AGRICULTURAL ECONOMICS FACULTY RESOURCES, PRODUCTIVITY AND REWARDS

by

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February 15, 1981

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Agriculture - Economic aspects 1981

Presented at AAEA meetings, Clemson University, July 26-29, 1981.

AGRICULTURAL ECONOMICS FACULTY

RESOURCES, PRODUCTIVITY AND REWARDS

Agricultural economists are sensitive to matters of professional performance and the promotional process. For many academic economists, a major criterion for advancement is research productivity as measured by research publications. University promotion committees give varying amounts of weight to research productivity and generally view publishing in national journals from one's own discipline as evidence of national prominence and professional achievement.

A number of previous studies have identified factors which contribute toward academic advancement among economists. Katz found research ability, publication record and national reputation to be the most important factors influencing salary and promotion decisions, whereas, student evaluations of faculty were least predictive of salary. Koch and Chizmar found teaching competence, scholarly activity and service committee activity ranked accordingly in importance in explaining salary increments. Lifetime monetary returns to article publication for full-time male faculty employed in university economics departments were examined by Tuckman and Leahey. In a study of academic salaries at the University of Illinois, Ferber found that scholarly publication may have been a factor in promotion. Siegfried and White's study of the reward structure at the University of Wisconsin Economics Department found articles in national journals yielded an additional $392 per year; articles in regional or specialty journals yielded $345 per year; and improvements in research performance yielded nearly

seven times the salary boost as comparable improvements in teaching. In a separate study of full-time male faculty in economics and education, Tuckman and Hagemann found that publishers are more highly rewarded than their unpublished colleagues and that outstanding teaching did not appear to be rewarded in either field. DeLorme, et. al., found experience and degree origin to be major determinants of salary and that rewards to teaching had increased gradually over time.

Studies of performance and rewards among agricultural economists have been more descriptive in nature while data limitations have hindered a systematic investigation of factors associated with differences among faculty. Opaluch and Just explored the institutional affiliation of academic agricultural economists contributing to major economic journals. Studies of contributions to the American Journal of Agricultural Economics have been made by Arnold and Barlowe; Finley; and Holland and Redman. Employment and mobility patterns among AAEA memberships have been studied by Peck and Babb and concentration of authorship in the Journal of Farm Economics was considered by Neilson and Riley. Finally, income data and factors which affect income of members of the AAEA were examined by Coffey.

This paper summerizes the findings of a recent study which measured research and teaching activities of agricultural economics faculty at land grant universities. Research resources and faculty productivity are identified and measured. Regional differences in research publications and general faculty characteristics are presented along with a discussion of regional concentration in publication output among agricultural economics faculty. A general salary model is developed to

determine the relationships between faculty resources, research productivity and faculty rewards. Monetary returns to research, teaching and grantsmanship are examined along with other factors which influence faculty salaries.

SURVEY AND DATA

In the Spring of 1980, 500 randomly selected agricultural economists at land grant universities were asked to complete a mailed questionnaire.[1] The questionnaire used in the study was pre-tested and designed to secure individual information, without threatening respondent anonymity. The 311 returned questionnaires represented a response rate of nearly sixty percent. Two hundred forty-one (241) of the respondants held PhD degrees. These individuals formed the sample for the analysis in this study.

Table 1 contrasts assistant, associate and full professors according to certain general characteristics and research performance. The average percentage research appointment declines somewhat during an average faculty member's career. Assistant professors appear to do significantly less consulting than associate or full professors, however, about an equal percentage of all ranks are successful in obtaining supporting grants. Assistant professors teach about the same number of undergraduate courses, but advise a greater number of undergraduate students, while the number of graduate courses taught appears to be about the same for assistant, associate and full professors. Few differences exist in the number of masters level students advised, but full professors supervise twice the number of PhD-level students on the average.

Table 1. General Characteristics of Agricultural Economics Faculty, 1979

	POSITION		
	Assistant	Associate	Full
GENERAL			
Percentage of sample	23.4	27.2	45.7
Average Appointment			
Research %	56	41	43
Teaching %	32	25	28
Extension %	10	31	19
Average:			
Age	34	41	51
Salary (12 mos.)	$24,109	$28,569	$36,088
Annual consulting income	$ 780	$ 3,902	$ 2,996
Percentage counsulting	38.2	64.1	61.2
Percentage obtaining grants	56.4	57.8	59.5
TEACHING			
Average Annual Number of			
Undergraduate courses taught	1.7	1.4	1.4
Graduate courses taught	.6	.5	.7
Undergraduate advisees	17.8	13.2	11.5
Masters advisees	2.1	2.0	2.3
PhD advisees	.9	.8	1.6
Percentage receiving teaching awards	5.4	9.4	14.7
RESEARCH			
Average Career number of papers in:			
AJAE	.4	1.0	2.8
Other national journals	1.1	2.5	5.3
Foreign journals	.4	.5	2.9
Regional journals	.9	1.3	3.0
Books	.1	.4	.9
Experiment stations	4.1	12.3	19.5
Papers presented	2.4	4.3	7.2
Percentage receiving research awards	5.5	9.4	24.1

Also in Table 1, research productivity by faculty rank is presented for a variety of research publication categories. Not surprising, an individual's overall research productivity increases over the course of a career as reflected by the increasing mean number of publications. Among full professors, about one-fourth have received some form of research award while only about 15 percent have received a teaching award.

REGIONAL DIFFERENCE IN FACULTY PUBLICATION OUTPUT[2]

In Table 2, agricultural economics faculty publications are contrasted by region. Regional averages in selected publication categories were computed for total career publications and annual average publications to adjust for years of professional experiences.[3] Immediately evident is that average career research productivity per individual faculty member is greatest in the North Central region which leads in all categories except regional journals. When adjusted for years of professional experience, the North Central region leads in four of the seven average annual publication categories. The Pacific region appears to be more prolific in AJAE publications, and the Mountain, Plains and Southwest more prolific in experiment station and extension publications, when the number of such publications are adjusted for years experience. For each publication category student t-tests are based on a comparison of the regional mean and the mean of all other regions considered as a group. Asterisks indicate significant differences between the two means. Referring to Table 2, the North Central region statistically accounts for a significantly greater number of publications in five of the

Table 2. Regional Differences in Research Publications by Agricultural Economists, 1979

Average Career Number of Papers in	North east	South	North Central	Pacific	Mtn., Plains and Southwest
AJAE	1.22	.83*	3.74***	3.08	.69**
Other national journals	2.51	1.46	7.35**	3.36	2.55
Foreign and International Journals	.49	.69	5.20**	1.20	.33
Regional journals	1.95	1.74	1.70	1.88	2.59
Experiment station and extension	10.90	11.43	15.43	11.20	17.43
Books	.45	.39	1.07***	.76	.21*
Papers presented	3.00	3.91	8.30**	6.00	4.95
Average Annual Number of Papers in					
AJAE	.13	.07**	.21***	.24***	.06**
Other national journals	.33	.17	.34	.29	.27
Foreign and International journals	.05	.06	.25***	.10	.02
Regional journals	.26	.17	.12*	.13	.30**
Experiment station and extension	.89	1.04	1.25	1.00	2.37*
Books	.04	.04	.06	.06	.02*
Papers presented	.46	.46	.55	.55	.44

[a]For regional delineation see Peck and Babb

*t-test difference between means significant at = .10 level
**t-test difference between means significant at = .05 level
***t-test difference between means significant at = .01 level

seven career publication categories relative to the average for all other regions.

Regional differences should be interpreted in light of general faculty characteristics of the region which are shown in Table 3. As in Table 2, t-tests are based on a comparison of the regional mean and the mean of all other regions taken as a group. Referring to Table 3, average age and experience of faculty members are greater in the North Central region, so one might expect that average research output for faculty members within this region would be greater. The average number of graduate assistants per faculty member is also greater in the North Central region. But even compensating for such factors, the North Central and Pacific regions still appear to have significantly higher average levels of research output relative to other regions.

In terms of salaries, those received by assistant and associate professors in the Mountain, Plains and Southwest region are somewhat lower than in other regions of the country. Highest assistant professor salaries are earned in the Pacific region, while highest associate professor are earned in the Northeast and North Central regions. Average full professor salaries are greater in the North Central region, however this may be the result of a higher level of years experience relative to other regions (See Table 3). Lowest average salaries for full professors were measured in the South.

The extent to which frequently published faculty may dominate a region's publication output was measured using regional concentration ratios for publications. Adapted from industry concentration ratios and measured as a follow-up to previous studies, regional concentration in

Table 3. Regional Differences in Resources and Activities of Agricultural Economists, 1979

	REGION[a]				
	North-east	South	North Central	Pacific	Mtn., Plains and Southwest
Research awards	.29	.13	1.00**	.44	.19
Teaching awards	.17	.25	.29	.04	.25
Age	42.71	43.71	45.43	42.92	43.53
Appointment					
Research %	46.40	47.35	38.88**	50.16	48.78
Teaching %	33.86**	23.22*	28.10	20.68	30.37
Extension %	15.05	19.20	24.35	26.28	17.62
Years as:					
Assistant	4.25**	3.45	3.63	3.28	3.13*
Associate	3.43	4.05	4.22	2.32*	3.23
Full	3.90	3.95	6.11**	3.48	4.33
Salary	$29,027**	$31,149	$32,993	$32,802	$29,413*
Consulting income	$ 2,071	$ 1,320	$ 3,238	$ 5,841**	$ 2,528
Grants obtianed	$56,467	$39,367	$120,458**	$53,304	$47.766
Courses taught					
Undergraduate	1.55	1.29	1.25	.88**	1.86***
Graduate	.62	.55	.69	.60	.71
Advisees:					
Undergraduate	14.98	9.53	11.19	8.96	18.80***
Masters	2.21	2.04	2.32	1.72	2.03
PhD	.95	1.04	1.86**	1.56	.96
Committee hours/wk.	3.52	4.58**	3.61	3.20	3.17
Employment changes	.86	.75	1.21	.84	.98

[a]For regional delineation, see Peck and Babb

*t-test difference between means significant at the = .10 level
**t-test difference between means significant at the = .05 level
***t-test difference between means significant at the = .01 level

publishing measures the percentage of total regional publications accounted for by the most published 10 and 20 percent of the faculty surveyed (Nielson and Riley). In terms of total career publications the North Central region experienced the greatest amount of concentration by most published faculty with 10 and 20 percent of these faculty, accounting for approximately 62 and 74 percent of the publications in that region, respectively (Table 4). The Pacific region appears to be the least "top-heavy" when both total career publications and annual average publications are considered. From an annual average publication standpoint, the Mountain, Plains and Southwest experienced the highest concentration ratios. That is to say, when career publications are adjusted for years experience, 10 and 20 percent of the faculty in the Mountain, Plains and Southwest region account for 49 and 64 percent of the publications in that region, respectively.

Concentration ratios are a measure of the relative productivity of highly published faculty within a particular region. However, comparisons of ratios across regions must be interpreted with caution. Faculty which appear to be relatively less productive in their region may be more productive relative to faculty in other regions or conversely, faculty in the top 10 percent in their own region may only be average in another region.

When combined with test results of mean differences across regions, concentration ratios give an indication of the factors which account for differences in research productivity across regions. For example, significant differences in mean publication categories and high concentration ratios suggest that differences in total career publications

Table 4. Regional Concentration In Publications Among Agricultural Economics Faculty, 1979

Region	CONCENTRATION RATIOS[a]			
	Total Career Publications		Annual Average Publications	
	Top 10%	Top 20%	Top 10%	Top 20%
Northeast	34.39	54.70	28.38	45.38
South	28.44	49.95	25.74	47.17
North Central	62.32	74.20	46.02	61.05
Pacific	23.97	49.14	17.36	37.40
Mountain, Plains and Southwest	41.10	59.32	48.98	63.84

[a]Percentage of publications in region accounted for by most published faculty in region.

positive relationship between experience and faculty rewards (Ferber, Katz, Siegfried and White, DeLorme, et al. and Coffey).

Courses taught. An indication of teaching load was measured by the total number of graduate and undergraduate courses taught during 1979 (COURSES). Previous studies have indicated that research is ranked over teaching for promotion and salary determination (Broder) and that teaching is negatively correlated with salary (Coffey). Lower salaries among teachers may result from an absence of professional recognition enjoyed by researchers, lower opportunity costs relative to research faculty, and less employment mobility.

Grants were measured by the grant money obtained by the faculty member during 1979 (GRANTS). Research grants enhance the flexibility and productivity of research programs and therefore, universities are thought to encourage and reward grantsmanship.

Employment mobility is defined as the number of employment changes since earning a PhD degree (CHANGE). Other studies have found employment mobility to be a significant salary determinant (DeLorme, et al; Katz). Faculty who are mobile and willing to move are thought to do so for higher salaries.

Rank is measured by dummy variables which receive a value of unity if the faculty member has been promoted (RANK 1 and RANK 2). Higher faculty salaries are thought to accompany promotions.

RESULTS

Ordinary least squares was used to estimate separate salary models, the results of which are found in Table 5. The two models which were

Table 5. Factors Associated With Differences in Salaries Among Agricultural Economics Research Faculty, 1979

Variable Name	Variable Description	Mean	Estimated Coefficient[a] Model 1	Model 2
	(Dependent Variable)			
SALARY	1979 Faculty salary, on 12-month basis	$31,436.87		
	(Explanatory Variables)			
1. INTERCEPT			23,773.52 (30.87)***	22,242.05 (25.48)***
2. PUBTOTAL	Weighted average[b] of total career publications	18.16	91.77 (4.76)***	--
3. PUBRATE	Weighted average[c] number of publications per year of experience	1.50	--	737.65 (3.02)***
4. YEARS	Years of professional experience with PhD	13.61	258.16 (5.47)***	335.37 (6.92)***
5. COURSES	Number of courses taught during 1979	2.07	-474.90 (- 2.59)***	-378.27 (- 2.08)**
6. GRANTS	Grant money received during 1979 ($100,000)	$65,736.00	301.85 (1.80)*	359.29 (2.18)**
7. CHANGE	Number of employment changes since earning highest degree	.86	865.96 (3.60)***	908.95 (3.83)***
8. RANK 1	= 1 if full professor, = 0 otherwise	.48	5,082.82 (5.16)***	5,805.70 (6.07)***
9. RANK 2	= 1 if associate professor = 0 otherwise	.27	1,072.78 (1.31)	1,646.56 (2.05)**
Number of observations = 222;		R^2=	.64	.65

[a] t-values given in parentheses

[b] Weighted average number of career publications were books = 5; AJAE = 2; other national, regional, foreign and international = 1 and experiment station and extension = 1/3.

[c] Weighted average number of career publications divided by years experience

* significant at the = .10 level
** significant at the = .05 level
*** significant at the = .01 level

estimated differed only in the specification of the publications variable. Model 1 utilized PUBTOTAL or total career publications while Model 2 utilized PUBRATE, or the annual rate of publication.

With one exception, all estimated parameter values in both models were statistically different from zero. The signs on the PUBTOTAL and PUBRATE coefficients in the two models were positive as expected. Based on the estimated coefficients in Model 1 and the weights associated with publications, additional career publications are estimated to yield the following annual salary increments: $450 for a book, $184 for an AJAE publication, $92 for other national, regional, foreign and international journals and $31 for experiment station and extension publications.

The relationship between the rate of faculty publication and salary was measured in Model 2. The PUBRATE coefficient takes into consideration the time required to produce selected publications or the frequency of publications over time. For example, an AJAE publication produced every four years would realize $369 in annual salary or one-fourth of the annual increment of $1476 associated with an AJAE publication produced every year. Given two individuals with four years of experience, an individual with two publications in the AJAE would realize an estimated annual salary approximately $369 more than that for an individual with only one AJAE publication. As a further example, consider an individual who publishes a book during his/her first 10 years of experience. According to Model 2, a rate of one book per ten years is worth approximately $369 in terms of annual salary.

These returns to publications are consistent with previous estimates which range from $229 to $337 (DeLorme, et al.) and from $345 to $392 (Siegfried and White). Estimates of returns to books were found to be comparable to that found by other studies: $272 to $1,094 (Tuckman and Leahey) and $351 to $1,146 (Tuckman and Hagemann).

Referring again to Table 5, each year of professional experience yields an additional $258 and $335 for Model 1 and Model 2 respectively while the number of courses taught yields a negative $475 and $378 respectively, in terms of annual salary. The negative teaching relationship does not necessarily imply that faculty are penalized for teaching, rather that teachers may receive smaller salary increments than those received by researchers. Furthermore, more competitive bidding among universities for published research faculty relative to teaching faculty may partially explain these differences in salary increments.

As expected, a positive relationship was found between grantsmanship and salary. Each $100,000 increment of research grants yields an estimated $302 and $359 in annual salary for Model 1 and Model 2 respectively. In terms of employment mobility, on the average, faculty receive an additional $866 or $909 in salary for an employment change. Finally, promotion to associate professor was associated with a $1,647 or $1,773 salary increment and promotion to full professor yielded a salary increment of $5,083 or $5,806 based on the models estimated. For both equations, approximately two-thirds of the variation in salaries was accounted for by the explanatory variables in the model as indicated by R^2 values of .64 and .65.

SUMMARY AND CONCLUSIONS

The reward structure for agricultural economics research faculty is instrumental in directing faculty resources and efforts. The processes whereby professional achievement and goals emerge from a conscious interaction of faculty, clientele and students is not well understood. This paper summarizes the findings of a study which measured certain aspects of research and teaching activities of agricultural economics faculty at land grant universities. General professional characteristics of these faculty were described and contrasted by faculty rank and region of employment. Of the faculty surveyed, about half had made employment changes since earning their PhD degree. Faculty in the North Central and Southern regions were found to be the most and the least mobile respectively. On the average faculty in the North Central region proved to be older and more experienced than their counterparts in other regions. Regional differences in agricultural economics faculty were found for total career publications and rate of publication. The North Central region dominated other regions in total career publications and in publication rates in four of seven publication categories. The Pacific region ranked first among regions in the annual average AJAE publications per faculty member, while the Mountain, Plains and Southwest dominated in the annual rate of production in regional journals and experiment station-extension publications.

The extent to which publishing differences across regions were due to small groups of highly published faculty was measured using concentration ratios. The North Central region was found to be

relatively top-heavy in total career publications with 10 and 20 percent of the faculty in the region accounting for 62 and 74 percent of the total publications, respectively. The Mountain, Plains, and Southwest appeared to be the most top-heavy when publication concentration was measured on an annual average basis.

A general model was developed to determine relationships between faculty resources, research productivity and faculty rewards. Salary determinants identified in the study were faculty publications, professional experience, teaching loads, grantsmanship, employment mobility and faculty rank. Career and annual rates of return to selected publications were computed. An additional career AJAE publication was shown to yield an annual salary increment of $184 while an additional book was shown to yield $460 in annual salary. Total returns to all publications were found to increase substantially as the annual rate of publishing increased. Grantmanship, employment mobility, experience and faculty rank were all found to be positive salary determinants. Perhaps disturbing but not surprising, teaching loads were found to have negative effect on salary. The long term consequences of lower monetary returns to teaching on the quality of instruction in agricultural economics departments was not explored in this study. Likewise, the impact of the current reward structure on the quality of instruction delivered by future generations of agricultural economics faculty remains a topic for further research.

NOTES

[1]Respondents were selected at random from agricultural economics faculty listed in: U.S. Department of Agriculture, Science and Education Administration. Professional Workers in State Agricultural Experiment Stations and Other Cooperating State Institutions 1978-79. Agriculture Handbook 305. U.S. Government Printing Office, May 1979.

[2]Regional delineations were adapted from: Peck, Anne, E., and Emerson M. Babb. "The AAEA Membership: Employment and Mobility Patterns." American Journal of Agricultural Economics 58 (1976) 600-5.

[3]The number of annual average publications was computed by dividing total career publications by years of professional experience.

[4]This modified weighting scheme was adopted from DeLorme, et. al.

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