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FACTORS AFFECTING THE RANK AND SALARY OF AGRICULTURAL ECONOMISTS: COMMENT AND ANALYSIS

by

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ABSTRACT

An analysis by Lee of factors affecting academic agricultural economists is reviewed for missing and/or misspecified variables. A subsequent analysis based on a sample of federally employed agricultural economists is presented. The regression model indicates variables measuring education, experience and job tenure are the strongest determinants of rank and salary. Individuals' gender proves insignificant in explaining rank and salary of federally employed agricultural economists.

DRAFT

Factors Affecting the Rank and Salary of Agricultural Economists: Comment and Analysis

In the December 1981 issue of the AJAE Lundeen and Clauson, Lee, Redman, and Lane report on the conduct, results and analysis of a survey to determine the relative opportunities for and status of women in agricultural economics. Lee's multiple regression analysis of factors determining agricultural economists' salaries focuses on a comparison of males and females in the profession but considers a range of variables that can impact one's rank and salary. The dependent variable in Lee's model is before-tax 1980 salary. Her nine independent variables are: educational background (whether Ph.D. received or not); years since last degree was received; tenure (months) in present job; number of journal articles and other professional publications; number of books published; whether or not the individual's position is primarily administrative; number of times unemployed or on extended leave for six months or more; percent of income derived from consulting; and the sex of the respondent. Lee found this model explained 69.5 percent of variation in salary for a sample of 145 male and female AAEA members responding to the survey. It performed better, explaining 76.8 percent of variation in salary, for a more homogeneous sample of 104 male and female agricultural economist respondents with academic employers. In the analysis of academic salaries, only the coefficients of books published, career interruptions and consulting proved insignificant. The model describes a significant, negative coefficient associated with being female, and implies that, all else constant, women

receive approximately $3,000 less per year than do men in academia. All other significant coefficients are positive and range in estimated contribution of from $114 per annual professional publication to $12,446 associated with possession of a Ph.D. degree.

The purposes of this paper are to provide a critical review of the implications of Lee's study and to report on and compare with Lee's findings the results of a similar subsequent analysis conducted by this author using data collected from a sample of federally employed agricultural economists.

Comment on and a Reinterpretation of Lee's Model

Lee's findings support some old and suggest some new theories regarding the contribution of a range of various professional activities and characteristics to one's salary. The primary focus of her analysis, however, was to compare its results for male and female respondents. Thus, my comments address the adequacy of her data set and model in allowing such a comparison.

There are two potentially important characteristics in describing one's relative rank and salary that were excluded from the model. For one of these, the individual's primary professional specialty, data were collected by Lundeen and Clauson. The results of the "Survey on the Opportunities for and Status of Women in Agricultural Economics", as reported by Redman, suggest men and women have made some significantly different choices with respect to their area of specialization within agricultural economics. For instance, roughly 7 percent of female respondents to that survey indicate a specialization in agribusiness,

where 17 percent of the males classified themselves as agribusiness specialists. Alternatively, 17 percent of the women indicated they specialized in an area classified as "welfare, consumer, urban/regional" economics, while less than 8 percent of the men chose that area. The recent findings by Stanton and Farrell regarding research priorties suggest to this author that the choice of specialty may affect one's rank and salary and partially explain the residual salary differential observed by Lee. Stanton and Farrell surveyed agricultural economic Department chairmen and administrators to determine their judgement as to the most important areas toward which work in agricultural economics should be directed. A total of 39 percent of those surveyed indicated commercial agricultural production and marketing as priority research areas. Consumer, welfare, and urban/regional economics were not singled out by the program administrators as being among the most important issues. Thus, in comparing the results of these two surveys it becomes apparent that a larger proportion of men than women are active in the specialties that are more popular with research program administrators. This could have strong implications regarding the mean salaries observed for men and women, yet that relationship was not explored by the Lee model.

Another variable that might further explain salary differentials between men and women in academia, but for which data are unavailable from the survey, is geographical location. The average salary for professors of all ranks varies greatly among individual academic institutions, and somewhat among gross U.S. regions. Boddy found that while the median annual salary for agricultural economists with full professor status at universities with Ph.D. programs was $31,300,

those salaries ranged among individial institutions from below $21,500 to above $37,000 per year. Associate and assistant professor salaries for that same academic year ranged from $18,000 to above $26,000, and from $15,000 to above $23,000, respectively. Preliminary data for the 1981-82 academic year show a similar variation of salaries among academic institutions (Boddy, personal communication). Data on the geographic distribution of female agricultural economists in academia were not reported by Lundeen and Clausen or Redman. If, however, that distribution is skewed towards institutions or regions where mean salaries for agricultural economists are low relative to other institutions or regions, the absence of a geographic location variable could explain some portion of the coefficient for sex described by Lee's model. This matter deserves further investigation.

One of the variables included in Lee's model is a candidate for problems of misspecification. Namely, the publications variable is described by data resulting from a survey question asking, "How many publications have you had in the last five years related to your field of specialty?" Thus, respondents' reports of their publication record lumped refereed journal articles, Experiment Station bulletins, extension publications, working papers and all other publications one might broadly classify as "professional" into a single category. There was no way to separate or distinguish among various classes of publication. Nevertheless, decisions regarding hiring, tenure, promotion and merit-based salary increases can be strongly influenced by the distribution of an individual's publications among different specific professional outlets. Accounting for this reality by disaggregating the publication variable into a set of separate

variables could impact the model results not only in terms of the publications' coefficient(s) and significance, but also by possible changes in the observed contributions of education, administration, and sex.

The potential but untested problems of missing variables, and variable misspecification, coupled with the fact that Lee's analysis applied primarily to agricultural economists with academic employers suggests her conclusion that "significant salary differentials between men and women exist after accounting for education, experience, research productivity, and other variables" should not be interpreted as having broad application to the profession. The remainder of this paper describes and compares with Lee's results, a model based on data collected from federally employed agricultural economists.

Federal Employment of Agricultural Economists

The establishment and seeming success of Equal Opportunity programs in government, coupled with provisions of the Civil Service Reform Act that require sound justification of personnel actions, distinguish the Federal Government as an employer of agricultural economists and other professionals. These distinctions suggest that salary differentials associated with one's sex, race or other characteristics unrelated to professional capability, should be nonexistent. This hypothesis has not been analytically tested.

The USDA's Economic Research Service (ERS) is the largest single Federal employer of agricultural economists. Thus, it was chosen as a case study agency for examination of factors affecting agricultural economists' rank and salary. As of December 31, 1981, 526 individuals were employed by ERS in its agricultural economist job series. Females

comprise 16 percent (82 individuals) of that work force. The proportion of female agricultural economists in ERS is over three times higher than that indicated by AAEA membership lists for the profession overall. The mean annual salary for female agricultural economists in ERS was $26,951 as of the end of 1981; males' mean salary was $37,772. It was hypothesized by this author that the observed salary differential results primarily from the facts that: the vast majority of female employees have been with ERS for a shorter period of time than the average male employee; and, on the average, the female employees do not possess the level of educational training observed for the male population.

A Survey of ERS Agricultural Economists

In February 1982 a survey questionnaire was mailed to a sample of ERS agricultural economists to collect data for a multiple-regression analysis of factors affecting their salaries. Although the survey includes a request for indication of respondents' sex, and was designed to yield data that could be analyzed through use of a modified version of Lee's model, it was intended that it provide data for analysis of and focus on a broader range of issues than Lee addressed.

The questionnaire was comprised of 21 questions to collect data from individuals on their: current employment status and employment history with ERS; general educational characteristics; recent (last five years) publication record; sex; and perceptions of their professional position in relation to members of the opposite sex. Since 26 percent of ERS agricultural economists work outside of the Washington, D.C. metropolitan area, current geographic location was collected as an employment variable. In an attempt to overcome

ambiguity with respect to what constitutes a professional publiation, respondents were asked to indicate on the survey form the number of publications in each of nine specified categories that they had authored in the last five years. Included as separate, explicitly defined categories of publications were: refereed journal articles; published research report series, including Experiment Station bulletins; Situation and Outlook reports; ERS Staff Reports; popular articles; book chapters; and books.

The questionnaire was sent to each of the 82 female agricultural economist-classed ERS employees, and to a sample of male employees in the same job series. The male sample was selected in two ways. First, from an alphabetic listing of ERS agricultural economists, their sex and a salary indicator (GS grade and step levels), the first male's name on the list following each female name and possessing a GS-level within one step of the female's level, was placed in the sample. A similar matched-sampling procedure also was used by Lundeen and Clauson. In the ERS study it yielded 61 names. A separate, random choice of males yielded 135 names, 18 of which overlapped with the matched sample. A combination of the two sets gave a total sample of 178 men to whom the survey questionnaire was sent.

Survey Response and Analysis

The total response rate for the sample of 260 employees surveyed was 66 percent. That rate was evenly distributed among male and female respondents: 55 of 82 females and 117 of 178 males responded. The respondent sample represents approximately 33 percent of all ERS agricultural economists.

A model was developed with two objectives in mind, to: determine the contribution that various factors and characteristics make to federally employed agricultural economists' salary; and provide a set of results that lend themselves to valid comparison with Lee's findings. Accordingly, the dependent variable in the model is the before-tax, annual, fiscal year 1982 salary indicated by survey respondents' GS-grade and step levels. Independent variables tested as possible determinants of salary were:

(a) educational background--with Ph.D. = 1, otherwise = 0

(b) experience--(i) months since highest degree was received; (ii) tenure (months) with ERS;

(c) administrative duties--administrator = 1, otherwise = 0;

(d) geographic location--stationed in Washington, D. C. = 1, all field locations = 0;

(e) research productivity--(i) number of refereed journal articles published per year over last five years (or, if less than five years, annual average since receiving highest degree); (ii) sum of all other professional papers and reports per year over last five years;

(f) sex--female = 1, male = 0;

(g) career interruptions--number of times unemployed or on extended leave for six or more consecutive months;

(h) area of specialization indicated by ERS Division in which individual is employed--National Economics Division = 1, all other Divisions = 0.

No variable for consulting was included since ERS employees are not permitted to independently consult. The geographic location variable was included to test a popular impression that, all else equal, Washington, D. C.-based personnel receive higher pay.

The possible contribution to salary of focus on National Economics Division (NED) work, as opposed to that in the Natural Resource Economics, International Economics or Economic Development Divisions was tested because NED's objectives correspond most closely to the categories of issues reported by Stanton and Farrell to be perceived as highest priority areas of research.

Regression results are shown in Table 1. The coefficients of the variables describing geographic location and career interruption proved highly insignificant.[1] The coefficient measuring journal publication record also proved insignificant but that describing publications exclusive of journal articles indicates a positive, significant contribution to annual salary of total research output.[2] Possession of a Ph.D., months since receiving highest degree, length of tenure with ERS, employment within NED, and assignment of administrative duties all prove to be strong, positive, significant contributors to one's salary. The negative coefficient associated with the dummy gender variable is insignificant.

Discussions and Conclusions

There are several interesting differences between the results presented here and Lee's findings for agricultural economists with academic employers. First, possession of a Ph.D., although the most highly significant independent variable in both analyses, seems to contribute almost twice as much to academic salaries as it does to ERS professional salary. This finding most likely reflects differences in the missions of the institutions; particularly the relative focus on teaching, where a Ph.D. is highly desirable, vis-a-vis provision of economic intelligence, where one's formal degree has less relevance.

Furthermore, the length of time since one's highest degree was received, a variable incorporating total professional experience as well as an indication of probable age, seems to make a larger and more significant contribution to academic than to ERS salary. Tenure in one's current job makes a greater proportional contribution to the salary of the academic agricultural economist sample analyzed by Lee, but is a more highly significant variable in terms of explaining ERS salaries. The estimated impact of publication output on salary cannot be directly compared for the two analyses since the variables describing publication are not defined in the same way.

The most glaring difference between the two models' results is that while Lee's model suggests a large, significant salary disadvantage for females, the analysis of ERS agricultural economists does not attribute significant differences in salary to gender. Perceptions regarding the impact of one's sex on rank and salary, collected from the two groups sampled, reveal relative differences that conflict somewhat with this difference in analytical results. Lee reports that in response to the question, "Do you think you are paid less or have a lower level job than you would if you were of the opposite sex?", 22 percent of female and 4 percent of male respondents to the Lundeen and Clausen survey answered affirmatively. Surprisingly, from the ERS sample for which model results imply little or no significant salary differential between the sexes, a greater proportion--38 percent of female and 27 percent of male respondents--reported they perceived they are "paid less, have a lower level job or fewer career advancement opportunities than...if (they) were of the opposite sex". This suggests there is either a fairly sizeable gap between

perception and reality, or one or both of the models' results are misleading.

Inclusion of a proxy variable for area of specialization in the ERS model helped to more fully explain salary differences among individuals. Inclusion of a location variable did not increase the model's explanatory power. Since locational considerations are technically not supposed to affect rank or salary, and all ERS employees, regardless of location, are restricted to identical pay scale and merit increase requirements, this is not surprising. However, fund availability, and promotion and salary increase procedures do vary by academic institution. Thus it is more likely a location variable could prove significant in a model estimated with the sample used by Lee.

Comparisons between the results of Lee's model and the model presented herein are limited by the differences in the structure and functions of the agricultural economist-employing institutions (academia and government) from which observations were drawn. However, the ERS-based model does imply that variables unconsidered by Lee could help explain variation among individuals' salaries. Furthermore, its results demonstrate that assumptions, perceptions or specific analytic findings regarding the potential salary disadvantage of female agricultural economists cannot broadly be applied to the profession.

Table 1. Regression Results for Sample of ERS Agricultural Economists

Variable	Estimated Coefficient
Intercept	21,994.22 (22.25)[a]
Ph.D.	6,980.82 (9.14)
Journal articles per year	399.58 (.71)[b]
All other publications per year	164.82 (1.78)
Months since highest degree	18.90 (3.90)
Tenure with ERS (months)	41.09 (6.99)
Washington, D.C. location	146.02 (.19)[b]
National Economics Division	1,581.21 (2.26)
Administrator	7,177.11 (7.20)
Career interruptions	-116.23 (.15)[b]
Gender (Female = 1; Male = 0)	-856.48 (1.03)[b]
F	71.38
R^2	.810
Number of observations[c]	161

[a]Numbers in parentheses are t-values (absolute value). Unless designated otherwise, coefficients are significant at a 95 percent level or above.

[b]Coefficient is statistically insignificant at a 70 percent level or less.

[c]Observations comprise the full set of completed responses to the ERS survey by individuals in professional levels (GS-9 through GM-15) of the Federal economist job series.

Footnotes

[1] A backwards, stepwise regression was run by deleting variables for which coefficients were found to be insignificant, in order of degree of insignificance observed. At no stage of the stepwise deletion of the four insignificant variables did the level of significance of remaining variables' coefficients change by as much as one percent. Thus, the variables may correctly be assumed independent of one another, and the coefficients describing the effects of location, career interruption, journal publication and gender all prove insignificant at levels of 70 percent or less.

[2] Alternative model specifications were run to test the contribution of each of the nine publication categories on which observations were collected. No single category of publications proved to be a significant contributor to salary. However, when all publications, including journal articles were lumped in a single variable, a coefficient of $177.79, with a t-value of 2.06 was derived, and coefficients of all other variables remained approximately the same as those shown in Table 1.

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