Agricultural Economists' Performance and Pay:

An Analysis of Land Grant University Salaries

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Abstract: The objective of the 1998 Tracking Survey conducted by the CWAE was to examine differences in the professional experiences of female agricultural economists, including the salary study presented here. A comparative analysis presents detailed frequency, performance and pay measures for all types of employers. The econometric analysis of salary focuses more specifically on agricultural economists currently employed in the Land Grant System. The importance of salary to an individual, their rank, experience, refereed journal articles and book chapters appear to have the greatest effect on salary. Although there is no clear gender bias, the number and age of children has negative implications on the salary earned by women.

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Historically, academia has been the most important employer of new Ph.D.s in agricultural economics, and continued to be the largest single employer during the 1990s (even though hiring slowed in the late 1980s). Yet, the expectations and salaries of those employed by land grant universities may be undergoing change due to expanding faculty hires, reduced tenure-track positions and correspondingly increasing numbers of nontenure-track faculty, aging faculty, and increased diversity amongst agricultural economists (Zepeda and Marchant).

The purpose of this paper is to identify and quantify the determinants of salaries of agricultural economist faculty at land-grant universities. The data analyzed is taken from a 1998 survey of the non-student membership of the American Agricultural Economics Association (AAEA) undertaken by the Committee of Women in Agricultural Economics (CWAE). Responses from this recent survey provide insight on how salaries of agricultural economist faculty are related to motivations for taking their current job, productivity, demographics, career experience, and family choices. Since 1998 was the first sampling in the tracking survey, there is no analysis of trends, progress, or retention. Rather this study presents a snapshot of the current status of the profession. As a benchmark, generalized position, performance, and salary data are presented for the entire sample of agricultural economists.

Background Research

There are several primary factors that may differentiate pay among agricultural economists in academic positions including type of appointment, mix of activities, type of academic institution, and individual productivity differences (Thilmany). A report on the status of University faculty conclude that productivity is difficult to observe and measure (CFAT, 1997). Yet, several past studies have looked at determinants of agricultural faculty salaries, including the value of outputs (Broder and Ziemer; Barrett and Bailey). These studies have generally found that the number of scholarly publications was the primary determinant of salaries, controlling for other factors (such as field of study, experience, gender, grant dollars awarded and the number of job offers from other institutions).

Broder and Ziemer constructed a general salary model to assess the relationship between rewards, productivity, and faculty resources. Productivity measures included total publications, annual rate of publication, and experience. Courses taught, grants, rank, and faculty mobility were also used to explain the variation in salaries. Barrett and Bailey conducted a similar analysis of Utah Experiment Station faculty using similar explanatory variables. Nevertheless, neither study included relevant personal variables such as gender, ethnicity, marriage and family choices, and motivations for positions held in their model. Finally, Hamermesh, Johnson, and Weisbrod (1982) introduced a measure of "quality" of one's scholarly work, to approximate a standard human capital earnings function, which contained very detailed citation data, but once again, ignored any demographic or personal factors.

The Role of Gender

The gender gap in salaries of agricultural college graduates has been reported in Broder and Deprey; Preston, Broder and Almero; Barkley; and Barkley, Stock and Sylvius. Each study found that females were paid significantly less than their male counterparts after controlling for personal and professional characteristics other than gender. Although these studies did not specifically focus on post-graduate students or agricultural economists, such individuals did represent a subgroup of the sample.

Barkley, Stock, and Sylvius concluded that a woman's choice to marry and have children significantly was negatively related to earnings (absolutely by $13,700, or $7700 after controlling for other factors), whereas these same characteristics were positively correlated with a man's earnings. Higher starting salaries for males and effects of marital and family choice (both signaling potential gender bias) accounted for about half of current salary differences. This, together with the finding that women in agricultural economics are less likely to be married, have children, or have as many children (Cheney), may indicate a perceived need of female agricultural economists to choose between career and family. Although beyond the scope of this study, it is a theory that warrants further study.

This paper extends the models of previous studies agricultural economics faculty salaries in several important directions. First, the motivation behind current job and the last job selection are investigated as they have shown to be significant factors in salary explanation (Preston, Broder, and Almero, 1990; Barkley et al.). Secondly, careful consideration is given to the differences between male and female faculty salaries.

Data and Methods

The American Agricultural Economics Association Employment Services Committee of the (AAEA-ESC) conducts regular surveys of all academic departments to determine important trends (Etheridge; Marchant and Zepeda; Zepeda and Marchant). Data from past surveys include various demographic, regional and salary averages, as well as tracking hiring, promotion and attrition of agricultural economists. Although the AAEA-ESC surveys provide a wealth of information, there is no tracking of individual or personal factors across time: a weakness addressed with this survey and study.

The data for this study consists of respondents to a mail survey undertaken by CWAE in 1998. In April 1998, a tracking survey was mailed to nearly 900 individuals who were members of the AAEA. After a second mailing, 494 useable survey responses were entered in the database. The survey population included all identified women and/or minorities in the AAEA professional (non-student) membership and a random sample of their white male counterparts. The sample was purposely stratified to include a larger share of women and ethnic minorities (Cheney). The full sample was used for our initial comparative analysis (Table 1), but a smaller sample was included in the econometric analysis. After eliminating incomplete surveys and those with employers other than Land Grant Universities, there were 186 responses included in the estimation. The sample includes faculty of all ranks (assistant, associate, and full) at land grant universities (both 1862 and 1890 schools), as well as those in administrative positions. The salary measure is the salary earned during 1996 (not controlling for whether there was a 9- or 12-month contract). If I recall correctly, I thought the question was worded

as 12-month salary - does that imply a 12-month contract?Salary information was solicited using categorical variables, with the midpoint of each category used to approximate actual salary.

Comparative Analysis of Agricultural Economists

Salary in any field of work is likely to be strongly correlated with age and experience. Figure 1 shows the average age, experience and salary for all survey respondents, as well as the female and male sub-samples. Although females are paid less, it may be explained by fewer years of experience. It is interesting to note that females are an average of nine years younger, but have only five years less experience, indicating that they enter the job market at an earlier age than males. Figure 2 presents initial statistics on research productivity by gender. The greatest variance across gender is refereed journal articles and paper presentations at professional meetings. The lower averages for females may be related to their fewer years of experience.

The effect of employer objectives, philosophy and performance evaluation on the professional choices made by agricultural economists is of interest to this study for at least two reasons. First, such effects may influence the relative success of a professional in terms of both salary and promotion. Also, perceptions of such differences may influence the employment choices made by individuals at the outset or throughout their careers. The expectations and merit criteria for different employers may also create issues for those who switch between types of employers mid-career since their human capital may not be fully transferable. Aggregate means can provide a method for broad comparison. In this case, the means show that agricultural economists employed in

different areas of the field may have different incentives, expectations, or may simply self-select to employment that best suits their comparative advantage.

Although academics make up a significant portion of the sample, those employed by government, industry and international organizations are also well-represented (Table 1). The data in this table relates only research output, and although this biases the analysis to some degree, such measures are the only common output expected among the full set of employers. Taking this bias into account, Table 1 presents various measures of scholarly output and salary for all survey respondents grouped by their current employer.

The average number of refereed journal articles, presented papers, books, chapters in books, and other publications, varies significantly across employers. The relatively high publication and presentation numbers for academic employees is not surprising given perceptions of a "publish or perish" mentality in academia. It is interesting to see that the number of awards does not vary greatly, or follow any trend with respect to employer, which may indicate an appreciation for the diversity of work done by agricultural economists for various audiences and clientele.

The salary comparison across employers is also interesting, especially given how closely aligned average salaries are across types of employers. This may signal that the skills and experience of agricultural economists is equally appreciated by all types of employers, even though expectations of effort allocation and output differ. It may also suggest that competitive markets work, and with the movement of agricultural economists across employers, supply and demand keep salaries in equilibrium.

To determine how specific factors may affect differences in salary and productivity across gender, further statistical results focuses on smaller, more similar cohorts of professional (Table 2). Cohorts were chosen in order to examine how specific factors may affect differences in salary productivity across gender and rank. After dividing respondents based on rank, years of experience, and gender, the average of each grouping's performance measures were calculated.

The largest cohort is male, full professors with over ten years in rank, followed by male associate professors with 1-5 years and 6 plus years in rank, respectively. Although the number of females is relatively low, the share of females at lower ranks and with fewer years of experience illustrates an increasing presence of women in academia. Moreover, the balance in gender shares at lower ranks allows for more effective comparisons among those cohorts.

Pay and Performance

The salary results in Table 2 are presented in absolute terms (not controlling for 9- vs. 11-month contracts). The average annual salary was $61,700 for the sample. For comparative purposes, the 12-month equivalent salaries reported in a previous AAEA-ESC study were $74,329 for professors, $56,604 for associate professors, and $48,828 for assistant professors (Marchant and Zepeda). In this study, salary increases with rank and experience, but not as uniformly as one might assume. Explaining the differences in these salaries is the focus of the remainder of this paper.

In a previous study using this data, Thilmany found higher pay for administrative duties and lower pay for teaching, but inconclusive results for research and extension

efforts. Using econometric modeling, we can control for all potential salary determinants and single out the effect of various factors on the salary of agricultural economists.

Conceptual and Empirical Model Specification

The current salary of individual *i* is specified to be a function of motivation for job selection ($MOTIVATION_{i)}$), productivity ($PRODUCTIVITY_i$), career experience ($CAREER_i$), demographic variables ($DEMO_i$), and family ($FAMILY_i$).

$$SALARY_i = f(MOTIVATION_i; PRODUCTIVITY_i, DEMO_i; CAREER_i; FAMILY_i)$$

Preston et al. and Barkley et al. both included the importance of job-related factors in job selection. They were expected to affect earnings as they capture the underlying motivation behind taking a specific type of job (Barkley et al.). These were found to be significant.

The research productivity variables discussed previously were computed for the five years prior to 1998. This captures the relationship between recent productivity and salaries. Publications are delineated between refereed journal articles, extension publications, papers presented at professional meetings, books written, and book chapters. All publications are expected to contribute positively towards salary level.

Along with the studies already mentioned, others have found a significant differences in earnings between men and women (see Barkley et al.). Following others (Broder and Deprey; Barkley et al.) ethnicity is included in the salary model. It is assumed that minority men receive lower salaries than their white male counterparts.

Previous research has shown a positive but diminishing relationship between work experience and earnings. Thus, variables measuring total work experience, rank, and an interaction term between rank and length of time at current rank are included as explanatory variables. It has been previously shown that research is ranked over teaching for promotion (Broder) and that it is negatively correlated with salary (Coffey). Credit hours taught per year as an indication of teaching load are included.

Following Broder and Ziemer and Barkley et al., employment mobility is defined as the number of employment changes since earning a Ph.D. Other studies have found employment mobility to be a significant positive salary determinant (Delorme et al., Broder and Ziermer, Barkley et al). With the shift to alternative funding sources, due to decreasing government support, there is greater importance for grantsmanship (Ballenger and Kouadio). The grants variable is measured as the average received per year over the last five years. Since no distinction is made between individually and jointly obtained grants, the estimated figures can not be interpreted as an accurate measure of individual grantsmanship.

As discussed previously, Barkley et al. found family choice variables to be significant in explaining salary differentials. In order to further investigate the effect of gender on earnings, several family choice variables are included in the salary determination model. Marital status (unmarried, and married or partnered) is included, as is a variable for the number of children under two years of age. In order to further investigate the difference between genders, an interaction term between gender and

marital status, and between gender and children variables will be included to provide separate estimates of the effects of family relationships for men and women.

The empirical model is:

$SALARY_i = f($ *Constant, Salary_Importance$_i$, Articles$_i$, Extension_Pub$_i$, Papers$_i$, Books$_i$,Chapters$_i$, Gender$_i$, Minority_Male$_i$, Rank$_i$,Years*Rank$_i$, Credits$_i$, Jobs$_i$, Grants$_i$, Marital_Status$_i$,Gender*Marital_Status$_i$,* Infants_i, Gender*Infants_i)

Where:

$\text{Salary\_Importance}_i$	=	the importance of salary in employment choice (1: not at all important, 5: very important);

Publications (In last five years):

Articles_i	=	the number of articles in refereed journals;
Extension_Pub_i	=	the number of extension publications;
Papers_i	=	the number of papers presented at professional meetings;
Books_i	=	the number of books written;
Chapters_i	=	the number of chapters in books written;
Gender_i	=	gender of the respondent (0: male, 1: female);
Minority_Male_i	=	dummy variable (0: not minority male, 1: minority male);
Rank_i	=	professor rank (1: assistant, 2: associate, 3: full);
Years*Rank_i	=	interaction term between the number of years at a rank, and the rank;
Credits_i	=	number of credit hours taught;
Jobs_i	=	the number of jobs held since receiving Ph.D.;
Grants_i	=	the grant support received per year;
Marital_Status_i	=	dummy variable of marital status (0: unmarried, 1: married or partnered);
$\text{Gender*Marital\_Status}_i$	=	interaction term between gender and marital status, (1: married woman, 0: else);
Infants_i	=	number of children under the age of two;
Gender*Infants_i	=	interaction term between gender and number of children, (non-zero: women with children, 0: else).

The model is estimated using OLS with a linear regression. The following weights were used to correct the non-representative sample:

w_i = *(percentage of members in group i in AAEA)/(percentage of members of group i in sample)*

Example: Proportion of women in AAEA = 12%

Proportion of women in sample = 22%

$w_1 = 0.12/0.22 = 0.5455$

Results

Since the dependent variable, Salary, is measured as the midpoint of a salary range, there was concern that there may be heteroskedasticity in the error terms. White's heteroskedasticity consistent covariance matrix estimator was used, so standard errors are unbiased and consistent, although coefficient estimators are not efficient. Over 47% of the variation in salary was explained by the model (Table 1). With a few exceptions, the signs of the independent variables were as expected. A number of the coefficients, however, are not significantly different from zero. None of the demographic variables are significant, though the signs correspond with expectations.

The importance of salary does affect salary levels. The productivity associated with additional publications yield the following estimated salary increments: $262 for peer-reviewed journal articles, and $163 for presented papers. Extension publications, written books, and chapters in books do not appear to yield significant increases in salary.

Rank was significant. Each progressive promotion contributes $5,214, on average, to a professor’s annual salary. The number of years at a rank was also significant; an

additional year at a rank added about $572. Though insignificant, the number of credit hours taught has the expected negative sign.

Job mobility is not significant in explaining salary level. This may be due to the lack of job mobility amongst the people in the sample. On average, respondents have stayed with the same job since receiving their Ph.D. (mean = 1.80). Grants also did not contribute significantly to salaries, but this may be due to the fact that grants are not measured on an individual basis.

Marital status is insignificant in explaining salary level, as is the interaction term between gender and marital status. Thus neither married men nor women are negatively affected by being married. Interestingly, however, the number of infants (children under the age of two) increases annual salary by $6940, counter to what was expected.. Of the faculty who had infants, over 53 percent were full professors, 40 percent were associate professors, and only 7 percent were assistant professors. Thus, the positive sign on the infant variable can be explained by the preponderance of highly ranked faculty members who have young children.This is similar to results found by others (Barkley et al.). On the other hand, women who have children under the age of two incur a surprisingly high cost for having these children. A woman with young children loses about $11,770 every year while those children are under two years of age. Time that must be taken off at any career stage carries a high opportunity cost, in terms of salary.

Conclusion

This study examines the role productivity plays in salary determination, with special attention to academic faculty. The data and comparisons in this paper illustrate several important aspects of the agricultural economics field. First, there is a diverse, interdependent set of job expectations for agricultural economics faculty, all of which affect performance measures and salary uniquely. Such diversity is not problematic as long as individuals know employers' expectations and rewards.

The Land Grant faculty salary model developed in this paper specifically analyzed relationships between faculty characteristics, performance and salaries. Regression results confirmed that salary levels are affected by the importance placed on salary when choosing a job, peer-reviewed journal articles and presented papers increase annual salary levels by $262 and $163, respectively. Rank and the number of years at a rank increased annual salary by $5214 and $572, respectively.

Surprisingly, demographic variables such as gender and ethnicity do not appear to affect salary levels. Similarly, credit hours taught, the number of jobs, and the size of grants received do not appear to affect salary levels in this model.

The hypothesised family choice variables provided the greatest surprise. Each additional child under the age of two increased annual salary levels by about $6941. But, for women who have children under the age of two, each child costs about $11,770 in lost salary, annually.

Some have argued that the present general reward structure at landgrant universities tends to reward research, possibly at the expense of teaching and extension

efforts. From this perspective, administrators who are sensitive to teaching quality and extension activities for their landgrant university may wish to encourage and support efforts in the latter areas.

Finally, the issue of gender and pay will continue to be debated until the pay of women equals the pay of men in the profession. It does appear that the new cohorts of male and female assistant professors have equal salaries, and with a few exceptions, similar academic positions. Yet, if administrators wish to encourage diversity in their departments, personal barriers to female faculty must be minimised.

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Table 1: Position, Performance and Salary for Agricultural Economists by Type of Employer, 1993-98

Employer	N	Refeered Journal Articles	Presented Papers	Books/ Chapters	Other Pubs.	Awards	Research Share (%)	Grant Dollars per year	Salary (Not Adjusted)
Government	90	4.19	6.46	0.28/1.97	22.68	2.05	54	$19,100	$62,300
1862 Land Grant University	221	8.35	12.27	0.54/2.64	35.53	1.76	39	$37,400	$63,500
1890 Land Grant University	20	6.50	14.50	0.57/6.22	17.84	2.27	41	$49,400	$62,100
Other Academic Employer	61	5.22	9.16	0.30/1.73	14.46	1.00	26	$24,000	$47,000
Industry	33	3.09	6.38	0.08/0.82	12.74	0.67	45	$23,200	$66,400
Internat'l Organization	28	5.90	6.00	0.67/3.24	12.39	0.82	38	$53,300	$71,800
Non Gov't Org. (NGO)	9	8.00	17.17	1.00/3.20	54.50	1.60	25	$44,000	$65,600
Self-Employed	8	2.00	2.75	2.33/0.67	11.63	0.67	14	$10,000	$52,500
Retired	12	1.20	2.20	0.75/1.40	50.75	8.67	18	$28,600	$27,500
Other	10	1.83	2.67	0.0/0.67	17.83	1.20	22	$16,700	$31,000

Table 2: Academic Performance Measures by Rank, Years of Experience and Gender

Productivity Measures for the 5 year period, 1993-98

Rank and Gender	Refereed Journal Arts.	Presented Papers	Books	Chapters in books	Awards	Grant $s per year	Other Pubs.	Salary (Unadjusted)
All	7.00	10.27	0.24	1.80	1.06	$26,000	19.56	$61,700
Full- 10+ yrs., female	14.40	25.60	0.40	7.80	3.00	$47,500	26.8	$77,500
Full- 10 + yrs., male	6.75	8.91	0.38	2.18	1.29	$28,750	21.67	$80,933
Full- 5-10 yrs., female	1.00	7.00	1.00	7.00	0.00	$20,000	6.00	$70,000
Full- 5-10 yrs., male	5.80	9.65	0.45	2.90	0.60	$27,000	34.25	$66,000
Full- 1-5 yrs., female	7.36	9.64	0.18	1.91	1.82	$37,000	17.64	$60,900
Full- 1-5 yrs., male	11.90	22.05	0.30	2.15	1.50	$36,840	31.55	$63,500
Associate, 6+ yrs., female	4.29	4.36	0.14	1.07	0.57	$22,100	10.57	$63,750
Associate, 6+ yrs., male	8.29	13.25	0.04	1.21	1.38	$24,500	25.21	$49,570
Associate, 1-5 yrs., female	6.18	8.59	0.12	1.82	0.65	$18,000	10.00	$51,760
Associate, 1-5 yrs., male	8.48	10.74	0.26	1.59	1.00	$35,185	22.81	$58,150
Assistant, 4-6 yrs., female	5.18	7.00	0.12	1.06	0.94	$12,350	8.41	$46,470
Assistant, 4-6 yrs., male	9.38	11.54	0.15	0.77	1.08	$20,770	14.00	$45,380
Assistant, 1-4 yrs., female	2.29	7.76	0.06	0.82	0.41	$12,500	7.71	$43,530
Assistant, 1-4 yrs., male	5.50	6.00	0.06	0.61	0.44	$17,050	10.22	$43,333

Table 3: Determinants of Landgrant Professor Salaries, 1998

Dependent Variable: Salary
Mean: 73,280, SD: 20,007
Min.: 45,000, Max.: 115,000
Sample Size: 186
$R^2 = 0.5022$

Variable	**Estimated Coefficient**	**t-statistic**	**P-Value**	**Mean**
		Motivation in Taking Job		
Importance of Salary	2376.482	1.621	0.107	3.6686
		Productivity		
Peer-Reviewed Journal Articles	222.1837	1.823	0.070	8.2068
Extension Publications	-28.757	-1.113	0.267	11.0770
Presented Papers	-119.186	-1.481	0.140	10.9818
Books Written	1373.449	0.726	0.469	0.3310
Chapters in Books	534.894	2.113	0.036	2.0066
		Demographics		
Gender	-2713.35	-0.624	0.534	0.0525
Minority Men	-3335.456	-1.118	0.265	0.0955
		Career Experience		
Rank	5277.448	2.552	0.012	2.5062
Years*Rank	831.220	5.589	0.000	18.4443
Credit Hours Taught	-171.587	-0.711	0.478	6.0447
Number of Jobs	1585.894	1.324	0.187	1.7991
Grants	446.913	1.068	0.287	3.8167
		Family Choices		
Marital Status	1296.926	0.460	0.646	0.8838
Gender*Marital Status	6644.673	1.213	0.227	0.0461
Number of Infants	6193.008	1.684	0.094	0.0728
Gender*Infants	-11125.31	-2.760	0.006	0.0077
Constant	31772.19	5.287	0.000	

Figure 1: Professional Experience and Salary
1998 Averages

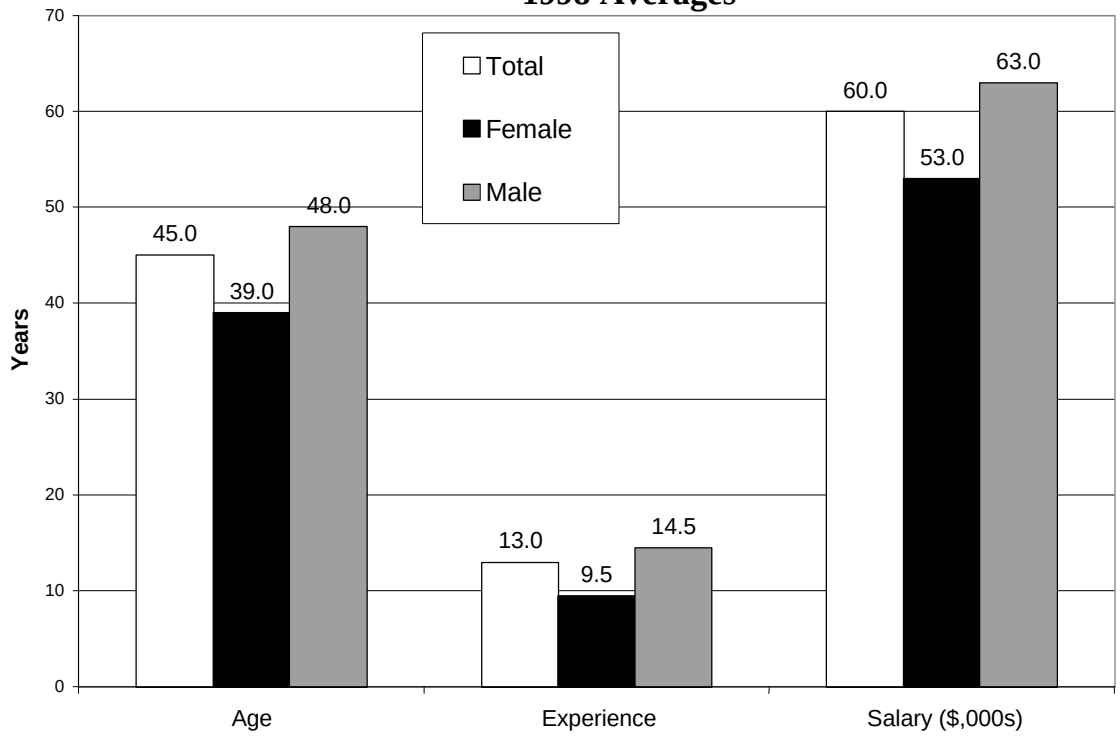

Figure 2: Professional Accomplishments,
Total Output, 1993-98