

SCHOLARLY COLLABORATION AND PRODUCTIVITY PATTERNS IN PUBLIC ADMINISTRATION: ANALYSING RECENT TRENDS

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Previous studies have confirmed the interdisciplinary nature of the field of public administration (Mosher 1956; Ventriss 1991; Forrester 1996; Rodgers and Rodgers 2000; Schroeder *et al.* 2004) and encouraged the exploration of one important indicator of interdisciplinarity: research collaboration. One way that collaboration patterns are explored is through the study of co-authorship among faculty members (Smart and Bayer 1986; Forrester 1996; Katz and Martin 1997). In the field of public administration, studies on co-authorship and productivity of scholars are sparse. In this article, we use bibliometric data to explore collaboration patterns as they relate to productivity levels and quality of publications within the field of public administration. Our study finds that more productive scholars, as well as those with the highest impact, are less likely to collaborate than their colleagues. Our results also indicate that there are gender differences in collaboration patterns and productivity within the field of public administration.

INTRODUCTION

Over the past three decades scholars in public administration have employed diverse methodologies for assessing the research productivity of doctoral programmes (Cleary 1992, 2000; McCurdy and Cleary 1984; White 1986; Adams and White 1994), the productivity of individual faculty members (Farber *et al.* 1984; Rodgers and Rodgers 2000; Schroeder *et al.* 2004), the reputation and ranking of institutions housing educational programmes (Morgan *et al.* 1981; Morgan and Meir 1982; Legge and Devore 1987; Douglas 1996; Forrester 1996), and the nature of research guiding the field (Perry and Kraemer 1986; Houston and Delevan 1990; Stallings and Ferris 1988; Box 1992; Lan and Anders 2000; Wright *et al.* 2004). Several previous studies in public administration have used journals or individual researchers as the unit of analysis to assess the research productivity of individual faculty members, but only a handful have studied co-authorship trends.

One way to explore faculty productivity is to study co-authorship patterns, which is generally taken as a measure of collaboration and is shown to correlate highly with productivity (Hafernik *et al.* 1997; Eaton *et al.* 1999; Laband and Tollison 2000; Fox and Mohapatra 2007; Gaughan and Ponomariov 2008). Since the concept of collaboration is difficult to measure, several previous studies have used co-authorship as a proxy measure for collaboration (Clarke 1964; Bayer and Smart 1991; Miller *et al.* 1996; Hafernik *et al.* 1997; Van Raan 1998; Bahr and Zemon 2000; Glänzel 2002). Katz and Martin (1997) warn that these two terms cannot be used interchangeably, but they acknowledge that co-authorship is the easiest way of quantifying collaboration.

Another concept that is increasingly linked with the concept of collaboration within academia is interdisciplinary research. Many research projects in the fields of public administration and policy have become increasingly interdisciplinary. In these environments, collaboration is often not only desirable, but required, because a single scholar

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rarely has full command of the variety of disciplinary skills required to complete the project. The interdisciplinary nature of the fields of public policy and administration has been noted by several scholars (Mosher 1956; Ventriss 1991; Forrester 1996; Rodgers and Rodgers 2000; Schroeder *et al.* 2004). Forrester (1996) conducted a study of faculty members who published in 26 professional journals within public administration and policy from 1989–1993. The study results indicated that less than 20 per cent of the faculty members identified themselves as specializing in public administration. Forrester concludes that the results of his study indicate that the field is not necessarily ‘suffering an identity crisis as much as they indicate that Public Administration is exceptionally interdisciplinary and complex’ (p. 565). In table 1 we provide a brief overview of several previous studies that have focused on analysing publication and collaboration trends within the field of public administration.

The purpose of this study is to provide an updated view of the collaboration patterns within the discipline of public administration. Studying collaboration and productivity patterns within this field is particularly important because in promotion and tenure cases more emphasis is often placed on sole-authored work. In this article, we explore how general trends in collaboration patterns in public administration (as a whole) have changed over time. If the field as a whole is evolving into a more collaborative discipline, we would assume that junior scholars would be expected to publish both sole-authored and co-authored work (with value being placed on both types of work). On the other hand, if most scholars in public administration are publishing sole-authored work (and if the highest quality pieces are sole authored) then the expectation that junior faculty will be evaluated based on sole-authored research is more reasonable.

The two research questions that we focus on in this study explore this relationship between collaboration patterns and measures of academic success. In particular, we focus on whether or not collaboration patterns differ for the most productive scholars and their less productive colleagues. The research questions are:

1. How do the collaboration patterns of the most productive/most highly cited/highest impact scholars in public administration compare with the collaboration patterns for other public administration scholars?
2. What are the gender differences in collaboration patterns for the top public administration scholars?

TRENDS IN COLLABORATION AND PRODUCTIVITY

Research collaboration

Katz and Martin (1997) define collaboration as the ‘working together of researchers to achieve the common goal of producing new scientific knowledge’ (p. 7). Clearly, this is only one definition of collaboration and the concept can be defined in a variety of ways. According to Laband and Tollison (2000), collaboration in the sciences can be classified as either formal or informal. Formal collaborations generally include manuscript co-authorships, joint presentations at conferences, meetings, seminars, and workshops. Informal collaborations are generally classified as conversations with colleagues and feedback received from colleagues, journal editors, and manuscript referees. The form of collaboration that we focus on here is formal collaboration, which gives rise to journal publication.

The literature has documented several advantages and disadvantages of scholarly collaboration. In most cases, collaboration allows for greater division of labour, especially

TABLE 1 *Publication and collaboration trends in the field of public administration: a brief literature review*

Unit of analysis	Author/year	Measurement type	Summary findings
Journal	Douglas 1996; Legge and Devore 1987; Morgan <i>et al.</i> 1981	<ul style="list-style-type: none"> Measured number of articles published by faculty in the top 10 PA journals 	<ul style="list-style-type: none"> Found considerable similarity between program reputation and productivity in PA/policy programs Concluded that the most productive programs produce more research and more productive graduates
	Colson 1990	<ul style="list-style-type: none"> Measured journal citation rates and impact factor 	<ul style="list-style-type: none"> Confirmed the rankings of PA journals such as: <i>PAR</i>, <i>ASQ</i>, <i>APSR</i>, <i>A&S</i> and <i>JPAM</i>
	Perry and Kraemer 1986; Stallings and Ferris 1988	<ul style="list-style-type: none"> Identified trends in <i>PAR</i> by coding articles based on research methodology, design and approach 	<ul style="list-style-type: none"> Found that PA is strongly practice-oriented with less focus on causal analysis and theory testing Argued that researchers lack institutional support for research, and funding opportunities are limited within the discipline
	Houston and Delevan 1990, 1994	<ul style="list-style-type: none"> Content analysed 6 journals in PA in 1990 and an added set of comparative journals from academic and practice oriented disciplines in 1994 	<ul style="list-style-type: none"> Concluded that PA research is less involved with theory testing and is quantitatively less rigorous when compared with business management and social work administration Established that PA research is predominantly sole-authored
	Forrester 1996	<ul style="list-style-type: none"> Measured number of articles published from 1989–1993 in 26 journals Measured citation counts and assigning weights to journals 	<ul style="list-style-type: none"> Evaluated the schools that contribute most to the refereed PA journals Found that 60 per cent of the articles published were sole-authored Concluded that less than 20 per cent of authors identified themselves as PA scholars indicating the interdisciplinary nature of the field
	Wright <i>et al.</i> 2004	<ul style="list-style-type: none"> Coded 143 articles on 60 items that reviewed measurement methods in 6 journals of PA from 1996–1998 	<ul style="list-style-type: none"> Found that only one-tenth of the PA researchers reported reliability and validity measures Established that over half the researchers use self-administered surveys
	Individual	Farber and Thompson 1984	<ul style="list-style-type: none"> Conducted citation analysis to explore research productivity of core public policy faculty identified by APPAM member institutions

TABLE 1 *Continued*

Unit of analysis	Author/year	Measurement type	Summary findings
	Rodgers and Rodgers 2000	<ul style="list-style-type: none"> • Measured number of publications • Measured citations and impact factors • Analysed publication productivity of 91 assistant professors employed in 1990 	<ul style="list-style-type: none"> • Concluded that researchers publishing in cross-disciplinary journals were more productive, had higher quality publications, and published more than researchers who published only in disciplinary journals
	Schroeder <i>et al.</i> 2004	<ul style="list-style-type: none"> • Used survey data and CV analysis to analyse the top scholars in PA 	<ul style="list-style-type: none"> • Established that nearly two-thirds of the top 63 scholars published multiple-authored publications in <i>PAR</i> while close to three-fourths published sole authored articles in <i>PAR</i> • Found that only 26 per cent had a PhD in Public Administration as the main field; confirmed the interdisciplinary nature of the field

among scientists working in laboratory settings (Maio and Kushner 1981; Barnett *et al.* 1988; Laband and Tollison 2000). In addition, co-authorship can help to build synergies among researchers who might historically lack the specialization and skill sets to solve complex interdisciplinary problems while working alone (McDowell and Melvin 1983; Hudson 1996). Collaboration also brings experienced faculty and students together to work on creative projects and, thus, fosters mentorship (Hafernik *et al.* 1997; Bozeman and Corley 2004). Joint authorship is a phenomenon which is on the rise and technological advances have made this process easier (Hudson 1996; Miller *et al.* 1996). However, collaborative projects might prove challenging because they require greater compromise, can have ambiguous goals and conflicting writing styles, and can result in hyper-authorship which might give rise to problems of allocating authorship credit (Lindsey 1980; Hudson 1996; Bahr and Zemon 2000; Mullen and Kochan 2001).

As the following citations show, research collaboration has been widely studied in the natural sciences (Clarke 1964; Zuckerman 1967; Smart and Bayer 1986; Stokes and Hartley 1989; Kyvik and Teigen 1996; Cronin 2001; Glänzel 2002; Lee and Bozeman 2005; Figg *et al.* 2006), economics (McDowell and Melvin 1983; Barnett *et al.* 1988; Heck and Zaleski 1991; Piette and Ross 1992; Durden and Perri 1995; Hudson 1996; Laband and Tollison 2000; Maske *et al.* 2003; Sutter and Koch 2004), political science (Maio and Kushner 1981; Young 1995; Miller *et al.* 1996; Fisher *et al.* 1998; Garand and Graddy 1999), and sociology (Grant and Ward 1991; Krysik and Nichols-Casebolt 1994; Pontille 2003; Moody 2004). Fewer studies of collaboration patterns exist within the field of public administration, however.

Co-authorship and productivity

Within the natural sciences, the share of co-authored papers has increased remarkably (Price 1963; Clarke 1964; Meadows 1974; Fox and Faver 1984; Bayer and Smart 1991; Glänzel 2002; Bozeman and Corley 2004; Lee and Bozeman 2005). A similar trend can be observed in the social sciences (Heck and Zaleski 1991; Durden and Perri 1995;

Hudson 1996; Miller *et al.* 1996; Cunningham and Dillon 1997; Fisher *et al.* 1998; Sutter and Kocher 2004). Often collaboration in academia results in the publication of a co-authored manuscript. This is a trend that has been well documented in the natural sciences and engineering – the social sciences, however, are not far behind. Over the years, a rise in co-authorship among disciplines such as economics, political science, and sociology has been well-documented. A study by Miller *et al.* (1996) among political scientists found close to a three-fold increase in multiple-authorship – from 16 per cent in 1954–74 to 41 per cent from 1974–1994 for faculty members publishing in the *American Political Science Review*. A similar trend was found in economics where the share of co-authored papers increased from 30 per cent in 1977 to 54 per cent in 1997. A study by Schroeder *et al.* (2004), however, found that approximately 75 per cent of the top public administration scholars publish by themselves. Similar conclusions were drawn by Houston and Delevan (1990) when they concluded that research in public administration is predominantly sole-authored. If individual publications in other disciplinary journals were to be analysed, the results could be different. A study by Rodgers and Rodgers (2000) found that scholars in the field of public administration who published in cross-disciplinary journals had higher productivity and published in higher quality journals.

Based on these studies, our first hypothesis is that we will observe – as scholars have observed in other fields – a rise in the number of co-authored articles (and a related decrease in the number of sole-authored articles) in the field of public administration. Increasing trends towards co-authorship often result in scholars producing more articles (Barnett *et al.* 1988; Eaton *et al.* 1999; Durden and Perri 1995; Glänzel 2002; Maske *et al.* 2003; Lee and Bozeman 2005). Eaton *et al.* (1999) examined 1,259 articles in consumer research journals in psychology from 1977–1996 and found a strong correlation (0.87) between author productivity and number of co-authors. According to their study, frequently published scholars are more connected and have a greater likelihood of attracting potential collaborators. A rise in productivity in economics is also attributed to an increase in joint authorships (Barnett *et al.* 1988; Durden and Perri 1995; Maske *et al.* 2003).

Fisher *et al.* (1998) analysed 11,261 articles in the fields of sociology, political science and criminology published in 7 journals from 1964–1996. They found that multiple-authorship was less widespread for theoretical articles and more common for empirical articles that adopted sophisticated quantitative approaches. Most of these studies assign straight counts to co-authored articles, but this approach has been criticized by Lee and Bozeman (2005) who argue that the approach does not hold true when fractional counts (dividing the number of publications by the number of authors) are employed. Based on the previous literature, our second hypothesis is that the most productive public administration scholars are more likely to publish co-authored articles when compared to scholars who are less productive. We expect to observe the reverse trend as well (that is, less productive scholars are more likely to publish sole-authored articles). Table 2 provides an overview of some significant studies which focus on the relationship between collaboration and productivity.

Co-authorship and quality of publications

The results reported in the literature for previous studies that have explored the relationship between collaboration and publication quality are mixed. Research studies which focus on this relationship date back to Harriet Zuckerman's 1967 project analysing productivity and collaboration patterns among Nobel Laureates. She concluded that award-winning scientists were more likely to collaborate with other productive scholars

TABLE 2 *Examining the relationship between collaboration patterns and productivity*

Data source	Author/year/discipline	Study findings
Individual authors and journal articles	<ul style="list-style-type: none"> Economics (Barnett <i>et al.</i> 1988; Durden and Perri 1995; Maske <i>et al.</i> 2003) 	<ul style="list-style-type: none"> Found increasing productivity as a result of collaboration, explaining the recent growth in joint-authored articles in economics
Consumer behaviour research journals: 1977–1996	<ul style="list-style-type: none"> Consumer research (Eaton <i>et al.</i> 1999) 	<ul style="list-style-type: none"> Found a strong relationship between author productivity and number of co-authors on a publication Concluded that authors who published frequently were more connected and likely to attract potential collaborators
Journal articles published in biomedical research, chemistry, and mathematics journals	<ul style="list-style-type: none"> Sciences (Glänzel 2002) 	<ul style="list-style-type: none"> Found that productivity increased with co-authorship in all fields except mathematics Analysed articles published in 1996 in the Science Citation Index to conclude that researchers witnessed a peak in their average annual productivity rates when they had 6 co-authors on a paper in biomedical research, 3–4 co-authors in chemistry, and 1–2 co-authors in mathematics
Curriculum vitae of 434 scientists	<ul style="list-style-type: none"> Natural science and engineering (Lee and Bozeman 2005) 	<ul style="list-style-type: none"> Concluded that research collaboration impacts publication productivity in a positive way only if ‘normal count’ of journals was taken into consideration. The results did not prove significant with ‘fractional count’*

*Normal count refers to a simple count of all the peer reviewed publications for the 443 scientists from 2001 to 2003 indexed in the *Science Citation Index – Expanded*; fraction count was calculated by dividing the number of publications by the number of authors for the same time period and the sample.

when compared with their less prolific counterparts (Zuckerman 1967). In 1980, Presser examined the editorial review decision on 242 papers – with approximately 80 per cent of the papers submitted from psychology and sociology disciplines – submitted to *Social Psychology Quarterly (SPQ)* between 1 September 1976 and 31 August 1977. After controlling for department type, Presser (1980) found evidence that multiple-authored papers were less likely to be rejected than single-authored submissions. When comparing articles submitted by authors affiliated with departments that offered both doctoral and non-doctoral degrees, favourable editorial reviews were received for multiple-authored articles when compared with single-authored articles, but Presser found the relationship between article acceptance and collaboration stronger in departments that did not offer doctoral degrees. In sum, the *SPQ* study concluded that the acceptance rates of peer reviewed manuscripts, which was taken as a measure of article quality, not only depended on the number of authors, but also on the type of institution that employed the authors.

In another study, Glänzel (2002) examined articles in chemistry, mathematics, and biomedical research from 1980 to 1998 and found a strong relationship between collaboration and citation rates. Multiple-authored papers were more likely to be cited when

TABLE 3 *Examining the relationship between collaboration patterns and publication quality*

Unit of analysis	Author/year/discipline	Study findings
Journals	<ul style="list-style-type: none"> • Economics (Barnett <i>et al.</i> 1988; Piette and Ross 1992) • Library sciences (Hart 2007) 	<ul style="list-style-type: none"> • Did not find evidence that co-authorship leads to an increase in the quality of the publication
Journals	<ul style="list-style-type: none"> • Sciences (Glänzel 2002) 	<ul style="list-style-type: none"> • Concluded that multiple-authored articles are on the rise in chemistry, biomedicine and mathematics • Found that in chemistry, biomedicine and mathematics, co-authored articles received more citations than sole-authored articles
Journals	<ul style="list-style-type: none"> • Psychology (Nemeth and Goncalo 2005) 	<ul style="list-style-type: none"> • Found a positive and direct relationship between number of authors and citation rates after holding geographical location constant (which is measured by the institutional affiliation of the researchers) • Concluded that the numbers of citations increases if collaborators are separated by geographic distance
Editorial decisions of publications	<ul style="list-style-type: none"> • Psychology (Presser 1980) 	<ul style="list-style-type: none"> • Found moderate evidence that co-authored papers were of high quality although this finding was based on higher acceptance rates of co-authored journal articles

compared with single-authored publications. Similar results have been found by other authors (Smart and Bayer 1986; Nemeth and Goncalo 2005; Figg *et al.* 2006). Overall, these studies indicate that collaboration often results in a higher quality research product. Nevertheless, some studies have found evidence that co-authorship does not lead to an increase in quality of publications (Barnett *et al.* 1988; Piette and Ross 1992; Hart 2007). Table 3 provides an overview of some significant studies focused on the relationship between collaboration and publication quality. Given that the majority of studies reviewed find a positive correlation between co-authorship and publication quality, our third and fourth hypotheses are that more highly cited and higher impact authors, respectively, will be more likely to publish co-authored articles than their less successful peers.

Co-authorship and gender

A number of studies across several social science disciplines, including public administration (Rubin 1990, 2000), have examined the relationship between gender and co-authorship (Grant and Ward 1991; Krysik and Nichols-Casebolt 1994; Young 1995; Cunningham and Dillon 1997; Fisher *et al.* 1998; Bahr and Zemon 2000; Breuning and Sanders 2007). A study by Breuning and Sanders (2007) analysed co-authorship patterns for female authors in eight top political science journals from 1999 to 2004. They found that over 50 per cent of the articles published in prestigious political science journals were single-authored, while around 44 per cent were co-authored. Around 37 per cent of the co-authored papers

were written by one or more female scholars. The authors concluded that the lower number of female authors did not imply lower productivity, but that women were less likely to publish in top quality journals. At the time of their study, the authors found that the majority of the women were turned down due to the varying rates of academic rank (women were more likely to be in assistant professor positions) and methodologies applied (women were more likely to employ case study analysis as opposed to statistical analyses).

Grant and Ward (1991) came to a similar conclusion when they found that female scholars co-authored fewer articles in the most prestigious sociology journals. They also found that in mixed gendered articles women were less likely to be listed as first authors. Thus, they argued that gender discrimination was found to exist in the pre-publication, during publication and post-publication phases. Grant and Ward (1991) concluded that women had fewer resources to pursue research (particularly in terms of teaching and administrative loads), and fewer opportunities to be part of research teams, and thus were less likely to publish in prestigious journals, and received fewer citations.

Even though female scholars might be less likely to publish in the most prestigious journals, when compared with males, they are often more likely to publish jointly and participate in mixed-gendered research teams (Young 1995; Cunningham and Dillon 1997; Fisher *et al.* 1998; Bahr and Zemon 2000). For the field of public administration, Rubin (1990, 2000) examined the participation of females in the American Society of Public Administration (ASPA). In particular, Rubin explored the scholarship contributions of these women in three prestigious public administration journals (*Public Administration Review*, *Journal of Public Administration and Theory* and *Public Productivity and Management Review*). Rubin concluded that all of these journals showed a growth in female co-authored articles, but the overall percentage was not large enough to suggest an increase in their overall participation. Female scholars authored or co-authored less than one-third of the articles in *Public Administration Review* and approximately 25 per cent in *Journal of Public Administration and Theory* and *Public Productivity and Management Review*.

Table 4 provides examples of studies that have examined the relationship between scholarly collaboration and gender, productivity, and publication quality. Based on these studies, our fifth hypothesis is that female authors in public administration will be more likely to collaborate than males. However, these studies also suggest that women might be less likely to publish in top journals (as indicated by the journal impact factor) and would be less likely to be cited when compared with men. Therefore, our sixth and seventh hypotheses, respectively, are that female public administration scholars will be less likely to be cited than their male peers and less likely to publish in high impact journals. In the two sections that follow, we will outline the details of our dataset and present the results of our analysis.

DATA DESCRIPTION

The data for this study were collected from ISI's Web of Science (WOS) Social Science Citation Index (SSCI), a database that indexes publication documents including articles, bibliography, book reviews, editorial material, letters, abstracts and notes. For this study, we focused on peer-reviewed articles that were catalogued in the SSCI index between 1973–2007 (the full range of dates indexed in the WOS database). We collected the entire population of articles from all 23 journals listed under the 'public administration' category. A full list of these journals is provided in table 5.

TABLE 4 *Examining the relationship between collaboration patterns and gender*

Unit of analysis	Author/year/discipline	Study findings
Journals	<ul style="list-style-type: none"> Public administration (Rubin 1990, 2000) 	<ul style="list-style-type: none"> Concluded that the membership of women in ASPA (American Society of Public Administration) increased from 19 per cent in 1976 to 39 per cent in 1998 Found that women authored/co-authored 29 per cent of articles in <i>PAR</i> annually Established that 8 per cent of the editorial board for <i>PAR</i> was comprised of women in 1998
Journals	<ul style="list-style-type: none"> Political science (Breuning and Sanders 2007) 	<ul style="list-style-type: none"> Concluded that fewer co-authored articles were published by women. Found that women published less in top journals
Journals	<ul style="list-style-type: none"> Information systems (Bahr and Zemon 2000; Cunningham and Dillon 1997) Political science, sociology and criminology (Fisher <i>et al.</i> 1998) 	<ul style="list-style-type: none"> Found that females were more likely to publish with mixed-gendered research teams. Concluded that females were more likely to collaborate than men
Literature review	<ul style="list-style-type: none"> Sociology (Grant and Ward 1991) 	<ul style="list-style-type: none"> Suggested that gender discrimination was evident in pre, during, and post publication phases Concluded that females have fewer resources, are less likely to publish in prestigious journals, and have fewer citations
Journals	<ul style="list-style-type: none"> Social work (Krysiak and Nichols-Casebolt 1994) 	<ul style="list-style-type: none"> Concluded that articles in which all authors are female increased from 7.4 per cent to 16.8 per cent during a span of 10 years from 1982 to 1991; although the proportion of women co-authors increased, the total number of articles published by both genders decreased during the same time span
Journals	<ul style="list-style-type: none"> Political science (Young 1995) 	<ul style="list-style-type: none"> Found that female participation in cross-gendered collaborations has increased over time (1983–1994) although single male authorship or male-only collaboration is still the dominant form of authorship in political science Concluded that joint collaborations between 2 or more female authors (exclusively) are almost non-existent

A total of 16,990 articles published under the public administration category were downloaded into the software package Vantage Point (VP), a data mining software package that is used for bibliometric analysis. Several variables were exported from the WOS system into the VP software, including: author name, author affiliation, title of the journal article, information about co-authors' institutions and country of residence,

TABLE 5 *List of journals used for sampling design for public administration***2006 ISI Web of science public administration journals (23)**

Administration and Society
Administration In Social Work
American Review of Public Administration
Australian Journal of Public Administration
Canadian Public Administration
Canadian Public Policy Analyse De Politiques
Climate Policy
Contemporary Economic Policy
Environment and Planning C Government and Policy
Governance An International Journal Of Policy and Administration
International Review of Administrative Sciences
Journal of European Public Policy
Journal of Policy Analysis and Management
Journal of Public Administration Research and Theory
Journal of Social Policy
Philosophy and Public Affairs
Policy and Politics
Policy Sciences
Policy Studies Journal
Public Administration
Public Administration and Development
Public Administration Review
Public Money and Management

total number of citations, cited reference count, keywords, subject category, and publisher information.

The data were cleaned to exclude authors who remained anonymous, duplicate titles, and to combine the names of the same authors that appeared in a different format. For example, when 'Douglas, K.C.' was listed as 'Douglas, K.' in a different publication in cases where these were the same person, they were combined. Data cleaning resulted in 15,547 individual author records for the public administration field. These data were then exported into SPSS for further analysis. The unit of analysis for this study was the individual author. Supplemental gender data were collected for the 95th percentile of the most productive authors in public administration (N = 1094) to allow for gender comparisons across the top scholars in the field.

RESEARCH DESIGN

The overarching goal of this study is to explore the relationship between collaboration patterns and measures of academic success for public administration scholars. As we demonstrated above, these relationships have been explored extensively in other natural science and engineering disciplines. The three measures of academic success for which we have collected bibliometric data are: (1) productivity; (2) number of citations; and (3) journal impact factor. For all of these variables, we use the individual author as the unit of analysis. Thus, we operationalize scholarly productivity as the number of articles published by each person within the 23 disciplinary journals during the study period (that is, 1973–2007). In a similar fashion, number of citations is operationalized as the total number of cites that each person received within the WOS journals during the

TABLE 6 *The 100 scholars with most articles in ISI Web of Science 'public administration' journals (reported alphabetically)*

Abney, G.	Davies, B.	Kernaghan, K.	Nalbandian, J.	Smith, J.
Austin, M.	deLeon, P.	Klijn, E.	Nijkamp, P.	Stanbury, W.
Bailey, S.	Doern, G.	Knapp, M.	O'Toole, L.	Stewart, J.
Bardach, E.	Doig, A.	Kraemer, K.	Painter, M.	Stivers, C.
Barnes, M.	Dollery, B.	Lambright, W.	Perlmutter, F.	Stoker, G.
Behn, R.	Durant, R.	Levine, C.	Perry, J.	Straussman, J.
Berman, E.	Ferlie, E.	Lewis, G.	Peters, G.	Streib, G.
Bird, R.	Frederickson, G.	Lewis, J.	Poister, T.	Taylor-Gooby, P.
Bovaird, T.	Golembiewski, R.	Lodge, M.	Pollitt, C.	Thomas, C.
Boyne, G.	Goodin, R.	Lynn, L.	Potoski, M.	Thompson, F.
Bozeman, B.	Goodsell, C.	Martin, L.	Powell, M.	Walker, R.
Brinkerhoff, D.	Gregory, R.	Martin, S.	Rhodes, R.	Weimer, D.
Brooks, A.	Gummer, B.	May, P.	Riccucci, N.	Weiss, J.
Brown, K.	Hardy, B.	Mead, L.	Richardson, J.	Weller, P.
Brudney, J.	Harrison, S.	Meier, K.	Rondinelli, D.	Wettenhall, R.
Brunner, R.	Hood, C.	Menzel, D.	Rosenbloom, D.	Wildavsky, A.
Carmichael, P.	Ingraham, P.	Midwinter, A.	Savoie, D.	Wise, C.
Christensen, T.	Jordan, A.	Montgomery, J.	Schick, A.	Wistow, G.
Collins, P.	Kearney, R.	Morgan, D.	Selden, S.	Wright, D.
Cooper, T.	Keating, M.	Mulgan, R.	Slack, K.	Wright, M.

study period. Furthermore, for each author, the average impact factor is computed by taking the mean impact factor of all of the articles authored by that person in the public administration WOS journals during the study period. Since impact factors are assigned to journals rather than individuals, this mean represents a measure of the quality of the outlet that the person is publishing in rather than a direct measure of the quality of the specific manuscript (which is best measured using the times cited indicator).

In table 6 and table 7, we provide a snapshot of our dataset by listing the 100 scholars with the highest number of articles and citations, respectively, for the 23 'public administration' journals from ISI's Web of Science (WOS) between 1973 and 2007. It is important to note, however, that when we analyse the 'top scholars' (presented below), we define that group as more than just these 100 scholars. Specifically, we use the 95th percentile for productivity ($N = 1094$) and the 95th percentile for times cited ($N = 795$) to define the top scholar categories. Therefore, the researchers listed in tables 6 and 7 are part of the top scholar categories, but there are 100s of additional researchers that are also counted as top scholars in our analyses.

We also believe that there are some significant caveats associated with assuming that all leading public administration scholars would be on these lists. First, the 23 journals included in our analysis do not include several public administration journals that scholars often publish in such as *Administrative Theory and Praxis*, *International Journal of Public Administration*, *Public Administration Quarterly*, *Public Management*, and *Review of Public Personnel Administration*, among others. Second, this list does not include interdisciplinary journals that many public administration scholars regularly publish in, such as public management journals, political science journals, human resource journals and public

TABLE 7 *The 100 scholars with most cites in ISI Web of Science 'public administration' journals (reported alphabetically)*

Aldrich, H.	Ferlie, E.	Kraemer, K.	Poister, T.	Stoker, G.
Ascher, W.	Fischhoff, B.	Legrand, J.	Pollitt, C.	Streib, G.
Backoff, R.	Fisher, A.	Levine, C.	Pratchett, L.	Svara, J.
Behn, R.	Fiss, O.	Lewis, G.	Rainey, H.	Terry, L.
Bennett, C.	Forrest, R.	Lindblom, C.	Rawls, J.	Thomson, J.
Boorse, C.	Frederickson, G.	Lowndes, V.	Rhodes, R.	Townsend, P.
Boyne, G.	Goodin, R.	Macintyre, S.	Ricketts, E.	Vanhorn, C.
Bozeman, B.	Gregory, R.	Maciver, S.	Rittel, H.	Vanmeter, D.
Bretschneider, S.	Gutmann, A.	Martin, S.	Roemer, J.	Viscusi, W.
Brudney, J.	Hamilton, J.	May, P.	Romzek, B.	Walsh, K.
Brunner, R.	Hanushek, E.	Meier, K.	Rosenbloom, D.	Watson, S.
Buchanan, A.	Harding, A.	Moe, R.	Sabatier, P.	Webber, M.
Daniels, N.	Harrison, S.	Moon, M.	Sawhill, I.	Weiss, C.
deLeon, P.	Hart, D.	Morgan, D.	Scharpf, F.	Weiss, J.
Denhardt, R.	Hood, C.	Murie, A.	Schick, A.	Whitaker, G.
Doyle, M.	Hope, C.	Nagel, T.	Sen, A.	White, J.
Dunleavy, P.	Ingraham, P.	O'Toole, L.	Sigelman, L.	Wildavsky, A.
Durant, R.	Kearney, R.	Perry, J.	Skelcher, C.	Wise, L.
Dworkin, R.	Kettl, D.	Peters, G.	Sooman, A.	Wistow, G.
England, R.	Knapp, M.	Pierson, P.	Stewart, J.	Wright, D.

finance journals. Third, our list of the 100 most cited scholars does not have a control for self-citations. Even though citations serve as a good measure of quality, some researchers have documented the challenges associated with using self-citations (Garfield 1979; Ferber 1988; MacRoberts and MacRoberts 1996; White and McCain 1998). Fourth, this study does not include book publication as a measure of research productivity. Since books are a key indicator of productivity in the field of public administration, some leading scholars who publish more books (and fewer articles) will not be on our lists. Fifth, only six of the 23 journals catalogued in ISI's Web of Science (WOS) are international journals. Therefore, if some highly productive international scholars are less likely to publish in US journals, they might not appear in the list. Lastly, this dataset covers the time period of 1973–2007 and therefore the more established and senior scholars are more likely to be listed.

RESULTS

In table 8, we provide an overview of the summary descriptive statistics for our dataset. Given that a few of the authors in the dataset have extremely high levels of productivity and a high number of citations, we report both the median and mean values. This table illustrates that the mean and median number of articles per person are, respectively, 1.62 and 1.0; the mean and median number of cites per person are, respectively, 6.82 and 2.

Our first hypothesis was that co-authorship would have increased over time in the field of public administration as it has in other natural and social science fields. Our data analysis confirmed this hypothesis and we did find an increase in co-authored publications (and a related decrease in sole-authored publication) over time.

TABLE 8 *Descriptive statistics for bibliometric dataset*

Variable	Public administration
Publication range for sample	1973–2007
Number of journals	23
Sample size (number of authors)	15,547
Mean number of articles/person	1.62
Median number of articles/person	1
Mean number of times cited/person	6.82
Median times cited/person	2

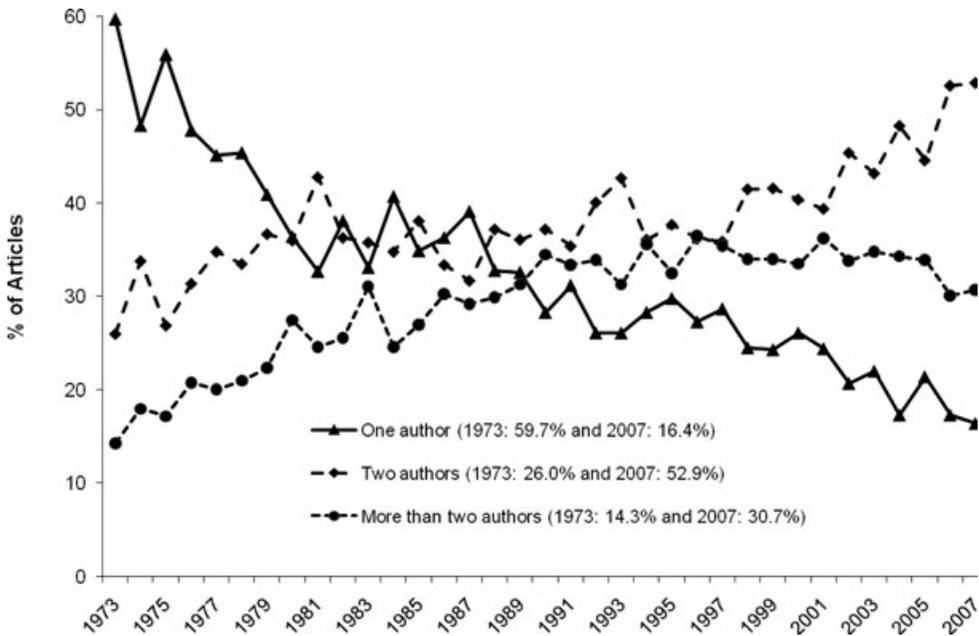


FIGURE 1 *Co-authorship trends for articles in public administration between 1973–2007*

Figure 1 presents the co-authorship patterns for public administration scholars over the three decades examined. The results show that in 1973 about 60 per cent of the articles were sole-authored and by 2007 that number had decreased to 16 per cent. In terms of the percentage of sole-authored articles that have been published in the public administration field over the past three decades, this represents a dramatic drop. At the same time, the number of articles authored by two scholars doubled over time, representing 26 per cent of the articles in 1973 and about 53 per cent of the articles in 2007. Articles with more than two authors are also more prevalent in 2007 (about 31 per cent) than they were in 1973 (about 14 per cent), but the increase is not as dramatic as the increase in articles authored by two scholars.

Collaboration patterns for top scholars in public administration

One of our research questions is focused on exploring differences in the collaboration patterns of the most productive, most highly cited, and highest impact factor scholars

in public administration and policy with their peers. To explore this relationship, and to determine if patterns differ based on the definition of top scholars, we define top scholars as those with three different indicators: 95th percentile for total productivity; 95th percentile for total times cited; and 95th percentile for average journal impact factor. We use these definitions of top scholars to test our second, third and fourth hypotheses.

Top scholars defined by productivity

Within the context of our analysis, we define scholarly productivity as the total number of articles published within the 23 WOS-defined public administration journals by each person between 1973 and 2007. We further defined the top scholars as those authors falling within the 95th percentile for this total measure of productivity ($N = 1094$). We then compared the collaboration rates of these scholars with their peers. Some descriptive statistics for these most productive authors are listed in table 9.

Our second hypothesis was that the most productive scholars would be more likely to collaborate than their less productive peers. Surprisingly, our results did not confirm this hypothesis. We found that within the public administration field the most productive scholars collaborate less than their peers. On average, the most productive scholars had a mean of 1.82 co-authors per article while the less productive scholars had a mean of 2.05 co-authors per article. By computing the ratio of sole-authored to co-authored articles, we were able to explore additional trends in collaboration patterns. The results in table 9 also demonstrate that the less productive scholars published almost the same number of co-authored papers as sole-authored papers (with a ratio of sole- to co-authored articles of 1.09), while the most productive scholars were more likely to publish sole-authored articles (with a ratio of sole- to co-authored articles of 1.51). Yet this difference in collaboration patterns disappears when we define top scholars according to the number of times their articles have been cited.

Not surprisingly, the most productive scholars published in significantly higher impact journals than their less productive colleagues (with an average journal impact factor of 0.82 for the top scholars and an average of 0.73 for their less productive peers). Even though the most productive scholars were less likely than their peers to collaborate (that is, collaborated with fewer people on articles and had a higher ratio of sole- to co-authored articles), they still published significantly more sole-authored and co-authored articles than their less productive peers.

Top scholars defined by times cited

The number of times that an article has been cited is a well-accepted measure of academic quality. Thus, our third hypothesis was that the most highly cited scholars in public administration (that is, $N = 795$ for the 95th percentile for times cited) would be more likely to collaborate on articles than their less cited peers. Our results presented in table 9 indicate that our dataset did not confirm this hypothesis. We did not find significant differences in collaboration patterns across the most highly cited scholars in public administration and their less cited peers. The middle columns of table 9 demonstrate that some of the significant differences in collaboration patterns disappear when top scholars are defined by citations. On average, the most highly cited scholars in public administration have a mean of 2.04 co-authors per article while their less cited colleagues have an average of 2.01 co-authors per person. Furthermore, this difference is not significant at the 0.05 level. In addition, there were no significant differences in the ratio of sole- to co-authored articles when the top scholars were defined by number of citations. We can also explore

TABLE 9 *Co-authorship patterns for public administration*

Variables	Top scholars defined by number of articles ¹		Top scholars defined by number of citations ²		Top scholars defined by average impact factor for journals ³				
	95th percentile N = 1094	T value (p value)	Others N = 14453	95th percentile N = 795	T value (p value)	Others N = 14752	95th percentile N = 1769	T value (p value)	Others N = 13778
Mean impact factor per person	0.82	8.10 (.0001)	0.73	1.01	20.64 (.0001)	0.72	1.46	137.39 (.0001)	0.64
Mean # sole authored articles per person	2.95	29.35 (.0001)	0.53	2.42	17.25 (.0001)	0.60	0.65	-2.49 (0.01)	0.70
Mean # co-authored articles per person	3.39	29.97 (.0001)	0.74	3.01	18.44 (.001)	0.82	0.61	-17.93 (.0001)	0.97
Mean number of co-authors per article per person	1.82	-9.99 (.0001)	2.05	2.04	-.48 (NS) ⁴	2.01	1.83	-7.604 (-.0001)	2.06
Ratio sole to co-authored articles per person	1.51	7.05 (.00010)	1.09	1.36	1.70 (NS)	1.23	1.24	-.257 (NS)	1.26

¹Productivity is defined as the total number of articles published by scholars from 1973-2007.

²Times cited is defined as the total number of times that the authors PA articles have been cited in the WOS database between 1973-2007.

³Impact is defined as the average impact factor per person for articles published in the PA dataset between 1973-2007.

⁴NS = not significant at 0.05 level.

the general productivity measures for the most highly cited scholars in the dataset. Not surprisingly, the most highly cited scholars were more productive than their peers on both sole-authored articles (2.42 articles per person for the most highly cited scholars compared with 0.60 per person for their peers) and co-authored articles (3.01 articles per person for the most highly cited scholars compared with 0.82 for their peers).

Top scholars defined by impact factor

Our fourth hypothesis was that scholars that publish in higher impact journals would be more likely to collaborate than their peers who publish in lower quality journals. Our analysis yielded mixed results for this hypothesis. On the one hand, when we define top scholars as those publishing in the journals with the highest average impact factors (that is, $N = 1769$ for the 95th percentile for impact factors), the collaboration trends are similar to those found for the most productive scholars. Thus, public administration scholars publishing in the highest impact outlets have fewer collaborators than their lower impact colleagues. Therefore, this result does not confirm our hypothesis that scholars publishing in higher quality journals would be more likely to collaborate. On the other hand, the difference between the ratio of sole- to co-authored articles disappears for the two groups. When we define top scholars by journal impact, the highest impact scholars publish on average about 1.24 sole-authored articles for each co-authored article they publish, while the ratio for the lower impact scholars is 1.26. So while this result does not confirm that scholars publishing in higher impact journals are more collaborative, it does demonstrate that they do not have a ratio of sole- to co-authored articles that is significantly different from their peers who publish in lower quality journals.

When we examine the general productivity trends for the scholars who publish in the highest impact journals, we see some interesting results. Somewhat surprisingly, the scholars who publish in the highest impact journals in public administration tend to be less productive than their colleagues. While the top scholars (defined by average impact factor of journals) published about 0.65 sole-authored articles per person, their peers published significantly more sole-authored articles (with 0.70 per person). This trend of decreased productivity levels for top scholars continued for co-authored articles. While scholars publishing in the highest impact journals published 0.61 co-authored articles per person, their peers published 0.97 co-authored articles per person.

Overall, within the public administration field, the most productive and highest impact scholars collaborate less than their colleagues. This is an interesting result given that many studies have shown that top scholars in science and engineering fields tend to collaborate more than their colleagues. Another interesting result is that the scholars publishing in the highest impact journals have lower overall levels of productivity than their peers. We can speculate that these scholars are spending more time producing high quality work (and publishing that research in high quality journals) while their colleagues might be more focused on generating larger numbers of articles for lower quality outlets. In the section that follows we explore some gender differences in collaboration patterns and productivity for the top scholars in the field of public administration and public policy.

Gender differences in collaboration patterns

Our second research question focused on exploring the gender differences in collaboration patterns for top scholars in public administration. Top scholars for this part of the analyses were defined only by productivity levels (that is, individuals who rank among the 95th

TABLE 10 *Gender differences in co-authorship patterns of most productive (95th percentile) public administration scholars*

Variables	Male	T value (p value)	Female
Sample size	926	N/A	168
Total times cited	35.14	.46 (NS)	33.39
Mean impact factor per person	0.81	-3.47 (.001)	0.90
Mean # sole authored articles per person	3.05	2.94 (.003)	2.38
Mean # co-authored articles per person	3.43	1.14 (NS)	3.15
Mean number of co-authors per article per person	1.81	-1.09 (NS)	1.87
Ratio sole to co-authored articles per person	1.56	2.43 (.015)	1.78

NS = not significant at 0.05 level

percentile based on the total number of articles published in the top 23 journals of public administration from 1973 and 2007). Since gender data were not available in the bibliometric database, this analysis required that we collect additional gender data for each top scholar. We did this via a web search of personal and departmental web pages.

Table 10 presents the results of our comparison of top female public administration scholars (N = 168) with top male public administration scholars (N = 926). Based on trends in other fields, our next three hypotheses were, respectively, that females would collaborate less than their male colleagues; women would be less cited than men; and women would publish in lower impact journals than men. Interestingly, we did not find many significant differences in the collaboration patterns across gender. Even though the male top scholars were more productive on sole-authored articles, there was no significant difference in productivity levels between males and females for number of co-authored articles. Additionally, both male and female top scholars had, respectively, around 1.8 and 1.9 mean numbers of co-authors.

Our analysis of the quality of publications for the top male and female scholars yielded some additional noteworthy results. First, we did not find significant differences in the number of times that the top male and female authors were cited. On average, male top scholars had been cited about 35 times over the study period while female top scholars had been cited about 33 times. Yet, when we compared the average journal impact factor for the male and female top scholars, we found that the female scholars published in significantly higher impact journals than the male scholars. During our future data collection of supplemental information on gender, PhD completion year, and faculty rank, we will be interested to explore if these trends for quality of publications change when we control for the PhD completion year. Since the study period is relatively long (1973–2007), we expect that women are more likely to publish in the latter portions of this time period (given that women have lagged behind men in entering the academic workforce).

Caveats

There are several benefits of using publication records for this analysis. First, the co-authorship/collaboration data that we analysed are not based on respondent recall or

perception so we were able to obtain consistent data across respondents. Second, we were able to utilize the 34-year study period with data for each year. Third, we had access to a full list of all publications from the public administration journals indexed within the WOS. There are, however, some caveats associated with using any bibliometric dataset for this type of analysis. First, the productivity and impact factors focus only on publications within the disciplinary field. As mentioned above, it is likely that many of the authors in our dataset have also published outside of their field and the current analysis does not fully capture these records (although it does capture times cited outside of the disciplinary field). Second, we recognize that journal impact factors, which are one measure of journal quality, have not remained static over time. Third, in this study, we are assuming that collaboration means co-authorship. This is an issue that is up for much debate and we do not believe that co-authorship is the only measure of collaboration, even though it is a formalized, peer-reviewed form of collaboration. We would like to go on to supplement this analysis with a questionnaire that would ask respondents to report more informal collaborations that do not lead to co-authored peer-reviewed articles. Lastly, we acknowledge that there are some cases of co-authorship where the author order is not representative of the relative level of the authors' involvement in the research and writing of articles. Because of this potential caveat we do not analyse our data with an explicit focus on author order; rather, we explore the number of co-authors as a more general measure of collaboration. This, we do not attempt to attach higher value to first authorship in this study.

DISCUSSION

Our analysis indicates that within the public administration field the most productive and highest impact scholars collaborate less – and with fewer people – than their colleagues. In contrast, we found that there is no significant difference in the number of collaborators between the most highly cited scholars and their colleagues. Our findings do not confirm our hypotheses and past studies in other fields that have shown that the most productive scholars (Barnett *et al.* 1988; Eaton *et al.* 1999; Durden and Perri 1995; Glänzel 2002; Maske *et al.* 2003; Lee and Bozeman 2005) and the most cited scholars (Smart and Bayer 1986; Glänzel 2002; Nemeth and Goncalo 2005; Figg *et al.* 2006) are more likely to collaborate than less productive or less cited scholars. There are several reasons why this result has practical significance. First, our findings indicate that the field of public administration is somewhat different from other academic disciplines, especially the natural sciences where several studies have repeatedly shown that the most productive scholars publish jointly (Cronin 2001; Glänzel 2002; Porac *et al.* 2004). This finding is important for university administrators who evaluate tenure cases in public administration in a similar way to the natural sciences. Our results suggest that there are convincing arguments to be made for different promotion and tenure committees based on disciplines – or, at the very least, that external letter writers are explicitly asked to comment on disciplinary differences. Second, our results indicate that the field of public administration might be going through a transition – from a largely non-collaborative discipline to a more collaborative discipline – and, at the same time, more senior scholars (that is, more highly cited and productive scholars) might not yet have adopted this new collaborative model. Since we do not have the data to control for the age (or PhD year) of the scholars in our dataset, using our current dataset, we cannot yet test this hypothesis. Nevertheless, we believe that our results indicate that university administrators need to be attentive to potential changes in

the collaboration patterns of the field over time and make sure that younger scholars are not punished for following recent disciplinary trends in their research.

We also found some interesting results by gender. Based on previous studies (Young 1995; Cunningham and Dillon 1997; Fisher *et al.* 1998; Bahr and Zemon 2000), we expected that female faculty members would be more likely to collaborate than male scholars. This was not evident through our analyses; our study found no significant differences in the mean number of co-authored articles per person by gender. While collaboration patterns were similar for the top male and female scholars, we did find that top male scholars are more likely than female top scholars to publish sole-authored articles. This result is similar to gender differences in productivity within the natural sciences and engineering (Levin and Stephan 1998; Xie and Shauman 1998; Bellas and Toutkoushian 1999; Corley 2005). Since productivity can be affected by several factors, it would be interesting to see if lower productivity rates among women faculty change with age or rank. The fact that in our study female faculty in public administration prove to be less productive than their male counterparts warrants further investigation.

While some previous studies have shown that women are less likely to publish in high quality journals (Grant and Ward 1991; Breuning and Sanders 2007), the results of our study tell a different story. We found that female top scholars in public administration are more likely than their male colleagues to publish in high quality journals as demonstrated through high journal impact factor scores. These results mirror the findings from a study conducted by Mauleón and Bordons (2006) on the scientific performance of material scientists. They concluded that even though female material science faculty members are less productive than their male peers, it is clear from the higher impact factor scores of their work that they are more selective in the outlets they choose for publication.

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