years (*Sen 2-5*) and 5-10, 10-20, and 20+ years (*Sen 5-10*, *Sen 10-20*, and *Sen 20+*, respectively). Because faculty move from one interval to the next in the longitudinal study, it is possible to estimate the effect of seniority while retaining our quadratic specification for experience.<sup>7</sup>

The longitudinal data also permit a detailed specification of the variables pertaining to employment status of one's partner. Of particular interest, the longitudinal data contain information on the date that the partner was first employed with the university, permitting us to test for differential monopsonistic discrimination based on timing of employment.

Monopsonistic discrimination is likely to be more severe when both partners are hired at the same time than when the second partner begins at a later date. When the two are hired together, there is a strong possibility of a package deal. The second job may even have been created to accommodate the dual-career couple. In that event, the likelihood of voluntary mobility will be lower and, therefore, the degree of monopsony power higher. Even if the couple were not hired jointly, employment of the partner at the same time as the faculty member or shortly thereafter may indicate a greater job commitment by the partner, and again higher mobility costs and greater opportunity for monopsonistic wage discrimination.

Given the likely importance of timing, after first estimating the basic wage regression with the variable *Partner's Years* we try an alternative specification that allows a differential effect on wage growth based on the date of partner's initial employment

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<sup>7</sup>The drawback of the interval specification is that it ignores the effect of changes in seniority within intervals. To the extent changes in seniority within intervals affect wages and are not captured by the seniority dummies, part of the influence of seniority could be attributed to experience.

with the university. In the second specification, we replace the variable *Partner's Years* with a pair of variables--*Start1* (number of years partner has been employed at the university if partner started within one year of the faculty member's initial employment) and *Start>1* (number of years partner has been employed at the university if partner started more than one year later). The expectation is that the coefficient of *Start1* will be more negative than the coefficient of *Start>1*.

Finally, we allow for differential monopsonistic discrimination when the partner is hired initially as a nontenure-track instructor and only later moves into a tenure-track position. Although the sample is restricted to faculty on tenure-track lines, some of this faculty was first employed as nontenure-track instructors. The fact that such faculty was given tenure-track positions only at a later date suggests that many of this faculty may have been hired as part of a package deal. If the faculty member were hired as a trailing partner, and not on the basis of his or her own qualifications, this arrangement would be expected to adversely affect salary growth. To test whether there is a differential effect on pay for faculty who are hired initially as instructors at approximately the same time as their partner, we add the variable *Instructor/Start1*, which captures the differential effect of salary growth for faculty who start as an instructor within one year of the partner's initial employment with the university.

In conclusion, the longitudinal model is richer in specification than the cross-sectional model in the sense that it incorporates information on timing of partner's employment and on whether or not a faculty member started on an instructor's line. The longitudinal model also has the advantage of accounting for unmeasured productivity characteristics of faculty. The primary limitation of the longitudinal model is that it is limited to faculty for whom employment status of the partner changed during the sample period.

### 3. The Data

With the exception of data on citations, which were collected from *The Science Citation Index* and *The Social Science Citation Index*, all data were collected from Kansas State University records. Data on graduate faculty status and number of dissertations supervised came from the Graduate School. Most of the remaining data were obtained from the university's Institutional Research and Analysis, which keeps budgetary and administrative records. The cross section consists of 782 male faculty for the 1994/95 academic year. The longitudinal data set contains 2,066 observations of 212 male dual-career faculty who were employed at the university for at least two years during the 14-year sample period, 1981/82 to 1994/95, and whose partner's employment status changed.

Although we initially envisioned estimating separate equations for male and female faculty, there were too few female, tenure-track, dual-career faculty to obtain reliable estimates. Only 33 female faculty were eligible for inclusion in the panel study, in large part the result of females' underrepresentation in tenure-track positions.

Both cross-sectional and longitudinal samples were restricted to tenure-track faculty. With the exception of department heads, who were included, faculty with administrative assignments were excluded from the sample because of the problems associated with measuring productivity of administrators. Faculty from the departments of music, art, and military sciences were also excluded because of the inherent difficulty of measuring productivity in these departments.

Collecting data on the employment status of the partner required considerable and careful work. We combined university annual budgets, university telephone directories, and university catalogs. To identify potential partnerships, we initially created a pool of university employees with the same last name, same address, or same telephone number. In most cases supplemental information permitted us to ascertain the relationship of employees but, because of the difficulty of identifying same-sex partnerships, the sample was restricted to male-female couples. Based on these restrictions, 28.3 percent of male faculty employed in 1994/95 was identified as having a partner who worked at some time at Kansas State University. For those identified as dual-career faculty for the longitudinal sample, we collected employment records of the individual and the individual's partner over the entire time period of employment with the university.

Table 1 presents summary statistics of the cross-sectional data set, both overall and by employment status of partner (whether or not she has worked for the university). Not only do dual-career faculty average an additional 2.1 years of seniority, consistent with higher mobility costs, they also appear to be more productive than "single-career faculty," the expression we use to designate faculty without a partner working for the university. For example, dual-career faculty average 48 percent more citations to their research than single-career faculty. They also are more likely to hold a doctoral degree and to be on the graduate faculty and, on average, have been major professor for more completed doctoral dissertations.

Summary statistics for the longitudinal data are reported in Table 2. Overall, the mean length of partner's employment with the university is 4.09 years. For faculty whose partner was hired within one year of the faculty member (25.5 percent of the sample), the mean of partner's employment is 4.16 years. For faculty whose partner was first employed more than one year later, the partner had been working for the university an average of 4.07 years. The distribution of seniority reveals that dual-career faculty typically acquires high levels of seniority, consistent with the cross-sectional data. Overall, 35 percent of the observations fall into the interval 10-20 years, and 23 percent are in the interval 20+ years.

#### **4. Empirical Findings**

##### **Cross-sectional Results**

Table 3 presents cross-sectional results for the academic year 1994/95. Results are

reported with and without variables on academic rank. Estimated coefficients of both rank variables are highly significant and indicate a 13 percent boost in pay for associate professors and 42 percent higher wages for full professors than assistant professors.<sup>8</sup>

As expected, given the correlation between rank and faculty productivity, estimated coefficients of the other productivity variables fall once rank is taken into account. Regressions without rank capture both the direct effect of a variable on pay and the indirect effect, through increased prospects of promotion. When rank is included, coefficients measure the conditional effect of a variable given the faculty member's rank.

As an illustration of the sensitivity of results, consider the effect of experience. Although all four models reveal significantly positive but diminishing returns to experience, the estimated experience-earnings profile is steeper in the models without rank (models 1 and 3). For a male faculty member with 17.9 years of experience (the mean of the cross-sectional sample), the cumulative returns to experience are estimated to be 56.1 percent in model 1 but only 24.8 percent in model 2. Even estimated returns in model 2 are higher than those obtained in a study of the same university by Ragan and Rehman (1996). But their study did not include variables for seniority, which caused them to understate returns to experience. This is because seniority has a negative effect on pay, consistent with the theory of monopsony.

For a faculty member who has been at Kansas State University for 14.6 years (the sample mean), seniority reduces pay by approximately 12.7 percent (model 1) to 16.3 percent (model 4). These estimates reveal a penalty for seniority comparable to that found by Ransom (0.5 to 1.5 per year). For a faculty member with 14.6 years of seniority and experience, the combined effect of these two variables is a 28.9 percent premium when rank is omitted (based on the results from model 1) but only 2.5 percent when rank is included.

In all four models, we find highly significant returns to completion of a doctoral degree, receipt of a teaching award, and designation as a University Distinguished Professor. There is also evidence of returns to citations, though both the estimated value of a citation and the level of significance depend on whether or not rank is included. Similarly, admission to the graduate faculty and supervision of doctoral dissertations are correlated positively with pay, but estimated coefficients lose statistical significance when rank is added.

Of greatest interest is the effect of employment status of partner with the university. Whether the partner was employed continuously or intermittently, there is no evidence

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<sup>8</sup>Because the dependent variable is log salary, the percentage salary premium is measured by the formula  $(\exp^{\infty} - 1) * 100$  where  $\infty$  is the coefficient of the particular dummy variable (*Associate Prof* or *Full Prof*).

of an adverse effect on faculty pay. Nor does pay fall with number of years partner was employed by the university or number of years employed in a faculty position.

Interpretation of these results is clouded, however, by our earlier observation that faculty whose partner is employed by the university are more productive as measured by such observable outcomes as citations and number of doctoral dissertations supervised. Such faculty also have a higher probability of being married than other male faculty (0.97 versus 0.83), and prior research suggests that married men may have more-positive unmeasured characteristics than other men.<sup>9</sup> The greater skills and ability of dual-career faculty might also be anticipated theoretically. Because of the difficulty of finding attractive joint offers, dual-career faculty are more likely to be underplaced than other faculty at the same university.

If dual-career faculty have unmeasured characteristics that are positively correlated with pay, cross-sectional estimates of partner's employment status will be biased positively--the variables measuring partner's employment status with the university will capture not only any negative effect of such employment but also the positive contributions of unmeasured faculty characteristics. Accordingly, it is important to see whether or not cross-sectional results hold once we net out for personal characteristics of faculty. That is the goal of the next section, which presents results of a fixed-effects model that examines how pay of individual faculty changes over time depending on employment status of partner.

### **Longitudinal Results**

*Productivity variables.* Results of the fixed-effects longitudinal model appear in Table 4. As with the cross-sectional model, there are positive but diminishing returns to experience and significantly higher pay for receipt of both the doctoral degree and the University Distinguished Professor Award, although parameter estimates of the latter variable must be interpreted cautiously in light of the fact that only two of the faculty in our sample became University Distinguished Professors during the sample period. Receipt of a university teaching award boosts faculty pay by a statistically significant 7 percent when rank is omitted and by an insignificant 5 percent when rank is included. The loss of significance may reflect the fact that rewards for teaching excellence occur in part through enhanced prospects for promotion.

Results for the citation variables are more robust than in the cross-sectional model, with coefficients of both variables statistically significant at the 5 percent level even when rank is included.

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<sup>9</sup>The evidence to date is mixed. Among the studies to conclude that the marriage premium results, at least in part, from unmeasured characteristics of those who marry are Cornwell and Rupert (1995, 1997) and Nakosteen and Zimmer (1997). See also Korenman and Neumark (1991).

As expected, the estimated returns to rank are appreciably lower when estimated with longitudinal rather than cross-sectional data. Cross-sectional estimates are biased upward by the correlation between rank and unmeasured characteristics of faculty. When unmeasured characteristics of faculty are accounted for, promotion to associate professor is estimated to raise pay by 4 percent while promotions to full professor boosts pay a further 11 percent.

*Seniority.* Table 4 indicates that faculty pay is inversely related to seniority even after accounting for unmeasured faculty characteristics. Although lower-quality faculty may be less likely to receive outside offers, as implied by the models of Harris/Holmstrom and Lazear, the negative returns to seniority found in the cross-sectional model are not primarily the result of any correlation between seniority and unmeasured characteristics of faculty. Estimated coefficients of almost all seniority variables are highly significant in the longitudinal model and assume increasingly negative values as faculty move into higher seniority intervals. Based on estimates of model 1, and relative to faculty with two or fewer years of seniority, pay falls by 4 percent for 2-5 years of seniority, by 6 percent for 5-10 years, 7 percent for 10-20 years, and 9 percent for more than 20 years of seniority.

The penalty for seniority estimated with the fixed-effects model is slightly smaller than that estimated with cross-sectional data, consistent with the argument that senior faculty have less favorable characteristics; but the smaller absolute value of the coefficients alternatively may result, at least in part, from the forced specification of seniority in interval form for the fixed-effects model. Interestingly, the estimated coefficients of the seniority variables are remarkably similar to those estimated by Ransom with 1969 Carnegie Survey data.

*Partner's employment with the university.* Models 1 and 2 indicate that the longer the partner's employment with the university, the lower is a faculty member's salary. Based on the estimated coefficient of *Partner's Years*, salary of a faculty member falls by approximately 0.5 percent for each year the partner is employed at the university. This finding, which is statistically significant, is consistent with differential monopsonistic discrimination based on lower mobility of dual-career couples working for the university.

The next question is whether wage discrimination is experienced equally by those whose partner joins the university at approximately the same time and those whose partner is first employed at a later date. As argued in section II, mobility costs are likely to be higher when couples are hired together than when a faculty member is hired first and his partner picks up a university job years later. Based on this argument, salary growth should be affected to a greater extent for faculty whose partner begins working for the university within one year of the faculty member's employment than for faculty whose partner first begins more than one year later.

To allow for a differential effect based on timing of partner's initial employment, we replaced *Partner's Years* with *Start1* (years partner has been employed if partner started within one year) and *Start>1* (years partner has been employed if partner started more than one year later). Whether or not rank is included, the estimated coefficient of *Start1* is negative and statistically significant at the 1 percent level (see models 3 and 4). The results indicate that wage growth is approximately 0.9 percent less for each year that partner is employed with the university provided that she began her employment within one year of the faculty member. The estimated coefficient of *Start>1* is also negative in both models, but its magnitude and statistical significance are lower. For faculty whose partner started more than one year later, the estimated wage discount for each year partner is employed is only half as large (0.40 to 0.44 percent), and this estimate is significant at only the 10 percent level in models 3 and 4.

To test whether the nature of partner's job affects the size of the wage discount, models 5 and 6 add the variable *Faculty Years*, number of years the partner has been employed at the university as a faculty member. The estimated coefficient is small and statistically insignificant, suggesting that whether or not the partner is employed as a faculty member has no added impact on salary.

Although the sample is restricted to faculty on tenure-track lines, some of these faculty were first employed as nontenure-track instructors. The fact that such faculty were given tenure-track positions only at a later date raises the possibility that many of these faculty were the trailing partner--hired not on the basis of their own qualifications, but because the university sought the services of their partner. Mobility costs of such faculty are likely to be even higher than those of other dual-career faculty.

To test whether there is a differential effect on pay of faculty who initially were hired as an instructor at approximately the same time as the partner, we interacted *Start1* with a dummy variable that assumes the value one if the faculty member was hired as an instructor. Results from models 7 and 8 provide strong evidence of adverse salary growth for this subgroup of faculty. Parameter estimates of the new variable, *Instructor/Start1*, are significant at the 1 percent level and reveal that faculty who started as an instructor at about the same time their partner was hired experience an additional 2 percent reduction in pay for each year their partner is employed.

The addition of this variable reduces the estimated coefficient of *Start1* but does not eliminate its statistical significance. The implication is that faculty hired at the same time as their partner receive a wage discount and the size of this discount is greater for faculty who started as an instructor. The other notable effect of adding *Instructor/Start1* to the equation is the reduction in the estimated coefficient of *Start>1* and the corresponding loss of statistical significance. According to models 7 and 8, dual-career faculty experience significantly lower salary growth only if they are hired at the same time as their partner.

## **5. Summary and Conclusions**

Arguing that mobility costs are higher when both partners work for the same university, at least when that university is located in a nonurban labor market, we extend the model of Ransom by allowing monopsony power to vary not only with seniority but also with employment status of partner. Empirically, this model is estimated with both cross-sectional and longitudinal data from Kansas State University.

The longitudinal data permit estimation of a fixed-effects model, which is especially important in light of a competing (nonmonopsonistic) explanation for the negative relationship between seniority and faculty pay. According to the models of Harris/Holmstrom and Lazear, the lower pay of senior faculty may result from less favorable unmeasured characteristics of such faculty. One notable finding of our study is that faculty pay is negatively and significantly related to seniority of male faculty in both cross-sectional and fixed-effects models.

Cross-sectional data reveal no evidence that partner's employment with the university adversely affects faculty pay, but there is reason to anticipate that cross-sectional estimation will be biased towards finding no effect. To the extent dual-career academic couples face restricted job opportunities, dual-career faculty are likely to be underplaced--to be of higher quality than other faculty at the university. Consistent with this view, dual-career faculty have higher values than other faculty for such productivity proxies as citations and number of doctoral dissertations supervised. They also are more likely to be married, which may be another indication of positive personal characteristics. Accordingly, dual-career faculty can be expected to have more favorable unmeasured characteristics than faculty in general, in which case the estimated effect of partner's employment with the university will be biased positively by the failure of the cross-sectional model to account for these characteristics.

To eliminate this bias in cross-sectional estimation, we estimate a fixed-effects model for faculty whose partner's employment status changed over the 14-year sample period. Findings reveal that pay of male faculty is negatively and significantly related to the number of years the partner has been employed at the university. Empirical results further suggest that the effect on pay depends on the timing of the partner's initial employment, consistent with the hypothesis that mobility costs are higher when couples are hired together. There is only weak evidence of monopsonistic discrimination against faculty whose partner first began employment with the university more than one year after the faculty member. In contrast, faculty whose partner started within one year experience nearly a 1.0 percent reduction in pay for each year the partner is employed with the university. Faculty who started as an instructor within one year of the partner and only later move to a tenure-track position experience an even larger wage loss. Our interpretation is that such faculty are disproportionately likely to be the trailing partner and therefore to have higher mobility costs than other dual-career faculty.

In conclusion, the present findings provide further evidence of monopsonistic pay determination in academia. They also provide the only evidence of which we are aware that pay of faculty depends not only on characteristics of the faculty member but also on employment status of the partner. Further research is necessary to see whether these findings are duplicated at other universities and whether monopsonistic discrimination on the basis of partner's employment status holds equally for female faculty. Nonetheless, a central message of this study is that faculty pay depends on more than faculty productivity.

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Table 1. Summary Statistics of Cross-Sectional Data: Means (and Standard Deviations)

Variables	Total Sample	Dual-Career	Single-Career
<i>Ln Pay</i>	10.86 (0.28)	10.87 (0.25)	10.85 (0.29)
<i>Experience</i>	17.88 (10.24)	19.11 (8.94)	17.39 (10.67)
<i>Experience</i> <sup>2</sup>	424.17 (396.00)	444.72 (348.75)	416.07 (413.14)
<i>Seniority</i>	14.64 (10.40)	16.13 (9.24)	14.05 (10.73)
<i>Seniority</i> <sup>2</sup>	321.64 (358.12)	345.14 (325.23)	312.38 (370.15)
<i>Citations</i>	84.51 (193.73)	110.37 (235.32)	74.33 (173.84)
<i>Citations</i> <sup>2</sup> (x 1000)	44.62 (22.59)	67.31 (28.02)	35.69 (199.65)
<i>Degree</i>	0.884 (0.32)	0.901 (0.30)	0.877 (0.33)
<i>Grad Fac</i>	0.797 (0.40)	0.873 (0.33)	0.767 (0.42)
<i>Dissertations</i>	2.55 (6.48)	3.27 (8.05)	2.26 (5.73)
<i>Teach Award</i>	0.047 (0.21)	0.045 (0.21)	0.048 (0.21)
<i>Disting Prof</i>	0.014 (0.12)	0.014 (0.12)	0.014 (0.12)
<i>Intermittent</i>	0.214 (0.41)	0.756 (0.43)	0.00 (0.00)
<i>Continuous</i>	0.069 (0.25)	0.244 (0.43)	0.00 (0.00)
<i>Partner's Years</i>	2.42 (5.17)	8.54 (6.51)	0.00 (0.00)
<i>Faculty Years</i>	0.703 (3.11)	2.49 (5.46)	0.00 (0.00)
Total Sample Size	782	221	561
Tenured Faculty	584	188	396
Assistant Professors	193	29	164
Associate Professors	230	73	157
Full Professors	359	119	240

Note: Data are for the 1994/95 academic year at Kansas State University and are for male faculty only. See text for definition of variables.

Table 2. Summary Statistics of Panel Data Set Means (and Standard Deviations)

Variables	Mean	St. Dev.	Min	Max
<i>Ln Pay</i>	10.41	0.27	7.24	11.12
<i>Experience</i>	15.42	8.33	0	41.24
<i>Experience</i> <sup>2</sup>	307.28	286.37	0	1700.83
<i>Sen 2-5</i>	0.132	0.34	0	1
<i>Sen 5-10</i>	0.211	0.41	0	1
<i>Sen 10-20</i>	0.355	0.48	0	1
<i>Sen 20+</i>	0.225	0.42	0	1
<i>Citations</i>	102.09	231.17	0	1627
<i>Citations</i> <sup>2</sup> (x 1000)	63.84	26.83	0	2647
<i>Degree</i>	0.798	0.40	0	1
<i>Grad Fac</i>	0.749	0.43	0	1
<i>Dissertations</i>	2.69	7.19	0	60
<i>Teach Award</i>	0.039	0.19	0	1
<i>Disting Prof</i>	0.005	0.07	0	1
<i>Partner's Years</i>	4.09	4.32	0	22
<i>Start ≤ 1</i>	1.06	2.97	0	21
<i>Start &gt; 1</i>	3.03	4.03	0	22
<i>Instructor/Start ≤ 1</i>	0.473	2.37	0	22
<i>Faculty Years</i>	0.729	2.67	0	22
<i>Associate Prof</i>	0.317	0.47	0	1
<i>Full Prof</i>	0.466	0.50	0	1

Note: Data are for academic years 1981/82 through 1994/95. Sample consists of 2066 observations for 212 male faculty. For 54 of the faculty, partner started employment at the university within one year of the faculty member.

Table 3. Regression Results for Cross-Sectional Models (dependent variable is natural log of salary)

Variable	Model 1	Model 2	Model 3	Model 4
<i>Experience</i>	0.0347*** (8.59)	0.0187*** (4.92)	0.0349*** (8.65)	0.0188*** (4.97)
<i>Experience</i> <sup>2</sup>	-5.49e-04*** (-5.27)	-3.54e-04*** (-3.79)	-5.56e-04*** (-5.34)	-3.59e-04*** (-3.84)
<i>Seniority</i>	-0.0127*** (-3.28)	-0.0168*** (-4.92)	-0.0133*** (-3.43)	-0.0172*** (-5.03)
<i>Seniority</i> <sup>2</sup>	2.32e-04*** (2.13)	3.39e-04*** (3.51)	2.42e-04** (2.22)	3.45e-04*** (3.56)
<i>Citations</i>	3.82e-04*** (3.98)	1.58e-04* (1.85)	3.86e-04*** (4.02)	1.61e-04* (1.88)
<i>Citations</i> <sup>2</sup>	-2.23e-07*** (-2.97)	-7.67e-08 (-1.15)	-2.27e-07*** (-3.02)	-7.95e-08 (-1.19)
<i>Degree</i>	0.1162*** (3.52)	0.0698** (2.39)	0.1168*** (3.54)	0.0705** (2.41)
<i>Grad Fac</i>	0.0524** (2.42)	0.0155 (0.81)	0.0502** (2.32)	0.0141 (0.73)
<i>Dissertations</i>	0.0033** (2.31)	0.0023* (1.80)	0.0033** (2.26)	0.0022* (1.76)
<i>Teach Award</i>	0.1331*** (3.95)	0.0811*** (2.72)	0.1327*** (3.94)	0.0814*** (2.73)
<i>Disting Prof</i>	0.3074*** (4.96)	0.2464*** (4.52)	0.3097*** (5.00)	0.2472*** (4.52)
<i>Intermittent</i>	0.0294* (1.66)	0.0185 (1.19)	0.0084 (0.35)	0.0017 (0.08)
<i>Continuous</i>	-0.0028 (-0.10)	0.0023 (0.10)	-0.0419 (-1.16)	-0.0262 (-0.83)
<i>Partner's Years</i>	--	--	0.0021 (0.92)	0.0019 (0.95)
<i>Faculty Years</i>	--	--	0.0035 (1.32)	0.0017 (0.72)
<i>Associate Prof</i>	--	0.1236*** (5.85)	--	0.1242*** (5.88)
<i>Full Prof</i>	--	0.3518*** (13.32)	--	0.3506*** (13.27)
Adjusted R <sup>2</sup>	0.5468	0.6829	0.5899	0.6839
F-Value	14.46	21.21	14.16	20.67

\* Coefficient is statistically significant at the 10 percent level, two-tailed test.

\*\* Coefficient is statistically significant at the 5 percent level, two-tailed test.

\*\*\* Coefficient is statistically significant at the 1 percent level, two-tailed test.

Notes: (1) Also included are departmental dummies.

(2) Sample consists of 782 male faculty.

(3) Numbers in parentheses are *t*-values.

Table 4. Regression Results for Fixed-Effects Models

Variable	(1)	(2)	(3)	(4)
<i>Experience</i>	0.0474*** (13.52)	0.0394*** (10.57)	0.0477*** (13.59)	0.0398*** (10.65)
<i>Experience</i> <sup>2</sup>	-7.05e-04*** (-9.17)	-5.78e-04*** (-7.23)	-7.18e-04*** (-9.29)	-5.91e-04*** (-7.35)
<i>Sen 2-5</i>	-0.0370*** (-2.62)	-0.0230 (-1.63)	-0.0339** (-2.38)	-0.0204 (-1.43)
<i>Sen 5-10</i>	-0.0628*** (-3.30)	-0.0529*** (-2.78)	-0.0578*** (-2.99)	-0.0482** (-2.49)
<i>Sen 10-20</i>	-0.0705*** (-2.69)	-0.0770*** (-2.98)	-0.0653*** (-2.64)	-0.0721*** (-2.76)
<i>Sen 20+</i>	-0.0841*** (-2.62)	-0.0869*** (-2.74)	-0.0795** (-2.47)	-0.0825*** (-2.59)
<i>Citations</i>	3.05e-04*** (3.03)	2.72e-04*** (2.73)	2.87e-04*** (2.83)	2.56e-04*** (2.55)
<i>Citations</i> <sup>2</sup>	-1.80e-07*** (-3.14)	-1.51e-07*** (-2.66)	-1.74e-07*** (-3.04)	-1.46e-07** (-2.58)
<i>Degree</i>	0.0451*** (4.49)	0.0462*** (4.66)	0.0452*** (4.50)	0.0463*** (4.67)
<i>Grad Fac</i>	-0.0262** (-1.86)	-0.0278** (-2.08)	-0.0238* (-1.75)	-0.0264** (-1.96)
<i>Dissertations</i>	0.0012 (0.81)	0.0020 (1.38)	0.0011 (0.75)	0.0019 (1.32)
<i>Teach Award</i>	0.0728** (2.35)	0.0492 (1.60)	0.0740** (2.39)	0.0503 (1.64)
<i>Disting Prof</i>	0.3073*** (6.07)	0.3139*** (6.28)	0.3029*** (5.97)	0.3097*** (6.19)
<i>Partner's Years</i>	-0.0051** (-2.31)	-0.0053** (-2.46)	--	--
<i>Start ≤ 1</i>	--	--	-0.0092*** (-2.66)	-0.0091*** (-2.65)
<i>Start &gt; 1</i>	--	--	-0.0040* (-1.75)	-0.0044* (-1.92)
<i>Faculty Years</i>	--	--	--	--
<i>Instructor/Start ≤ 1</i>	--	--	--	--
<i>Associate Prof</i>	--	0.0390*** (2.87)	--	0.0378* (2.77)
<i>Full Prof</i>	--	0.1404*** (6.67)	--	0.1390*** (6.60)
R-square (within)	0.3205	0.3414	0.3213	0.3421
F-value	61.98	59.54	58.05	56.18

\* Coefficient is statistically significant at the 10 percent level, two-tailed test.

\*\* Coefficient is statistically significant at the 5 percent level, two-tailed test.

Table 4. Regression Results for Fixed-Effects Models (Continued)

Variable	(5)	(6)	(7)	(8)
<i>Experience</i>	0.0477*** (13.59)	0.0398*** (10.65)	0.0476*** (13.62)	0.0388*** (10.42)
<i>Experience</i> <sup>2</sup>	-7.17e-04*** (-9.23)	-5.92e-04*** (-7.33)	-6.96e-04*** (-9.02)	-5.48e-04*** (-6.81)
<i>Sen 2-5</i>	-0.0338** (-2.37)	-0.0205 (-1.44)	-0.0371*** (-2.60)	-0.0228* (-1.61)
<i>Sen 5-10</i>	-0.0578*** (-2.99)	-0.0483** (-2.49)	-0.0648*** (-3.35)	-0.0574*** (-2.97)
<i>Sen 10-20</i>	-0.0653** (-2.47)	-0.0721*** (-2.76)	-0.0745*** (-2.83)	-0.0849*** (-3.26)
<i>Sen 20+</i>	-0.0796** (-2.47)	-0.0824*** (-2.59)	-0.0885*** (-2.75)	-0.0947*** (-2.98)
<i>Citations</i>	2.88e-04*** (2.83)	2.55e-04** (2.54)	2.80e-04*** (2.76)	2.44e-04** (2.45)
<i>Citations</i> <sup>2</sup>	-1.74e-07*** (-3.04)	-1.46e-07** (-2.57)	-1.79e-07*** (-3.14)	-1.50e-07*** (-2.66)
<i>Degree</i>	0.0453*** (4.50)	0.0462*** (4.66)	0.0461*** (4.60)	0.0473*** (4.81)
<i>Grad Fac</i>	-0.0238* (-1.75)	-0.0263* (-1.95)	-0.0214* (-1.58)	-0.0242* (-1.81)
<i>Dissertations</i>	0.0011 (0.75)	0.0019 (1.32)	8.59e-04 (0.58)	0.0017 (1.18)
<i>Teach Award</i>	0.0744** (2.38)	0.0497 (1.60)	0.0715** (2.32)	0.0460 (1.51)
<i>Disting Prof</i>	0.3032*** (5.97)	0.3093*** (6.17)	0.3016*** (5.97)	0.3096*** (6.23)
<i>Partner's Years</i>	--	--	--	--
<i>Start ≤ 1</i>	-0.0093*** (-2.63)	-0.0090*** (-2.57)	-0.0074** (-2.14)	-0.0068** (-1.98)
<i>Start &gt; 1</i>	-0.0041* (-1.71)	-0.0043* (-1.81)	-0.0031 (-1.36)	-0.0033 (-1.45)
<i>Faculty Years</i>	1.75e-04 (0.10)	-2.37e-04 (-0.13)	--	--
<i>Instructor/Start ≤ 1</i>	--	--	-0.0181*** (-3.87)	-0.0222*** (-4.79)
<i>Associate Prof</i>	--	0.0377*** (2.76)	--	0.0457*** (3.34)
<i>Full Prof</i>	--	0.1390*** (6.59)	--	0.1527*** (7.22)
R-square (within)	0.3213	0.3421	0.3268	0.3502
F-value	54.39	53.03	55.77	54.97

\* Coefficient is statistically significant at the 10 percent level, two-tailed test.

\*\* Coefficient is statistically significant at the 5 percent level, two-tailed test.

\*\*\* Coefficient is statistically significant at the 1 percent level, two-tailed test.

Notes: (1) Sample consists of 2066 observations for 212 male faculty.

(2) Numbers in parentheses are *t*-values.

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### *Abstract*

Extending the literature on monopsony in academic labor markets, we find that faculty pay is inversely related to seniority in both cross-sectional and longitudinal data sets for a large public university in the United States. Fixed-effects results indicate that the negative relationship cannot be explained by lower quality of senior faculty. Arguing that mobility costs are higher when both partners work for the same university, we allow monopsony power to vary by employment status of partner. We find that pay of male faculty is negatively and significantly related to the number of years the partner has been employed by the university and that the penalty is greater when couples are hired together.

JEL classifications: J42, J31



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