Composition of Agricultural Economics Faculties in 1862 Land Grant Institutions

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The diverse specialties of the agricultural economics profession have been noted in several recent AAEA presidential addresses (Johston; Libby; Houck; Eidman; Armbruster). These addresses argue that this diversity is a source of strength, ensuring the continuing relevance and viability of the profession and its association. Houck also noted that diversity among agricultural economics departments arises from differences in regional issues, educational missions, and outreach goals. Such diversity is also borne out in recent national surveys regarding important directions for the profession (Ahearn, et al.) In addition, a 1992 paper session on the implications of the changing political economy for Land Grant universities stressed accountability to clientele in order to remain relevant and viable (Skees; McDowell; Hite; Bonnen).

Little analysis has been conducted, however, to evaluate faculty resource allocations at the department level in response to state-level demands for services. The research reported in this paper examines the relationship of current departmental faculty resource allocations among the areas of agriculture, natural resources, and rural/community economics to descriptive data for each individual state. Specifically, the research 1) quantifies the current allocation across the three areas in each department, 2) evaluates state-level forces driving that allocation, and 3) examines the role of these forces in explaining where the next additional position would be allocated. In addition,

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predicted allocations are compared to department head allocations. Finally, a typology of departments is constructed.

Email Survey

An email survey was sent to chairs and heads of departments of agricultural economics of the 1862 Land Grant institutions in each state during the spring and summer of 1998. The survey consisted of seven questions. First, the heads or chairs were asked to classify existing and new, but unfilled, permanent, tenure-track faculty positions to the areas of agriculture, natural resources, community economics, or other. The second question then asked the heads to reallocate positions among the four areas to as to better meet the demands on the department. The next question asked the heads how they would allocate an additional, free, new position. The remaining questions dealt with department information such as the numbers of undergraduate and graduate students, presence of a Ph.D. program, and the head's own professional orientation.

Three electronic communications and a follow-up letter were used to generate useable responses from departments in 45 of the 50 states[3]. Connecticut, Maryland and Vermont did not respond. Michigan State indicated that their faculty situation did not fit our questions, and Wisconsin refused to participate. Misunderstood questions were clarified to ensure appropriate question responses.

Summary statistics for the survey responses appear in Table 1. The average size of the departments was 22.2 faculty with 14.6 devoted to agriculture, 3.9 devoted to natural resources, and 2.2 working in community economics. In response to the question about allocating a new position, department heads indicated that their desired hires would

be 31 percent to agriculture, 31 percent to natural resources, and 29 percent to community economics[4].

Table 1. Faculty Size of Departments of Agricultural Economics

	Average	High	Low
Total Department Size	22.2	52.1	3.0
Agriculture Faculty	14.6	40.5	0.0
Resources Faculty	3.8	9.0	0.0
Community Faculty	2.2	7.5	0.0
Other Faculty	1.5	15.0	0.0

What explains allocations?

Current demand for agricultural economic teaching, research, and outreach services should explain the allocation of faculty time over each of the areas delineated in the survey if colleges of agriculture administrators are able to optimally allocate scarce faculty resources. However, it is recognized that because faculty hires may represent a 30-year commitment, there is likely limited flexibility for addressing short-term or recent changes in the demands for faculty time. While new hires and faculty who change areas of emphasis in mid-career may address shifts in demand, the allocation of faculty resources relative to demand is a dynamic resource allocation problem under uncertainty, which would require much more extensive data than was collected in this survey.

Recognizing the dynamic nature of faculty resource allocations, but also noting the short-term adjustments that can be made by departments to specific situations and also the relatively static state-level situations, an effort was made to relate department faculty allocations to each state's contemporaneous demand for services in each area as

[3] Two departments were contacted in each of the following states: Arkansas (research and extension), California (Berkeley and Davis), and Tennessee (research and extension). The two administrative units for these states were combined into a single unit for the purposes of this analysis.
[4] Individual responses are not reported due to assurances of confidentiality.

reflected by state-level secondary data. Variables were collected for each state that might explain current faculty resource allocations. The variables included are: the number of undergraduates in the college of agriculture, the number of other colleges in the state providing agricultural programs, metropolitan population, non-metropolitan populations, farm employment, agricultural employment at the wholesale and retail level, total state employment, rural unemployment rate, oil and gas sales, mineral sales, gross state product, acres of farmland, acres of cropland, acres of federal land, number of park visitors, number of hazardous waste disposal sites, state educational expenditures per student, number of farms, number of farms selling less than $10,000 annually, number of farms selling more than $100,000 annually, the number of farmers who list farming as their main occupation, total crop sales, total animal product sales, value of exports, and a Herfindahl index measuring the concentration of each state's agriculture across commodities[5].

Due to the correlation among the variables hypothesized to explain faculty allocations, factor analysis was used as a data reduction technique. Six factors were identified, explaining 80 percent of the variance in the data. The factors and variables with primary loadings on each factor are presented in Table 2. The first factor can be thought of as a combination of variables relating to rural, largely agricultural states. The second factor represents attributes associated with larger, more populous, and wealthier agricultural states with large universities. The third factor represents large farms with farming as a primary occupation. The fourth factor corresponds to rural poverty and mineral-extracting states with low educational expenditures. The fifth factor is a combination of oil and gas revenues, an agricultural sector concentrated in only a few

[5] Data and variable explanations are available from the authors.

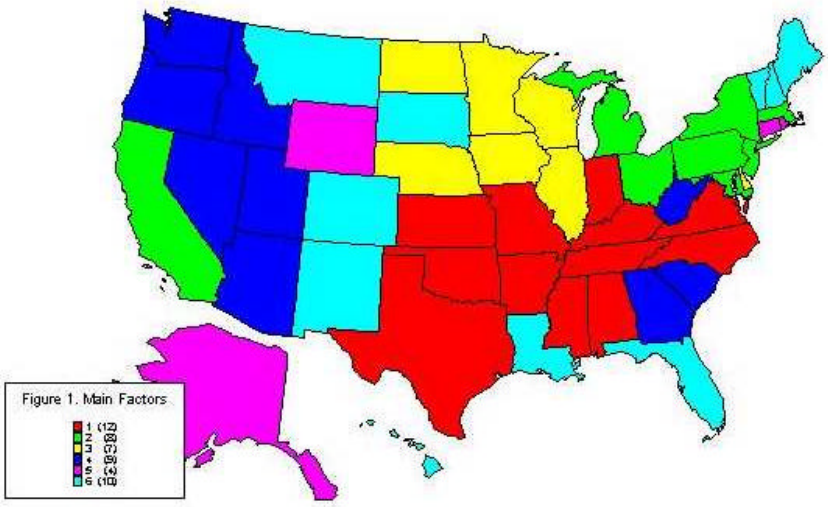
commodities, and a large amount of federal land. Finally, the last factor reflects many acres of farmland with a significant wholesale and retail support industry.

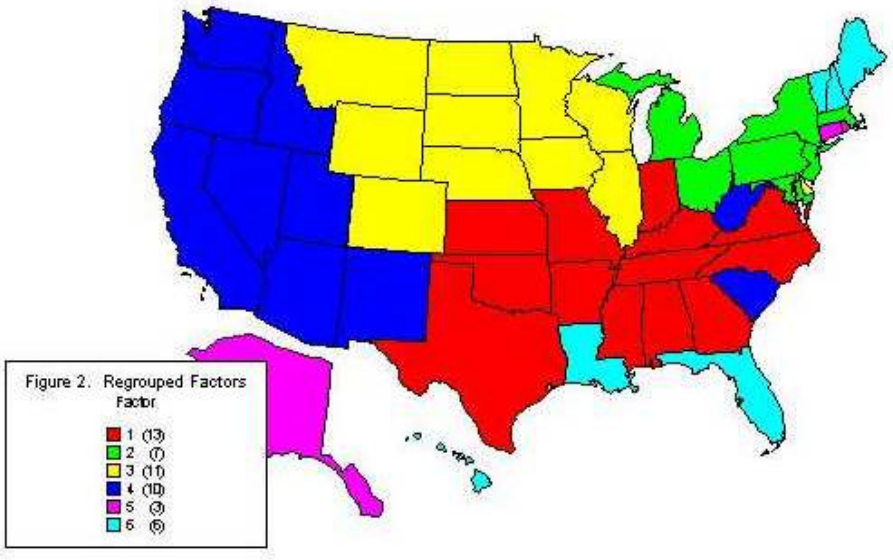
Table 2. State Data Factors and Their Primary Loading Variables.

Factors					
1	2	3	4	5	6
Other Colleges	College Undergraduates	Farming as Main Occupation	Rural Unemployment	Oil and Gas Sales	Wholesale and Retail Agricultural Employment
Non-metro Population	Metro Population	Farms Selling $100,000+	Mineral Sales	Federal Land Acres	Acres of Farmland
Farm Employment	Total State Employment		Educational Expenditures (-)	Herfindahl Index	
Cropland	Gross State Product				
Farms Selling <$10,000	Park Visitors				
Number of Farms	Waste Sites				
Animal Sales	Crop Sales				
Exports					

Factor scores of each of these six factors then were calculated for each state. The factor score of primary magnitude was mapped for each state (Figure 1). States with the same primary factors tend to fall together in regional groups including New England, the Mid Atlantic and Eastern Great Lakes states; the South; the Upper Midwest; the Rocky Mountain States; and the Far West, with a few exceptions. The principal factors seem to characterize each state well, and identify like states. In fact, when a close, secondary factor is used for some states instead of the primary factor, more states fall into regional groupings (Figure 2), closely approximating USDA geographical divisions. Therefore, it

seems reasonable to use the factor scores for each individual state as descriptive variables to explain faculty resource allocations.





Statistical models were developed to explain the numbers of faculty allocated to agriculture, to natural resources, and to community economics in each state. The counts of faculty members in each group were regressed on the factor scores for the six factors

representing state-level secondary data. The results are presented in Table 3. The data provide significant explanatory power for the numbers of agricultural faculty in the departments, with the first two factors generating significant parameter estimates. The models for the resources and community economics faculty provide less explanatory power. The number of resource economics faculty is explained chiefly by Factor 2. States with large metropolitan populations, larger universities, larger gross state products and more agricultural emphasis on crops tend to have more faculty devoted to natural resource issues. The model explaining community economics positions does not perform well. In fact, the overall regression is not significant. Still, as expected, Factor 4 offers an explanation of the number of faculty allocated to this area of work.

Table 3. Results of OLS Regressions Models.

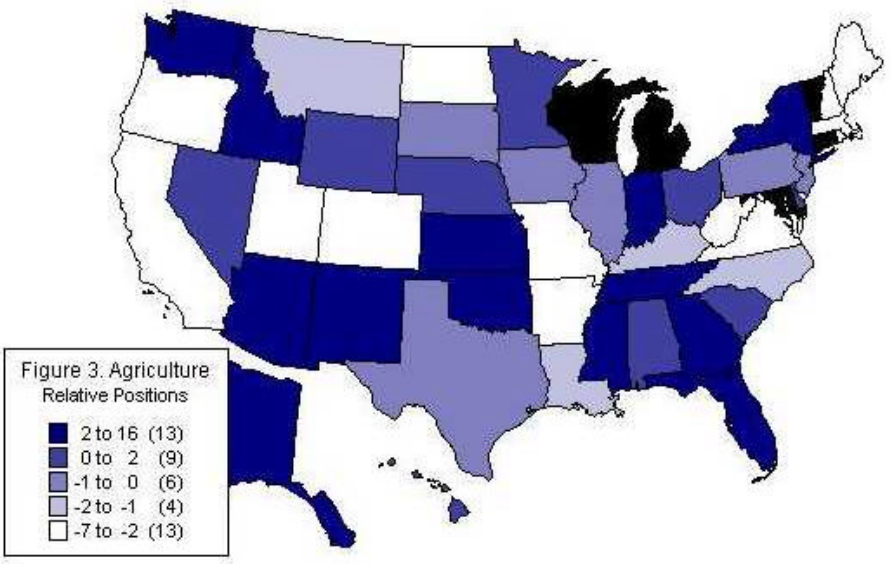
	Dependent Variable - Number of Faculty in:		
Variable	Agriculture	Resources	Community
	parameter estimates		
Constant	14.34**	3.88**	2.17**
Factor 1	6.68**	0.03	0.36
Factor 2	4.26**	1.13**	0.44
Factor 3	0.05	-0.32	-0.05
Factor 4	0.01	0.29	0.57*
Factor 5	-0.95	-0.16	-0.22
Factor 6	0.04	0.16	-0.04
Adjusted R^2	.756	.226	.039

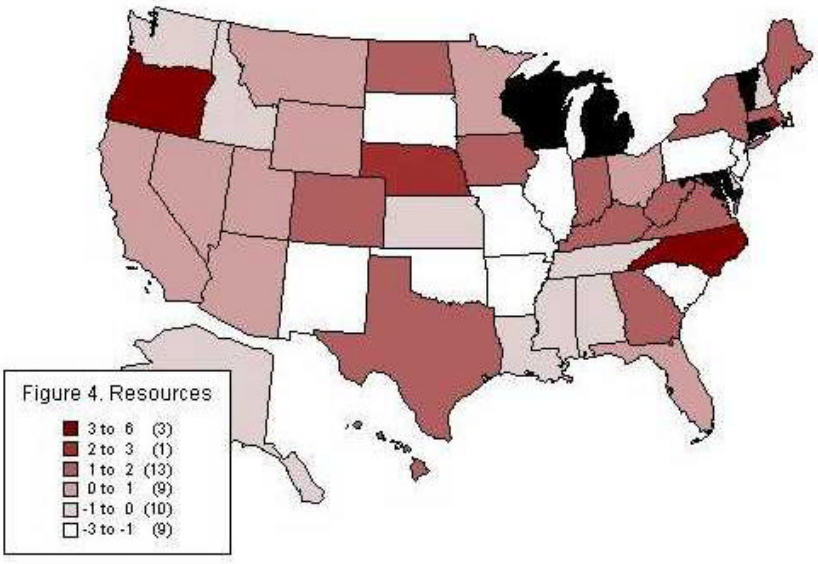
** indicates parameter estimate is significant at the 1% level or greater
* indicates parameter estimate is significant at the 10% level or greater

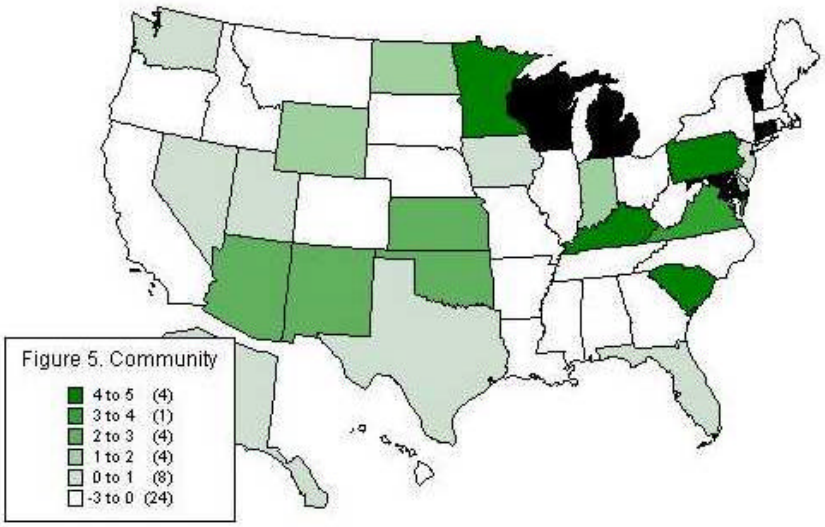
Do allocations reflect state conditions?

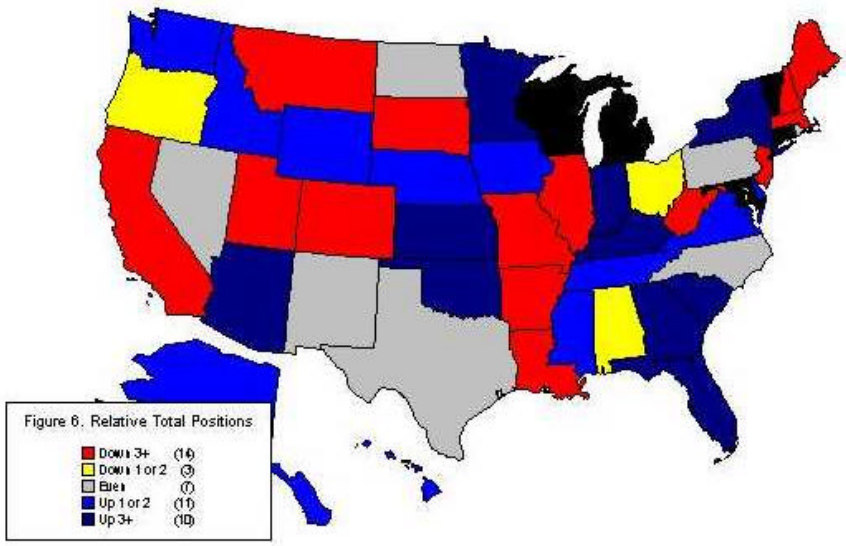
Predicted position numbers from each of the three regression equations were compared to actual positions in those areas as reported by department heads. The resulting residuals represent current under- or over-allocations for each department relative to state secondary data (reflecting demand) and relative to the 45-state

departmental allocations. These measures are presented as maps in Figure 3 to Figure 5. In addition, the total positions under- or over-allocated for each department are also presented in Figure 6. One can see which departments have been staffed well or poorly relative to their states' needs and other departments of agricultural economics.









The survey responses on the allocation of a new position were compared to the under- or over-allocations calculations described in the previous paragraph. The heads' indicated allocations of a new position were compared to the area where there was the greatest apparent need. Forty percent of the responding department heads would have allocated a new position to the area with the greatest apparent need. But, 27 percent would have allocated a new position to the area with the greatest apparent relative

strength (least need). Of the remainder, 9 percent would have allocated the new position to a non-economic area, and 24 percent would have allocated the new position to the area of neither greatest nor least apparent need.

Which departments should collaborate with each other?

Given specific allocative needs of different departments, collaborations could be used to offset weak program areas or to create synergy in strong areas. Certainly, state secondary data suggest that the current USDA regions do reflect geographic differences adequately and are a beginning to the exploration of common problems across state lines. However, the composition of departments of agricultural economics does not adequately reflect state needs in each of the three areas, with some states being poorly supported in each area. Examples of under-supported states include Arkansas, Missouri, and Illinois.

A Typology of Department Structures

Another question is whether the allocations of positions among the three areas fall into any identifiable patterns. Can departments be grouped according to their structure? Analysis of such groupings may lead also to possible collaborations within regions with some departments supplementing others with weaker programs in specific areas. Examples would include Kentucky and South Carolina sharing community economics expertise with neighboring states, or Oregon and Washington sharing resource and agricultural economics faculty. Such collaboration already occurs in several regions of the country.

Cluster analysis was performed on the departmental current faculty allocation data, resulting in nine different clusters of departments (Table 4). Cluster membership seems to be based on total size first, followed by relative allocations to natural resource and community economics areas. One can see that there is some overlap with geographic regions as shown in Figure 1, however such relationships are not consistent or uniformly applied.

Table 4. Department Typologies

		Faculty (averages for cluster)			
Cluster	States	Total	Agric.	Res.	Comm.
Very Small – Resources	AK, NH, RI	4.67	.33	4.17	.17
Very Small – Add Agriculture	DE, HI, MA, ME, MT, NV, UT, WV, WY	10.31	5.19	3.83	1.29
Small – Agriculture	AL, AR, ID, NJ, SD	15.5	13.25	1.4	.85
Small – Resources and Community	AZ, CO, LA, ND, NM, OR, VA	17.21	9.95	4.4	2.86
Medium – Agriculture and Resources	GA, MO, MS, NC, NE, OH, TN	25.39	20.5	4.06	.83
Medium – Balanced	KY, SC, WA	24.0	15.0	3.5	5.5
Large – Agriculture and Resources	CA, FL, IA, IL, NY	34.2	25.43	5.86	2.91
Large – Agriculture and Community	KS, MN, OK, PA	28.63	21.0	2.38	5.25
Very Large	IN, TX	46.25	37.25	6	3

Implications of the Analysis

The analysis presented in this paper provides only a starting point for further discussion and examination of the allocation of scarce faculty resources in response to clientele demand in each state. However, the data collected and their analysis do provide some insights into the drivers of position allocations.

It does appear that agriculture drives the allocation of faculty resources, whether the issues are directly related to agricultural production and marketing or more tangentially related through environmental and community issues associated with an

agricultural sector. It appears that McDowell's hypothesis that Land Grant institutions in many states are held hostage to agricultural interests is supported, at least in part.

The data and analysis also provide some insight into the relative strengths and weaknesses of individual departments across the three areas of agriculture, resources, and community. Departments that are under-endowed in specific areas are identified and it is found that many departments are poorly endowed in all three areas. One might argue, however, that for resources and community the analysis only shows relationships across departments. If all departments have too few resources allocated to these areas in relation to public demand, then the relative allocations have no bearing on the allocation of future positions.

Finally, the analysis of current department allocations and the identification of departmental typologies may help in identifying potential for future collaborative programming. Such efforts are already in place in many areas, but perhaps better and more unique partnerships might also be explored.

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