Scientometrics, Vol. 3, No. 4 (1981) 275–303

RESEARCH PRODUCTIVITY, UNIVERSITY REVENUE, AND SCHOLARLY IMPACT (CITATIONS) OF 169 BRITISH, CANADIAN AND UNITED STATES UNIVERSITIES (1977)

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(Received May 6, 1980 in revised form September 24, 1980)

One hundred and sixty-nine universities, comprising three separate samples from Britain, Canada, and the United States were evaluated in terms of their productivity across all disciplines. The 1977 *Arts and Humanities, Social Science*, and *Science Citation Indices* were used as the basis for counting the total number of publications from each of the universities. The 10 overall most productive universities were Harvard University; the University of Texas; the University of California, Los Angeles; the University of London, England; the University of Wisconsin; the University of Illinois; the University of Minnesota; the University of California, Berkeley; Stanford University; and the University of Washington, Seattle. Fifteen of the most productive 100 universities were from the United Kingdom while eleven were from Canada. Additional data were collected including: the revenue of the university, the year the university was founded, the number of subscriptions to current periodicals, the number of bound volumes in the library, the aptitude scores and number of both graduate and undergraduate students, the total number of faculty members, and the number of publications of, reputational rating, and citations to, the faculty members in the psychology departments. A powerful general factor was found to permeate the more than 30 disparate measures, i.e., those universities that were high on one measure were high on others. This general factor could be labelled a dimension of wealth, quality, or size.

Introduction

The generation of knowledge today, particularly scientific knowledge, takes place primarily in universities. The present study is concerned to help identify which universities currently contribute the most to the generation of this knowledge, and to examine their characteristics.

Several attempts have been made in the past to evaluate different *departments* within universities, the most notable of which were carried out on universities in the United States by the American Council on Education (ACE) in 1964[1] and 1969[2]. These used average "peer ratings" gathered from extensive surveys, i.e.,

samples of university faculty members rated the "quality" of graduate faculties in their own fields, at other institutions. These ratings tended to be remarkably stable (typically $r = 0.9$) over the five year period.[3]

This use of ratings in evaluation has been criticized. One objection has been that such ratings are simply a survey of subjective opinions and are distorted by "halo effects", i.e., the evaluation of a particular department may be influenced by the overall prestige of the school. On the other hand, it is possible that the extremely stable reputational ratings are accurate representations of reality. This latter view is clearly supported by evidence from three recent studies.

The first of these, by *Hartnett, Clark* and *Baird*[4], drew on data collected by the Council of Graduate Schools and the Educational Testing Service involving peer ratings of the quality of doctoral programs in chemistry, history, and psychology. The correlations between these ratings and those from the ACE study conducted eleven years earlier showed extremely high stability; they were all 0.90 and higher. Generalizability of these ratings was also found for sub-specialities. For example, the overall rating of the history department showed correlations of 0.90 and higher with subareas such as ancient, medieval, modern, American, and Third World history. Of more importance for purposes of validity, these subjective ratings were highly related to a number of "objective" measures including (a) the number of journal articles and book reviews per faculty member published in the previous 3 years, (b) the percentage of faculty with research grants from non university sources, (c) the percentage of faculty with Ph.Ds from departments rated in the top category in the 1969 ACE survey, (d) the number of Ph.D.s awarded annually during the previous 3 years, (e) the mean salary of the full professors, and (f) student-faculty ratios (a negative correlation). This study suggests that reputational ratings are highly related to objective indices of quality, and that quality is a pervasive characteristic of universities across diverse measures.

A second study also found the *Roose* and *Andersen* ratings to be valid against "objective" bibliometric indices. *Anderson, Narin* and *McAllister*[5] gathered 12775 publications from the Corporate Index of the *Science Citation Index (SCI)*[6] for 115 United States universities for the years 1965 to 1973. Three separate bibliometric indices were derived: total number of publications, an index of the quality of the publications based on how often the particular journal was cited, and a quantity x quality measure derived by multiplying the former two. Strong degrees of associations were found between the *Roose* and *Andersen* ratings and the three bibliometric measures for ten separate scientific disciplines ranging from physics to psychology, with the large majority of the correlations being greater than 0.60. Additional analyses, using partial correlations, revealed the *Roose* and *Andersen* reputational ratings to be independently and additively influenced by the separate

size and quality measures of research output, with the size of the output apparently contributing more to generalized "halo effects" than quality.

Endler, Rushton and *Roediger*[7] also provided evidence for the existence of a pervasive general factor of productivity and impact within universities. These authors assessed the quality of 180 *psychology* departments in Canada, the United Kingdom, and the United States, based on the number of *citations* appearing in the 1975 *Social Science Citation Index (SSCI)*[8], for each faculty member. In this study the assumption was made that the number of citations a person has to his or her work, the greater had been the impact of that work on others. Validity data on citations as a measure of impact indicate that citations allow for prediction of Nobel Prize winners and membership in National Academies of Science.[9] Give the assumption that citations to individuals assess the impact of that individual one can ascertain the *departmental* impact by summing over all the citations to individuals in that department. Following this procedure, *Endler, Rushton,* and *Roediger* found that the top 10 psychology departments were at Stanford, Michigan, Harvard, Illinois, Yale, Pennsylvania, Purdue, Chicago, Toronto and U.C.L.A. A major finding was that these rankings correlated 0.68 with the reputational assessments of the same psychology departments made 6 years earlier.[10] Similar results were found when quality was measured by mean or median number of citations. Further analysis demonstrated that both the reputational ratings and the *SSCI* citation measures had significant positive correlations with measures of the psychology departments', research productivity (i.e., journal publications) and faculty size.

The present article considers further the possibility that universities high on one measure of "quality" will be high on others. This view implies that the quality of universities can be assessed through a number of independent procedures, each producing a similar rank order. Further, we investigate whether such institutions will attract the most able students and the greatest amount of revenue and research resources (e.g., library facilities and periodicals). We attempt to examine this possibility using three independent samples of universities from Canada, the United Kingdom, and the United States.

Method

One hundred and sixty-nine universities comprised the total sample, 39 of which were from the U.K., 31 from Canada, and 99 from the United States. These universities were chosen because they were among the leading institutions in their countries and because their psychology departments had been studied previously and a large amount of data was available on them.[11] The 180 universities

used in these previous studies were reduced to 169 for the present investigation because in a few cases, branch campuses were amalgated into one university because other data were available at this level only. For instance in the U.S., the University of Illinois included both the Champaign-Urbana and Chicago-Circle campuses. In the U. K. data from the University Colleges of Bangor, Cardiff, Swansea, and UWIST were collapsed to from the University of Wales. When all data could be gathered for virtually independent campuses, as in the University of California system (Berkeley, Los Angeles, etc.) and the State University of New York (e.g., Stony Brook), they were treated as independent universities.

Up to 34 measures were taken for each university. Twenty-one of these were concerned with the university as a whole, while thirteen were concerned specifically with the psychology departments.

University productivity. Three measures were derived separately from the 1977 Corporate Indices of the *Science Citation Index (SCI)*[12], *Social Science Citation Index (SSCI)*[13], and *Arts and Humanities Citation Index (A & HCI)*[14]. The *Corporate Indices* list all publications in the included journals, under the institutional affiliation of the author, collapsed across all departments and teaching institutions of that university. Thus by summing all of these, an estimate is derived of that university's total output in physical science journals, and those which represent the behavioral sciences and arts and humanities respectively. These numbers may be slightly inflated by overlap between the journals covered by the *SCI, SSCI* and *A & HCI.* In addition these articles pertain to the output of the university as a whole and not just its faculty members, i.e., publications from administrative and technical staff as well as students and research workers are included.

Other university data were derived from a number of sources. The 11th edition of the *American Universities and Colleges* (1973)[15] provided data on U.S. schools concerning the financial revenue of the university, the number of bound volumes in the library system, the number of periodicals subscribed to and the number of graduate and undergraduate students. The 1978 *World Almanac*[16] provided data on the year that both the U.S. and Canadian universities were founded, and their faculty size. The 54th edition of the *Commonwealth Universities Yearbook* (1977)[17] provided equivalent data on the British and Canadian universities, except that British faculty size was derived from the *World of Learning 1977–78.*[18] In addition average incoming undergraduate Scholastic Aptitude Test (SAT) scores were obtained for some of the American schools from *The Insider's Guide to the Colleges 1978–79.*[19] From the above information, a number of additional variables were computed: the mean *SCI, SSCI,* and *A& HCI* publications (by dividing each by the number of faculty); the total number of students (by adding the graduate and undergraduates together); and the student-faculty ratios (by dividing the

number of students by the number of faculty). In addition, the incomes for the various countries were standardized on 1976 U.S. dollar equivalents (i.e., British figures X 2.4; Canadian X 1.2 and U. S. X 1.58).

Psychology department data were obtained mostly from earlier mentioned studies.[20] These measures were the total, mean, and median number of 1975 *SSCI* citations accruing to the faculty members of those departments, the number of faculty with greater than 25 and 100 citations, the total and mean number of faculty in the psychology department, and the reputational rating of that department as measured in the 1969 ACE study.[21] Information about the average scholastic aptitude scores of graduate students in psychology was taken from the American Psychological Association's (APA) publication *Graduate Study in Psychology, 1975–76.*[22] The measures taken were the Graduate Record Examination (GRE) scores on the Verbal, Quantitative, and Advanced indices, and the Miller Analogies Test (MAT).

Some variables had missing data. For example, no British or Canadian data were obtained on students' aptitude scores. The scores are also missing for several American universities. Pearson product moment correlation coefficients were calculated between all variables, and a separate principal components analysis was computed for each of the three samples, i.e., British, Canadian, and United States.

In any undertaking of this magnitude, errors are bound to occur. One problem resides in the "errors" due to the sources we chose to collect our data from. In regard to income, for example, our source for British and Canadian universities was the 54th edition of *The Commonwealth Universities Yearbook* (1977).[23] McGill University is reported there to have a total income of (Canadian) $87 317 000. This, however, is for 1974/75 and *excludes* "ancillary enterprises". The University of Western Ontario is reported with an income of (Canadian) $110 880 000. This however, is for 1975/76 and *includes* $13 000 000 for "ancillary enterprises." On another dimension, our source gives The University of Montreal a total student population of 33 346. This figure is abnormally high because both part-time and full-time students were combined, whereas for other universities part-time students were not included. It is possible that even greater anomalies have occured. Throughout, our convention was to list the variable entries *as our source defined them.* This "objective" method of defining entries is undoubtedly a source of some error, but seemed to us a better procedure than relying on our "subjective" judgements regarding correcting discrepancies, particularly when considering we are making comparisons across nations. It should be kept in mind when considering our results, therefore, that we defined our variables in the particular way that we did.

Table 1
Ranking of the top 100 British, Canadian and U.S. in the combined *Arts and Humanities, Science,*

Universities	Total publications (A & HCI, SCI & SSCI)	Total University Faculty Size	Rank	Mean publications (A & HCI, SCI & SSCI)	Rank	Total SCI publications
1. Harvard U.	7 115	3 860	(13)	1.8	(19.5)	5 565
2. U. of Texas	6 694	5 639	(7)	1.2	(36)	5 238
3. U. of California Los Angeles	6 261	2 265	(30)	2.8	(7)	4 375
4. U. of London, *U.K.*	6 157	1 665	(44)	3.7	(3)	4 480
5. U. of Wisconsin	5 478	6 615	(4)	0.8	(76.5)	3 842
6. U. of Illinois	5 264	7 558	(3)	0.7	(87)	3 808
7. U. of Minnesota	4 442	5 601	(8)	0.8	(76.5)	3 491
8. U. of California Berkeley	4 428	2 429	(26)	1.8	(19.5)	3 302
9. Stanford U.	4 195	1 755	(40)	2.4	(11)	3 332
10. U. of Washington Seattle	4 002	3 891	(12)	1.0	(52.5)	3 096
11. U. of Pennsylvania	3 924	4 306	(11)	0.9	(62.5)	3 044
12. Yale University	3 907	1 450	(52)	2.7	(8)	2 819
13. U. of Michigan	3 878	5 362	(9)	0.7	(87)	2 793
14. U. of Toronto, *Canada*	3 655	2 224	(31)	1.6	(25)	2 607
15. Johns Hopkins U.	3 562	700	(92.5)	5.1	(1)	2 831
16. U. of Chicago	3 429	1 045	(77)	3.3	(5)	2 521
17. Columbia U.	3 326	6 000	(6)	0.6	(90)	2 296
18. Cornell U.	3 214	1 507	(50)	2.1	(15)	2 496
19. City U. of New York	3 186	15 116	(1)	0.2	(100)	1 868
20. Massachusetts Institute of Technology	3 073	972	(81)	3.2	(6)	973
21. U. of California Davis	2 894	1 260	(62)	2.3	(12)	2 418
22. U. of North Carolina	2 732	6 325	(5)	0.4	(97)	1 776
23. U. of Southern California	2 682	9 973	(2)	0.3	(99)	2 057
24. U. of Maryland	2 619	3 454	(14)	0.8	(76.5)	1 800
25. Penn. State U.	2 601	3 052	(19)	0.9	(62.5)	1 888
26. U. of Colorado	2 563	2 729	(21)	0.9	(62.5)	2 016
27. Indiana U.	2 534	3 223	(16)	0.8	(76.5)	1 558
28. Ohio State U.	2 523	3 363	(15)	0.8	(76.5)	1 828
29. U. of California San Diego	2 487	946	(85)	2.6	(9)	2 171
30. U. of Cambridge, *U.K.*	2 414	1 200	(67)	2.0	(17.5)	1 781

Universities by the total number of publications produced
and Social Science Citation Indices, 1977

Rank	Total SSCI publications	Rank	Total A & HCI publications	Rank	Income (Millions of dollars)	Rank	Total students	Rank
(1)	1 283	(3)	267	(7)	307.9	(12)	13 919	(58)
(2)	1 157	(6)	299	(4)	439.6	(3)	63 144	(3)
(3)	1 159	(5)	227	(12)	328.0	(11)	26 510	(25)
(4)	1 305	(1)	372	(2)	294.7	(14)	36 495	(12)
(5)	1 299	(2)	337	(3)	696.2	(1)	120 132	(1)
(6)	1 226	(4)	230	(11)	526.9	(2)	52 803	(6)
(7)	818	(10)	133	(31)	409.9	(4)	47 380	(8)
(9)	867	(9)	259	(8)	259.2	(22)	28 400	(23)
(8)	723	(15.5)	140	(27)	302.3	(13)	11 711	(66)
(10)	769	(13)	137	(29)	266.9	(20)	30 813	(20)
(11)	713	(18)	167	(19)	283.0	(17)	17 270	(46)
(13)	798	(12)	290	(6)	207.4	(28)	7 641	(79)
(14)	899	(7)	186	(17)	–	–	31 334	(18)
(15)	691	(19)	292	(5)	213.9	(27)	32 643	(17)
(12)	586	(23)	145	(23)	240.4	(25)	7 375	(82)
(16)	719	(17)	189	(16)	381.5	(5)	5 682	(92)
(19)	799	(11)	231	(10)	253.9	(23)	12 350	(63)
(17)	574	(24)	144	(24.5)	264.6	(21)	14 325	(54)
(25)	895	(8)	423	(1)	334.4	(9)	115 437	(2)
(68)	410	(41)	44	(88)	369.9	(7)	7 787	(78)
(18)	389	(44)	87	(48)	105.7	(63)	12 275	(64)
(31)	738	(14)	218	(14)	267.3	(19)	28 779	(22)
(21)	545	(27.5)	80	(51.5)	153.1	(42)	18 457	(42)
(29)	675	(20)	144	(24.5)	283.9	(16)	61 409	(4)
(24)	614	(21)	99	(44)	281.7	(18)	40 235	(11)
(22)	458	(32)	89	(47)	190.4	(32)	19 243	(37)
(38)	732	(15.5)	253	(9)	348.2	(8)	59 824	(5)
(27)	552	(26)	143	(26)	373.3	(6)	48 515	(7)
(20)	261	(68.5)	55	(77)	164.3	(37)	5 127	(96.5)
(30)	411	(40)	222	(13)	54.5	(86)	10 849	(67)

Table 1

Universities	Total publications (A & HCI, SCI & SSCI)	Total University Faculty Size	Rank	Mean publications (A & HCI, SCI & SSCI)	Rank	Total SCI publications
31. Northwestern U.	2 399	1 681	(43)	1.4	(29)	1 774
32. New York U.	2 386	5 160	(10)	0.5	(93)	1 705
33. Washington U. St. Louis	2 343	2 141	(33)	1.1	(43)	2 007
34. U. of Iowa	2 340	1 193	(68)	2.0	(17.5)	1 831
35. U. of Florida	2 278	2 868	(20)	0.8	(76.5)	1 818
36. U. of Pittsburgh	2 213	2 204	(32)	1.0	(52.5)	1 563
37. U. of Missouri	2 207	2 722	(27)	0.8	(76.5)	1 541
38. Oxford U., *U.K.*	2 198	1 300	(56)	1.7	(22)	1 553
39. Purdue U.	2 129	2 376	(28)	0.9	(62.5)	1 637
40. State U. of New York – Buffalo	2 046	979	(80)	2.1	(15)	1 431
41. U. of Rochester	2 036	1 228	(65)	1.7	(22)	1 618
42. Michigan State U.	2 032	2 687	(23)	0.8	(76.5)	1 546
43. U. of British Columbia, *Canada*	1 991	1 789	(39)	1.1	(43)	1 384
44. McGill U., *Canada*	1 985	1 255	(61)	1.6	(25)	1 576
45. U. of Manchester, *U.K.*	1 761	1 900	(35)	0.9	(62.5)	1 312
46. Rutgers State U.	1 742	1 580	(47)	1.1	(43)	968
47. U. of Georgia	1 728	1 694	(41)	1.0	(52.5)	1 203
48. U. of Alberta, *Canada*	1 703	1 487	(51)	1.1	(43)	1 333
49. Princeton U.	1 657	785	(87)	2.1	(15)	1 195
50. U. of Alabama	1 620	1 177	(69)	1.4	(29)	1 346
51. U. of Virginia	1 592	1 660	(45)	1.1	(52.5)	1 249
52. U. of Utah	1 576	1 050	(75)	1.5	(27)	1 224
53. Boston U.	1 569	1 880	(37)	0.8	(76.5)	1 030
54. U. of Kansas	1 563	1 286	(58)	1.2	(36)	1 106
55. U. of Massachusetts	1 562	1 892	(36)	0.8	(76.5)	999
56. U. of Connecticut	1 546	1 375	(54)	1.1	(43)	1 116
57. U. of Tennessee	1 536	3 217	(17)	0.5	(93)	1 185
58. Case Western Reserve	1 523	1 250	(64)	1.2	(36)	1 256
59. Duke U.	1 513	1 253	(63)	1.2	(36)	1 007
60. U. of Glasgow, *U.K.*	1 511	2 054	(34)	0.7	(37)	1 221
61. U. of Kentucky	1 306	1 545	(48)	1.1	(52.5)	1 071
62. Vanderbilt U.	1 490	1 687	(42)	0.9	(62.5)	1 175
63. U. Arizona	1 443	1 828	(38)	0.8	(76.5)	951
64. State U. of New York Stony Brook	1 405	643	(95)	2.2	(13)	1 063

(cont.)

Rank	Total SSCI publications	Rank	Total A & HCI publications	Rank	Income (Millions of dollars)	Rank	Total students	Rank
(32)	500	(30)	125	(32.5)	133.5	(50)	10 701	(68)
(33)	545	(27.5)	136	(30)	332.8	(10)	27 907	(24)
(23)	299	(60)	37	(91.5)	121.2	(54)	6 302	(89)
(26)	412	(39)	97	(45)	198.4	(30)	18 740	(41)
(28)	403	(42)	57	(74.5)	229.3	(26)	21 051	(30)
(37)	570	(25)	80	(51.5)	199.8	(29)	30 044	(21)
(41)	528	(29)	138	(28)	241.9	(24)	43 356	(9)
(39)	433	(35)	212	(15)	55.7	(85)	24 910	(26)
(34)	385	(45)	57	(74.5)	193.3	(31)	8 750	(76)
(42)	444	(34)	171	(18)	143.8	(45)	17 245	(47)
(35)	366	(49)	52	(82)	179.5	(35)	41 686	(10)
(40)	414	(38)	72	(58)	284.2	(15)	5 945	(90)
(43)	490	(31)	117	(34)	137.7	(49)	19 980	(35)
(36)	351	(52)	58	(72)	88.6	(69.5)	17 156	(48)
(46)	338	(54)	111	(36)	68.6	(80)	14 036	(57)
(70)	610	(22)	164	(20)	169.0	(36)	31 210	(19)
(51)	449	(33)	76	(56)	154.1	(41)	19 001	(40)
(45)	269	(64)	101	(41.5)	98.3	(68)	19 736	(36)
(52)	307	(56)	155	(22)	117.4	(57)	5 127	(96.5)
(44)	234	(76.5)	40	(90)	57.3	(84)	12 649	(62)
(48)	335	(55)	108	(37.5)	127.8	(51)	9 607	(72)
(49)	292	(61)	60	(68)	124.1	(53)	20 528	(32)
(61.5)	423	(36.5)	116	(35)	115.3	(58)	20 299	(31)
(57)	371	(47)	86	(49)	83.5	(73)	18 265	(44)
(66)	400	(43)	163	(21)	142.8	(46)	23 339	(28)
(56)	368	(48)	62	(65)	118.7	(56)	20 028	(34)
(53)	304	(57.5)	47	(86.5)	160.8	(39)	36 304	(13)
(47)	235	(75)	32	(95.5)	102.8	(66)	7 062	(84)
(65)	423	(36.5)	83	(50)	180.6	(34)	6 483	(88)
(50)	225	(80)	65	(60)	45.1	(92)	9 127	(75)
(58)	362	(51)	73	(57)	189.3	(33)	16 333	(50)
(54)	256	(70)	59	(70.5)	109.7	(62)	5 528	(95)
(72)	384	(46)	108	(37.5)	147.0	(43.5)	22 989	(29)
(60)	264	(66.5)	78	(53.5)	59.7	(82)	9 754	(70)

Table 1

Universities	Total publications (A & HCI, SCI & SSCI)	Total University Faculty Size	Rank	Mean publications (A & HCI, SCI & SSCI)	Rank	Total SCI publications
65. U. of Wales, *U.K.*	1 355	344	(99)	3.9	(2)	1 024
66. Wayne State U.	1 345	1 600	(46)	0.8	(76.5)	1 030
67. U. of Miami (Florida)	1 328	1 290	(57)	1.1	(52.5)	1 162
68. U. of Nebraska	1 324	2 461	(25)	0.5	(93)	945
69. Temple U.	1 323	2 426	(27)	0.5	(93)	915
70. U. of Oregon	1 317	1 062	(74)	1.2	(52.5)	971
71. U. of Cincinnati	1 310	3 161	(18)	0.4	(97)	986
72. Emory U.	1 293	950	(82)	1.4	(30.5)	1 070
73. U. of Western Ontario, *Canada*	1 282	1 269	(59)	1.1	(52.5)	853
74. Iowa State U.	1 278	1 518	(49)	0.8	(76.5)	1 023
75. McMaster U., *Canada*	1 239	771	(88)	1.6	(25)	962
76. U. of Birmingham, *U.K.*	1 217	1 046	(76)	1.2	(52.5)	850
77. U. of Edinburgh, *U.K.*	1 207	1 400	(53)	0.9	(62.5)	842
78. U. of Hawaii	1 157	2 302	(29)	0.5	(93)	810
79. U. of Leeds, *U.K.*	1 108	319	(100)	3.5	(4)	882
80. Brown U.	1 071	432	(98)	2.5	(10)	754
81. U. of Bristol, *U.K.*	1 064	2 500	(24)	0.4	(97)	887
82. U. of Manitoba, *Canada*	1 057	1 210	(66)	0.9	(62.5)	821
83. U. of Montreal, *Canada*	1 051	1 268	(60)	0. 2	(76.5)	758
84. Virginia Polytechnical U.	1 048	1 070	(73)	1.1	(52.5)	763
85. U. of Liverpool, *U.K.*	965	1 010	(79)	1.1	(52.5)	756
86. U. of Newcastle upon Tyne, *U.K.*	951	1 100	(71.5)	0.9	(62.5)	787
87. Colorado State U.	943	952	(82)	1.1	(52.5)	756
88. U. of Sheffield, *U.K.*	927	924	(86)	1.1	(52.5)	702
89. U. of Oklahoma	918	1 343	(55)	0.7	(87)	652
90. U. of Guelph, *Canada*	890	709	(91)	1.3	(31.5)	727
91. U. of California Santa Barbara	890	947	(84)	0.9	(62.5)	562
92. Florida State U.	889	1 100	(71.5)	0.8	(76.5)	522
93. U. of Mexico	875	1 171	(70)	0.7	(87)	589
94. U. of Waterloo, *Canada*	851	741	(90)	1.1	(43)	637

(cont.)

Rank	Total SSCI publications	Rank	Total A & HCI publications	Rank	Income (Millions of dollars)	Rank	Total students	Rank
(63)	228	(78)	103	(40)	82.8	(74)	–	–
(61.5)	238	(73.5)	77	(55)	140.1	(48)	32 985	(15)
(55)	145	(95)	21	(100)	124.5	(52)	13 589	(54)
(73)	301	(59)	78	(53.5)	110.3	(61)	20 304	(33)
(74)	342	(53)	66	(59)	158.7	(40)	24 450	(27)
(69)	285	(63)	61	(66)	79.8	(75)	14 712	(53)
(67)	264	(66.5)	60	(68)	142.0	(47)	33 946	(14)
(59)	170	(90)	53	(80)	111.7	(60)	3 994	(99)
(77)	365	(50)	64	(61.5)	112.6	(59)	18 024	(45)
(64)	223	(81)	32	(96.5)	163.8	(38)	19 097	(39)
(71)	226	(79)	51	(83)	70.9	(78)	10 147	(69)
(78)	266	(65)	101	(41.5)	44.9	(93)	7 880	(77)
(79)	240	(71.5)	125	(32.5)	51.6	(88)	9 551	(73)
(81)	287	(62)	60	(68)	147.0	(43.5)	19 242	(38)
(76)	169	(91)	57	(74.5)	45.4	(91)	9 358	(74)
(89)	213	(82)	104	(39)	60.1	(81)	5 643	(93)
(75)	128	(99)	49	(84)	43.7	(94.5)	6 634	(86)
(80)	193	(84)	43	(89)	88.5	(71)	14 137	(56)
(84)	238	(73.5)	54	(78)	119.2	(55)	33 346	(16)
(83)	261	(68.5)	24	(99)	88.6	(69.5)	11 977	(65)
(85.5)	146	(94)	63	(63.5)	48.0	(89)	7 041	(85)
(82)	116	(100)	48	(85)	43.7	(94.5)	6 554	(87)
(85.5)	160	(92)	27	(98)	104.4	(64)	15 813	(51)
(89)	172	(89)	53	(80)	31.9	(97)	7 080	(83)
(97)	209	(83)	57	(74.5)	41.6	(96)	18 384	(43)
(88)	132	(97)	31	(96)	71.1	(77)	9 738	(71)
(97)	234	(76.5)	94	(46)	70.8	(79)	13 578	(60)
(99)	304	(57.5)	63	(63.5)	104.3	(65)	16 456	(49)
(96)	187	(85)	100	(43)	85.5	(72)	14 933	(52)
(92)	178	(86)	36	(92)	58.3	(83)	12 714	(61)

Table 1

Universities	Total publications (A & HCI, SCI & SSCI)	Total University Faculty Size	Rank	Mean publications (A & HCI, SCI & SSCI)	Rank	Total SCI publications
95. U. of California Riverside	843	766	(89)	1.1	(43)	621
96. U. of Sussex, *U.K.*	842	495	(97)	1.7	(22)	538
97. U. of Southampton, *U.K.*	813	631	(96)	1.3	(31.5)	639
98. Tulane U.	810	700	(92.5)	1.2	(36)	626
99. Washington State U.	793	1 013	(78)	0.8	(76.5)	598
100. Dalhousie U., *Canada*	711	699	(94)	1.0	(52.5)	477
Total	215 653	218 643		131.0		159 111
Mean	2 157	2 186		1.3		1 591

Undoubtedly there are other sources of measurement error. The listings in the *Citation Indices* are subject to several sources of error in the counting up of over 80 000 citations for the psychologists, and over 230 000 publications for the universities as a whole. On the other hand all the data have been double-checked and we feel that the amount of error is small relative to the size of the undertaking and does not seriously affect the overall rankings of the universities across the several dimensions.

One last source of error variance that might be mentioned concerns the variable dates of the archives from which we gathered data. For example, while the figures on the student numbers and finances of the United States universities were for the years 1971–1972, the figures for faculty members and their productivity were from 1977. Similarly, for the comparisons with the psychology departments, while the reputational ratings were published in 1969, the publication and citation measures were for 1975.

Finally, while the finances of the United States universities were gathered for 1971–1972, those from British and Canadian universities were gathered for 1975–1976. These discrepancies between years would serve to obscure and reduce comparisons and relationships between variables.

(cont.)

Rank	Total SSCI publications	Rank	Total A & HCI publications	Rank	Income (Millions of dollars)	Rank	Total students	Rank
(94)	175	(87.5)	47	(85)	54.3	(87)	5 758	(91)
(98)	240	(71.5)	64	(61.5)	19.2	(99)	4 185	(98)
(91)	141	(96)	33	(93)	26.9	(98)	5 345	(94)
(93)	131	(98)	53	(80)	75.9	(76)	7 496	(80)
(95)	158	(93)	37	(90.5)	99.3	(67)	14 200	(55)
(100)	175	(87.5)	59	(70.5)	47.2	(90)	7 401	(81)
	43 685		11 246		16 494.5		2 084 519	
	437		112		166.5		21 056	

Results

The 169 universities in our sample produced over 230 000 publications in 1977 by our criterion. These publications were far from evenly distributed across the different universities, nor across the three countries that comprised our samples. Table 1 presents a rank ordering, in terms of total productivity, of the 100 most productive universities. Also reported in Table 1 for each university is the university's total faculty size, mean publications, number of publications separately for the *SCI, SSCI,* and *A & HCI*, income (standardized on 1976 U.S. dollar equivalents), total number of students, and the university's rank on each of these variables. The 10 overall most productive universities were Harvard University; the University of Texas; the University of California, Los Angeles; the University of London, England; the University of Wisconsin; the University of Illinois; the University of Minnesota; the University of California, Berkeley; Stanford University; and the University of Washington-Seattle. Fifteen of the most productive 100 universities were from the United Kingdom while eleven were from Canada. The most productive British universities were the University of London (4th), Cambridge University (30th), Oxford University (38th), the University of Manchester (45th), the University of Glasgow (60th), and the University of Wales (65th). The most productive

Table 2

Pearson product moment correlations

	1	2	3	4	5	6	7	8	9	10	11
1. Total publications (A & HCI, SCI and SSCI	1.0	0.55	0.39	0.23	0.62	0.94	0.82	0.99	0.98	0.82	−0.13
2. Total university faculty size		1.0	−0.27	0.67	−0.32	0.66	−0.37	0.50	−0.21	0.62	−0.10
3. Mean publications			1.0	0.23	0.62	0.24	0.82	0.42	0.98	0.16	−0.13
4. Total A & HCI publications				1.0	0.24	0.88	0.17	0.71	0.23	0.74	−0.30
5. Mean A & HCI publications					1.0	0.03	0.78	0.01	0.50	−0.08	−0.12
6. Total SSCI publications						1.0	0.14	0.90	0.28	0.88	−0.30
7. Mean SSCI publications							1.0	0.16	0.28	0.03	−0.10
8. Total SCI publications								1.0	0.49	0.78	−0.26
9. Mean SCI publications									1.0	0.20	−0.14
10. University revenue										1.0	−0.15
11. Year university was founded											1.0
12. Number of volumes in library											
13. Number of current periodicals											
14. Total number of students											
15. Total students/faculty ratio											
16. Total number of undergraduate students											
17. Undergraduate student/faculty ratio											
18. Total number of graduate students											
19. Graduate student/faculty ratio											
20. GRE, Verbal											
21. GRE, Quantitative											
22. GRE, Advanced											
23. MAT											
24. SAT, Verbal											
25. SAT, Mathematical											
26. Roose and Anderson Ratings											

among 26 variables on 98 American Universites

12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
0.83	0.66	0.39	−0.34	0.42	−0.33	0.54	−0.18	0.27	0.16	0.15	0.36	0.11	0.24	0.44
0.48	0.37	0.82	−0.19	0.69	0.25	0.82	−0.28	−0.01	−0.08	−0.07	0.03	−0.12	−0.06	0.35
0.27	0.21	−0.28	−0.23	−0.30	−0.22	−0.18	0.17	0.37	0.22	0.40	0.36	0.44	0.53	0.44
0.80	0.63	0.65	−0.13	0.60	−0.17	0.72	−0.08	0.21	0.09	0.20	0.20	0.22	0.28	0.62
0.14	0.09	−0.26	−0.07	−0.27	0.01	−0.19	0.39	0.24	0.15	0.46	0.38	0.64	0.55	0.21
0.86	0.69	0.53	0.23	0.55	−0.24	0.68	−0.12	0.23	0.14	0.18	0.14	0.08	0.19	0.67
0.18	0.13	−0.33	−0.10	−0.33	−0.03	−0.21	0.52	0.20	0.09	0.42	0.24	0.51	0.51	0.21
0.79	0.63	0.33	−0.37	0.36	−0.36	0.47	−0.20	0.28	0.17	0.12	0.22	0.10	0.25	0.68
0.29	0.24	−0.24	−0.28	−0.25	−0.26	−0.14	0.05	0.20	0.09	0.42	0.29	0.39	0.50	0.46
0.73	0.69	0.57	−0.12	0.67	−0.10	0.69	−0.06	0.17	0.05	−0.01	0.09	−0.02	0.08	0.61
−0.46	−0.12	0.08	0.30	0.12	0.21	−0.11	0.10	−0.25	−0.19	−0.27	−0.31	−0.26	−0.27	0.20
1.0	0.76	0.33	−0.30	0.35	−0.29	0.50	−0.10	0.32	0.12	0.22	0.20	0.32	0.41	0.64
	1.0	0.32	−0.15	0.41	−0.13	0.43	−0.09	0.17	0.03	0.13	0.16	0.16	0.28	0.54
		1.0	0.24	0.89	0.08	0.81	−0.16	−0.01	−0.08	−0.07	−0.05	−0.38	−0.30	0.25
			1.0	0.29	0.77	0.04	0.22	−0.24	−0.19	−0.21	−0.17	−0.59	−0.58	−0.21
				1.0	0.32	0.76	−0.13	−0.01	−0.04	−0.11	−0.08	−0.44	−0.38	0.17
					1.0	0.00	0.33	−0.19	−0.08	−0.12	−0.12	−0.65	−0.68	−0.24
						1.0	0.43	0.04	−0.08	−0.06	−0.05	−0.32	−0.25	0.37
							1.0	0.02	−0.15	0.13	−0.02	−0.07	−0.13	−0.04
								1.0	0.60	0.58	0.63	0.48	0.47	0.41
									1.0	0.70	0.78	0.27	0.26	0.44
										1.0	0.81	0.49	0.43	0.45
											1.0	0.37	0.47	0.22
												1.0	0.91	0.26
													1.0	0.36
														1.0

Table 3a
Item loadings > |0.30| on the five factors revealed by the principal components analysis for the 39 British Universities

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
1. Total publications (A & HCI, SCI and SSCI)	0.96				
2. Total university faculty size	0.44	−0.54	−0.55		
3. Mean publications	0.76	0.43		0.31	
4. Total A & HCI publications	0.92				
5. Mean A & HCI publications	0.62		0.53	0.30	
6. Total SSCI publications	0.96				
7. Mean SSCI publications	0.77	0.33			
8. Total SCI publications	0.95				
9. Mean SCI publications	0.76	0.34	0.42	0.36	
10. University revenue	0.94				
11. Year university was founded	−0.33	0.60		−0.44	
12. Number of volumes in library	0.51	−0.57		0.60	
13. Number of current periodicals	0.34	−0.44		0.72	
14. Total number of students	0.96				
15. Total student/faculty ratio	0.59	0.70			0.33
16. Total number of undergraduate students	0.93		−0.32		
17. Undergraduate student/faculty ratio	0.38	0.55			
18. Total number of graduate students	0.94				
19. Graduate student/faculty ratio	0.68	0.48			0.46
20. Total citations to psychology faculty	0.91			−0.33	
21. Psychology faculty size	0.83			−0.36	
22. Mean citations to psychology/faculty	0.43	−0.57	0.63		
23. Median citations to psychology/faculty		−0.61	0.56		0.38
24. Number of psychology faculty with >25 citations	0.84			−0.33	
25. Number of psychology faculty with >100 citations	0.81	−0.30			0.30
26. Total publications of psychology faculty	0.88			−0.37	
27. Mean publications of psychology faculty		0.73			−0.53
Percentage of total variance accounted for	55%	13%	10%	8%	6%

Table 3b
Item loadings > |0.30| on the five factors revealed by the principal components analysis for the 31 Canadian Universities

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
1. Total publications (A & HCI, SCI and SSCI)	0.96				
2. Total university faculty size	0.86		−0.42		
3. Mean publications	0.75		0.41		
4. Total A & HCI publications	0.89				
5. Mean A & HCI publications	0.40		0.64	−0.45	
6. Total SSCI publications	0.97				
7. Mean SSCI publications	0.72		0.57		
8. Total SCI publications	0.94				
9. Mean SCI publications	0.74			0.40	
10. University revenue	0.86		−0.37		
11. Year university was founded	−0.34				0.49
12. Number of volumes in library	0.90				
13. Number of current periodicals	0.80				
14. Total number of students	0.86	0.40			
15. Total student/faculty ratio		0.84	0.41		
16. Total number of undergraduate students		0.43			
17. Undergraduate student/faculty ratio		0.83	0.40	0.31	
18. Total number of graduate students	0.89				
19. Graduate student/faculty ratio	0.66	0.46		−0.30	
20. Total citations to psychology faculty	0.88			−0.31	
21. Psychology faculty size	0.74	0.34			
22. Mean citations to psychology/faculty	0.89				
23. Median citations to psychology/faculty	0.68	−0.40	0.41		
24. Number of psychology faculty with >25 citations	0.86				
25. Number of psychology faculty with >100 citations	0.78				−0.41
26. Total publications of psychology faculty	0.87				
27. Mean publications of psychology faculty	0.63	−0.35		0.41	0.30
Percentage of total variance accounted for	60%	10%	8%	5%	5%

Table 3c
Item loadings > |0.30| on five factors revealed by the principal components analysis for the 98 United States Universities

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
1. Total publications (A & HCI SCI and SSCI)	0.71	0.42			0.41
2. Total university faculty size	0.81				
3. Mean publications					0.87
4. Total A & HCI publications	0.86				
5. Mean A & HCI publications					0.35
6. Total SSCI publications	0.82	0.39			
7. Mean SSCI publications					0.61
8. Total SCI publications	0.65	0.42			0.46
9. Mean SCI publications					0.90
10. University revenue	0.84				
11. Year university was founded					
12. Number of volumes in library	0.67	0.49			
13. Number of current periodicals	0.62	0.41			
14. Total number of students	0.84				
15. Total student/faculty ratio			−0.77		
16. Total number of undergraduate students			−0.34		
17. Undergraduate student/faculty ratio	0.84		−0.87		
18. Total number of graduate students	0.86		−0.30		

Canadian universities were the University of Toronto (14th), the University of British Columbia (43rd), McGill University (44th), and University of Alberta (48th), the University of Western Ontario (73rd), the McMaster University (75th). The great majority of the most productive universities, however, were clearly those from the United States, a finding that others have also reported.[24]

In order to assess the interrelatedness of all the variables in Table 1 and also those others of interest (e.g., number of volumes in the library, number of periodicals currently subscribed to, number of undergraduate and graduate students, student-faculty ratios etc.), Pearson product moment correlations were calculated separately for the British, Canadian, and United States. The matrix for the United

Table 3c (cont.)

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
19. Graduate student/faculty ratio			0.83		
20. Total citations to psychology faculty	0.34	0.76			
21. Psychology faculty size	0.50				
22. Mean citations to psychology faculty		0.86			
23. Median citations to psychology faculty		0.73		0.39	
24. Number of psychology faculty with >25 citations	0.30	0.62			
25. Number of psychology faculty with >100 citations		0.83			
26. Total publications of psychology faculty	0.44				
27. Mean publications of psychology faculty		0.35			0.35
28. Roose and Anderson Ratings	0.45	0.57			0.30
29. SAT, Verbal				0.30	
30. SAT, Mathematical			0.81		
31. GRE, Verbal				0.72	
32. GRE, Quantitative				0.98	
33. GRE, Advanced				0.84	
34. MAT				0.87	
Percentage of Total Variance Accounted for	36%	20%	8%	7%	5%

States sample is presented in Table 2. The data for the British and Canadian samples are available elsewhere.[25] In all three samples most of the correlations are *highly* significant, clearly suggesting the operation of a pervasive general factor in operation among all the variables. In order to examine this possibility, the three matrices were factored by principal components analysis, with unities in the diagonal. Five factors emerged with eigenvalues greater than one in both the British and Canadian samples, while 8 did so in the United States. In all three samples large first factors emerged accounting, respectively, for 55%, 60%, and 36% of the total variance of the British, Canadian, and United States samples. The loadings of all items $> |0.30|$ on the first five factors and the proportion of total variance for which they account are shown in Table 3.

Table 4a

Pearson product moment correlations* between the variables concerned with the entire university and those on the scientific impact and size of the *psychology* departments for 39 British Universities

Data on Entire University	Psychology Departmetn data						
	1 Total citations to Psychology Faculty	2 Psychology Faculty Size	3 Mean citations to Psychology Faculty	4 Number of Psychology Faculty with >25 citations	5 Total publications of Psychology Faculty	6 Mean publications of Psychology Faculty	Average r
1. Total publications (A & HCI, SCI and SSCI)	0.86	0.82	0.33	0.79	0.84	0.16	0.63
2. Total university faculty size	0.37	0.28	0.19	0.41	0.29	−0.13	0.24
3. Mean publications (A & HCI, SCI and SSCI)	0.48	0.59	0.21	0.38	0.62	0.51	0.47
4. Total A & HCI publications	0.83	0.69	0.46	0.79	0.77	0.23	0.63
5. Mean A & HCI publications	0.44	0.40	0.39	0.38	0.49	0.54	0.44
6. Total SSCI publications	0.90	0.84	0.34	0.83	0.84	0.16	0.66
7. Mean SSCI publications	0.61	0.62	0.36	0.53	0.68	0.51	0.55
8. Total SCI publications	0.84	0.81	0.31	0.77	0.88	0.14	0.63
9. Mean SCI publications	0.49	0.57	0.26	0.39	0.59	0.47	0.46
10. University revenue	0.86	0.90	0.20	0.76	0.91	0.16	0.63
11. Year university was founded	−0.29	−0.07	−0.41	−0.29	−0.11	−0.02	0.20

12. Number of volumes in library	0.37	0.08	0.55	0.40	0.16	0.14	0.28
13. Number of current periodicals	0.08	0.10	–0.13	0.04	0.10	–0.16	0.01
14. Total number of students	0.84	0.84	0.23	0.77	0.85	0.05	0.60
15. Total student/faculty ratio	0.40	0.44	0.02	0.32	0.42	0.01	0.27
16. Total number of undergraduate students	0.78	0.77	0.22	0.71	0.77	0.01	0.54
17. Undergraduate student/faculty ratio	0.24	0.19	–0.03	0.19	0.17	–0.22	0.09
18. Total number of graduate students	0.88	0.91	0.21	0.81	0.91	0.09	0.64
19. Graduate student/faculty ratio	0.61	0.59	0.09	0.57	0.58	–0.09	0.39
Average r =	0.59	0.55	0.24	0.53	0.58	0.14	0.44

*All correlations over $r = 0.33$ are significant at $p < 0.05$ for a two-tailed test for $N = 39$

Table 4b
Pearson product moment correlations* between the variables concerned with the entire university and those on the scientific impact and size of the *psychology* department for the 31 Canadian Universities

Data on Entire University	Psychology Department data						
	1 Total citations to Psychology Faculty	2 Psychology Faculty Size	3 Mean citations to Psychology Faculty	4 Number of Psychology Faculty with >25 citations	5 Total publications of Psychology Faculty	6 Mean publications of Psychology Faculty	Average r
1. Total publications (A & HCI, SCI and SSCI)	0.88	0.62	0.87	0.82	0.82	0.62	0.77
2. Total university faculty size	0.68	0.72	0.64	0.62	0.77	0.55	0.66
3. Mean publications (A & HCI, SCI and SSCI)	0.63	0.45	0.77	0.73	0.62	0.54	0.62
4. Total A & HCI publications	0.88	0.69	0.78	0.76	0.79	0.52	0.74
5. Mean A & HCI publications	0.38	0.27	0.38	0.38	0.33	0.24	0.33
6. Total SSCI publications	0.86	0.72	0.84	0.82	0.88	0.63	0.79
7. Mean SSCI publications	0.66	0.35	0.72	0.66	0.63	0.51	0.59
8. Total SCI publications	0.82	0.57	0.85	0.80	0.79	0.65	0.75
9. Mean SCI publications	0.54	0.35	0.72	0.66	0.56	0.58	0.57
10. University revenue	0.72	0.71	0.65	0.62	0.71	0.42	0.64
11. Year university was founded	−0.30	−0.06	−0.33	−0.28	−0.17	−0.18	−0.22

12. Number of volumes in library	0.74	0.62	0.74	0.71	0.75	0.55	0.69
13. Number of current periodicals	0.64	0.65	0.62	0.61	0.64	0.43	0.60
14. Total number of students	0.65	0.79	0.60	0.56	0.68	0.43	0.62
15. Total student/faculty ratio	0.13	0.33	0.11	0.09	0.09	0.00	0.13
16. Total number of undergraduate students	0.52	0.75	0.51	0.46	0.63	0.45	0.55
17. Undergraduate student/faculty ratio	−0.11	0.14	−0.10	−0.14	−0.12	−0.10	−0.07
18. Total number of graduate students	0.84	0.75	0.72	0.71	0.69	0.33	0.67
19. Graduate student/faculty ratio	0.55	0.63	0.48	0.50	0.45	0.11	0.45
Average r	0.60	0.54	0.59	0.56	0.57	0.40	0.54

*All correlations over $r = 0.36$ are significant at $p < 0.05$ for a two-tailed test for $N = 31$

Table 4c
Pearson product moment correlations* between the variables concerned with the entire university and those on the scientific impact and size of the psychology departments for 98 United States universities

Data on Entire University	1 Total citations to Psychology Faculty	2 Psychology Faculty Size	3 Mean citations to Psychology Faculty	4 Number of Psychology Faculty with >25 citations	5 Total publications of Psychology Faculty	6 Mean publications of Psychology Faculty	Average r
1. Total publications (A & HCI, SCI and SSCI)	0.71	0.47	0.56	0.63	0.58	0.36	0.50
2. Total university faculty size	0.38	0.57	0.16	0.34	0.50	0.12	0.35
3. Mean publications (A & HCI, SCI and SSCI)	0.29	–0.04	0.41	0.27	0.12	0.32	0.23
4. Total A & HCI publications	0.58	0.53	0.41	0.53	0.55	0.23	0.47
5. Mean A & HCI publications	0.07	–0.12	0.16	0.12	–0.04	0.06	0.04
6. Total SSCI publications	0.71	0.57	0.51	0.65	0.64	0.32	0.57
7. Mean SSCI publications	0.19	–0.06	0.27	0.22	0.06	0.18	0.14
8. Total SCI publications	0.69	0.42	0.56	0.60	0.54	0.36	0.55
9. Mean SCI publications	0.31	–0.02	0.42	0.28	0.14	0.33	0.24
10. University revenue	0.56	0.52	0.37	0.54	0.54	0.22	0.46
11. Year university was founded	–0.28	–0.12	–0.25	–0.20	–0.19	–0.19	0.21

12. Number of volumes in library	0.72	0.43	0.58	0.63	0.52	0.30	0.53
13. Number of current periodicals	0.55	0.34	0.43	0.52	0.47	0.29	0.43
14. Total number of students	0.19	0.53	–0.04	0.18	0.42	0.00	0.21
15. Total student/faculty ratio	–0.33	–0.06	–0.36	–0.25	–0.15	–0.23	–0.23
16. Total number of undergraduate students	0.14	0.48	–0.11	0.13	0.41	0.02	0.18
17. Undergraduate student/faculty ratio	–0.37	–0.06	–0.46	–0.32	–0.16	–0.26	0.27
18. Total number of graduate students	0.38	0.62	0.13	0.29	0.50	0.01	0.32
19. Graduate student/faculty ratio	–0.11	–0.05	–0.08	–0.09	–0.11	–0.17	0.10
20. GRE, Verbal	0.20	–0.05	0.40	0.21	0.02	0.27	0.19
21. GRE, Quantitative	0.23	–0.10	0.50	0.27	0.05	0.38	0.22
22. GRE, Advanced	0.24	0.07	0.36	0.33	0.20	0.24	0.24
23. MAT	0.20	0.09	0.20	0.34	0.10	0.05	0.16
24. SAT, Verbal	–0.23	–0.23	0.49	0.25	–0.02	0.31	0.10
25. SAT, Mathematical	0.36	–0.06	0.53	0.31	0.14	0.40	0.28
26. Roose and Anderson ratings	–0.69	–0.34	–0.64	–0.69	–0.47	–0.39	–0.54
Average r =	0.36	0.22	0.35	0.35	0.29	0.23	0.30

*All correlations over r = 0.20 are significant at $p < 0.05$ for a two-tailed test for N = 98.

The general factor so clearly highlighted in Table 3 is further explicated by the analyses of the interrelationships among the data on the psychology departments with that of the university as a whole. These data are presented in Table 4 separately for the three samples. Those psychology departments with large numbers of highly cited individuals are clearly subsets of universities which are the most productive overall, have the most students and faculty, the most library books and periodicals, and the most money.

Discussion

The purpose of this study was to obtain information corcerning the generality of the "quality" of most of the major universities in Britain, Canada, and the United States for the year 1977. We have discovered that a pervasive general factor exists within universities in all three countries. For example, there is a very strong tendency for universities productive overall to be highly productive in specific areas, i.e., universities with productive science departments are highly productive in the social sciences and arts and humanities too (even when money and size are controlled for). The degree of wealth a university has also clearly predicts the high degree of productivity and the large population of students and faculty. Further, merely by knowing how many members of the psychology department had greater than 25 citations, one may predict the total number of publications produced by the entire university, the number of books in the library, the total number of graduate and undergraduate students, the faculty size, and the total university revenue. Knowing the faculty size of the psychology department is also a valid predictor of the same variables. The pervasiveness of this general factor is perhaps particularly compelling given the sources of error in our data that we outlined in the Methods.

It is interesting to conjecture as to why research productivity, as measured by the total number of publications, correlates so highly with so many other characteristics of universities. We have generated three labels which might account for the "general factor" that emerged from the data. It may be designated as a factor of wealth, quality or size.

Revenue is clearly a principal mediator: The number of millions of dollars a University earns predicts all the other variables of interest in this study. For example, in the United States sample there is a correlation of $\underline{r} = 0.82$ between a university's income and the number of publications produced by its faculty members. In the British and Canadian samples, this figure is even higher ($\underline{rs} = 0.96$ and 0.85). The size of these correlations suggests they are measuring

virtually identical dimensions. Thus, the quality and wealth of a university are clearly related. At present the funding of universities ranges widely (19.2 to 696.2 millions in 1976 U.S. dollars for the universities in Table 1). One could argue that productive faculty are partially a function of the opportunities provided them, such that faculty from a university which values research and is financially able to provide research space, technical and secretarial support, and freedom from heavy teaching loads, will produce research of greater quantity, as well as impact.

In regard to a dimension of quality, one suggestion is that universities acquire "prestige", a certain reputation in society. Academic "superstars" are few in number, and tend to be highly concentrated in just a few places. It may be that these "superstars" attract students to a particular university, more directly in the case of graduates than in the case of undergraduates, who are attracted to the generalized "reputation" of quality that a university has achieved. In the United States sample, the productivity and impact measures of universities correlated significantly with scholastic aptitude scores of both graduates and undergraduates. This argument implies that a prime mover is the quality of the faculty. A superior faculty creates prestige, attracts research money, quality students, and still more governmental money. This is followed by further increments in prestige, expansion, and so on.

The student and faculty population of a university is a third dimension which is implicated. The total number of students and faculty a university had also predicted productivity. A large student body means more faculty members, more money, and therefore greater potential for doing research. Perhaps in larger universities there is more flexibility in regard to teaching, thus freeing faculty for research. Further, with more graduate students who collaborate on research projects, (and subsequently cite their faculty mentors), the indices of "quality" of faculty will increase.

Whatever the final explanation for the results found here, it is clear, as has often been pointed out in the literature, that scientific productivity is a highly stratified phenomenon.[26] It will be interesting to see what changes occur over the next decades, and why. It will also be interesting to see how universities in countries other than those examined here might compare, both now, and in the future.[27]

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This research was supported by Social Science and Humanities Research Council of Canada Grant No. 410-78-0108 to the first author.

We wish to thank Dr. George E. *Connell*, President of the University of Western Ontario, for his valuable comments on an earlier manuscript, Dr. Norman S. *Endler*, Professor of Psy-

chology at York University, for making the data from his 1977 *Canadian Psychological Review* article available to us, and Dr. Henry L. *Roediger* III, Professor of Psychology at Purdue University, for his interest and encouragement. Although we acknowledge our thanks to these scholars, they are in no way responsible nor even necessarily in agreement with, the analyses and interpretations presented.

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