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ABSTRACT

The effect of administrative service responsibilities of chemistry department chairs on their scholarly careers as scientists was studied. The relationship between selected personal and work environment characteristics and productivity was compared for department chairs and their full-time faculty peers. A total of 67 chemists who had served as chairs of departments between 1966 and 1973 but who had not served in this capacity for a 6-year period preceding and following were studied. Each was compared with a peer with the same academic rank and specialty area, in the same academic department. Four publication productivity measures were assessed: single-authored, senior-authored, junior-authored, and total publications. The number of Ph.D. students sponsored (i.e., graduated) was also assessed as a productivity measure. Five measures of personal and work environment characteristics were obtained for all 134 chemists. Regression analysis indicated few differences between the two groups, except during the chair interval, during which reduced publication productivity occurred. The productivity of department chairs on all four publication measures was related to department size. (SW)

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ADMINISTRATIVE SERVICE AND RESEARCH PERFORMANCE;
A STUDY OF CHEMISTRY DEPARTMENT HEADS

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Daniel R. Coleman, Chairman
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ADMINISTRATIVE SERVICE AND RESEARCH PERFORMANCE:

A STUDY OF CHEMISTRY DEPARTMENT CHAIRS

Knowledge of the complex nature of the department chair position has progressed substantially since the seminal work of Dressel, Johnson, and Marcus (1970) which found the position to be "vague, often misunderstood, and not clearly perceived" (p. 84). Subsequent research on the goal orientations (Smart and Elton, 1975), information needs (Johnson, 1976), administrative effectiveness (Hoyt and Spangler, 1979), job satisfaction (Smart, 1975), professional development (Booth, 1978; Creswell, Seagren, and Henry, 1980), and job responsibilities (Roach, 1976; Smart, 1976) of department chairs has enhanced understanding of the complex nature of the position, appreciation of academic discipline variability in incumbents' attitudes and behaviors, and realization that there is no "one best way" to manage academic departments.

The scholarly stature of those attracted to this position and the effect of such administrative service on their subsequent scholarly careers are topics that have not received attention. These topics are important both to universities that seek to attract and retain established scholars in this key leadership position and to individuals who are contemplating service in this administrative capacity.

The lofty importance assigned to publication productivity criteria in evaluation processes (Boyd and Schietinger, 1976; Centra, 1977; Thorne, Scott, and Beard, 1976) and reward

structures (Katz, 1973; Marsh and Dillon, 1980; Tuckman, 1976) is clear evidence that universities place a high value on research and scholarly performance. It seems reasonable to assume that an established record of scholarship would facilitate the effectiveness of department chairs in the predominantly research oriented environments that characterize most major universities. Such a record should assist department chairs in acquiring the professional respect of their colleagues, strengthen opportunities for obtaining vital research funding, and increase the likelihood of identifying and attracting highly qualified new faculty members. These considerations illustrate the potential importance to universities in attracting and retaining department chairs with an established scholarly record.

The professional stature and recognition of individuals in the scientific community is acquired principally through the publication process which permits peers to assess the relative importance of scientific contributions (Fox, 1983; Hagstrom, 1965; Merton, 1973). A strong positive relationship between the professional stature and publication productivity of individual scientists has been clearly established (Cole and Cole, 1973; Fox, 1983; Garfield, 1979). Administrative services as a department chair could constitute a serious interruption in the scholarly careers of individual scientists. For example, Dressel, Johnson, and Marcus (1970) noted that the "burden of administrative detail" and the "staggering amount of routine activities required" could seriously jeopardize the scholarly

performance of department chairs (p. 82). Thus the potential effect of administrative service on the subsequent scholarly careers of department chairs is an important consideration for individuals contemplating this career opportunity.

The central purpose of this study is to examine the effect of administrative service as department chair on the scholarly careers of scientists through an analysis of their publication and doctoral student productivity records over an approximate two-decade period. A longitudinal, experimental design is employed with a control group of scientists who have not served in an administrative capacity throughout an equivalent time period. This purpose thus explores potential variation in the level of publication and doctoral student productivity of department chairs and their full-time faculty peers.

Previous research has clearly shown that the publication productivity of individual scientists is highly variable. For example, Lotka (1926), Price (1963), and Allison and Stewart (1974) demonstrate that ten to fifteen percent of scientists produce from one-third to one-half of the papers in print. Fox (1983) concludes that the explanation of the sources and determinants of such variability in publication patterns constitute a central problem in the study of science and scholarship. She suggests that efforts to explore such variability fall into three categories: personal characteristics of scientists, aspects of their work environment, and feedback processes in the scientific community associated with the distribution of resources and rewards.

Thus, a second purpose of this study is to examine the relationship between selected personal and work environment characteristics and the publication productivity of scientists over an approximate two-decade period. The objective of this particular inquiry is to determine whether the relationships are similar for department chairs and their full-time faculty peers.

Research Procedures

Sample

The sample was selected from the faculties of 120 graduate chemistry departments included in each biennial issue of the Directory of Graduate Research published by the American Chemical Society from 1962-63 through 1980-81. A total of 531 chemists served as chairs of these departments during this period. The study was based on data for an experimental sample of department chairs and a control sample of departmental peers who held full-time faculty appointments throughout the two-decade period. The following criteria were used to select members of the respective samples.

Experimental Sample (Chairs). All chemists who had served as chairs of the 120 departments between 1966 and 1973 but who had not served in this capacity for a six-year period preceding and following at any of the 120 departments were included in the experimental sample. This sampling design thus covers three time intervals in the careers of the experimental sample members: (1) pre-chair interval, a six-year period preceding tenure as chair,

(2) chair interval, a variable period ranging from two to eight years of service as chair between 1966 and 1973, and (3) post-chair interval, a six-year period immediately following service as chair. A total of 67 chemists satisfied these selection criteria and constituted the experimental sample.

Control Sample (Peers). Each of the 67 chemists in the experimental sample was paired with a peer at the same academic department. Peers were randomly selected from those in the department whose academic rank and research speciality area (e.g., organic, physical) were the same as those of the individual in the experimental sample. In addition, peers could not have served in an administrative capacity at any of the 120 universities throughout the two-decade period.

Variables

Publication and Doctoral Student Productivity. Four publication and one doctoral student productivity measures were collected from each biennial issue of the Directory of Graduate Research for all 134 chemists. The four publication productivity measures were the number of single-authored, senior-authored, junior-authored, and total publications. The doctoral student productivity measure was the number of Ph.D. students sponsored (i.e., graduated) in each issue of the Directory of Graduate Research. A two-year lag time from initiation to publication of research project findings was assumed. Table 1 presents the publication years associated with the three time intervals for each of the ten possible tenure periods that individuals in the

experimental sample served as department chairs between 1966 and 1973.

(Insert Table 1 about here)

Personal and Work Environment Characteristics. Five measures of personal and work environment characteristics were obtained for all 134 chemists. These measures were the career age of each chemist (i.e., years since receipt of Ph.D.), quality of the department from which he obtained his Ph.D., quality of his current department of employment, the number of full-time faculty, and the total graduate student enrollment of his current department. Cartter (1966) ratings were used as measures of departmental quality; the professional age of chemists and the number of department faculty and graduate students were obtained from the Directory of Graduate Research biennial issues.

Analyses

Multivariate Analysis of Variance (MANOVA). A two by three repeated measures MANOVA design was used to assess potential differences in the publication and doctoral student productivity measures of chemistry department chairs and faculty peers. The independent variables were chair status (chairs, peers) and time interval (pre-chair, chair, post-chair). The dependent variables were three annual publication measures (single authored, senior-

authored, and junior-authored publications) and one annual doctoral student productivity measure (Ph.D. graduates) for each time interval.

Multiple Regression. Multiple regression procedures were used to assess the relationship between the five personal and work environment characteristics and the publication productivity measures for each of the three intervals. The purpose of these analyses was to determine if the personal and work environment characteristics were similarly related to the publication productivity measures of department chairs and their faculty peers during each of the three time intervals.

Separate regression equations were computed for each publication and doctoral student productivity measure during each time interval. For the prechair interval, each productivity measure was regressed on the five personal and work environment characteristics; for the chair and post-chair intervals, the corresponding measure (e.g., senior-authored publications) for the prior interval(s) was entered into the equation first and followed by the five personal and work environment characteristics.

Regression equations were computed for the combined sample of chairs and peers and for each group separately. An F-ratio was then computed following Rao's (1965) procedures, to determine if the pooled residual sum of squares for the separate groups' equations was significantly lower than the residual sum of squares for the combined sample, given a concomitant reduction

of residual degrees of freedom when using two groups. A significant reduction in the residual sum of squares would indicate a differential relationship between the productivity measure and the personal and work environment characteristics of department chairs and their faculty peers.

Results

Multivariate Analysis of Variance (MANOVA).

The MANOVA results indicated that both main effects were statistically significant (chair status, $F = 2.73$, $df = 4/63$, $p < .05$ time intervals, $F = 5.90$, $df = 8/59$, $p < .001$), while the interaction term did not reach a level of statistical significance ($F = 1.50$, $df = 8/59$). The latter result indicated that differences in the publication and doctoral student productivity of department chairs and peers were consistent across the three time intervals.

Table 2 presents the univariate F -ratios and group means and standard deviations on the dependent variables.

(Insert Table 2 about here)

Inspection of the univariate F -ratios in Table 2 suggested that the overall difference between department chairs and peers was attributable to the number of junior-authored publications ($F = 9.10$, $df = 1/66$, $p < .01$) of the respective groups. Department

chairs ($\bar{X} = 2.32$) annually published more junior authored articles than their peers ($\bar{X} = 1.52$) across the three time intervals. None of the univariate relations for the remaining dependent variables reached a level of statistical significance ($p < .05$).

Multiple Regression

Regression analysis results for the pre-chair and post-chair time intervals revealed few systematic differences between chairs and their faculty peers; that is, the relationships between the four publication productivity measures and the five personal and work environment characteristics were essentially similar for the two groups. Such was not the case, however, during the chair interval as revealed in the regression results presented in Table 3.

(Insert Table 3 about here)

The computation of separate equations for the two groups produced a statistically significant reduction in the pooled residual sum of squares for the combined groups' equation on all four publication productivity measures during the chair interval. This was especially true for both junior and senior-authored publications ($p < .01$) and somewhat less so for total ($p < .05$) and single-authored publications ($p < .10$).

Inspection of the regression coefficients in Table 3 shows only one instance in which personal or work environment characteristics contributed significantly to explaining the publication productivity of faculty peers. They tended to publish more senior-authored publications as the square of their professional age increased.

The productivity of department chairs on all four publication measures, however, was systematically related to work environment characteristics. The characteristics (number of full-time faculty and total graduate student enrollment) were essentially measures of departmental size. The general pattern of results for department chairs suggests a curvilinear relationship between publication productivity and departmental size (i.e., the linear component has a negative weight and the quadratic term has a positive weight). This tendency is fully apparent in the equations for total publications and single-authored publications, and is partially evident in the equations for senior and junior-authored publications.

Discussion

The validity of the results of this study and the generalizations that may be drawn from them are obviously limited by the rather small sample size and the fact that the subjects were from a single academic discipline. Nevertheless, they are encouraging in at least two respects. First, they suggest that universities have been successful in attracting

scientists with established scholarly credentials to serve as department chairs. This is evident from the finding that chemistry department chairs had a substantially stronger publication record than faculty peers in the department for a six-year period prior to their acceptance of the chair position. Secondly, administrative activities as department chair did not appear to diminish the publication productivity of chairs, relative to faculty peers, during their administrative tenure or for a six-year period following their administrative responsibilities.

These findings are encouraging both to universities and individuals. They demonstrate that universities have been able to attract established scholars to this key leadership position and suggest that they have a reasonable likelihood of retaining their services since service in this administrative capacity does not appear to interrupt their publication performance, at least for short and moderate tenures. The ability of universities committed to research and graduate education activities to attract and retain the administrative involvement of established scholars seems especially critical if these institutions are to remain competitive in the current era of declining graduate enrollments and research funding. Similarly, individual scientists contemplating short to moderate terms of service as department chairs might be encouraged by these findings since such administrative involvement need not diminish their current level of scholarly productivity. These mutually reinforcing

conditions bode well for maintaining the high caliber of department leadership in research and graduate oriented universities.

Service as department chair, however, apparently subjected incumbents to circumstances not faced by their full-time faculty peers. The publication productivity of the latter appears to be essentially unaffected by their personal and work environments, while that of department chairs seems to vary in relation to several work environment characteristics, notably measures of departmental size. Chairs of relatively small and large departments are able to maintain or improve their publication performance during the period of their administrative involvement, which chairs of moderate size departments tend to experience a diminution in their publication productivity. One possible explanation for this aberration is that smaller departments impose relatively few administrative burdens on their chairs and larger departments perhaps have the resources to provide their chairs with sufficient administrative support (e.g., administrative assistants, assistant department chairs) so that their research performance is not seriously interrupted. Moderate size departments, on the other hand, may be too small to provide such additional administrative support and too large for one person to administer effectively without a detrimental affect on his/her publication record. While such possibilities warrant further study, it is clear that the research performance of chairs, unlike their full-time faculty peers, is related to

work environment characteristics during their administrative tenure. Such differences, however, tend to diminish after their return to the faculty.

Several areas for future research are immediately apparent from these findings. The degree to which similar findings would emerge from comparable studies of chairs of other departments deserves attention given existing knowledge of wide variation in the attitudes and behaviors of faculty and chairs due to the level of paradigm development, concern for the practical application of subject matter, and involvement in the study of organic objects of departments (Biglan, 1973; Creswell and Roskens, 1981).

The present study was based on data for department chairs who served short to moderate terms of administrative service. Extending this tenure to longer terms of service could well result in different findings. Such research would be of great value, however, to individual scientists contemplating this career opportunity by providing an estimated length of service beyond which diminished scholarly productivity appears likely to occur.

The identification of other personal and work environment characteristics that are supportive of and detrimental to the scholarly performance of department chairs during and following the time of their administrative service deserves attention. Such efforts could be instructive to the efforts of university officials to make this key leadership position attractive to established scholars.

The fact that chairs and faculty peers tend to differ principally in terms of the formers' higher participation in collaborative research projects in a junior author capacity is an interesting finding that might suggest what kinds of individuals are attracted to and selected to serve in this leadership position. Collaborative research endeavors could well be a mechanism for individuals to become known by and to establish their professional credibility among a large segment of the departments' faculty. Such visibility, in conjunction with a deferential willingness to accept junior author status, might be attributes that departmental faculty find attractive in their selection of department chairs.

The department chair position remains an important focus for research given its centrality to the leadership process in American higher education. The findings of this study provide an initial assessment of the scholarly credentials of individuals serving in this capacity and the relationship of such administrative service to their subsequent research performance. The rather favorable nature of these findings deserve further scrutiny before we can have full confidence in their validity.

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Table 1

Publication Years for Periods Before, During, and
After Service as Department Head

Years as Department Head	Publication Years		
	Before	During	After
1. Two-year period:			
1966-67 (n=8)	1962-67	1968-69	1970-75
1968-69 (n=7)	1964-69	1970-71	1972-77
1970-71 (n=4)	1966-71	1972-73	1974-79
1972-73 (n=4)	1968-73	1974-75	1976-81
2. Four-year period:			
1966-69 (n=6)	1962-67	1968-71	1972-77
1968-71 (n=10)	1964-69	1970-73	1974-79
1970-73 (n=14)	1966-71	1972-75	1976-81
3. Six-year period:			
1966-71 (n=8)	1962-67	1968-73	1974-79
1968-73 (n=5)	1964-69	1970-75	1976-81
4. Eight-year period:			
1966-73 (n=1)	1962-67	1968-75	1976-81

Table 2
Means, Standard Deviations, and Univariate F -Ratios^a

Time Intervals and Dependent Variables	Department Chairs		Faculty Peers	
	\bar{x}	σ	\bar{x}	σ
<u>Pre-chair Interval</u>				
Ph.D. graduates	0.85	0.73	0.73	0.70
Single-authored	0.25	0.33	0.32	0.49
Senior-authored	1.68	1.94	1.59	1.87
Junior-authored	2.21	2.47	1.47	1.86
<u>Chair Interval</u>				
Ph.D. graduates	0.86	0.71	0.74	0.79
Single-authored	0.15	0.45	0.23	0.44
Senior-authored	1.04	2.40	1.55	2.30
Junior-authored	2.34	3.02	1.39	1.87
<u>Post-chair Interval</u>				
Ph.D. graduates	0.62	0.59	0.62	0.59
Single-authored	0.29	0.52	0.24	0.42
Senior-authored	0.67	1.16	1.01	1.96
Junior-authored	2.40	2.89	1.71	1.92

^aUnivariate F -ratios for the four dependent variables were: Ph.D. graduates ($F=1.04$), single-authored publications ($F=0.20$), senior-authored publications ($F=0.74$), and junior-authored publications ($F=9.10$, $df=1/66$, $p < .01$).

Table 3

Significant B-Weights for Chair and Peer Regression
Equations: Chair Interval

Predictor Variables	Criterion Measures							
	Total publications		Single authored		Senior-authored		Junior-authored	
	Chairs	Peers	Chairs	Peers	Chairs	Peers	Chairs	Peers
Pre-chair measure	.941	.918	.679	.577	.662	1.066	.690	.757
Personal Characteristics:								
Professional age						-.046		
Square of professional age								
Quality of Ph.D. granting department								
Work Environment Characteristics:								
Graduate enrollment	-.517							
Square of graduate enrollment	.022						.006	
F.T.E. faculty			-.060		-.057			
Square of F.T.E. faculty			.002					
Quality of current department								
Constant	1.839	.060	.533	.040	1.319	.672	-.047	.275
R ²	.708	.731	.464	.402	.330	.784	.540	.563

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