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ABSTRACT

This study used the restricted access database of the 1993 National Study of Postsecondary Faculty to examine faculty workload by academic discipline for full-time regularly appointed teaching and research faculty in public Carnegie research I and II and Doctoral I and II institutions (n=2,056). Data are reported for 14 disciplinary areas (agriculture, business, education, engineering, fine arts, health, English, comminations, history, biology, physical science, mathematics, economics, psychology, and sociology) and include teaching load by student level, research funding by source, and scholarly productivity. Chi-square analysis considered whether faculty at different Carnegie class institutions were more or less likely to engage in an activity, and whether there was a difference in magnitude if engaged. In Chi-square analyses significant at the 0.05 level, teaching was associated with Carnegie class in 19 of 120 analyses, obtaining external funding was associated in 3 analyses, and outcomes of publishing was significant in only 1 case. Differences by magnitude were found in 5 instances. There are nine data tables and nine figures. (Contains 12 references.) (CH)

Using National Survey of Postsecondary Faculty Data to Form Disciplinary Specific Comparative Productivity Figures for Public Institutions with Significant Graduate and Research Programs

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Using National Survey of Postsecondary Faculty Data to Form Disciplinary Specific Comparative Productivity Figures for Public Institutions with Significant Graduate and Research Programs

This study used the restricted access database of the 1993 National Study of Postsecondary Faculty to produce valid, representative faculty workload and activity information by academic discipline for the full-time teaching and research faculty of public Carnegie research and doctoral institutions. The descriptive information includes teaching loads by student level, research funding by source, and scholarly productivity. Statistics are reported for 14 disciplinary areas and are intended to provide fair and objective comparative figures for those concerned with faculty workload and productivity issues.

Purpose of the Study

There is a dearth of reliable and valid comparative information about faculty productivity available to university administrators. This forces reliance on anecdotal evidence, parochial practices, or for the fortunate few, data exchange materials. Even the developing national effort to collect basic information on faculty productivity, the *National Cost Study* by the University of Delaware and Dr. Michael Middaugh, is not collected at a level of detail and does not collect information from enough categories to support analysis of faculty workload. Likewise, data exchanges typically are in the aggregate and prevent the unit level processing required for accurate accumulation of comparable figures. Even if analysis is limited to instructional production standards, there are few good sources of information.

Among the sources that might be used to establish instructional standards are the body of research on the relationship between class size and learning (Smith & Glass, 1980), formula-funding standards used by states to determine the instructional component of appropriations (Ahumada, 1990; Dijkman, 1985), and mathematical fit of departmental aggregate data (Bloom, 1983; Chatman, 1993). The first possible source, class size research, is promising but very incomplete and there is no way to translate the curvilinear relationship between class size and learner gains (Smith & Glass, 1980) into practical standards without establishing acceptable levels of learning. In addition, research in learning and class size has not been extensive enough to support disciplinary and student-level differences in college instruction. The second source, formula-funding standards used by states, are typically uniform across institutional types and are based on descriptive studies performed at their inception. Generally, these standards have changed little even though higher education has increased greatly in size and complexity and, if put to the test, formula-funding standards do not fit institutional data well (Chatman, 1993). The third source, best-fit mathematical techniques, has used departmental aggregate data shared among institutional data exchanges to find FTE faculty to SCH FTE ratios that minimize observed error. While the resulting standards do fit reported data better than formula-funding standards, considerable error remains (Chatman, 1995a; Chatman, 1995b). In sum, there are significant problems with each of these alternatives and none of these speak to faculty activity beyond teaching.

There is a descriptive research alternative (Chatman, 1996). The best publicly available efforts to collect faculty workload information have been by the U.S. Department of Education's National Center for Education Statistics (NCES) in its *National Study of Postsecondary Faculty* (NSOPF) of 1988, repeated in 1993, and currently being performed again. This study relies on the restricted access database of NSOPF-93 to provide valid, representative faculty workload and activity information by academic discipline for teaching and research faculty of public universities: Carnegie Research 1 and 2 and Doctoral 1 and 2 institutions.

The tables published here are intended to provide a fair and objective comparative figure for university administrators concerned with faculty workload and productivity issues. The figures are representative of faculty nationwide at public universities with substantive doctoral programs and logically reflect their activities in providing both undergraduate and graduate instruction, making professional contributions, and in acquiring and performing sponsored research. The figures are benchmarks to use as were the original benchmarks: reliable, consistent marked lengths on the workbench to return to when measurements are in question; not to be used in support of recent business fads applied to postsecondary education (Birnbaum, 2000). By their descriptive nature, the benchmarks offered here are not prescriptive nor do they represent optimal levels of performance. Likewise, it is unlikely that many universities would strive for or reasonably expect to attain a uniform level of performance in all areas.

1992-93 National Survey of Postsecondary Faculty

The *1992-93 National Study of Postsecondary Faculty* was the second cycle of the NCES study of U.S. faculty at public and independent, not for profit, institutions. Specifically, the 1987-88 and 1992-93 surveys were to provide a national profile of the professional background, responsibilities, workloads, salaries, benefits, and attitudes of postsecondary faculty. The first cycle was in 1987-88 when information was gathered from a sample of over 480 institutions, 3,000 chairpersons, and 11,000 faculty. The 1992-93 cycle was limited to institutions and faculty but was expanded to include samples of 974

institutions and 31,354 faculty. Of these, 817 institutions and 25,780 faculty participated for response rates of 85% and 87%, respectively.

A key difference between the 1987-88 and 1992-93 surveys was criteria for inclusion. Both the 1987-88 and 1992-93 surveys included faculty who regularly had teaching assignments, but the 1992-93 survey also included faculty and administrators with faculty positions who did not regularly teach and employees who taught whether or not they were considered to be "faculty". Specifically excluded were those with instructional duties outside the U.S., if not on sabbatical, temporary replacements, faculty on unpaid leave, military personnel teaching only ROTC courses, instructional personnel supplied by independent contractors, and teaching assistants. While useful for its purposes, the broad inclusion of faculty did not directly support the type of analysis planned in this study.

The following restrictions for inclusion of faculty were imposed on the 1993 NSOPF survey respondents for this research project. Analysis was of faculty employed by **public Carnegie Research I or II or Doctoral I or II institutions**. The faculty enjoyed a **full-time** appointment and identified their **principal activity as teaching or research**. Lastly, the faculty had **regular appointments**, not temporary appointments. Faculty with acting, affiliate or adjunct, or visiting status were removed. These restrictions resulted in 2,056 faculty selected who were distributed as shown in Table 1. Given the two-stage sampling design used by NCES, institutions randomly selected and the faculty of those institutions randomly sampled, and an approximate 90% response rate, the faculty included here were likely employed by about 16 Research 1, 13 Research 2, 12 Doctoral 1, and 14 Doctoral 2 institutions. Table 1 shows the number of faculty by discipline and Carnegie type. The number of faculty by discipline varied from 73 in psychology to 186 in engineering and the total number of faculty by type of institution was roughly comparable. A chi-square test found that disciplinary structure varied by Carnegie Class. While not an important result in disciplinary comparisons, the disproportionately large number of faculty in agriculture and biology at Research 1 and 2 institutions and education and business at Doctoral 1 and 2 institutions might be important in explaining institutional sponsored research amounts and Carnegie Classification generally.

In general, reported faculty discipline was used to classify productivity measures but these were aggregated as necessary to allow group sizes of about 75 or more. The process of forming aggregates of sufficient size while maintaining a level of detail required of practitioners' face validity tests, resulted in the scheme listed in Table 1. Alternative approaches, such as Biglan's (1973) or CIP 2- or 4-digit based groupings, were considered then discarded on the advice of institutional researchers attending a regional conference presentation of this material (1999 MidAIR Conference). The consensus of those in attendance was that the structure should mirror academic structures as closely as possible to be palatable to chairs and deans.

Table 1: Discipline Area Distribution by Carnegie Classification

	Number of Faculty					Column Percentages			
	R1	R2	D1	D2	Sum	R1	R2	D1	D2
Agriculture	44	36	13	23	116	7%	8%	3%	4%
Business	26	24	45	45	140	4%	5%	10%	8%
Education	39	39	50	57	185	7%	8%	11%	11%
Engineering	60	51	21	54	186	10%	11%	5%	10%
Fine Arts	32	27	23	30	112	5%	6%	5%	6%
Health	45	23	39	30	137	8%	5%	8%	6%
English	40	34	47	48	169	7%	7%	10%	9%
Communications	48	36	28	26	138	8%	8%	6%	5%
History	31	32	33	32	128	5%	7%	7%	6%
Biology	65	45	29	29	168	11%	10%	6%	5%
Physical Science	51	31	32	43	157	9%	7%	7%	8%
Mathematics	40	31	26	46	143	7%	7%	6%	9%
Economics	31	15	16	22	84	5%	3%	3%	4%
Psychology	15	14	26	18	73	3%	3%	6%	3%
Sociology	26	31	35	28	120	4%	7%	8%	5%
Totals	593	469	463	531	2,056	100%	100%	100%	100%

Notes: Chi Square = 104 (df=42, p<.001)

The three components of faculty productivity shared here: instructional load, sponsored research, and professional contributions were based on one of two time intervals. When describing courses taught or sponsored research, faculty were instructed to report as of fall 1992. Multiple sections of the same course were counted as separate classes, but the lab section did not count as a separate class. Faculty were to identify their role in sponsored research as principal investigator, co-principal investigator, or staff.

When reporting professional contributions (i.e., presentations, publications, performances, etc.) faculty were to report both lifetime and number in past two years. Faculty were to report only products accepted for publication or published and were to report multiple presentations or publications of the same work only once. However, these professional contributions included multiple authorship. For this study, the following conditions were imposed. **Individual instruction was not included**. Team-taught classes were attributed completely to the faculty reporting the course as no evidence was provided with which to accurately distribute effort. Sponsored research activities were included if the faculty reported themselves as **principal investigator or co-principal investigator**. And last, only the publication and presentation record of the **two most recent years** was included.

Analysis

Of principal concern was balancing the desire for sufficient detail to support university application with sufficient sample size to make that detail reasonably useful. Face validity demanded that the information be reported at a disciplinary level no higher than a college and preferably at that of the department. Personal experience has shown that data for broadly stated disciplinary clusters is rarely applied. It was also understood that face validity would be a function of perceived institutional similarity and that it would be helpful to differentiate faculty by Carnegie Classification. Of the two competing objectives, disciplinary affiliation was given precedence. Also challenging were the nature of the key distributions examined: research funding, publications/presentations/etc., and instructional assignment variables (i.e., student credit hours or SCHs). These variables were in no way normally or even symmetrically distributed.

Given the nature of the data and the face validity demands of applied research application that prevent cross-discipline options, the straightforward, undemanding and robust chi-square test of association was used. Specifically, the analysis considered two questions. First, were faculty of different Carnegie Class institutions more or less likely to engage in an activity and second, was there a difference in magnitude if engaged? The first question called for a simple yes or no classification of faculty along several lines:

- Did they teach lower-division students?
- Did they teach upper-division students?
- Did they teach graduate students?
- Did they receive competitively obtained external funding (foundation, industry or federal) as a principal or co-principal investigator during fall 1992?
- Did they publish or present a work product in a competitive, peer-reviewed or juried environment?

The second question addressed the degree of production in these areas: student-credit-hours produced, externally funded research dollars, and number of refereed or juried products within the past two years. Given the tremendously skewed distributions being studied a rather simplistic approach was taken where the median value by disciplinary area was used to divide faculty into two groups, above or below the median, on each of the three measures. Placing faculty into these two, nearly equally sized groupings helped to support analysis in areas where participation by faculty was low. In all cases, the chi-square tests were of 2x4 cross-tabulations – high/low or yes/no by Carnegie Classification (R1, R2, D1 or D2) within disciplinary area.

Results

Cases where the chi-square statistic was significant are shown in Table 2 with notes identifying unexpected table cell frequencies. In sum, 19 of the 120 analyses were significant at the 0.05 level. Those differences were most often in teaching assignments, with 4 cases at lower-division (English, communications, mathematics, and economics), 4 at upper-division (business, education, health, and biology) and 2 at the graduate level (communications and physical sciences). Obtaining external funding was associated with Carnegie Class in 3 cases (health, biology, and mathematics) and the dichotomous outcome of publishing was significant in only 1 case (biology). The search for differences in occurrence by magnitude of measure found only 1 instance where faculty were more or less likely to be in the upper 50% on student credit hour production (sociology) and 1 case of faculty being more likely to be in the

upper 50% on amount of external funding (business). There were 3 instances where faculty were more or less likely to be in the upper 50% on refereed publications and juried works (engineering, health, and English). Where significant differences were noted, they are explained in detail as clarifying notes to the subject area profiles.

Table 2: Instances of Significant Association (Chi-Square Probability < .05) of Carnegie Classification (Research 1 and 2 and Doctoral 1 and 2) and Occurrence or Magnitude of Activity within Disciplinary Areas

	Occurrence					Magnitude of Occurrence		
	LD	UD	GR	External Funding	Refereed Publications	SCH	External Funding	Refereed Publications
Agriculture								
Business		1					2	
Education		3						
Engineering								4
Fine Arts								
Health		5		6				7
English	8							9
Communications	10		11					
History								
Biology		12		13	14			
Physical Science			15					
Mathematics	16			17				
Economics	18							
Psychology								
Sociology						19		

Notes:

1 Fewer R1 faculty taught upper-division courses in business (9.877, DF=3, p=.020, n=140)

2 R1 & R2 business faculty were more often on the high side of the median in external support than were D1 & D2 faculty. 11.667, DF=3, p=.009, n=18

3 R1 education faculty were less likely to teach upper-division courses (10.935, DF=3, p=.012, n=185)

4 D2 faculty were uniquely below the median in number of publications for engineering faculty. 8.002, DF=3, p=.046, n=143

5 R1 & R2 health faculty were less likely to teach upper-division (10.935, DF=3, p=.012, n=185)

6 R1 health faculty were more likely to have external support for research (25.029, DF=3, p<.001, n=137)

7 D2 faculty were uniquely below the median in number of publications for health faculty. 8.293, DF=3, p=.040, n=83

8 R1 English faculty were less likely to teach lower-division courses and D2 faculty were more likely to do so. 18.511, DF=3, p=.013, n=169

9 R2 faculty were uniquely less likely to publish above the median rate for English faculty. 8.166, DF=3, p=.043, n=100

10 R1 communications faculty were less likely to teach lower division courses (16.456, DF=3, p<.001, n=138)

11 R1 communications faculty were more likely to teach graduate-level courses (11.177, DF=3, p=.011, n=138)

12 R1 & R2 biology faculty were less likely to teach upper-division courses (15.762, DF=3, p<.001, n=168)

13 R1 & R2 biology faculty were more likely to have external support for research. 8.162, DF=3, p=.043, n=168

14 R1 faculty were more likely to publish at a rate above the median for biology faculty (8.682, DF=3, p=.034, n=168)

15 R1 faculty in the physical sciences were LESS likely to teach graduate-level courses. 7.927, DF=3, p=.048, n=157

16 R1 faculty were less likely to teach lower-division courses in math (15.640, DF=3, p<.001, n=143)

17 R1 faculty were more likely to have external support for research in math (14.021, DF=3, p=.003, n=143)

18 D2 economics faculty were more likely and R1 faculty were less likely to teach lower-division courses. 7.664, DF=3, p=.053, n=84

19 R2 sociology faculty were more likely to produce SCHs at a rate above the median. 14.793, DF=3, p=.002, n=110

Occurrence was tested as a Carnegie Level (R1, R2, D1, D2) x Measure (Yes or No) Chi Square
Magnitude was tested as a Carnegie Level (R1, R2, D1, D2) x Measure (Above or Below Median) Chi Square
Health and law professional programs are not included.

The number of cases where the faculty of Carnegie classified institutions differed in workload, activity or productivity was remarkably low in light of the importance assigned Carnegie Class in higher education press and by institutions themselves. In addition, of the cases of statistical significance, several failed to support preconceived notions about Carnegie Class. A few of these include the following:

- The 4 cases where likelihood of teaching upper-division courses varied when there were no differences in likelihood of teaching lower-division or graduate courses.
- Sociology, where Research 2 faculty were more likely to produce SCHs at a rate above the median when Doctoral 1 and 2 faculty were not.
- English, where Research 2 faculty were less likely to publish above the median rate when Doctoral 1 and 2 faculty were not.

In contrast, there were about 13 instances where the observed trends were generally as might be expected with Research 1 and 2 faculty less likely to teach lower-division and more likely to teach upper-division, have external support, and publish at a higher than average rate. Unfortunately, the number of faculty of each Carnegie Class within discipline and the crude data transformation does not support a more detailed treatment.

Unit Performance Profiles by Area: Applied Professions (Table 3), Arts and Humanities (Table 4), Sciences and Mathematics (Table 5), and Social Sciences (Table 6)

Quite a lot of self-reported detail is provided about the output of faculty in each discipline. The unit performance profiles report number of faculty, how they spent their time on average, the level of courses taught - along with contact hours, credit hours, and enrollment -, sources and amounts of research support, and scholarly production. Disciplinary areas have been clustered into four groups: applied professions, arts and humanities, sciences and mathematics, and social sciences. Professional programs in health and law have not been included. Otherwise, table notes describe the fields included and the derivation of the statistics. Each table includes a section labeled Summary Measures. Summary Measures are offered for use by administrators

interested in composite indicators and are expressed on a per faculty capita basis. The four measures offered on a per faculty basis are student credit hours, sponsored research dollars as mean and median weighted, and refereed or juried works. As described here, research dollars per faculty includes sponsored research from all sources: institutional, state and external. The second sponsored research statistic is uncommon. It was determined by multiplying the median award by the number of awards then dividing by the total number of faculty. In much the same way that a distribution's median is a better measure of central tendency for a very skewed distribution, the adjusted median tends to mute the affect of a few extremely large values.

Table 3: UNIT PERFORMANCE PROFILE (Applied Professions)

University System USA: Applied Professions	Notes 1	Discipline: Agriculture	Business	Education	Engineering	Health
Number of Faculty		116	140	185	186	137
Distribution of Time						
Teaching		40%	51%	57%	46%	57%
Research		40%	29%	19%	37%	20%
Professional Growth		3%	4%	4%	3%	5%
Administration		5%	6%	7%	6%	7%
Consulting		1%	4%	3%	3%	3%
Service		9%	6%	9%	4%	7%
Teaching (Fall Semester)						
Lower Division						
Percentage Teaching		25%	15%	24%	25%	18%
Credit Hours / Faculty Teaching L.D.		3.9	5.0	5.3	4.5	5.2
Contact Hours / Faculty Teaching L.D.		5.4	4.5	6.7	6.1	11.1
Enrollment / Faculty Teaching L.D.		57	76	76	59	59
Student Credit Hours / Faculty Teaching L.D.		164	248	195	190	185
Upper Division						
Percentage Teaching		45%	76%	51%	61%	52%
Credit Hours / Faculty Teaching U.D.		4.6	6.3	5.4	4.1	8.1
Contact Hours / Faculty Teaching U.D.		6.1	6.1	6.9	5.1	12.5
Enrollment / Faculty Teaching U.D.		40	86	54	45	75
Student Credit Hours / Faculty Teaching U.D.		122	280	153	129	328
Graduate						
Percentage Teaching		28%	42%	64%	49%	45%
Credit Hours / Faculty Teaching Graduate		4.6	4.2	5.9	3.3	5.3
Contact Hours / Faculty Teaching Graduate		4.7	4.4	6.7	3.6	6.6
Enrollment / Faculty Teaching Graduate		24	39	32	18	43
Student Credit Hours / Faculty Teaching Graduate		77	118	98	53	141
Total						
Percentage Teaching		65%	96%	94%	91%	91%
Credit Hours / Faculty Teaching		6.7	7.6	8.3	5.7	8.2
Contact Hours / Faculty Teaching		8.3	7.5	10.0	7.0	12.4
Enrollment / Faculty Teaching		60	97	70	56	75
Student Credit Hours / Faculty Teaching		181	312	200	167	290
Research Funding (PI or Co-PI)						
Institutional						
Percentage Acquiring		38%	14%	12%	16%	18%
Average of Those Awards (1,000s of 98 $s)		$103.2	$124.3	$932.6	$192.1	$59.9
Median of Those Awards (1,000s of 98 $s)		$18.8	$3.4	$2.3	$18.2	$11.0
Foundations						
Percentage Acquiring		24%	9%	9%	16%	18%
Average Award (1,000s of 98 $s)		$44.8	$881.0	$180.8	$170.3	$281.9
Median Award (1,000s of 98 $s)		$22.8	$12.2	$47.8	$56.9	$25.0
Business & Industry						
Percentage Acquiring		29%	4%	3%	24%	6%
Average Award (1,000s of 98 $s)		$47.9	$21.0	$69.2	$120.2	$138.9
Median Award (1,000s of 98 $s)		$17.1	$18.2	$14.2	$36.4	$45.5
State						
Percentage Acquiring		28%	4%	7%	15%	8%
Average Award (1,000s of 98 $s)		$290.2	$31.5	$122.7	$258.3	$69.8
Median Award (1,000s of 98 $s)		$34.1	$24.5	$51.2	$62.6	$38.7
Federal						
Percentage Acquiring		41%	4%	9%	41%	19%
Average Award (1,000s of 98 $s)		$82.3	$51.0	$653.9	$498.9	$543.8
Median Award (1,000s of 98 $s)		$57.5	$23.8	$213.4	$113.8	$108.1
Total						
Percentage Acquiring		75%	24%	30%	66%	41%
Average Award (1,000s of 98 $s)		$241.6	$397.4	$669.8	$498.7	$440.9
Median Award (1,000s of 98 $s)		$66.0	$13.1	$56.9	$113.8	$48.6

Table 3: UNIT PERFORMANCE PROFILE (Applied Professions Continued)

University System USA: Applied Professions	Notes	Discipline				
	1	Agriculture	Business	Education	Engineering	Health
Scholarship (Last 2 Years)						
Publications: Peer Reviewed	2					
Percentage		82%	69%	57%	77%	61%
Average of Those		5.0	3.8	3.6	5.1	4.4
Publications: Other Scholarly	3					
Percentage		84%	64%	63%	75%	64%
Average of Those		9.5	5.0	6.2	7.6	5.3
Presentations & Performances	4					
Percentage		83%	64%	74%	70%	77%
Average of Those		7.7	5.2	8.4	7.2	6.5
Patents & Copyrights						
Percentage		4%	3%	2%	9%	4%
Average of Those		1.4	1.5	1.0	1.7	1.0
Summary Measures						
Teaching SCH / Faculty	5	117	301	188	153	265
Research (1000s of 98 $s) / Faculty	6	$159.3	$84.8	$175.0	$289.8	$158.4
Adjusted Median Research (1000s 98 $s)	7	$43.5	$2.8	$14.9	$66.1	$17.5
Refereed Articles / Faculty	8	4.1	2.6	2.1	3.9	2.6

1 Agriculture includes agriculture and home economics (agribusiness, agriculture sciences, renewable resources, other agriculture and home economics).
Business includes accounting, banking and finance, business administration and management, human resources development, organizational behavior, and marketing and distribution.
Education includes curriculum and instruction, educational administration, education evaluation and research, educational psychology, special education, student counseling, and general education.
Engineering includes general engineering, civil engineering, electrical engineering, mechanical engineering, chemical engineering, other engineering fields and engineering-related technologies.
Health includes health sciences fields: allied health technologies, health services administration, nursing, public health, and other health sciences. Does not include first professional fields: medicine, dentistry, pharmacy, and veterinary medicine.

2 Articles published in refereed professional or trade journals and creative works in a juried media.

3 Articles published in nonrefereed professional or trade journals; creative works published in nonjuried media or in-house newsletters; published reviews of books, articles, or creative works; chapters in edited volumes; textbooks, other books; monographs; research or technical reports disseminated internally or to clients; and computer software.

4 Presentations at conferences, workshops, etc. and exhibitions or performances in the fine or applied arts.

5 Total student credit hours generated divided by number of faculty.

6 Total funded research from all sources divided by number of faculty.

7 The adjusted median research per faculty is computed as the median research award times number of awards divided by the number of faculty.

8 For two most recent years, number of articles published refereed professional or trade journals and creative works published in a juried media divided by number of faculty.

Clarifying Remarks

Fewer Research 1 faculty taught upper-division courses in business (54% versus 78-88%).

Fewer Research 1 faculty taught upper-division courses in business. Relatively more Research 1 and 2 faculty with external support garnered above median value external support then Doctoral 1 and Doctoral 2 faculty. In other words, while comparable percentages of business faculty at each of these Carnegie classes had external research support, the amount of that support favored Research 1 and 2 faculty. However, note that there were only 18 business faculty (13%) with competitive external support (foundations, business and industry, or federal).

Research 1 faculty in education were less likely to teach upper-division courses (28% versus 54-60%).

Doctoral 2 engineering faculty were uniquely below the median number of publications for engineering faculty (22% versus 41-49%).

Research 1 and 2 health faculty were less likely to teach upper-division courses. Research 1 faculty were more likely to have external support for research. Doctoral 2 faculty were uniquely below the median publications for health faculty at Research 1 and 2 and Doctoral 1 and 2 public institutions.

Five fields classified as "Applied Professions" were described in Table 3. These fields were agriculture, business, education, engineering and health. These fields prepare graduates for occupations at the bachelor degree level or higher. They also tend to be fields with little instructional service function to outside majors and are largely upper-division and graduate. The first section of Table 3 reports the mean percentage distribution of time by faculty. Collectively, these faculty spent about 80% of their time in teaching and research activities. Agriculture faculty spent the most time in research (40%) and were followed by engineering (37%), business (29%), health (20%) and education (19%). The percentage of time spent on professional growth and administration was very similar but agriculture faculty spent less time consulting, and service figures ranged from 9% for both agriculture and education to 4% for engineering.

Over 90% of faculty in business, education, engineering and health taught classes but that was only true for 65% of agriculture faculty. Only one-in-four or less faculty taught lower-division courses, about one-half taught upper-division courses. The percentage teaching graduate courses varied widely from 64% in education to 28% in agriculture. Overall, faculty loads differed markedly. For example, business faculty and engineering faculty had comparable contact hour assignments but business faculty produced more credit hours due to larger enrollments and a closer relationship between credit hours and contact hours.

The area of greatest dispersion by discipline is research funding. The percentage of faculty with sponsored research varied from 24% of business faculty to 75% of agriculture. Average awards for those with sponsorship also varied widely, being highest in education (nearly $670,000) and lowest in agriculture (about $242,000). Median award amounts were closer, but still disperse with a range from about $13,000 in business to nearly $114,000 in engineering.

The majority of faculty were professionally productive, with 60% or more having published in a peer-reviewed venue within the two most recent years but the highest rates of publication and largest number of publications per faculty were in agriculture (82% in peer reviewed and 84% other and 5 and 9.5 products on average, respectively). Peer reviewed

publications, other scholarly publications, presentations and performances were common with the large majority of faculty participating in each. Patents were uncommon in agriculture, business, education and health (2% to 4%). Patents were more common in engineering where 9% of faculty reported being granted a patent in the most recent two-year period.

Table 4: UNIT PERFORMANCE PROFILE (Arts & Humanities)

University System USA: Arts & Humanities	Notes	Discipline			
	1	Fine Arts	English	Communications	History
Number of Faculty		112	169	138	128
Distribution of Time					
Teaching		53%	58%	59%	49%
Research		22%	25%	23%	32%
Professional Growth		6%	3%	3%	4%
Administration		9%	8%	7%	9%
Consulting		4%	2%	2%	2%
Service		6%	4%	5%	5%
Teaching (Fall Semester)					
Lower Division					
Percentage Teaching		48%	49%	52%	60%
Credit Hours / Faculty Teaching L.D.		4.7	6.2	6.2	4.0
Contact Hours / Faculty Teaching L.D.		7.1	6.2	6.2	3.9
Enrollment / Faculty Teaching L.D.		44	53	56	95
Student Credit Hours / Faculty Teaching L.D.		126	162	192	298
Upper Division					
Percentage Teaching		61%	60%	75%	73%
Credit Hours / Faculty Teaching U.D.		4.8	5.2	5.1	4.5
Contact Hours / Faculty Teaching U.D.		6.6	5.3	5.6	4.5
Enrollment / Faculty Teaching U.D.		36	44	41	45
Student Credit Hours / Faculty Teaching U.D.		99	151	127	139
Graduate					
Percentage Teaching		39%	40%	38%	27%
Credit Hours / Faculty Teaching Graduate		4.6	4.1	3.5	3.4
Contact Hours / Faculty Teaching Graduate		4.9	4.5	3.8	2.9
Enrollment / Faculty Teaching Graduate		17	20	14	15
Student Credit Hours / Faculty Teaching Graduate		50	62	43	45
Total					
Percentage Teaching		92%	95%	94%	93%
Credit Hours / Faculty Teaching		7.6	8.3	8.8	7.1
Contact Hours / Faculty Teaching		10.2	8.5	9.3	6.9
Enrollment / Faculty Teaching		54	63	69	101
Student Credit Hours / Faculty Teaching		152	205	224	314
Research Funding (PI or Co-PI)					
Institutional					
Percentage Acquiring		18%	9%	12%	14%
Average Award (1,000s of 98 $s)		$16.4	$24.8	$64.4	$8.5
Median Award (1,000s of 98 $s)		$3.5	$3.4	$4.8	$4.6
Foundations					
Percentage Acquiring		5%	7%	4%	6%
Average Award (1,000s of 98 $s)		$16.5	$18.5	$6.9	$46.1
Median Award (1,000s of 98 $s)		$18.8	$4.2	$5.7	$5.7
Business & Industry					
Percentage Acquiring		1%	2%	1%	2%
Average Award (1,000s of 98 $s)		$2,136.2	$12.6	$8.4	$19.0
Median Award (1,000s of 98 $s)		$2,136.2	$3.0	$8.4	$17.1
State					
Percentage Acquiring		5%	1%	1%	1%
Average Award (1,000s of 98 $s)		$38.9	$35.6	$62.6	$9.1
Median Award (1,000s of 98 $s)		$5.7	$35.6	$62.6	$9.1
Federal					
Percentage Acquiring		4%	4%	4%	2%
Average Award (1,000s of 98 $s)		$86.4	$52.9	$1,383.5	$32.9
Median Award (1,000s of 98 $s)		$30.1	$22.0	$28.4	$28.4
Total					
Percentage Acquiring		29%	17%	20%	18%
Average Award (1,000s of 98 $s)		$96.1	$63.1	$299.1	$30.3
Median Award (1,000s of 98 $s)		$5.7	$4.6	$11.4	$12.3

Table 4: UNIT PERFORMANCE PROFILE (Arts & Humanities Continued)

University System USA: Arts & Humanities	Notes 1	Discipline: Fine Arts	English	Communications	History
Scholarship (Last 2 Years)					
Publications: Peer Reviewed	2				
Percentage		31%	59%	55%	60%
Average of Those		4.6	4.0	3.2	3.0
Publications: Other Scholarly	3				
Percentage		44%	66%	57%	80%
Average of Those		6.1	6.3	4.7	5.4
Presentations & Performances	4				
Percentage		81%	62%	70%	68%
Average of Those		28.4	7.6	5.2	4.2
Patents & Copyrights					
Percentage		7%	8%	5%	5%
Average of Those		1.9	1.5	3.7	2.8
Summary Measures					
Teaching SCH/Faculty	5	140	194	211	292
Research (1000s of 98 $s)/Faculty	6	$24.9	$9.5	$51.4	$4.8
Adjusted Median Research (1000s 98 $s)	7	$1.5	$0.7	$2.0	$1.9
Refereed Articles/Faculty	8	1.4	2.3	1.8	1.8

1 Fine Arts includes art history and appreciation, crafts, dance, design, dramatic arts, film arts, fine arts, music, music history and appreciation, and other visual or performing arts.
English includes general English, composition, American literature, English literature, linguistics, speech, and English as a second language.
Communications includes advertising, broadcasting and journalism, communications research, communication technologies, other communications, Chinese, French, German, Italian, Latin, Japanese, Other Asian, Russian or Other Slavic, Spanish, and other foreign languages.
History includes history and philosophy.

2 Articles published in refereed professional or trade journals and creative works in a juried media.

3 Articles published in nonrefereed professional or trade journals; creative works published in nonjuried media or in-house newsletters; published reviews of books, articles, or creative works; chapters in edited volumes; textbooks, other books; monographs; research or technical reports disseminated internally or to clients; and computer software.

4 Presentations at conferences, workshops, etc. and exhibitions or performances in the fine or applied arts.

5 Total student credit hours generated divided by number of faculty.

6 Total funded research from all sources divided by number of faculty.

7 The adjusted median research per faculty is computed as the median research award times number of awards divided by the number of faculty.

8 For two most recent years, number of articles published refereed professional or trade journals and creative works published in a juried media divided by number of faculty.

Clarifying Remarks

English faculty at Research 1 institutions were less likely to teach lower-division courses (23%) and Doctoral 2 faculty were more likely to teach lower-division (59%). Research 2 faculty taught lower-division at a rate of 40% and Doctoral 1 at a rate of 31%.
Research 2 English faculty less likely to publish at a rate above the median for English (about 23% versus 44-60%).

Communications faculty at Research 1 institutions were less likely to teach lower-division courses (31% versus 53-77%) and more likely to teach graduate level courses (56% versus 23-31%).

Table 4 displays faculty profiles for the arts and humanities fields of fine arts, English, communications, and history. These fields often share a strong instructional service function and are not often awarded large-dollar research projects. The self-reported percentage of time devoted to teaching ranged from 49% in history to 59% in communications and the combination of teaching and research accounted for 75% (fine arts) to 83% (English). For fine arts, English and communications, about 50% of faculty taught lower division courses and the majority taught upper division. Nearly 40% of faculty in these same fields taught graduate courses. History was somewhat different with a larger percentage teaching at the lower division (60%) and a smaller percentage teaching graduate courses (27%). Overall, 92% to 95% of faculty in these areas taught.

With 17% (English) to 29% (fine arts) of faculty reporting research funding and with median awards of $12,300 or less, these are not large-dollar, grant-intensive disciplines. It is also true that the most common source of funding was the institution, and federal grants were fairly uncommon, equal or less common than foundation awards. There were exceptions. In communications, the average federal award was over one million dollars (4% of communications faculty had a federal award).

It is within the scholarly production area that some of the uniqueness of these areas is clear. For example, 81% of fine arts faculty did presentations or performances and the average number was over 28. Fine arts faculty were less likely to publish articles or creative works in refereed or juried environments (31% versus 55% to 60%) and were less likely to publish in other forms (44% versus 57% to 80%). In contrast, history faculty were the most likely of these to publish, peer reviewed or otherwise.

Table 5: UNIT PERFORMANCE PROFILE (Sciences & Mathematics)

University System USA: Sciences & Mathematics	Notes 1	Discipline: Biology	Physical Sciences	Mathematics
Number of Faculty		168	157	143
Distribution of Time				
Teaching		32%	42%	51%
Research		52%	43%	29%
Professional Growth		3%	2%	3%
Administration		6%	7%	11%
Consulting		1%	2%	1%
Service		4%	4%	5%
Teaching (Fall Semester)				
Lower Division				
Percentage Teaching		17%	42%	49%
Credit Hours / Faculty Teaching L.D.		4.4	5.1	5.4
Contact Hours / Faculty Teaching L.D.		5.1	5.7	5.5
Enrollment / Faculty Teaching L.D.		179	139	76
Student Credit Hours / Faculty Teaching L.D.		598	485	258
Upper Division				
Percentage Teaching		33%	35%	50%
Credit Hours / Faculty Teaching U.D.		4.2	3.5	4.3
Contact Hours / Faculty Teaching U.D.		5.6	4.5	4.0
Enrollment / Faculty Teaching U.D.		59	49	75
Student Credit Hours / Faculty Teaching U.D.		182	151	254
Graduate				
Percentage Teaching		39%	34%	45%
Credit Hours / Faculty Teaching Graduate		4.1	3.5	3.8
Contact Hours / Faculty Teaching Graduate		6.7	3.7	4.1
Enrollment / Faculty Teaching Graduate		42	13	20
Student Credit Hours / Faculty Teaching Graduate		151	36	63
Total				
Percentage Teaching		70%	84%	90%
Credit Hours / Faculty Teaching		5.3	5.5	7.1
Contact Hours / Faculty Teaching		7.6	6.2	7.2
Enrollment / Faculty Teaching		95	95	74
Student Credit Hours / Faculty Teaching		315	320	258
Research Funding (PI or Co-PI)				
Institutional				
Percentage Acquiring		23%	22%	6%
Average Award (1,000s of 98 $s)		$26.0	$64.1	$9.6
Median Award (1,000s of 98 $s)		$9.1	$17.1	$5.7
Foundations				
Percentage Acquiring		20%	18%	6%
Average Award (1,000s of 98 $s)		$344.0	$378.3	$20.2
Median Award (1,000s of 98 $s)		$51.9	$22.8	$17.1
Business & Industry				
Percentage Acquiring		14%	15%	5%
Average Award (1,000s of 98 $s)		$98.0	$67.8	$232.1
Median Award (1,000s of 98 $s)		$45.5	$34.1	$81.9
State				
Percentage Acquiring		10%	4%	3%
Average Award (1,000s of 98 $s)		$77.9	$46.7	$97.4
Median Award (1,000s of 98 $s)		$48.4	$28.4	$79.7
Federal				
Percentage Acquiring		59%	48%	22%
Average Award (1,000s of 98 $s)		$356.1	$339.0	$568.3
Median Award (1,000s of 98 $s)		$102.4	$113.8	$34.1
Total				
Percentage Acquiring		73%	61%	32%
Average Award (1,000s of 98 $s)		$422.0	$427.8	$441.8
Median Award (1,000s of 98 $s)		$114.9	$141.1	$59.6

Table 5: UNIT PERFORMANCE PROFILE (Sciences & Mathematics Continued)

University System USA: Sciences & Mathematics	Notes	Discipline		
	1	Biology	Physical Sciences	Mathematics
Scholarship (Last 2 Years)				
Publications: Peer Reviewed	2			
Percentage		86%	83%	67%
Average of Those		5.8	6.4	4.2
Publications: Other Scholarly	3			
Percentage		61%	62%	47%
Average of Those		4.6	7.6	4.6
Presentations & Performances	4			
Percentage		74%	74%	61%
Average of Those		5.9	6.9	4.9
Patents & Copyrights				
Percentage		4%	9%	3%
Average of Those		1.4	2.6	1.0
Summary Measures				
Teaching SCH/Faculty	5	221	269	233
Research (1000s of 98 $s)/Faculty	6	$271.5	$227.5	$124.9
Adjusted Median Research (1000s 98 $s)	7	$73.9	$75.0	$16.8
Refereed Articles/Faculty	8	5.0	5.3	2.8

1 Biology includes the biological sciences: biochemistry, biology, botany, genetics, immunology, microbiology, physiology, zoology, and other biological sciences.
Physical Sciences includes astronomy, chemistry, physics, earth, atmospheric, and oceanographic (geological sciences), and other physical sciences.
Mathematics includes mathematics, statistics, and computer science.

2 Articles published in refereed professional or trade journals and creative works in a juried media.

3 Articles published in nonrefereed professional or trade journals; creative works published in nonjuried media or in-house newsletters; published reviews of books, articles, or creative works; chapters in edited volumes; textbooks, other books; monographs; research or technical reports disseminated internally or to clients; and computer software.

4 Presentations at conferences, workshops, etc. and exhibitions or performances in the fine or applied arts.

5 Total student credit hours generated divided by number of faculty.

6 Total funded research from all sources divided by number of faculty.

7 The adjusted median research per faculty is computed as the median research award times number of awards divided by the number of faculty.

8 For two most recent years, number of articles published refereed professional or trade journals and creative works published in a juried media divided by number of faculty.

Clarifying Remarks

Of all fields examined, Biology had the most differences by Carnegie classification. Research 1 and Research 2 faculty were less likely to teach upper-division courses than were Doctoral 1 and 2 faculty (22-23% versus 43-59%). Research 1 and 2 biology faculty were more likely to have external, competitively obtained support for research (71-77% versus 52-55%), and Research 1 faculty were more likely to publish in a refereed venue (95% versus 76-82%).
Research 1 faculty in the physical sciences were LESS likely to teach graduate level courses (20% versus 37-45%).

Research 1 mathematics faculty were less likely to teach lower-division courses (23% versus 58-61%) but were more likely to have external, competitively obtained research support (48% versus 13-26%).

The unit profiles for sciences and mathematics portray markedly different patterns. For example in reporting distribution of time, the three fields of biology, physical sciences, and mathematics report 80% to 85% spent in teaching and research. However, that is 51% teaching in mathematics, 42% of time teaching in physical sciences, and 32% of time teaching in biology. Consistent with that observation, biology faculty were less likely to teach (70%) than were physical sciences faculty (84%) or mathematics faculty (90%). Mathematics faculty were most likely to teach at the lower division (49%) and biology faculty were much less likely to teach lower division (17%). The percentages teaching upper division or graduate courses were similar for biology and physical sciences but mathematics faculty were more likely to teach at all levels.

It is within the research-funding component of the profile that the inverse, complimentary patterns are seen. In biology, 73% of faculty had support and 59% had federal support. In contrast, mathematics faculty were less likely to have support (32%) and much less likely to have federal support (22%). However, the average awards for the three fields were very similar and all were very large: $442,000 in mathematics, $422,000 in biology, and $428,000 in physical sciences. Comparison to median values shows the mathematics distribution to be more skewed.

These are also fields where faculty scholarly works are common and at a high rate. Two-thirds of mathematics faculty had peer-reviewed publications (67%) and the rates were substantially higher for physical sciences (83%) and biology (86%). The average number of peer-reviewed products was also high in these areas: 4.2 in mathematics, 5.8 in biology and 6.4 in physical sciences. The large majority of faculty also presented and the rate of presentations was about 5 or higher on average. Another measure of note was patents and copyrights, where 9% of physical sciences faculty averaged 2.6 products.

Table 6: UNIT PERFORMANCE PROFILE (Social Sciences)

University System USA: Social Sciences	Notes 1	Discipline: Economics	Psychology	Sociology
Number of Faculty		84	73	120
Distribution of Time				
Teaching		47%	41%	50%
Research		32%	37%	31%
Professional Growth		4%	3%	3%
Administration		10%	10%	7%
Consulting		3%	3%	2%
Service		5%	6%	6%
Teaching (Fall Semester)				
Lower Division				
Percentage Teaching		37%	29%	47%
Credit Hours / Faculty Teaching L.D.		5.1	4.0	5.4
Contact Hours / Faculty Teaching L.D.		4.8	4.2	5.5
Enrollment / Faculty Teaching L.D.		122	134	112
Student Credit Hours / Faculty Teaching L.D.		378	407	350
Upper Division				
Percentage Teaching		70%	44%	68%
Credit Hours / Faculty Teaching U.D.		4.9	4.8	4.8
Contact Hours / Faculty Teaching U.D.		4.5	4.5	4.6
Enrollment / Faculty Teaching U.D.		55	75	67
Student Credit Hours / Faculty Teaching U.D.		180	254	223
Graduate				
Percentage Teaching		40%	51%	35%
Credit Hours / Faculty Teaching Graduate		4.1	5.1	3.8
Contact Hours / Faculty Teaching Graduate		3.6	4.8	3.5
Enrollment / Faculty Teaching Graduate		22	26	19
Student Credit Hours / Faculty Teaching Graduate		71	79	58
Total				
Percentage Teaching		93%	89%	92%
Credit Hours / Faculty Teaching		7.5	6.5	7.8
Contact Hours / Faculty Teaching		6.9	6.3	7.6
Enrollment / Faculty Teaching		100	95	114
Student Credit Hours / Faculty Teaching		318	301	366
Research Funding (PI or Co-PI)				
Institutional				
Percentage Acquiring		21%	21%	15%
Average Award (1,000s of 98 $s)		$112.0	$12.5	$6.5
Median Award (1,000s of 98 $s)		$9.1	$4.1	$5.7
Foundations				
Percentage Acquiring		17%	16%	17%
Average Award (1,000s of 98 $s)		$1,402.8	$290.0	$459.5
Median Award (1,000s of 98 $s)		$71.1	$102.4	$22.8
Business & Industry				
Percentage Acquiring		6%	4%	3%
Average Award (1,000s of 98 $s)		$347.5	$24.3	$25.8
Median Award (1,000s of 98 $s)		$11.4	$29.6	$22.8
State				
Percentage Acquiring		8%	5%	5%
Average Award (1,000s of 98 $s)		$2,043.3	$780.7	$307.2
Median Award (1,000s of 98 $s)		$68.3	$54.6	$25.6
Federal				
Percentage Acquiring		8%	30%	11%
Average Award (1,000s of 98 $s)		$1,095.1	$635.0	$99.8
Median Award (1,000s of 98 $s)		$22.8	$107.5	$26.2
Total				
Percentage Acquiring		36%	52%	38%
Average Award (1,000s of 98 $s)		$1,512.1	$548.2	$272.9
Median Award (1,000s of 98 $s)		$46.7	$96.2	$20.5

Table 6: UNIT PERFORMANCE PROFILE (Social Sciences Continued)

University System USA: Social Sciences	Notes	Discipline		
	1	Economics	Psychology	Sociology
Scholarship (Last 2 Years)				
Publications: Peer Reviewed	2			
Percentage		64%	75%	68%
Average of Those		3.9	4.7	3.6
Publications: Other Scholarly	3			
Percentage		71%	64%	77%
Average of Those		7.4	5.5	6.8
Presentations & Performances	4			
Percentage		67%	77%	69%
Average of Those		7.8	6.6	5.8
Patents & Copyrights				
Percentage			5%	4%
Average of Those			1.0	2.0
Summary Measures				
Teaching SCH/Faculty	5	295	268	335
Research (1000s of 98 $s)/Faculty	6	$474.6	$250.8	$91.9
Adjusted Median Research (1000s 98 $s)	7	$14.6	$44.0	$6.9
Refereed Articles/Faculty	8	2.5	3.6	2.5

1 Economics includes economics and political science.
Psychology includes psychology only.
Sociology includes sociology, general social sciences, anthropology, archeology, area and ethnic studies, demography, and other social sciences.

2 Articles published in refereed professional or trade journals and creative works in a juried media.

3 Articles published in nonrefereed professional or trade journals; creative works published in nonjuried media or in-house newsletters; published reviews of books, articles, or creative works; chapters in edited volumes; textbooks, other books; monographs; research or technical reports disseminated internally or to clients; and computer software.

4 Presentations at conferences, workshops, etc. and exhibitions or performances in the fine or applied arts.

5 Total student credit hours generated divided by number of faculty.

6 Total funded research from all sources divided by number of faculty.

7 The adjusted median research per faculty is computed as the median research award times number of awards divided by the number of faculty.

8 For two most recent years, number of articles published refereed professional or trade journals and creative works published in a juried media divided by number of faculty.

Clarifying Remarks

Doctoral 2 economics faculty were more likely and Research 1 faculty were less likely to teach lower-division courses (59% and 23% respectively versus 31-40%).
Research 2 sociology faculty were more likely to produce student credit hours at a rate above the median (79% versus 30-52%).

Key Indicator and the Distribution of Key Indicators by Discipline (Tables 7, 8 and 9)

Table 7 reports participation rates. Participation rates are the percentage of faculty who taught, were awarded an external competitive grant or published in a refereed journal or had a creative work in a juried media. There are also simple high to low rankings offered. Clearly, there is much variation across disciplines. Percentage of faculty teaching ranged from 96% in business to 65% in agriculture. Percentage with competitive/external support varied from 68% in biology to 8% in communications. And the percentage publishing a peer reviewed work or creative product varied from 86% in biology to 31% in fine arts. **This table should help dispel the notion that institutional aggregates are appropriate measures. Unless composition by discipline fits the national composite or selected comparator institution, there will likely be observed differences due to the inclusion or exclusion of fields or relative concentration of other fields**. There are also complimentary patterns in evidence. Those disciplines low in teaching were high in funding and publication and vice versa. The patterns by Carnegie Class substantiated preconceived notions although the participation rate patterns were not dramatically different.

Table 7: Participation Rates by Discipline for Key Indicators

	SCHs			External/Competitive $			Refereed/Juried Works (2Yr)			
	#	%	Rank	#	%	Rank	#	%	Rank	Total
Agriculture	75	65%	15	72	62%	2	95	82%	3	116
Business	135	96%	1	18	13%	11	96	69%	6	140
Education	174	94%	3	34	18%	10	106	57%	13	185
Engineering	170	91%	9	107	58%	4	143	77%	4	186
Fine Arts	103	92%	7	11	10%	13	35	31%	15	112
Health	125	91%	10	46	34%	6	83	61%	10	137
English	160	95%	2	17	10%	12	100	59%	12	169
Communications	130	94%	4	11	8%	15	76	55%	14	138
History	119	93%	5	12	9%	14	77	60%	11	128
Biology	118	70%	14	115	68%	1	144	86%	1	168
Physical Science	132	84%	13	91	58%	3	130	83%	2	157
Mathematics	129	90%	11	41	29%	7	96	67%	8	143
Economics	78	93%	6	20	24%	9	54	64%	9	84
Psychology	65	89%	12	29	40%	5	55	75%	5	73
Sociology	110	92%	8	31	26%	8	82	68%	7	120
Research 1	488	82%	4	246	41%	1	428	72%	1	593
Research 2	408	87%	3	167	36%	2	318	68%	2	469
Doctoral 1	428	92%	2	115	25%	3	295	64%	3	463
Doctoral 2	499	94%	1	127	24%	4	331	62%	4	531

Table 8 displays the 25th, 50th (median) and 75th percentiles of the distributions of these three measures for all 15 fields and for Carnegie Classification for those with nonzero values in these areas. Once again, variance was dramatic. Median student credit hours produced by teaching faculty ranged from 295 in sociology to 120 in fine arts. Median external/competitive award ranged from $107,500 in education to $10,000 in communications. The apparent inconsistency between the academic profile median values and rank orders reported here illustrate that it is important to consider these measures in conjunction with participation rates and discipline profiles. Any isolated statistic can be very misleading. No effort was made to rank peer-reviewed products, as the medians were integer values with a limited range of 2 to 5. It was less clear in this table that Carnegie Classification was associated with difference of magnitude.

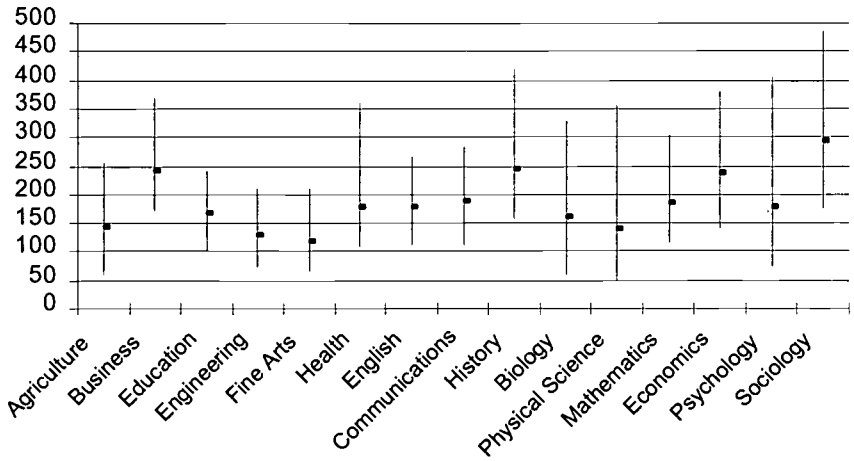
Table 8: Distribution Statistics for Key Indicators

Of those producing	SCHs				External/Competitive (1,000s of 98 $)				Refereed/Juried Works (2Yr)		
	25th	50th	75th	Rank	25th	50th	75th	Rank	25th	50th	75th
Agriculture	60	144	255	12	$20.0	$52.5	$121.0	7	2	4	6
Business	170	240	372	3	$3.0	$23.0	$48.0	10	2	3	5
Education	103	170	240	10	$17.0	$107.5	$250.0	1	2	3	4
Engineering	75	131	210	14	$40.0	$100.0	$290.0	2	2	4	6
Fine Arts	66	120	209	15	$1.5	$18.0	$50.0	13	1	3	5
Health	108	180	360	7	$15.0	$58.5	$260.0	6	2	3	5
English	113	180	266	7	$2.5	$12.0	$30.0	14	1	2	4
Communications	111	190	284	5	$3.4	$10.0	$25.0	15	2	3	4
History	159	245	420	2	$7.5	$22.2	$27.0	11	1	2	4
Biology	60	163	329	11	$40.0	$100.0	$200.0	2	2	4	8
Physical Science	48	140	357	13	$40.0	$100.0	$220.0	2	2	5	8
Mathematics	115	186	304	6	$20.0	$50.0	$140.0	8	2	3	5
Economics	141	237	380	4	$19.9	$45.0	$375.0	9	2	3	4
Psychology	75	180	405	7	$45.0	$100.0	$269.0	2	3	4	6
Sociology	176	295	486	1	$7.0	$20.0	$50.0	12	2	3	4
Research 1	81	159	285	4	$23.0	$95.0	$200.0	1	2	4	6
Research 2	104	175	288	3	$20.0	$60.0	$200.0	3	2	3	6
Doctoral 1	105	199	318	2	$16.5	$45.0	$136.4	4	2	3	5
Doctoral 2	117	209	330	1	$20.0	$71.9	$170.0	2	1	3	4

Rank was based on median value.
Median external support was for all awards from federal, foundation, and business and industry.

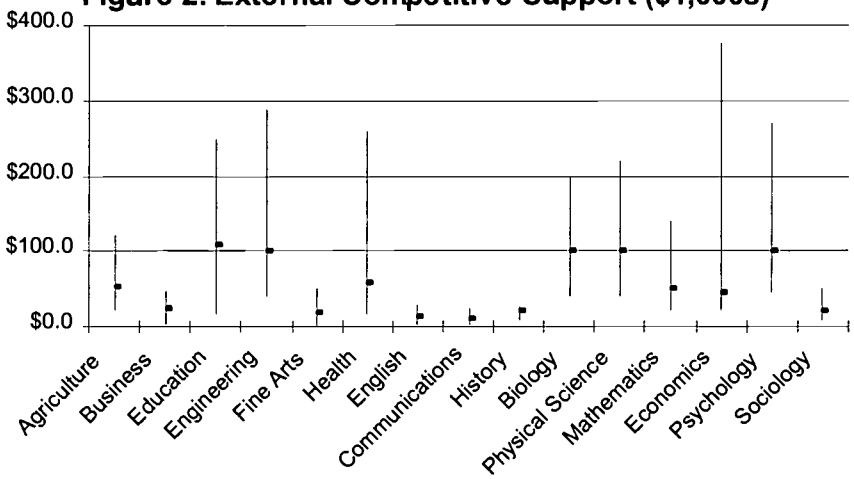
Figures 1 through 3 present the Table 8 results graphically, showing the 25th, 50th and 75th percentiles for all disciplines for student credit hour production, external competitive support, and refereed or juried products. Figures 4 through 6 are the same in content but display the intervals by Carnegie Classification. The figures help to illustrate that there is much overlap as well as dispersion among disciplines.

Figure 1: SCH Distributions



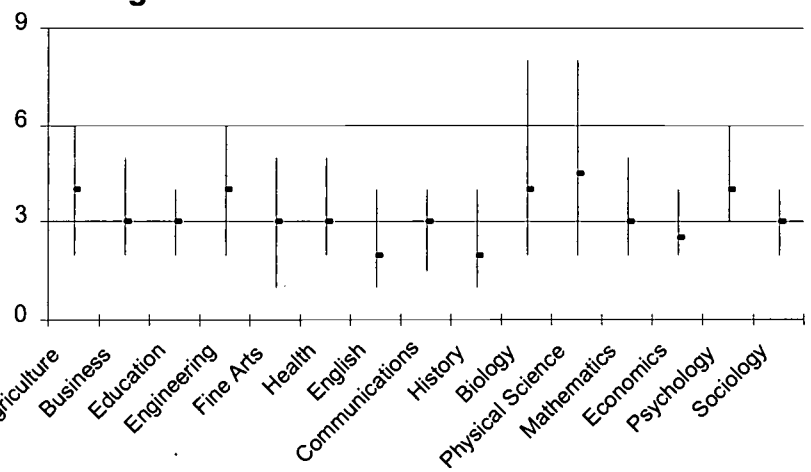
75th, Median & 25th Percentiles by Discipline

Figure 2: External Competitive Support ($1,000s)



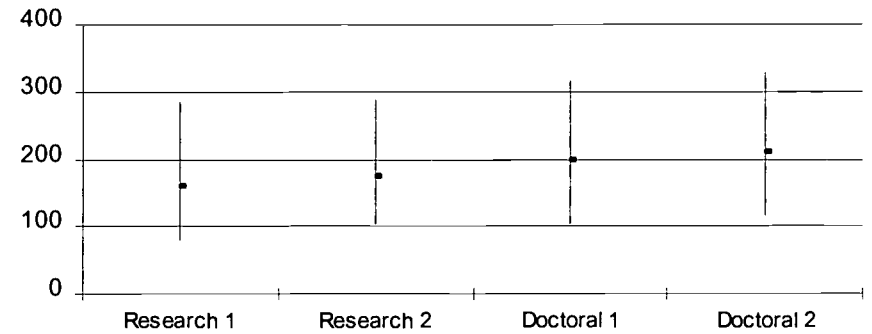
75th, Median & 25th Percentiles by Discipline

Figure 3: Refereed or Juried Products



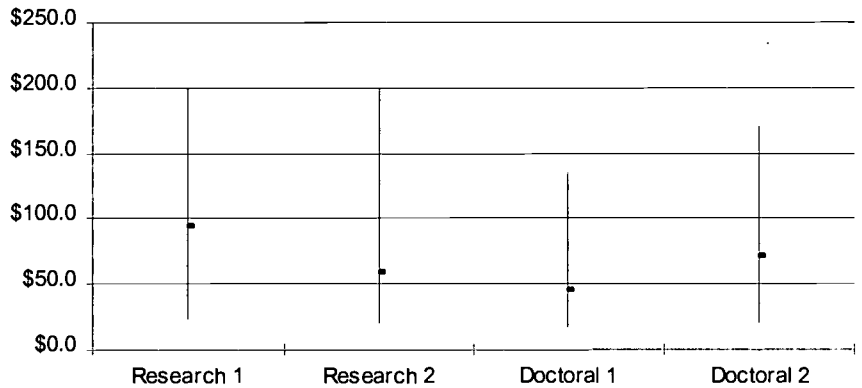
75th, Median & 25th Percentiles by Discipline

Figure 4: SCH Distributions



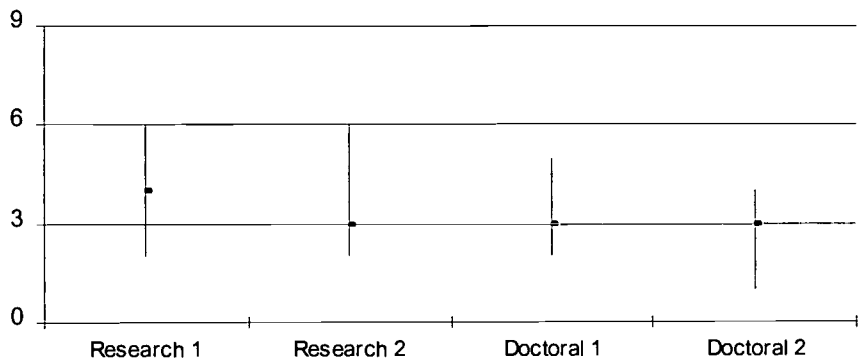
75th, Median & 25th Percentiles by Carnegie Classification

Figure 5:External Competitive Support ($1,000s)



75th, Median & 25th Percentiles by Carnegie Classification

Figure 6: Refereed or Juried Products



75th, Median & 25th Percentiles by Carnegie Classification

The table of key indicators by discipline, Table 9, reports work products distributed over the number of faculty in the area. The table displays student-credit-hours produced, research funding, and publications distributed over all faculty of a discipline. In other words, it recognizes that individual faculty have very different assignments but that when viewed collectively, there are important outcomes at the disciplinary level. For example, agriculture faculty produced 117 SCHs on average. Individual faculty might well have teaching assignments of more or less than 117 SCHs and some would have no teaching assignment, but a department of 10 faculty would be expected to produce about 1,170 SCHs (117*10). This averaging approach should be of more use to chairpersons and deans interested in the productivity of a collection of faculty and avoids micro-management accusations in that standards are not set at the level of individual faculty. The three measures, student credit hours, research and peer-reviewed publications were repeated from the Summary Measures section of the disciplinary profiles.

Table 9, and Figures 7 through 9, also address questions that might have come to the reader's attention while reviewing the previous materials about the relationship between self-reported time distribution and work products? Is there a relationship and is the relationship consistent across disciplines? Figures 7 through 9 show that there is some relationship between mean reported percentage of time expended, on the one hand, and both mean number of peer-reviewed products and median research dollars on the other hand. In both cases there is an amorphous cluster of 10 data points and a positive relationship created by 5 of the data points. The 5 data points were for the same **five disciplines in both cases: agriculture, biology, engineering, physical sciences, and psychology**. These were the disciplines where 50% or more of the faculty had sponsored research. In the other disciplines, it is unclear from these data that there is a relationship. Finally, it is clearer that there is probably no relationship worth notice between student credit hour production and time expended for instruction.

Table 9: Summary Indicators by Discipline and Reported Time Spent on Activity

	Teaching SCH		Research & Reviewed Products*				Prof. Dev.	Administration	Consulting	Service	Number of
	Mean	% Time	Mean $	Median $	Products	% Time	% Time	% Time	% Time	% Time	Faculty
Applied Fields											
Agriculture	117	40%	$159.3	$43.5	4.1	40%	3%	5%	1%	9%	116
Business	301	51%	$84.8	$2.8	2.6	29%	4%	6%	4%	6%	140
Education	188	57%	$175.0	$14.9	2.1	19%	4%	7%	3%	9%	185
Engineering	153	46%	$289.8	$66.1	3.9	37%	3%	6%	3%	4%	186
Health	265	57%	$158.4	$17.5	2.6	20%	5%	7%	3%	7%	137
Arts & Humanities											
Fine Arts	140	53%	$24.9	$1.5	1.4	22%	6%	9%	4%	6%	112
English	194	58%	$9.5	$0.7	2.3	25%	3%	8%	2%	4%	169
Communications	211	59%	$51.4	$2.0	1.8	23%	3%	7%	2%	5%	138
History	292	49%	$4.8	$1.9	1.8	32%	4%	9%	2%	5%	128
Sciences & Mathematics											
Biology	221	32%	$271.5	$73.9	5.0	52%	3%	6%	1%	4%	168
Physical Science	269	42%	$227.5	$75.0	5.3	43%	2%	7%	2%	4%	157
Mathematics	233	51%	$124.9	$16.8	2.8	29%	3%	11%	1%	5%	143
Social Sciences											
Economics	295	47%	$474.6	$14.6	2.5	32%	4%	10%	3%	5%	84
Psychology	268	41%	$250.8	$44.0	3.6	37%	3%	10%	3%	6%	73
Sociology	335	50%	$91.9	$6.9	2.5	31%	3%	7%	2%	6%	120

* Research support is in 1,000s of 98$s)

Notes: Percentages are mean percentage of time as reported by faculty.
Median research was computed as the median award times number of awards divided by number of faculty.
Research and reviewed products funding amounts are the mean and adjusted median totals that appear on disciplinary profiles.
Computations are for all faculty within discipline regardless of participation.

Figure 7: Median Research Dollars and Time Producing Research and Professional Products

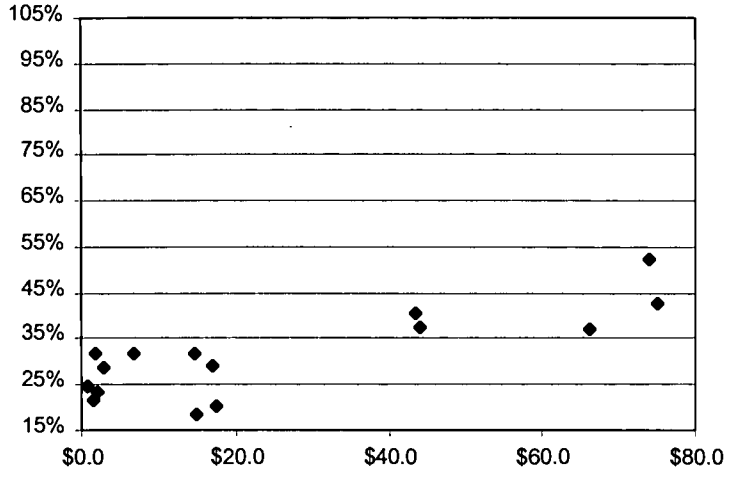


Figure 8: Mean Reviewed Products and Time Producing Research and Professional Products

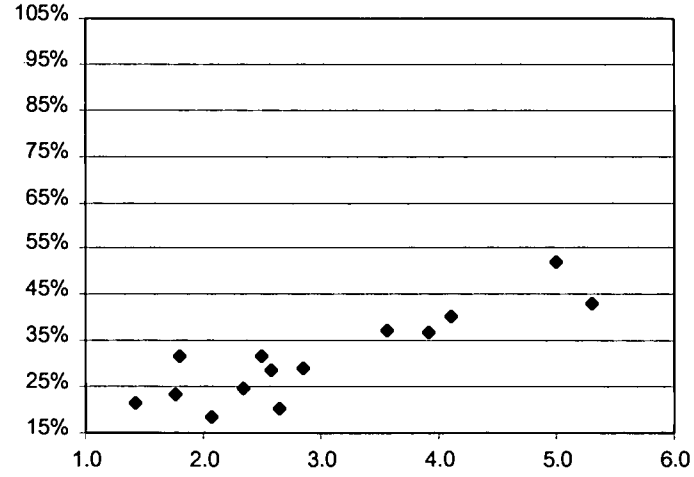
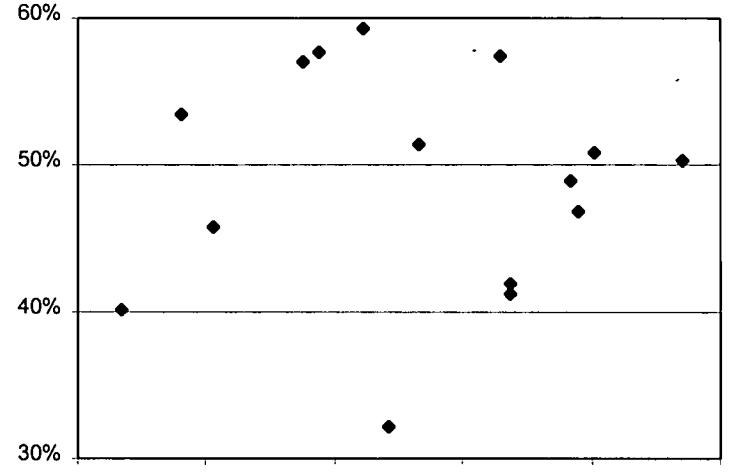


Figure 9: Mean SCHs Taught and Time Expended Teaching



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Discussion

Three outcomes of faculty effort are teaching, research, and scholarly works and three crude measures of these are student credit hours produced, research funding dollars, and number of scholarly works published in a referred journal or creative works in a juried media. In an era of performance indicators reporting, crude measures like these are seductive. But do they deliver the goods?

The most important observation to make from these data is that there are huge disciplinary differences and it makes little sense to compare faculty across disciplines or to combine faculty across disciplines to produce broad measures. The activities of faculty and their work products vary considerably. For the same reason, institutional level comparisons that ignore disciplinary composition and relative size of disciplines within the institution will be of very limited value. It was certainly true that disciplinary composition varied by Carnegie Class (Table 1).

A second important observation is that Carnegie Classification may reflect size and program composition more than research productivity per capita. Beyond likelihood of teaching, it was unclear whether average research funding and scholarly production bore a relationship to Carnegie Classification (Table 8). It was clearer that the likelihood of engaging in these activities was associated with Carnegie Classification (Table 7). In other words, if funding and publication are reflections of faculty quality, then faculty engaging in research and publication vary little in quality across Carnegie Classes. Whether are not they engage in these activities may vary more by Carnegie Class than does the magnitude of their engagement.

Last, a variety of measures are offered and it is recommended that multiple measures be used whenever assessing productivity and especially in this instance. Mean funding amount per award, mean funding per faculty, median funding per award, adjusted median research, and mean and median funding from clearly competitive external sources are all useful measures. Their

usefulness is dependent upon the application and in no application should only one measure be used.

Two very important policy arenas to which this paper can contribute vital information are budget review and planning and faculty workload. These policy arenas suffer from a lack of information generally and a lack of normative information specifically. Whether the issue is appropriate level of funding or of faculty performance expectations, normative information would contribute greatly to decision making and would help to move deliberations from the parochial, political, or budget adjustment driven (Zemsky & Massy, 1995).

The first of these, budget review and planning, is probably the most important from the viewpoint of social impact. Rationally based decision making in higher education management is limited by the quality of its data and even very complicated mathematical models of performance costs typically rely on very crude fundamental assumptions. An example of crude assumptions is the use of student level weighting of credit hour production where lower-division student credit hour production is weighted less heavily than upper-division, which is weighted much less than graduate student credit hour production with or without different base values for institutional types (Ahumada, 1990). From what source were these fundamental data elements taken: a 50-year old study, numbers pulled from pedagogical ether? As described earlier in this paper, none of the commonly available current standards bear close scrutiny. However, the fact that they are unsound does little to help the administrator faced with a department chairperson requesting an additional faculty position. On what basis will the decision be made?

The second policy area where valid comparative standards for faculty productivity would be especially valuable is faculty workload analysis. Within any institution there are differences of opinion regarding "normal" loads for faculty. Do faculty teach 2 courses per semester or 5? Do faculty spend 25% of their time in research or 50%? What differences are common for faculty of different disciplines? What performance level is exceptional, warranting special reward or recognition? Answers to these questions vary and the variance has a tremendous impact on

delivery costs and employee satisfaction. The obvious problem is that there are few comparative sources available. Hopefully, this paper has provided a firm basis from which to begin discussion.

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