

## PUBLICATION RECORDS AND TENURE DECISIONS IN THE FIELD OF STRATEGIC MANAGEMENT

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*To better define levels of accomplishment for publishing journal articles in strategic management, a bibliometric study was performed on the publication records of 96 doctorates in the field whose first post-degree job was in academics. By examining 20 journals that are outlets for research in strategic management, publication records were developed for each individual for the first 5-10 years following receipt of the doctoral degree. Two factors influenced the publication records of these new faculty. Having publications prior to receiving the doctorate and getting a first job at an institution with a graduate program in management were associated with more frequent publishing after an academic career began. As expected, the number of papers published was related to the likelihood of receiving tenure. However, despite the fact that they had produced more papers during the first 5 years than male faculty members and had higher citation rates, female faculty members were less likely to receive tenure. The findings are discussed in terms of institutional policy for hiring and evaluating new faculty.*

### INTRODUCTION

This study examines the quantity and quality of publications of a sample of individuals who received doctorates in strategic management between 1980 and 1987, and whose first post-degree job was as a faculty member in an American college or university. We examine each individual's publication record in strategic management journals prior to, and for as many as 10 years subsequent to, receiving her/his doctorate. Various distributions of research productivity describe the productivity of the sample over time and permit us to compare productivity for subsets of the sample based on gender and the availability of a graduate program in the department in which the individual obtained her/his first job. We also investigate whether the decision to grant tenure

was affected by the publication records or gender. The findings are discussed in terms of their implications for establishing publication expectations for new faculty and for conducting promotion and tenure investigations.

#### Evaluation of faculty scholarship

Universities evaluate faculty on three performance dimensions, viz., scholarship, teaching, and service. Typically, candidates are judged in terms of unspecified standards of achievement on each of the dimensions, and these standards may be applied inconsistently when evaluating different individuals (Needham, 1982). For example, female faculty members in some academic disciplines are expected to meet higher standards for promotion than males (e.g., Long, Allison, and McGinnis, 1993).

Performance standards are rarely specified in objective terms. Departmental standards for scholarship are generally more implicit than

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explicit, and promotion materials sent forward (i.e., upward) by the department seldom contain information about the quality of the credentials in relation to objective standards of accomplishment in the discipline (Centra, 1980). Administrators' concerns that particularistic, non-scientific factors (e.g., friendships or departmental politics) influence departmental tenure decisions resulted in the creation of school- and university-wide committees to review departmental evaluations of faculty (Garfield, 1983). Since these reviews are often substantive rather than simply procedural, conferring tenure and/or promotion requires that the candidate's credentials be approved by senior faculty and administrators whose academic backgrounds typically differ from those of the candidate (Heck and Cooley, 1988). Consequently, objective information about the candidate's performance should enable reviewers at higher organizational levels to evaluate the candidate's credentials in relation to more general standards of accomplishment within her/his discipline.

Bibliometrics are useful for objectively analyzing scholarship because of their high reliability (Borgman, 1989) and because candidates are evaluated in comparison with others working in the same discipline or, preferably, the same specialty (Garfield, 1983).<sup>1</sup> Bibliometric investigations have been conducted on publishing records in a variety of business fields, but not in strategic management.<sup>2</sup> In part, this neglect is the result of disagreements among scholars about the boundaries of this relatively new business discipline. However, MacMillan (1989) and Franke, Edlund, and Oster (1990) identified strategic management's forum and, thereby, made it possible to examine publication records in relevant journals that constitute an important component of a faculty member's scholarly performance.

## Factors that may influence publication records

Faculty scholarship is typically evaluated by examining an individual's publication record, i.e., *the number and quality of publications produced over a period of time*. There is scant research about the factors that influence academic publishing productivity (Newman and Cooper, 1993; Rodgers and Maranto, 1989). Further, some studies that have examined publication records in more than one academic discipline have found differences in the correlates of publishing activity across disciplines (e.g., Chubin, Porter, and Boeckmann, 1981). We propose three variables that may influence the publication records of faculty in strategic management.

### *Gender*

The professional careers of female and male scholars is a topic of increasing interest (Zuckerman, Cole, and Bruer, 1991). With respect to the productivity of female and male scholars, previous research in psychology (Helmreich *et al.*, 1980; Rodgers and Maranto, 1989) found that men produce a greater quantity of published work than women. Using data from the mid-1950s to mid-1960s, Long *et al.* (1993) reported that male and female assistant professors in biochemistry started their academic careers with similar numbers of publications, but that males had significantly more publications after 6 years. Finally, a study of 35,478 faculty members indicated that women published less than men after controlling for the type of school (e.g., public vs. private university, and university vs. 4-year college; Astin, Korn, and Dey, 1991). A variety of factors have been used to account for the smaller publication records of women (e.g., interruptions in careers to have children, sex discrimination, and the availability of academic mentors), and several social and social psychological theories have been proposed to explain gender differences in scientific productivity (Cole and Singer, 1991).

### *Prior publications*

Publishing prior to receiving one's doctorate may be construed as a 'sample' of the performance required of new faculty subsequent to receiving

<sup>1</sup> Bibliometrics apply mathematics and statistical methods to books and other communication media (Pritchard, 1969).

<sup>2</sup> Bibliometric analyses have been performed on the publication records of faculty members in business disciplines such as accounting (e.g., Hagerman and Hagerman, 1989; Schroeder and Saftner, 1989), finance (Alexander and Mabry, 1994; Borokhovich, Bricker, and Simkins, 1994; Zivney and Berlin, 1992), and industrial relations (Gordon and Purvis, 1991).

their Ph.D. According to the behavioral consistency theory (Wernimont and Campbell, 1968), individuals who publish prior to receiving their doctorates are expected to continue to be more productive scholars than individuals who have no pre-Ph.D. publications. Support for this theory may be found in the research of Long, Allison, and McGinnis (1979), Chubin *et al.* (1981), and Rodgers and Maranto (1989), who reported that pre-Ph.D. publications are good predictors of the number of post-Ph.D. publications.

#### *Availability of a graduate program at the first job*

Scientific attainment is clearly influenced by access to necessary resources. One such resource is the availability of a graduate program. Faculty members in departments with graduate programs may be able to enhance their research productivity because they interact with students who can provide useful comments about faculty research ideas and projects. Graduate students also may be available to assist with faculty research. If one is willing to assume that departments with graduate programs are more prestigious than departments without such programs, then there is ample evidence that publications will be more numerous among faculty members who are employed in departments with graduate programs than without graduate programs. Crane (1967), Cole and Cole (1973), Helmreich *et al.* (1980), and Rodgers and Maranto (1989) all found that the quality and/or prestige of the department providing the first job were related to the number of subsequent publications.<sup>3</sup> In sum, if faculty development in management is similar to the development of faculty in other business disciplines such as accounting (Cargile and Bublitz, 1986), research and publication activities may be enhanced by the presence of a graduate program.

#### **Publications and tenure decisions**

Publication records generally are considered to be an important influence on the decision to grant tenure to a faculty member. Rosenfeld and Jones

(1987) observed a positive relationship between the number of publications and academic rank 6 years after the doctorate within the field of psychology, and Bayer and Astin (1975) indicated that academic rank was related to the number of published articles in a large sample of faculty members representing a variety of disciplines. We expect that the decision to grant tenure to strategic management faculty members also will be related to the number of their publications.

Publishing standards may differ across candidates within a given institution (e.g., Needham, 1982). Zuckerman's (1991) review of the literature concluded that, even after controlling for time in the profession, males in tenure-track academic positions were more likely to be tenured than women in tenure-track positions. Further, Cole (1987) found that gender disparities among academic ranks were greater at more prestigious institutions, even after controlling for differential productivity. Finally, Long *et al.* (1993) concluded that rates of promotion from assistant to associate professor were lower among female biochemists than male biochemists. These data suggest that women in the field of strategic management may also have less chance of receiving tenure.

Publishing standards also may differ across institutions. For example, Hagerman and Hagerman (1989) reported that the number of publications required for tenure in accounting departments was higher in private universities than public universities. The presence of a graduate program could also influence the standards for tenure. For example, the availability of graduate students to assist with research may raise expectations about the number of articles that a faculty member should be able to produce. Further, schools without graduate programs might stress teaching as opposed to research and, therefore, have lower expectations for the amount of research required to grant tenure. If one equates the prestige of an academic department with the presence of a graduate program, then it is relevant to consider Cole and Cole's (1973) finding that the quantity of publications was correlated with rank in more prestigious physics departments, but was uncorrelated in less prestigious departments. Stahl, Leap, and Wei (1988) also reported that scholars from prestigious institutions were among the leading contributors to the management journals.

<sup>3</sup> The prestige or quality of the departments in these studies were assessed by panels of raters or by the research output of the faculty. It is not clear to what extent these measures were influenced by the availability of a graduate program.

Table 1. Summary of sample selection procedure

| Stages  | Criteria                                      | Sources   | Sample size |
|---------|---|---|-------------|
| Stage 1 | General selection based on dissertation title | <i>American Doctoral Dissertation Index</i>   | 267         |
| Stage 2 | Validity check (reassessment of the title)    | Authors   | 162         |
| Stage 3 | Doctoral recipients with academic careers     | <i>National Faculty Directory</i>   | 105         |
| Stage 4 | Sample reduction to 100                       | Select all doctoral recipients in sample from 1980 to 1986 and random selection of 8 cases from 1987            | 100         |
| Stage 5 | Triangulation (confirmation of the criteria)  | <i>Directory of Management Faculty, Membership Directory of the Academy of Management, Telephone interviews</i> | 96          |

## METHOD

### Selecting the sample of doctoral recipients in strategy

The multistage procedure summarized in Table 1 was used to identify individuals who were doctoral recipients in strategic management and whose first job was in academics. Every year, the *American Doctoral Dissertations Index* publishes a list of dissertations completed by doctoral recipients from American and Canadian degree-granting institutions. The list of dissertations is subdivided by academic discipline, and one of the specific areas is 'Management'.<sup>4</sup> Our sample was selected by reviewing the dissertation titles included in this category starting with the 1980 academic year and ending with the 1987 academic year.<sup>5</sup> Importantly, the names of the doctoral recipients were not used to identify strategy students because this would have biased the sample toward well-known academics in the strategy field, thereby inflating the publication records.

<sup>4</sup> In 1983, this category was renamed 'Business Administration, Management.' At the same time, a separate category, 'Business Administration,' was discontinued.

<sup>5</sup> Selection of doctoral recipients began with 1980 because several factors point to that year as being a watershed for the field of strategic management. First, Volume 1 of the *Strategic Management Journal*, the leading publication in the discipline (Franke *et al.*, 1990), was published in 1980. Second, after hovering around nine journals for a period of time, the number of relevant journals publishing strategic management material steadily increased from 9 in 1980 to 16 in 1988. Lastly, the total influence of strategic management research (i.e., the product of the average number of citations per journal and the number of strategy management journals) increased by a larger amount over the period from 1979 to 1981 than any other 2-year period prior to that (Franke *et al.*, 1990). This began a period of steady increase in the total influence statistic through 1988.

Each dissertation title was examined for key words which suggested that the research topic could be considered part of the field of strategic management. For example, titles that specifically mentioned the term 'strategy' generally were included ( $n = 25$  in the final sample). Additionally, dissertations were selected with titles that described research on: (a) activities that are typically strategic in nature (e.g., mergers, corporate acquisitions, diversification, joint ventures or long-range planning;  $n = 27$ ); (b) strategy concepts (e.g., industry environments, environmental scanning, strategy groups, or corporate performance;  $n = 31$ ); and (c) strategic planners (e.g., chief executives or boards of directors;  $n = 13$ ). Titles were judged independently by the authors. A total of 267 dissertations were chosen by both judges. Subsequent discussion led to agreement that 162 of the titles pertained to strategic management.

The *National Faculty Directory* was used to determine whether the 162 doctoral recipients assumed faculty positions following the conferment of their degrees. The *Directory* provides information about each individual's current institutional affiliation and other background data (e.g., the university that conferred his/her doctorate). Each of the 162 names was compared with the roster of faculty in the annual editions of the *Directory* in the 3 years subsequent to receipt of the doctorate. The *Directory* contained the names of 114 of the doctoral recipients, of whom 105 were retained for further study because they held jobs in a management department or a school of business administration.

Beginning with doctoral recipients in 1980, 100 names were selected in chronological order based

on the year they received their degrees.<sup>6</sup> All individuals who received their degrees through the end of 1986 ( $n = 92$ ) were retained. Eight individuals were chosen randomly from the sample of 13 doctoral recipients in 1987.

Three steps were taken to confirm that the members of the sample actually were strategic management faculty members. First, the *Directory of Management Faculty* (Hasselback, 1992) was consulted to determine if the expressed teaching and research interest of each individual was in the field of strategic management. For those individuals who were not listed in this directory, the 1992 *Membership Directory of the Academy of Management* was examined to see whether the individual was a member of the Business Policy & Strategy Division. After consulting these two sources, we were still unable to confirm that strategic management was a teaching or research interest of 25 individuals in the sample. These individuals were contacted by telephone and asked about their primary area of teaching and research. Based on the information from all of these sources, we could confirm that 96 individuals had primary interests in teaching and research involving strategic management. Four individuals who were misclassified as strategy students were dropped from the sample.

The gender and tenure status of each member of the sample were also determined. Forty-six members of the sample were assumed to have tenure because each (a) had been a member of the faculty at the university that provided her/his first academic position for at least 6 years; and (b) had achieved the status of an associate professor.<sup>7</sup> Telephone calls were made to verify the tenure status of the remaining 50 individuals in the sample and the gender of two individuals.<sup>8</sup>

<sup>6</sup> The availability of funds to pay for the search of the data base at the Institute for Scientific Information was the determining factor in choosing a sample of no more than 100 individuals.

<sup>7</sup> The validity of this assumption was tested by telephoning a random sample of 14 of these 46 faculty (30%) to determine their actual tenure status. In all cases, the faculty reported that they were tenured.

<sup>8</sup> At the same time that tenure and gender information were acquired during these calls, it was also reconfirmed for these 50 individuals that their dissertation, teaching, and research were in the field of strategic management.

## Identifying the strategic management journal set

The forum in which the work of strategic management scholars is most likely to be presented has been defined by MacMillan (1989) and Franke *et al.* (1990). Panels of management scholars identified 17 management journals as significant in business policy or strategic management. The evaluations of these experts were found to be related to two bibliometric indices of journal quality, viz., cumulative journal influence (i.e., the total citations in a year to all articles ever published in a journal) and current article impact (i.e., the sum of the citations in a year to a journal's articles from the prior 2 years and divided by the total number of those articles), assuming the latter corresponded to the time of the expert evaluation.<sup>9</sup> Three other journals that are outlets for articles dealing with strategic management, viz., *Interfaces*, *Organization Science*, and *Business Horizons*, were added to the 17 previously identified.

These 20 journals constitute the primary strategic management journal set, and these are listed in Table 2. The top 17 are presented in the order of their importance as outlets for scholarly work in strategic management based on expert evaluations (MacMillan and Stern, 1987). The article impacts for 1987 and 1990 are presented for each of the journals as well. The Spearman rank correlation was 0.92 between the panel ranking reported by MacMillan and Stern (1987) and the article impact factor for 1987 across the 16 journals for which both these data sources were available.

A subset of six high-quality journals (defined as a journal with an article impact of 1.00 or greater averaged across 1987 and 1990) was identified. This standard identifies journals in the top 20–30 percent of periodicals representative of the fields of management, business, applied psychology, economics, and finance (Franke *et*

<sup>9</sup> Bibliometric studies have found significant correlations between citation indicators (e.g., impact factor) and the journal rankings of disciplinary members in psychology (White and White, 1977), management (Johnson and Podsakoff, 1994), and sociology (Gordon, 1982). McAllister, Anderson, and Narin (1979) found correlations ranging from 0.7 to 0.9 for citation influence ratings and scientists' subjective assessments of the average influence per article in 58 scientific journals in 10 different disciplines.

Table 2. Journal data

| Journal rankings of experts in 1986 <sup>a</sup> | Article impact <sup>b</sup> |       | Acceptance rate <sup>c</sup> |       |
|--|-----------------------------|-------|------------------------------|-------|
|  | 1987                        | 1990  | 1981                         | 1994  |
| 1. <i>Strategic Management Journal</i>           | 1.983                       | 2.373 | -                            | -     |
| 2. <i>Administrative Science Quarterly</i>       | 1.796                       | 1.979 | 10%                          | 6-10% |
| 3. <i>Academy of Management Journal</i>          | 1.626                       | 2.500 | 11-20                        | 6-10  |
| 4. <i>Management Science</i>                     | 0.901                       | 1.104 | 11-20                        | 11-20 |
| 5. <i>Harvard Business Review</i>                | 1.653                       | 1.909 | < 10                         | 0-5   |
| 6. <i>Academy of Management Review</i>           | 1.965                       | 3.536 | 15-20                        | 6-10  |
| 7. <i>Sloan Management Review</i>                | 0.877                       | 0.700 | 10                           | 6-10  |
| 8. <i>Journal of Management Studies</i>          | 0.719                       | 0.754 | 21-30                        | 11-20 |
| 9. <i>California Management Review</i>           | 0.513                       | 0.891 | < 10                         | 6-10  |
| 10. <i>Organization Studies</i>                  | 0.459                       | 0.509 | -                            | 11-20 |
| 11. <i>Journal of Business Strategy</i>          | -                           | -     | -                            | 21-30 |
| 12. <i>Organizational Dynamics</i>               | 0.789                       | 0.675 | 11-20                        | 6-10  |
| 13. <i>Journal of Management</i>                 | 0.676                       | 1.000 | < 10                         | 6-10  |
| 14. <i>Decision Sciences</i>                     | 0.443                       | 0.620 | 15-20                        | 11-20 |
| 15. <i>Long Range Planning</i>                   | 0.193                       | 0.145 | -                            | -     |
| 16. <i>Journal of General Management</i>         | 0.226                       | 0.102 | -                            | -     |
| 17. <i>Human Resource Management</i>             | 0.104                       | 1.026 | 21-30                        | 6-10  |
| — <i>Interfaces</i>                              | 0.590                       | 0.451 | -                            | 21-30 |
| — <i>Business Horizons</i>                       | 0.267                       | 0.176 | -                            | 21-30 |
| — <i>Organization Science</i>                    | -                           | -     | -                            | 11-20 |

<sup>a</sup>Source for these quality rankings is MacMillan and Stern (1987).

<sup>b</sup>The impact factors were reported in the *Journal Citation Reports* (1988, 1991).

<sup>c</sup>Source for these acceptance rates is Cabell (1981, 1994).

al., 1990). To facilitate presentation of the findings, the primary set of 20 journals was divided into two subsets: the six *high-quality* journals and the *remaining* set of 14 journals.

### Preparing a distribution of the number of articles

The names of the 96 doctoral recipients were submitted to the Institute for Scientific Information (ISI). Using a data extraction procedure, ISI produced a machine-readable record of all the publications of the members of the sample for the years 1981-92. Each entry consisted of information concerning: the author(s); author address(es) including institution, department, city and state; article title; journal name; volume; beginning page number; publication year; total number of authors; subject category; and total number of cites. These records were used to generate distributions of the number of publications in the different journal sets. Only articles and research notes were counted as publications. Comments, book reviews, and editorials were not included.

## RESULTS

### Overall publishing activity

The 96 graduates published 268 papers in the primary journal set. Because several graduates coauthored papers with other members of the sample, only 259 distinct papers were produced overall. The average annual publication rate was 0.31. This statistic represents the average 'productivity' per year per graduate over the period between 1981 and 1992.

### Publication outlets

Table 3 presents the number of articles published in each of the journals comprising the primary set. The graduates tended to concentrate their publications in high-quality journals. Despite the fact that none of the graduates published an article in the *Harvard Business Review*,<sup>10</sup> the

<sup>10</sup>The fact that there were no articles published by the members of the sample in the *Harvard Business Review* probably is a reflection of the difference between this journal and the others in the primary set. Based on Cabell (1988), between 31 and 50 percent of the articles in *HBR* were

Table 3. Primary set of journals and publication

| Journal name   | Number of publications | Average yearly citations |
|--|------------------------|--------------------------|
| <i>Strategic Management Journal</i> <sup>a</sup>     | 59                     | 1.52                     |
| <i>Academy of Management Journal</i> <sup>a</sup>    | 37                     | 2.09                     |
| <i>Academy of Management Review</i> <sup>a</sup>     | 33                     | 3.18                     |
| <i>Journal of Management</i>                         | 25                     | 1.06                     |
| <i>Journal of Management Studies</i>                 | 20                     | 0.53                     |
| <i>Long Range Planning</i>                           | 15                     | 0.28                     |
| <i>Management Science</i> <sup>a</sup>               | 14                     | 1.11                     |
| <i>Sloan Management Review</i>                       | 12                     | 0.61                     |
| <i>Decision Science</i>                              | 9                      | 0.71                     |
| <i>Organizational Dynamics</i>                       | 6                      | 0.86                     |
| <i>Administrative Science Quarterly</i> <sup>a</sup> | 5                      | 4.33                     |
| <i>Human Resource Management</i>                     | 5                      | 0.18                     |
| <i>Organization Science</i>                          | 5                      | 0.40                     |
| <i>Interfaces</i>                                    | 4                      | 0.34                     |
| <i>Journal of Business Strategy</i>                  | 4                      | 0.00                     |
| <i>California Management Review</i>                  | 3                      | 1.32                     |
| <i>Organization Studies</i>                          | 3                      | 0.80                     |
| <i>Harvard Business Review</i> <sup>a</sup>          | 0                      | 0.00                     |
| <i>Journal of General Management</i>                 | 0                      | 0.00                     |
| <i>Business Horizons</i>                             | 0                      | 0.00                     |
| Total = 259  |                        | Average = 0.96           |

<sup>a</sup>Indicates high-quality journal.

average number of publications in the high-quality journals, 24.7 articles per journal, was substantially greater than the 7.9 articles per journal in the remaining set. Hence, it appears that the graduates focused their publishing efforts on journals with high impact that would provide the most professional exposure for their research. This notion is supported by the fact that the average number of citations per article per year published in the high-quality set was 2.45, whereas an article published in the remaining set received only 0.59 citations on the average each year.

invited contributions. Thirteen of the other 15 journals for which information was available invited less than 5 percent of the articles they published, and one journal reported that it invited 11–20 percent of its published papers. Further, *HBR* had the lowest acceptance rate of any of the journals (less than 5 percent). These figures suggest that *HBR* rarely publishes the writings of young scholars like those comprising the sample, but rather tends to publish the ideas of established academics, consultants, and other prominent public figures.

## Publication records

### Primary set

Twenty-nine of the 96 new faculty individuals (i.e., 30%) did not publish at all in the primary set during the 11-year time period studied. Forty-three of the graduates (i.e., 45%) failed to publish even once in the high-quality set.

Table 4 presents data on publication performance for different periods of time subsequent to receipt of the doctoral degree. Table 4a contains frequency distributions of the number of individuals in the sample who had various numbers of publications in the primary set (from 0 to at least 10 articles) beginning 4 years before graduation up until 10 or more years after graduation. This table indicates that 70 individuals had not published at all 1 year after graduation, while one individual had seven publications at this stage of his career. Because the numbers of individuals in the sample differ from year to year (generally decreasing with increased numbers of years following graduation), Table 4a also presents the distributions of publications in terms of relative

Table 4a. Publication performance in primary set relative to year of graduation  
(number and proportion of graduates in cells)

|    | Number of publications |    |    |      |      |      |      |      |          |          |           |          |
|----|------------------------|----|----|------|------|------|------|------|----------|----------|-----------|----------|
|    | n                      | 0  | 1  | 2    | 3    | 4    | 5    | 6    | 7        | 8        | 9         | ≥ 10     |
| -4 | 0                      | 1  | 93 | 72   | 0.77 | 17   | 0.18 | 3    | 0.03     | 1        | 0.01      | 0 (0.00) |
| -3 | -1                     | 1  | 92 | 79   | 0.86 | 11   | 0.12 | 2    | 0.02     | 1        | 0.01      | 1 (0.01) |
| -2 | 2                      | 87 | 81 | 0.93 | 5    | 0.06 | 1    | 0.01 | 1        | 0.01     | 1 (0.01)  | 1 (0.01) |
| -1 | 3                      | 96 | 46 | 0.96 | 21   | 0.22 | 7    | 0.28 | 27       | 0.28     | 7         | 0.07     |
| 0  | 4                      | 96 | 41 | 0.43 | 23   | 0.24 | 10   | 0.19 | 41       | 0.43     | 8 (0.24)  | 4 (0.24) |
| 1  | 5                      | 96 | 32 | 0.36 | 17   | 0.12 | 6    | 0.07 | 12       | 0.21     | 17 (0.19) | 6 (0.07) |
| 2  | 6                      | 88 | 32 | 0.37 | 9    | 0.10 | 7    | 0.08 | 7        | 0.08     | 9 (0.09)  | 9 (0.09) |
| 3  | 7                      | 58 | 17 | 0.29 | 3    | 0.05 | 6    | 0.10 | 7        | 0.03     | 6 (0.12)  | 3 (0.03) |
| 4  | 8                      | 88 | 17 | 0.29 | 4    | 0.05 | 4    | 0.07 | 2        | 0.03     | 4 (0.12)  | 4 (0.10) |
| 5  | 9                      | 96 | 41 | 0.44 | 8    | 0.08 | 7    | 0.08 | 2        | 0.02     | 1 (0.01)  | 0 (0.00) |
| 6  | 10                     | 96 | 46 | 0.44 | 10   | 0.10 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 7  | 11                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 8  | 12                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 9  | 13                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 10 | 14                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 11 | 15                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 12 | 16                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 13 | 17                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 14 | 18                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 15 | 19                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 16 | 20                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 17 | 21                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 18 | 22                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 19 | 23                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 20 | 24                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 21 | 25                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 22 | 26                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 23 | 27                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 24 | 28                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 25 | 29                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 26 | 30                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 27 | 31                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 28 | 32                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 29 | 33                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 30 | 34                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 31 | 35                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 32 | 36                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 33 | 37                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 34 | 38                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 35 | 39                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 36 | 40                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 37 | 41                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 38 | 42                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 39 | 43                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 40 | 44                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 41 | 45                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 42 | 46                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 43 | 47                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 44 | 48                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 45 | 49                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 46 | 50                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 47 | 51                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 48 | 52                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 49 | 53                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 50 | 54                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 51 | 55                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 52 | 56                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 53 | 57                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 54 | 58                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 55 | 59                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 56 | 60                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 57 | 61                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 58 | 62                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 59 | 63                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 60 | 64                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 61 | 65                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 62 | 66                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 63 | 67                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 64 | 68                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 65 | 69                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 66 | 70                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 67 | 71                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 68 | 72                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 69 | 73                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 70 | 74                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 71 | 75                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 72 | 76                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 73 | 77                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 74 | 78                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 75 | 79                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 76 | 80                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 77 | 81                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 78 | 82                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 79 | 83                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 80 | 84                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 81 | 85                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 82 | 86                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 83 | 87                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 84 | 88                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 85 | 89                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 86 | 90                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 87 | 91                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 88 | 92                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 89 | 93                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 90 | 94                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 91 | 95                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 92 | 96                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 93 | 97                     | 96 | 46 | 0.44 | 10   | 0.07 | 1    | 0.01 | 0 (0.00) | 0 (0.00) | 0 (0.00)  | 0 (0.00) |
| 94 | 98</                   |    |    |      |      |      |      |      |          |          |           |          |

Table 4b. Publication performance in high-quality set relative to year of graduation  
 (number and proportion of graduates in cells)

| Year after graduation | <i>n</i> | Number of publications |           |          |          |          |          |          |          |          |
|-----------------------|----------|------------------------|-----------|----------|----------|----------|----------|----------|----------|----------|
|                       |          | 0                      | 1         | 2        | 3        | 4        | 5        | 6        | 7        | 8        |
| -4                    | 63       | 62 (0.98)              | 0 (0.00)  | 1 (0.02) |          |          |          |          |          |          |
| -3                    | 75       | 74 (0.99)              | 0 (0.00)  | 1 (0.01) |          |          |          |          |          |          |
| -2                    | 87       | 82 (0.94)              | 4 (0.05)  | 1 (0.01) |          |          |          |          |          |          |
| -1                    | 92       | 82 (0.89)              | 8 (0.09)  | 2 (0.02) |          |          |          |          |          |          |
| 0                     | 93       | 78 (0.84)              | 11 (0.12) | 3 (0.03) | 1 (0.01) |          |          |          |          |          |
| 1                     | 96       | 78 (0.81)              | 12 (0.13) | 4 (0.04) | 1 (0.01) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 1 (0.01) |          |
| 2                     | 96       | 71 (0.74)              | 18 (0.19) | 2 (0.04) | 0 (0.00) | 2 (0.02) | 0 (0.00) | 0 (0.00) | 0 (0.00) | 1 (0.01) |
| 3                     | 96       | 60 (0.63)              | 24 (0.25) | 4 (0.04) | 5 (0.05) | 1 (0.01) | 1 (0.01) | 0 (0.00) | 0 (0.00) | 1 (0.01) |
| 4                     | 96       | 54 (0.56)              | 25 (0.26) | 6 (0.06) | 6 (0.06) | 1 (0.01) | 1 (0.01) | 0 (0.00) | 2 (0.02) | 0 (0.00) |
| 5                     | 96       | 49 (0.51)              | 26 (0.27) | 7 (0.07) | 6 (0.06) | 3 (0.03) | 1 (0.01) | 1 (0.01) | 0 (0.00) | 2 (0.02) |
| 6                     | 88       | 40 (0.45)              | 24 (0.27) | 7 (0.08) | 6 (0.07) | 3 (0.03) | 2 (0.02) | 2 (0.02) | 1 (0.01) | 0 (0.00) |
| 7                     | 58       | 25 (0.43)              | 16 (0.28) | 3 (0.05) | 3 (0.05) | 4 (0.07) | 2 (0.03) | 0 (0.00) | 1 (0.02) | 2 (0.02) |
| 8                     | 33       | 13 (0.39)              | 12 (0.36) | 0 (0.00) | 1 (0.03) | 3 (0.09) | 2 (0.06) | 0 (0.00) | 0 (0.00) | 3 (0.05) |
| 9                     | 20       | 6 (0.30)               | 6 (0.30)  | 1 (0.05) | 1 (0.05) | 2 (0.10) | 1 (0.05) | 1 (0.05) | 0 (0.00) | 1 (0.03) |
| ≥ 10                  | 9        | 2 (0.22)               | 2 (0.22)  | 0 (0.00) | 2 (0.22) | 1 (0.11) | 0 (0.00) | 1 (0.11) | 0 (0.00) | 1 (0.01) |

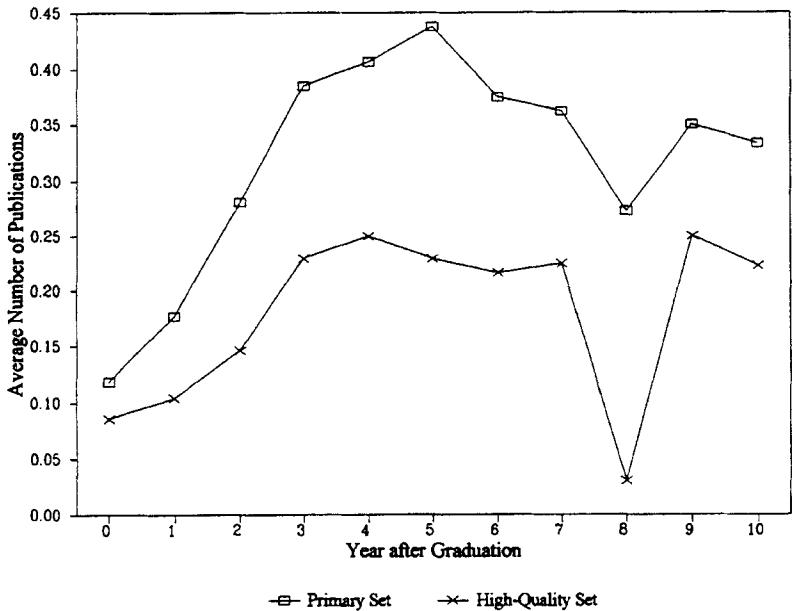


Figure 1. Publications in different sets of journals

frequencies. Thus, only 15 percent of the subgroup whose publishing record could be tracked 9 years after graduation ( $n = 20$ ) still had no publications in the primary set. Ten percent of this subgroup had exactly five publications, and 40 percent had five or more publications 9 years after graduation.

#### *High-quality set*

Table 4b presents frequency and relative frequency distributions for publication performance in the high-quality journal set. This table indicates that, for example, six individuals had no publications in this set 9 years after graduation, and this represents 30 percent of the 20 individuals whose publishing records were available for that period of time.

Publication records in the high-quality set and the remaining set were compared by calculating the average yearly publications in each of the journal sets for each of the 66 individuals who had at least one publication. The correlation between these averages in the two journal sets was 0.38 ( $p < 0.002$ ). Thus, the more that an individual published in high-quality journals, the more that he/she published in the journals comprising the remaining set.

The average number of publications in each of the first 10 years following graduation is

described in Figure 1. One plot represents the average number of publications per graduate in the primary set, and the other plot displays the average publications in the high-quality set. A burst of productivity 4–5 years after graduation is apparent in both plots, followed by a sharp drop in productivity extending to year 8 after graduation. The average publications per graduate then returns to approximately year 7 levels. Both plots suggest that the imminence of the tenure decision (usually the sixth year of employment) promotes publishing. The post-tenure drop-off may represent a brief resting period or it may reflect the fact that scholars pushing papers through the publishing pipeline as tenure approaches may allow the early stages of more recent projects to linger while they boost their publication record for the review year.<sup>11</sup>

#### *Sole-authored publications*

Sole authorship of papers often is mentioned as a standard for evaluating the record of candidates for tenure and promotion. In Table 5a, the 67 graduates who had published at least one paper were subdivided into groups on the basis of the

<sup>11</sup> We wish to acknowledge an anonymous reviewer's comments for suggesting these interpretations of this downturn in the publication rate during the seventh year.

Table 5a. Distribution of sole-authored papers published in primary set

| Number of total career publications | Number of authors | Number and proportion of sole-authored papers |           |          |          |          |
|-------------------------------------|-------------------|---|-----------|----------|----------|----------|
|                                     |                   | 0   | 1         | 2        | 3        | 4        |
| 1                                   | 23                | 19 (0.83)                                     | 4 (0.17)  |          |          |          |
| 2                                   | 9                 | 5 (0.56)                                      | 3 (0.33)  | 1 (0.11) |          |          |
| 3                                   | 8                 | 6 (0.75)                                      | 1 (0.13)  | 1 (0.13) |          |          |
| 4                                   | 7                 | 3 (0.43)                                      | 1 (0.14)  | 2 (0.29) | 1 (0.14) |          |
| 5                                   | 4                 | 1 (0.25)                                      | 1 (0.25)  | 0 (0.00) | 1 (0.25) | 1 (0.25) |
| 6                                   | 5                 | 0 (0.00)                                      | 2 (0.40)  | 2 (0.40) | 0 (0.00) | 1 (0.20) |
| 7-9                                 | 3                 | 0 (0.00)                                      | 2 (0.67)  | 0 (0.00) | 1 (0.33) |          |
| ≥ 10                                | 8                 | 1 (0.13)                                      | 2 (0.25)  | 2 (0.25) | 1 (0.13) | 2 (0.25) |
| Total                               | 67                | 35 (0.52)                                     | 16 (0.24) | 8 (0.12) | 4 (0.06) | 4 (0.06) |

Table 5b. Distribution of sole-authored papers published in high-quality set

| Number of total career publications | Number of authors | Number and proportion of sole-authored papers |           |          |          |          |
|-------------------------------------|-------------------|---|-----------|----------|----------|----------|
|                                     |                   | 0   | 1         | 2        | 3        | 4        |
| 1                                   | 28                | 23 (0.82)                                     | 5 (0.18)  |          |          |          |
| 2                                   | 7                 | 2 (0.29)                                      | 4 (0.57)  | 1 (0.14) |          |          |
| 3                                   | 5                 | 2 (0.40)                                      | 3 (0.60)  |          |          |          |
| 4                                   | 3                 | 2 (0.67)                                      | 1 (0.33)  |          |          |          |
| 5                                   | 2                 | 1 (0.50)                                      | 1 (0.50)  |          |          |          |
| 6                                   | 0                 | 0 (0.00)                                      |           |          |          |          |
| 7-9                                 | 5                 | 1 (0.20)                                      | 1 (0.20)  | 1 (0.20) | 1 (0.20) | 1 (0.20) |
| ≥ 10                                | 3                 | 1 (0.33)                                      | 0 (0.00)  | 2 (0.67) |          |          |
| Total                               | 53                | 32 (0.60)                                     | 15 (0.28) | 4 (0.08) | 1 (0.02) | 1 (0.02) |

number of their total career publications in the primary set. For each subgroup, a frequency distribution was created to display the number and the proportion of the total articles that were sole authored. It can be seen that, across all categories, 35 graduates (52%) had no sole-authored articles in the primary set, and only 8 of the graduates had 3 or more sole-authored publications. No one had more than four sole-authored articles.<sup>12</sup>

<sup>12</sup> These results are consistent with more general trends in scientific publishing. For example, the number of authors per article in 10 leading journals published by the American Psychological Association increased from 1.57 to 2.32 between 1960 and 1980 (Sacco and Milana, 1984). A remarkably similar increase of 1.67 to 2.48 authors per article for this same time period was revealed in a survey of 2800 scientific journals (Broad, 1981). For strategic management graduates, the average number of authors per article was 2.03 for the primary set, a figure that is somewhat lower than the most recent averages reported by Sacco and Milana and by Broad for other fields.

In Table 5b, the 53 graduates who had published at least one paper in a high-quality journal were subdivided into groups on the basis of the number of their total career publications in the high-quality set. Frequency distributions were created to display the number and the proportion of the articles that were sole authored. It can be seen that, across all categories, 32 graduates (60%) had no sole-authored articles in the primary set, and only 2 of the graduates had 3 or more sole-authored publications in the high-quality set.

### Factors that may influence publication records

#### Gender

To examine whether gender is related to the publication records, the sample was divided on

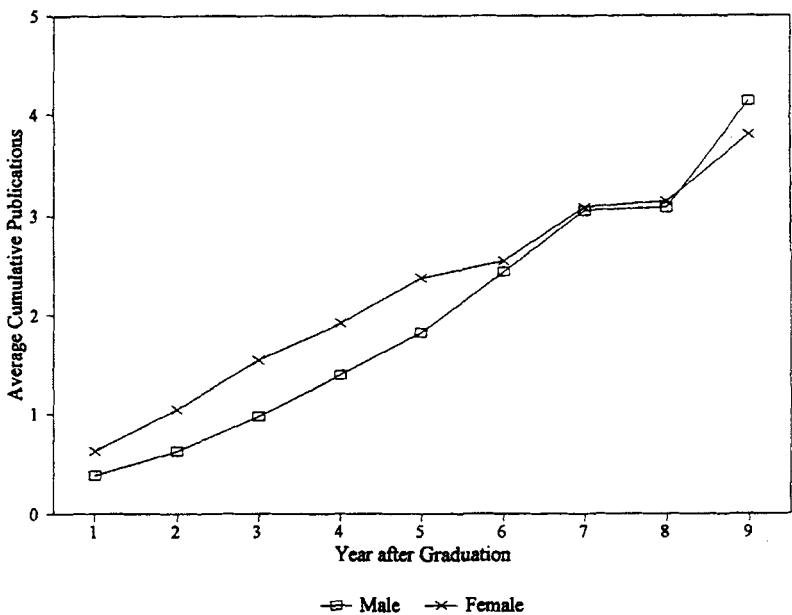


Figure 2. Cumulative publications by gender

the basis of gender and the publication records were summarized for the 24 females and 72 males. Figure 2 contains the average number of cumulative publications for each group for each year following graduation. On average, the total number of publications produced over the first 5 years of their academic careers is greater for females than their male counterparts. Beginning with year 6, the cumulative publishing records are virtually identical for men and women.

#### Prior publications

The sample of graduates was subdivided into two groups based on whether an individual had (PRIORS) or had not (NO PRIORS) published before receiving her/his doctorate. Prior to graduating, 21 individuals had between one and three publications in the primary set, and 15 individuals had between one and three publications in high-quality journals (see Table 4). Figure 3 presents the average cumulative number of publications for each of these groups in each year subsequent to receipt of their doctorates. The prior publications were not incorporated in the averages reported for the PRIOR group. Over the first 9 years, PRIORS consistently outperformed NO PRIORS. Excluding their prior publications, the PRIORS group had an average of 0.52 publi-

cations at the end of their first year of academic work, whereas the NO PRIORS group had an average of 0.08 publications. By the end of the ninth year after graduation, the PRIORS had an average of 5.25 publications, whereas the NO PRIORS had an average of 3.44 publications.

#### Availability of a graduate program

To test the effects of this variable, the sample was divided into two groups based on whether the department that provided the graduate's initial employment had a doctoral program in management ( $n = 52$  for WITH PROGRAM,  $n = 44$  for WITHOUT PROGRAM).<sup>13</sup> Figure 4 contains the average number of cumulative publications for each group for each year following graduation. The WITH PROGRAM group was consistently more productive. It had a higher average (0.75) than the WITHOUT PROGRAM group (0.11) after the first year, and the difference in the average productivity continued to increase through the end of year 9 (4.69 vs. 2.00).

<sup>13</sup> Barron's Guide to Graduate Business Schools (1990) was used to determine whether the schools that provided first jobs to the graduates had doctoral programs in management.

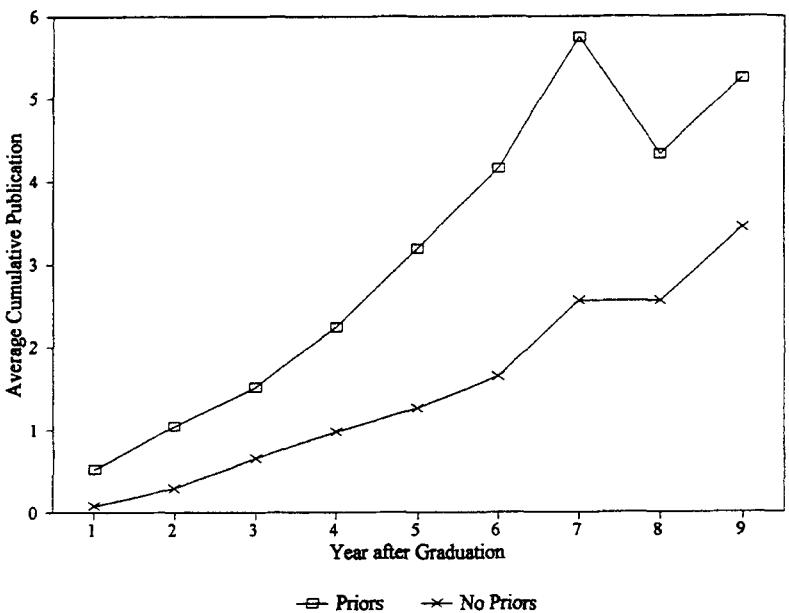


Figure 3. Cumulative publications by prior publication record

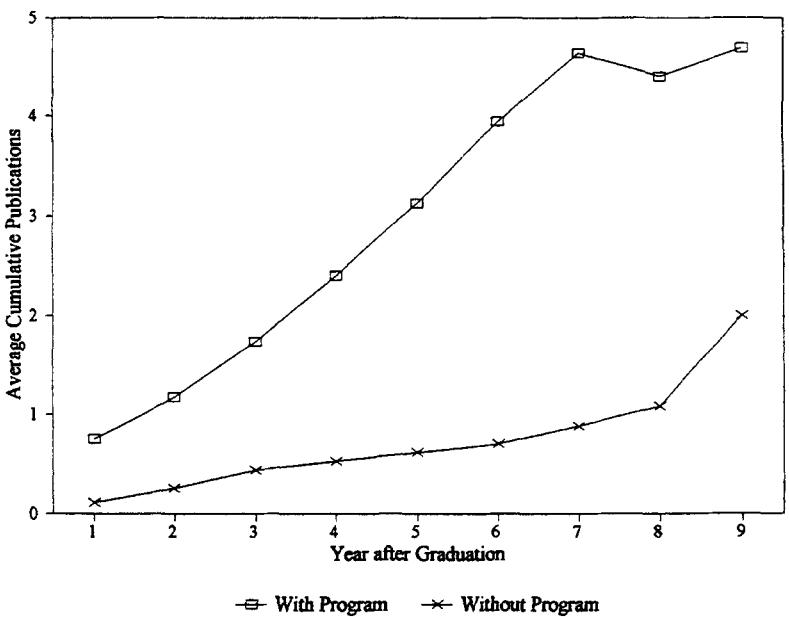


Figure 4. Cumulative publications by availability of graduate program

### Publications and tenure decisions

A regression analysis was performed to determine the role played in the granting of tenure by four independent variables: the number of publications,

gender, prior publications, and availability of a graduate program. For the purposes of this analysis, it was assumed that there was a publication lag of 1 year. Consequently, we estimated the number of articles produced by a candidate in 6

Table 6. Descriptive statistics and correlation coefficients

| Variables                            | Mean  | S.D.  | 1       | 2      | 3      | 4      |
|--------------------------------------|-------|-------|---------|--------|--------|--------|
| 1. Tenure (1 = yes)                  | 0.517 | 0.502 |         |        |        |        |
| 2. Number of papers                  | 2.44  | 3.00  | 0.222*  |        |        |        |
| 3. Availability of program (1 = yes) | 0.563 | 0.498 | -0.015  | 0.397* |        |        |
| 4. Gender (1 = female)               | 0.241 | 0.430 | -0.261* | 0.023  | -0.044 |        |
| 5. Prior publications                | 0.207 | 0.407 | -0.017  | 0.437* | -0.007 | 0.243* |

\*Significant at 0.05

Table 7. Logistic regression results for determinants of tenure<sup>a</sup>

| Effect                  | Regression coefficient | Standard error | $\chi^2$ |
|-------------------------|------------------------|----------------|----------|
| Number of publications  | 0.2991                 | 0.1210         | 6.11*    |
| Availability of program | 0.3873                 | 0.2597         | 2.23     |
| Gender                  | -1.3908                | 0.5935         | 5.49*    |
| Prior publications      | -0.6561                | 0.6986         | 0.88     |
| Constant                | -0.1208                | 0.3206         | 0.14     |

<sup>a</sup>The model chi-square = 42.42 ( $p < 0.06$ )

\*Significant at 0.05

years by reporting the number of publications 7 years after graduation.<sup>14</sup> Dummy variables were created to represent gender (0 = female, 1 = male), prior publications (0 = no prior publications, 1 = prior publications), and the availability of a graduate program (0 = no program, 1 = program). The criterion in the analysis was the tenure status of each member of the sample after 6 years of academic employment. The sample was divided into two groups: those who received tenure ( $n = 45$ ) and those who did not ( $n = 42$ ).<sup>15</sup> Given

the dichotomous nature of the tenure criterion, maximum likelihood logistic regression was used. Descriptive statistics about the variables involved in regression analysis and their intercorrelations are presented in Table 6. Table 7 contains the results of the regression analysis.

The results indicate that the number of publications and gender affected the probability of receiving tenure. Not unexpectedly, the greater the number of publications, the higher the probability that an individual would receive tenure.

The results for gender are more problematic. Women were less likely to receive tenure despite the fact that the cumulative numbers of publications over the first 7 years were quite similar for the two gender groups (see Figure 2). The probability of receiving tenure was more than twice as likely for males (0.57) than for females (0.25) at the mean of other independent variables. Additional analyses were required to account for these results. One possible reason for the fact that women were less likely to receive tenure is that they were employed in departments that have higher standards for granting tenure. However, using the availability of a doctoral program as a proxy for quality of the department, a chi-square test indicated that gender and employment in a department with a doctoral program were unre-

<sup>14</sup> In order to get information on the seventh year publication records for the 1986 graduates, the UnCover data base was consulted. UnCover contains the tables of contents of over 15,000 journals, including the 20 that comprise the primary set. For the purposes of examining tenure decisions, publications for the year 1993 were added to the records for the 30 individuals who received their doctorates in 1986.

<sup>15</sup> The sample size for this analysis was reduced to 87. Eight individuals who received doctorates in 1987 were deleted because 7 years of publication data were not available. Also, a ninth individual was deleted because he was an outlier. In this case, the individual was denied tenure despite having published 21 articles in the primary set within 7 years after receiving his doctorate. This was seven articles more than the next highest total for a member of the sample over the same time period. After regressing tenure on the number of publications, this individual's Studentized residual (2.51) was the only residual to exceed the suggested critical values for this influence statistic (2.50 (Freund and Littell, 1986) and 1.66 (Hoaglin and Welsh, 1978)). Therefore, this person's data were not included in subsequent analyses.

lated ( $\chi^2 = 0.221$ , d.f. = 1,  $p > 0.1$ ). Hence, women are no more likely than men to be subject to higher departmental standards by virtue of their initial place of employment. A second possible explanation deals with the nature of the publication records for female and male graduates. Because males were more likely to be granted tenure, one would expect their publications to be more numerous and/or of higher quality than the publications of females. However, in terms of the quantity of publications over the first 7 years, females and males did not differ significantly, whether PRIOR publications were included ( $\bar{x}_{\text{female}} = 2.67$ ,  $\bar{x}_{\text{male}} = 2.50$ ,  $F = 0.05$ , d.f. = 1, 85,  $p > 0.1$ ) or not ( $\bar{x}_{\text{female}} = 2.19$ ,  $\bar{x}_{\text{male}} = 2.24$ ,  $F = 0.01$ , d.f. = 1, 85,  $p > 0.1$ ). Most incongruous with the tenure decisions is the fact that females' publications were of greater quality on the average. Following previous studies (Rodgers and Maranto, 1989), the average number of citations per publication was used to measure quality. Females had an average of 0.45 citations per publication, and males had an average of 0.26 citations per publication ( $F = 5.32$ , d.f. = 1, 85,  $p < 0.05$ ). These findings suggest that particularistic factors other than publication records account for the lower probability of women receiving tenure.

The probability of receiving tenure was not influenced by the availability of a graduate pro-

gram despite the disparity in the publication records of faculty at the two types of management departments (see Figure 4). This finding suggests that different standards for granting tenure exist in the two types departments. To investigate this possibility, a  $2 \times 2$  ANOVA was conducted with receipt of tenure and availability of a graduate program as the independent variables, and number of publications as the dependent variable. Both main effects and the interaction were significant ( $p < 0.02$ ). Figure 5 contains a plot of the cell means that depicts the interaction. Tests of the simple main effects indicated that the number of publications influenced tenure decisions only in management departments that had graduate programs ( $F = 11.87$ , d.f. = 1, 83,  $p < 0.05$ ). Clearly, the number of publications was unrelated to the tenure decision in departments that did not have doctoral programs.

One concern about the results of regression analyses is the effect of multicollinearity. The most predictable effect of multicollinearity is to increase the size of the standard errors of the coefficient estimates. Consequently, we were not concerned with our interpretations for the two independent variables with significant effects in the full model. The effects of multicollinearity were further investigated by testing single-variable logit models for all of the independent variables. When used as the only independent vari-

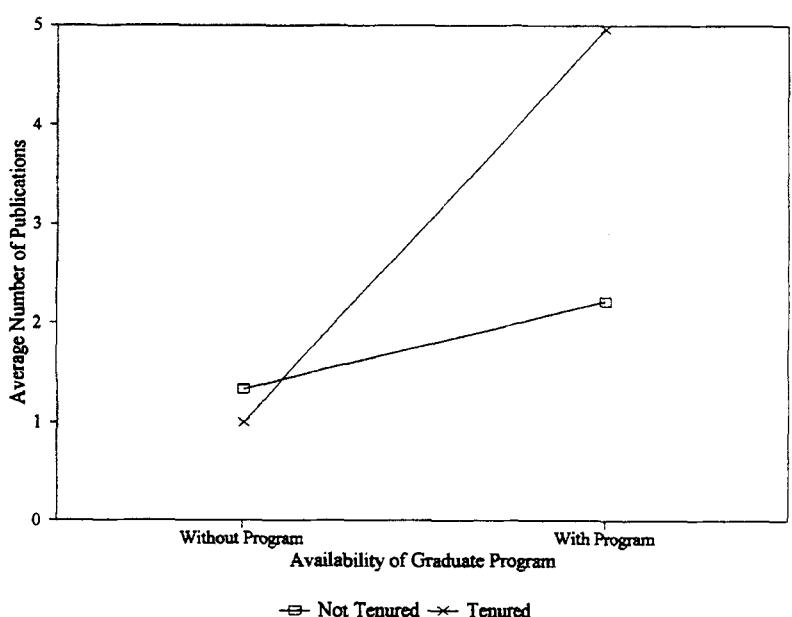


Figure 5. Publications by tenure status and availability of graduate program

able, neither availability of a graduate program nor prior publications were significant ( $p > 0.1$ ), while gender and number of publications were significant in these one-variable models ( $p < 0.01$ ). Further, a hierarchical approach was used in which program availability and prior publications were entered at the first step. This two-variable model was not significant ( $p > 0.1$ ). However, after adding gender and number of publications one at a time, significant increases in the explanatory power of model were observed at each step.

## DISCUSSION

Before discussing the implications of this study, a word is in order regarding the sample upon which its findings are based. The publication records revealed in this study represent only those attributable to individuals who received doctorates in management, whose dissertation titles were discernible as strategy research, and who immediately went to work in academics at the conclusion of their degree. Consequently, we do not incorporate the publication records of those who have worked in the strategy field after receiving doctorates in some other business or social science discipline. Also, the data do not include the publications of individuals whose first faculty position was abroad or whose first employment was in other than an academic institution (e.g., a private or public research foundation, private industry, or a government agency). Name recognition of widely published academics would have enabled us to identify some individuals whose circumstances caused them to be ignored by our process of sample selection, and the publication records of these individuals could have been incorporated into the study. However, this would have biased the sample given that we had no way of identifying the less prominent individuals (who may not have published at all) who did not immediately start their careers in a college or university, or whose dissertation title did not identify them as a student of strategic management. Our sample selection process was intended to produce publication records for individuals whose training and careers made them an unbiased norm group for other new academics in the field of strategic management. The follow-up work confirmed the status of the individuals in the sample as belong-

ing to the population whose publication records we intended to estimate.

The sample used in the present study has certain advantages not possessed by those used in other studies of publication records and, therefore, these data may be more useful as guides for evaluating a candidate's scholarship. Unlike other bibliometric research, this study examines the publication records of scholars in a specific field, viz., strategic management, within a general discipline, viz., management. Given the importance of making bibliometric comparisons to others working in the same field, future studies should develop normative publication records for more narrowly defined groups of scholars. Additionally, this study focuses on doctoral recipients who were immediately employed in academic jobs. Most studies of publication records in other disciplines (e.g., Zivney and Bertin, 1992) include individuals employed in other types of organizations for which publishing is not expected behavior (e.g., a government agency or private company). Consequently, earlier studies with more heterogeneous samples provide normative publication information that is biased in favor of finding lower publication rates.

These data appear to be useful for at least two purposes. First, they may assist in assessing scholarship, although we do not recommend replacing faculty judgement about research accomplishments with a purely numerical evaluation. Bibliometric information is not a substitute for faculty judgement about the quality and significance of scholarship.<sup>16</sup> However, many people charged with the responsibility of reviewing a candidate's research do not have the disciplinary background to make substantive evaluations and, therefore, it is likely that they rely, in part, on some assessment of the number of articles that have been produced. Indeed, Gomez-Mejia and Balkin (1992) found that the number of a faculty member's publications, especially those in top-tier management journals, is a primary determinant of faculty pay. It is in this sense that the publication records can be of use. Therefore, rather than supplanting subjective evaluations of academic performance, bibliometric data are most valuable when used to augment such judgements (Borgman, 1989).

<sup>16</sup> Different views about the role of bibliometric information in evaluating scientific work may be seen in Letters (1991).

Bibliometric data about publications in strategic management might be helpful in avoiding the confounding of performance with between-discipline differences in journal acceptance rates that may put strategy candidates at a disadvantage when reviewed by people from outside their field. For example, Mahoney (1985) reported that the acceptance rate for manuscripts in the physical sciences is approximately 80 percent, whereas only 20 percent of the articles submitted for publication in the social sciences are published. These differences in acceptance rates suggest that senior physical scientists who serve on university review committees may be susceptible to contrast errors that cause them to undervalue the research records of candidates from the social sciences. Strategic management faculty members appear to be especially vulnerable to such contrast effects given the acceptance rates for the primary set journals.

Publication records also can be used as a basis for establishing specific, yet realistic performance goals for untenured faculty. Merely emphasizing the salience of publishing for academic survival is insufficient. Instead, faculties may define expected levels of performance in terms of accomplishments by other new scholars in the field (e.g., the top 10 percent of the members of the relevant discipline). There is ample behavioral evidence on goal setting which suggests that specific and realistic publishing goals ought to have a salutary effect on faculty scholarship (Locke and Bryan, 1966).

Should a faculty articulate a quantitative standard of publishing activity, the likelihood of attaining that standard also may be estimated from these data. For example, a department might expect strategic management faculty members to publish an average of one article per year in order to be granted tenure. Assuming a publication lag of 1 year (thereby making it necessary to consult publication records for 7 years following receipt of the doctorate), it can be seen from Table 4a that 19 percent of the sample had six or more articles. If the one-per-year standard is defined in terms of only high-quality publications, Table 4b indicates that 9 percent of the sample had six or more articles.

In order to use these data as guidelines for evaluating research records or setting performance standards, it must be assumed that the publication records of graduates from the 1980s can be gen-

eralized to the 1990s. One factor that should influence the probability of publishing is the acceptance rate for each of the journals in the primary set. Twelve of the journals described in Table 2 have reported acceptance rates for both 1981 and 1994 (Cabell, 1981, 1994). The 1994 acceptance rate was lower than the 1981 acceptance rate in all 12 cases. This suggests that publishing an article has become more difficult and that recent doctorates may be less likely to match the publication records reported in the present paper.

This paper also investigated the factors that influence the publication records of, and the tenure decisions involving, strategic management faculty members. Two factors were related to the publication records. First, in accordance with the behavioral consistency model (Wernimont and Campbell, 1968), those who had published prior to receiving their doctorates continued to be the most prolific publishers in the sample. These findings are consistent with earlier studies of faculty productivity in a number of disciplines, including psychology (Rodgers and Maranto, 1989), biochemistry (Long *et al.*, 1979), and sociology and zoology (Chubin *et al.*, 1981).

Second, graduates who were employed by departments that had doctoral programs in management, i.e., the WITH PROGRAM group, published more than their counterparts in the WITHOUT PROGRAM group. This finding supports other studies which suggest that faculty members with access to graduate students are likely to be more productive than those without similar access (Cargile and Bublitz, 1986). Another explanation for the difference in publication records is that WITH PROGRAM departments may have recruited only those graduates who gave strong indications that they would be active researchers. Of the 21 graduates who had at least one pregraduation article, 16 (76%) began their academic careers in WITH PROGRAM departments. Interestingly, the five graduates who had pregraduation publications and worked for WITHOUT PROGRAM schools did not produce any subsequent articles. These few data suggest that working conditions in WITHOUT PROGRAM schools (e.g., high teaching loads) may have negative influences on publishing activity.

The paper also found that tenure standards were affected by two factors. First, the decision to grant tenure was based on the publication

records of only those faculty members employed by departments with graduate programs. Whereas faculty members who received tenure in WITH PROGRAM departments had approximately twice as many publications as those who did not receive tenure (on average, 4.65 publications vs. 2.08 publications), those who did and those who did not receive tenure from WITHOUT PROGRAM departments averaged approximately one publication. This finding is consistent with Cole and Cole (1973), who reported that the number of publications was related to academic rank in prestigious physics departments only. Obviously, factors other than articles in refereed journals account for the granting of tenure in WITHOUT PROGRAM departments. For example, teaching and service may play the most important role in the decision to grant tenure in these departments.

Gender also influenced the decision to grant tenure. After controlling for the type of department for which they worked, females were less likely than males to be granted tenure despite the fact that there was no difference in the quantity of articles produced and the fact that articles published by females were of higher quality. While our data do not permit us to explain this anomaly, the findings might be attributed to discrimination against female strategic management faculty. The decision rendered in the case of Rosalie Tung (who was not a member of the sample used in this research) indicates that at least one female faculty member has been able to prove in a court of law that tenure was denied because of gender-related matters (Lee, 1990). Our findings suggest that unequal treatment of female and male strategic management faculty may affect tenure decisions made in other management departments.<sup>17</sup>

Additional research is required to understand the publishing behavior of strategic management scholars. For example, Rodgers and Maranto's (1989) model might be used as a basis for determining whether individual academic ability and attending a prestigious graduate program affect the scholarly output of strategic management graduates. Also, Newman and Cooper's (1993) contention that the investigation of certain issues (i.e., research plots) produce greater pay-

offs in terms of the number of citations might be investigated in the field of strategic management. Finally, research is needed that constructs records for other types of publications, especially cases, books, and conference presentations.

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<sup>17</sup> It should be noted that our paper does not imply a gender bias in editorial decisions, but focuses on tenure decisions made by faculty and administrators.

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