Constructing a Peer Institution – A New Peer Methodology

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Abstract

Whatever your method of selecting institutions for comparison and benchmarking, you can both increase the validity and accuracy of those comparisons and extend the value of comparisons to department and college levels by constructing a peer institution from disaggregated components. This presentation will demonstrate the methodology using National Study of Instructional Costs and Productivity (Delaware Cost Study), the Faculty Salary Survey by Discipline (Oklahoma State), and Academic Analytics, LLC to construct better peer institutions with comparative statistics at campus, college and department levels for faculty salaries, instructional cost, instructional productivity, and research productivity. The methodology can also be used to fine-tune traditional peer methodologies and should be added to the IR arsenal of cluster, threshold, hybrid and panel-based peers.

Narrative

In the most influential IR document describing peer institution selection, Paul Brinkman and Deb Teeter (1987) wrote, "In developing peer groups, it is unrealistic to expect to find perfect matches, "clones" as it were, for the home institution." In fact, practitioners soon discover that the use of even a handful of narrowly described thresholds (same schools and colleges of same relative sizes) will eliminate all other universities and the researcher is left with an off-the-rack fit instead of a tailored fit. This paper asserts that Brinkman and Teeter were wrong about finding perfect matches. There is an alternative that will produce a near perfect match, a clone or doppelganger university. It just will not be a brick and mortar university. In fact, it won't exist except on spreadsheets or in computer code.

Traditional methods of peer group selection can be classified into developed or predetermined types. These types are not mutually exclusive and most commonly incorporate elements of multiple types. Predetermined types are easily communicated publicly and include:

1. Natural peers based on geography, athletics conferences, consortiums, or similar factors. These peers are particularly useful when communicating with legislators or the public in general.
2. Traditional peers based on long term associations or rivalries (e.g., Ivy League, State versus University of).
3. Jurisdictional peers based on political, legal, and administrative systems (e.g., state regional, campuses of the university system, accreditation regions).
4. Classification based peers are most often based on Carnegie "basic" classification or a subset thereof.

Developed peers rely on measured characteristics and can vary from simple (e.g., disciplinary composition clusters, public research II) to complex (e.g., student characteristics, funding levels, composition by student levels, professional programs):

1. Cluster analysis is more statistically complex. It sorts institutions into groups based on composition dimensions. For example, institutions can be sorted based on relative mix of disciplinary degrees awarded.
2. Threshold analysis is straightforward and easily communicated. For example, the characteristics of potential peers would have to fall within a range above and below the measured characteristic of the home institution. For example, if headcount enrollment at the home institution is 20,000 then peers would have enrollments between 17,500 and 22,500. Thresholds can be similarly applied to FTE enrollment, admissions scores, in state enrollment, or most anything.
3. It is more common for the methodology to be a hybrid of other types in various sequences (e.g., cluster analysis followed by threshold analysis and then submission to a panel).

4. Panel analysis relies on the expertise of professionals, typically institutional executives, who either nominate potential peers or eliminate potential peers identified by other methods.

The constructed peer methodology described in this paper can be applied to any peer set or combination of peer sets. For example, if the home institution is politically constrained to other two-year public institutions in the same state then the constructed peer methodology can be based on the elemental characteristics of those two-year public institutions.

The author's introduction to the concept of a constructed peer was through Dr. Joe Saupe. Among many other contributions to the profession, Joe was AIR's 2016 John Stecklein Distinguished Member Award recipient, AIR's 1981 Outstanding Service Award recipient, and author of the classic introduction to IR distributed by AIR, "*The Functions of Institutional Research*." The comparator methodology that Dr. Saupe used was for faculty salaries and was constructed to mirror our campus by faculty composition, rank and discipline -- to look exactly like us except for salary paid. Instead of our salaries, faculty salaries of the peer were set at the average by composition, rank and discipline of a peer set of institutions. The methodology answered the question, how much more or less would faculty salaries be if we paid every faculty member the peer institution average for that rank and discipline. For example, if we had 10 associate professors in civil engineering, we can compare their average salary to the average for civil engineering associate professors among the peer institutions. If we multiply the peer average by 10, we have a salary expenditure amount that can be both directly compared with our expenditure and combined with expenditures at other ranks, in other disciplines, or any combination to create comparative aggregates for a university that looks just like ours but pays different salaries. The idea is similar to that explored in Mark Twain's, *Prince and the Pauper,* or similar to the German concept of a *doppelganger*, two entities that look alike but have existed in different environments. The comparison of the two is a direct measure of the extent to which the differences are due to the environments or in the case of faculty salaries, due entirely to differences paid, local versus that peer composite average. Not only is the methodology more accurate, it can be highly tailored so that each department has its own peer set. There is one clear negative. The process loses transparency because it cannot be reproduced by a third party using publicly available documents.

The constructed peer methodology was not recognized as generalizable to other university performance characteristics and it did not contribute to discussion of peer institution groups that were popular in the 1980s and continue to dominate IR practice: various cluster analysis techniques and some measure of judgment (panel, hybrid, threshold, panel) about institutional key or performance statistics (Terenzini et Al., 1980; Brinkman & Teeter, 1987; Trainer, 2008; Xu, 2008). There are three very good reasons to revisit the methodology. First, good disaggregated data are available for critically important institutional research elements including faculty salaries (e.g., OSU since 1974) and instructional costs and productivity (Delaware since 1992). Second, disciplinary composition should always be an institutional research consideration because it dramatically affects every aspect of teaching, research and service and every aspect of the student experience. There is less variance among Universities by program than among programs within a University (Chatman, 2009). Third, IPEDS has inserted itself into the peer selection process based on the use of IPEDS data with the Executive Peer Tool (ExPT) and Data Feedback Report.

Methodology

Information from the Delaware Cost Study, the OSU *Faculty Salary Survey by Discipline*, and Academic Analytics, LLC will be used to construct *Doppelganger Universities* with comparative statistics at campus, college and department levels for faculty salaries (OSU), instructional cost and productivity (Delaware), and faculty research and scholarly productivity (Academic Analytics). The central feature of these sources and of the method is the weighting of comparative per capita or mean values to reflect the home campus composition. The methodology will be illustrated using per capita instructional costs from the Delaware Cost Study. The other applications are similar in that they find a comparator per capita figure at the lowest available level of aggregation and weight that per capita figure using home campus amounts to create a constructed or *doppelganger* department that can be combined with others to produce a constructed peer or *Doppelganger University*.

Comparing Instructional Costs at the Constructed Peer Institution

The following describes the steps for one department, Sociology. The same steps apply to other disciplines/departments and the results can be rolled into colleges or the university total.

1. The home campus instructional expenditure in sociology was $1.2 million.
2. The expenditure per FTE student (based on sociology SCHs by level) was $4,529 at the home campus.
3. The per student expenditure in sociology for research universities (RUH & RUVH) from the Delaware Cost Study was $5,764. The home campus therefore spent 79% of the "expected" amount or $1,235 less per student.
4. The home campus had 273 FTE students and therefore spent about $340,000 less to deliver sociology instruction than expected.
5. Steps 1 through 4 were repeated for the other departments and then aggregated to the college level. For the School of Social Sciences, Humanities and Arts, the instructional expenditure was 94% of the constructed peer; Engineering was 115%; and Natural Sciences was 84%. Overall, the home campus instructional expenditure was 95% of the constructed research university peer or over $2 million less.

In this example, all public research universities were used for comparison but Delaware supports analysis by selected peers and the peer set could even vary based on the department/discipline or college, especially if the home institution participates in a data sharing consortium (e.g., AAUDE). It is easy to imagine that an Engineering peer set could differ from a Natural Sciences peer set, etc.

Table 1 and Figures 1a and 1b show the detail behind computation (Table 1) and the difference between the local university and the comparative figures per FTE student by department (Figure 1a) and college (Figure 1b). The difference is displayed on a per student and over all students difference (difference per student and magnitude of difference over all FTE students). A big difference by FTE student in a small department may have less institutional impact than a small difference in a large department. It is clear that institutional composite was very close to that for the constructed peer but that there was much variation by department. That illustrates a danger of institutional measures. The composite can be at the mean value, suggesting normative performance, but be comprised of values showing wide variation. In fact, funding at the institutional level makes that misleading outcome more likely. The results are not prescriptive. They do not show programs to be cut or where investments are needed but they do identify areas of greater or lesser spending than is typical and ask whether that was intentional or a parochial artifact.

Other Examples

The technique is generally applicable. Any comparative measure can be weighted to reflect local composition to create aggregate comparative statistics and will be more accurate, valid and useful if it was constructed at a low level of aggregation – at least the department – before being aggregated to college and campus levels. The following will illustrate the methodology using faculty salaries and faculty professional performance but it could be extended to most any measure. For example, student satisfaction varies by area of major (Chatman, 2009). The mean level of satisfaction for a comparable set of institutions can be weighted by local number of students by major and then compared at the college or institutional level. Given that disciplinary differences are ubiquitous institutional values that ignore those differences may reflect composition more than real differences.

Faculty Salary Comparison

The predominate factor associated with faculty salaries variance is discipline and rank. Unless the comparator average has the same disciplines by rank in the same amounts, there will be error that can be controlled by constructing a peer that does have the same disciplines and ranks in the same amounts. The following example illustrates the methodology using Oklahoma State University Faculty Salary Survey averages by discipline for public Research I and Research II institutions. As was the case for instructional expenditures, the mean salary for the comparators by discipline and rank are weighted by the local university composition and the total expenditures are used to create college and institutional comparisons. For example history professors are paid $113,697 on average at RI and RII schools. The home institution had two professors. If the home department paid the two professors exactly the national mean, the home department would have spent $227,394. The home department actually paid $204,800 or 90% of the average. For all departments in the School of Social Sciences, Humanities and Arts, the home school spent $2,071,500 on professor salaries. If every department in the school had paid the national public R1 and R2 average to each professor, the school would have spent $1,887,400 or 10% less. The methodology is especially useful at UC Merced, an 11 year-old public research university, because its mix by rank is atypical. Because it is a new university, UC Merced has a much higher proportion of assistant professors than is typical and a much lower proportion of professors than is typical. The unweighted campus mean, not adjusted for the higher proportion of assistant professors and lower proportion of professors, for UC Merced would be well below the comparator even though the comparisons by rank were all above the comparator average and the weighted mean was above the comparator average. The values by rank, discipline, school and campus are shown in Table 2. As was the case for instructional costs, large differences for a few faculty should not be cause for alarm but substantially different patterns by school might be or there might be a strategic plan to recruit substantially more competitive faculty in one area or another.

Faculty Professional Performance

The third example relies on data from Academic Analytics, LLC, a fee-based service that gathers grant, publication, presentation, and citations for individual faculty and makes those data available to subscribing institutions. Because faculty are identified by disciplinary area and institution type, the mean values for all faculty in an area can be used as a comparative standard (Table 3). For example, and using the comparative subset of these pseudo value statistics in physics, the comparative values per faculty member were about 0.3 books, 16.8 journal articles, 200 citations, 1.2 grants, $150,000 grant dollars, and 0.7 honors and awards. Because the home department has 18 faculty members, the expected production for the 18 was 5.4 books, 302 journal articles, 3,600 citations, 21.6 grants, $2,700,000 grant dollars and 12.6 honors and awards. Actual production can be compared to the expectations and expressed as a percent (60% to 80% for this pseudo physics example). The expected and observed amounts can be aggregated to school and campus levels and can be used to identify relative strengths. Those relative amounts are expressed as a series of graphs (Figures 2 through 6). For UC Merced, journal article publications, citations and books were strong, number of grants was comparable, but grant dollars were lower. That is likely expected for a very young university but an effort to substantially increase the scope of grants might be useful.

Summary

There are remarkably few published productivity standards in higher education (Chatman, 2016). Instead, analysis is typically parochial, treating history as a comparative standard, or at the institutional level, treating a cluster of colleges as a comparative standard. The process of selecting peer institutions uses any of a variety of methods or combinations of predetermined or developed peer methods that have been well described elsewhere (Brinkman & Teeter, 1987) and continue to dominate higher education (NCES's Executive Peer Tool, ExPT). This is true even though much better data sources are available that support comparative analysis at the department level or of even smaller aggregates. This paper offers a constructed peer as a better, more accurate and more valid, peer because it perfectly reflects the disciplinary composition of the home institution and isolates the comparison to the variable being considered.

A constructed peer institution for comparison has important advantages to traditional, institutional peer methodologies. First, the process of constructing a peer produces comparative values at all levels of academic aggregation (e.g., department, school or college, university). Second, the normative or standard values used to construct the peer can be tailored by department, school or college so that each level can be based on its own tailored set of institutions. Perhaps the social sciences college of an engineering-focused university should have a different peer set than the engineering college. Third, in every case, the constructed peer fits the home institution accurately. It has the same programs in the same relative and absolute amounts. It has exactly the same number of faculty overall and by rank and discipline. It is a clone or doppelganger.

A constructed peer also has two substantial disadvantages. First, it is more difficult to make transparent and requires more effort on the part of the user when it is made transparent. Second, it is more difficult to explain to higher education constituencies. For a university president or chancellor, the choice between reporting the average faculty salary for Pac-12 institutions and a peer constructed from various combinations of AAU public institutions at the discipline level, will be a simple choice. And, while it is less accurate and less valid, comparisons at the institutional level are often very similar to the constructed institutional average. For larger groups, the methods tend to yield similar relative percentages. If the only purpose of the peer comparison is to compare institutional-level values, then this method of peer construction is probably not worth the additional effort and loss of transparency. However, if the value of comparisons is extended to school and department levels, then constructed peers are preferable.

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Table 1: UC Merced Pseudo Instruction Expenditures by Department
Compared to Expenditures at National Research Universities

Level	Degree Programs / Majors	CIP	UCM CIP Over CIP from Delaware Cost Study If Different	UCM FTES (Ugrad SCH / 15 + Grad SCH / 12)	UCM Instruction Expenditure	UCM Instruction $ / FTE Student	UCM Instruction FTE Per Student / National Research Univ Per Student	UCM - Delaware Instruction $ Per Student Difference	Instruction $ Difference Times UCM FTES in $100,000's	Doppelganger U: Weighting National Instruction Expenditure by UCM FTES
UCM	Anthropology	45.02	Anthropology	127.4	$888,679	$6,975	115%	$934	$1.2	
Delaware		45.02	Anthropology			$6,041				769,718
UCM	Applied Mathematics	27.03	Applied Mathematics	782.5	$3,300,100	$4,218	79%	-$1,110	-$8.7	
Delaware		**27.00**	**Mathematics and Statistics**			$5,327				4,168,325
UCM	Bioengineering	14.05	Biomedical/Medical Engineering	40.4	$805,709	$19,943	122%	$3,619	$1.5	
Delaware		14.05	Biomedical/Medical Engineering			$16,324				659,509
UCM	Biological Sciences	26.01	Biology, General	604.6	$3,392,147	$5,611	80%	-$1,418	-$8.6	
Delaware		26.01	Biology, General			$7,029				4,249,447
UCM	Chemistry	40.05	Chemistry	492.1	$2,905,605	$5,905	79%	-$1,567	-$7.7	
Delaware		40.05	Chemistry			$7,472				3,676,411
UCM	Cognitive Sciences	30.25	Cognitive Science	207.5	$1,508,545	$7,269	125%	$1,468	$3.0	
Delaware		**42.00**	**Psychology**			$5,801				1,203,893
UCM	Computer Science and Engineering	14.09	Computer Engineering	223.2	$2,474,021	$11,083	106%	$603	$1.3	
Delaware		**11.07**	**Computer Science**			$10,480				2,339,366
UCM	Earth Systems Sciences	40.06	Geological and Earth Sciences/Geosciences	103.7	$1,607,946	$15,506	158%	$5,689	$5.9	
Delaware		40.06	Geological and Earth Sciences/Geosciences			$9,817				1,018,016
UCM	Economics	45.06	Economics	228.8	$1,100,499	$4,810	79%	-$1,298	-$3.0	
Delaware		45.06	Economics			$6,108				1,397,488
UCM	Environmental Engineering	14.14	Environmental/Environmental Health Engineering	112.6	$1,632,681	$14,498	126%	$2,981	$3.4	
Delaware		**14.08**	**Civil Engineering**			$11,516				1,296,942
UCM	History	54.01	History	114.1	$1,035,698	$9,078	143%	$2,737	$3.1	
Delaware		54.01	History			$6,342				723,483
UCM	Literatures and Cultures	16.01	Literature & Cultures	457.8	$3,719,811	$8,125	137%	$2,190	$10.0	
Delaware		**16.01**	**Linguistic, Comparative & Related Lang Studies and Services**			$5,935				2,717,177
UCM	Management	52.02	Business Administration, Management and Operations	114.7	$565,035	$4,928	69%	-$2,229	-$2.6	
Delaware		52.02	Business Administration, Management and Operations			$7,156				820,605
UCM	Materials Science and Engineering	14.18	Materials Engineering	77.3	$844,570	$10,921	68%	-$5,052	-$3.9	
Delaware		14.18	Materials Engineering			$15,973				1,235,264
UCM	Mechanical Engineering	14.19	Mechanical Engineering	123.9	$2,047,071	$16,529	149%	$5,458	$6.8	
Delaware		14.19	Mechanical Engineering			$11,070				1,371,074
UCM	Physics	40.08	Physics	219.1	$1,941,943	$8,863	102%	$194	$0.4	
Delaware		40.08	Physics			$8,670				1,899,490
UCM	Political Science	45.10	Political Science and Government	172.7	$1,721,097	$9,968	142%	$2,954	$5.1	
Delaware		45.10	Political Science and Government			$7,013				1,210,958
UCM	Psychology	42.01	Psychology, General	826.7	$3,734,230	$4,517	78%	-$1,284	-$10.6	
Delaware		**42.00**	**Psychology**			$5,801				4,795,847
UCM	Sociology	45.11	Sociology	273.1	$1,236,805	$4,529	86%	-$735	-$2.0	
Delaware		45.11	Sociology			$5,264				1,437,513
UCM	Writing Program	23.13	Rhetoric and Composition/Writing Studies	725.2	$4,340,547	$5,985	118%	$895	$6.5	
Delaware		23.13	Rhetoric and Composition/Writing Studies			$5,090				3,691,457
				6,027.3	40,802,739	$6,770	100%	$20	$1.2	**40,681,981**
					Expected Research Univ. Instruction Expenditure	**$40,681,981**			$120,758	
					Actual UC Merced Instruction Expenditure	**$40,802,739**				

* TEACHING ASSISTANTS: Students at the institution who receive a stipend strictly for teaching activity. Includes teaching assistants who are instructors of record, but also includes teaching assistants who function as discussion section leaders, laboratory section leaders, and other types of organized class sections in which instruction takes place but which may not carry credit and for which there is no formal instructor of record. For purposes of this study, do not include graduate research assistants. If a graduate assistant's FTE is split between research and teaching, only report the portion of their FTE that reflects their teaching activity

*** The instruction function, for purposes of this study, includes general academic instruction, occupational and vocational instruction, community education, preparatory and adult basic education, and remedial and tutorial instruction conducted by the teaching faculty for the institution's students. Departmental research and service which are not separately budgeted should be included under instruction. In other words, department research which is externally funded should be excluded from instructional expenditures, as should any departmental funds which were expended

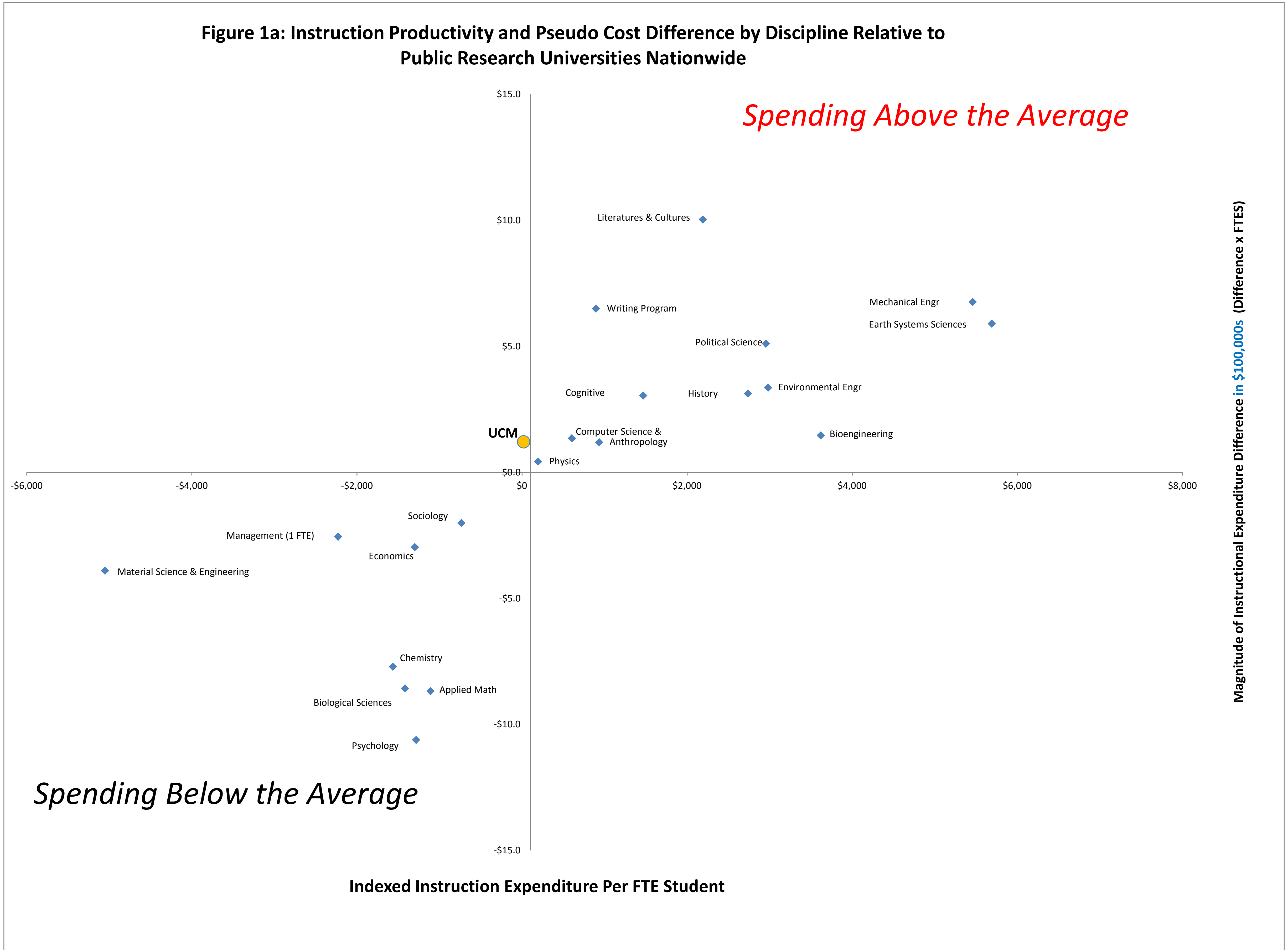
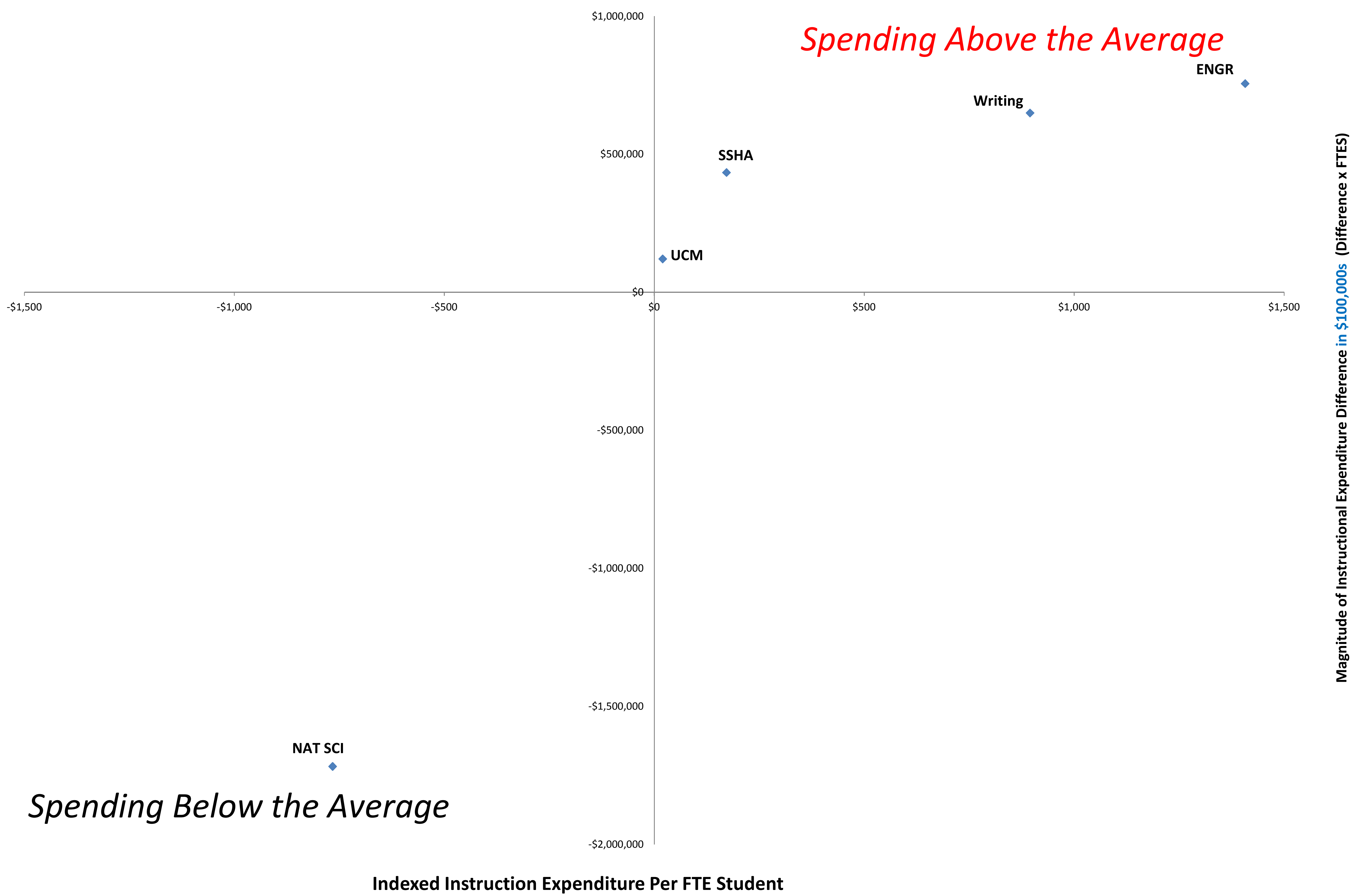


Figure 1a: Instruction Productivity and Pseudo Cost Difference by Discipline Relative to Public Research Universities Nationwide
Spending Above the Average
Spending Below the Average
$15.0
$10.0
$5.0
$0.0
-$5.0
-$10.0
-$15.0
-$6,000
-$4,000
-$2,000
$0
$2,000
$4,000
$6,000
$8,000
Literatures & Cultures
Writing Program
Mechanical Engr
Earth Systems Sciences
Political Science
Cognitive
History
Environmental Engr
UCM
Computer Science &
Anthropology
Bioengineering
Physics
Sociology
Management (1 FTE)
Economics
Material Science & Engineering
Chemistry
Applied Math
Biological Sciences
Psychology
Indexed Instruction Expenditure Per FTE Student
Magnitude of Instructional Expenditure Difference in $100,000s (Difference x FTES)

Figure 1b: Instruction Productivity and Cost Difference by Discipline Relative to Research Universities Nationwide (UC Merced Pseudo Spending Very Close to the Average)



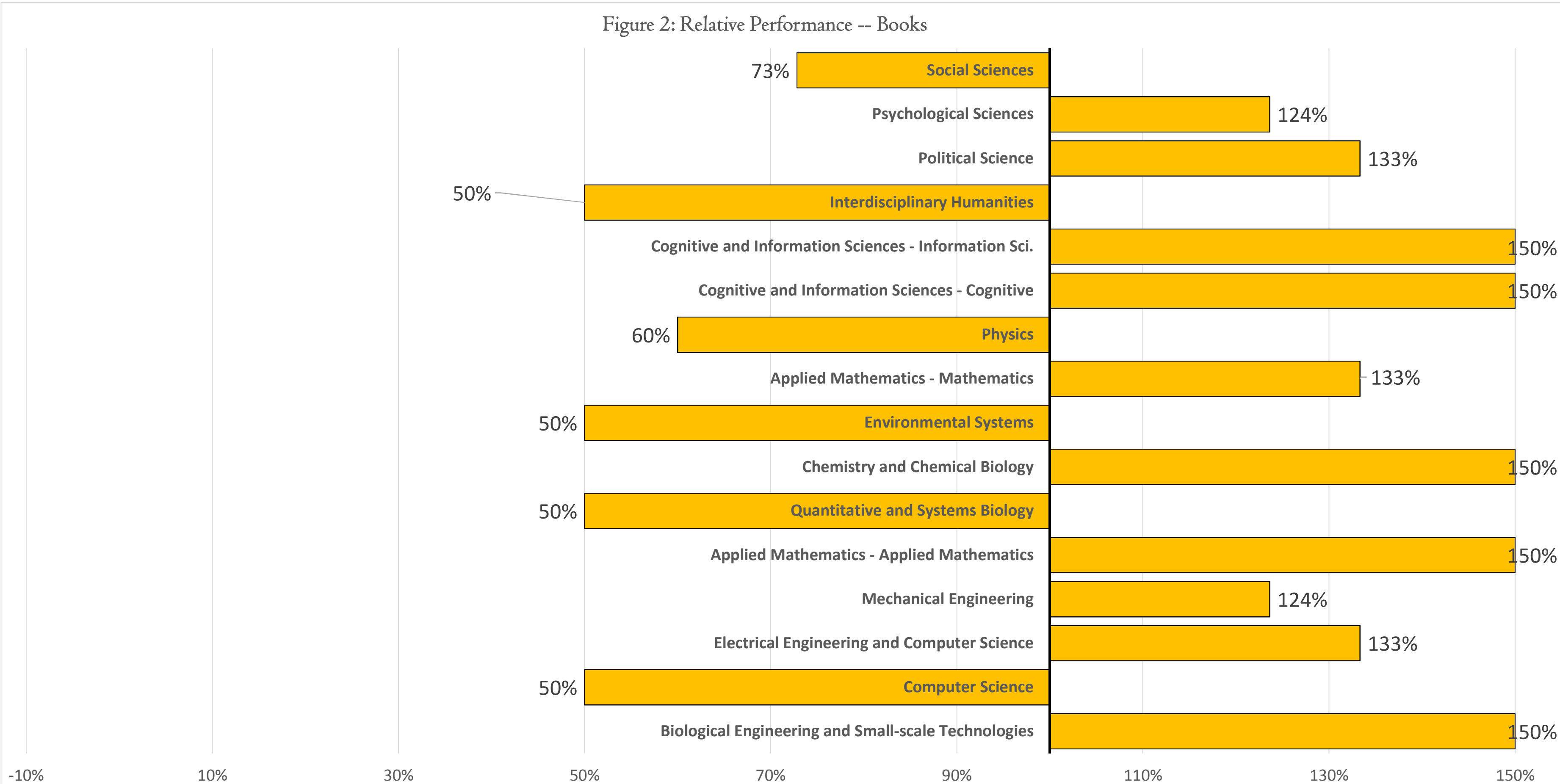


Figure 2: Relative Performance -- Books
73%
Social Sciences
Psychological Sciences
124%
Political Science
133%
50%
Interdisciplinary Humanities
Cognitive and Information Sciences - Information Sci.
150%
Cognitive and Information Sciences - Cognitive
150%
60%
Physics
Applied Mathematics - Mathematics
133%
50%
Environmental Systems
Chemistry and Chemical Biology
150%
50%
Quantitative and Systems Biology
Applied Mathematics - Applied Mathematics
150%
Mechanical Engineering
124%
Electrical Engineering and Computer Science
133%
50%
Computer Science
Biological Engineering and Small-scale Technologies
150%
-10%
10%
30%
50%
70%
90%
110%
130%
150%

Table 3: UC Merced Pseudo Data Compared to All Academic Analytics Universities (Public and Private)

UCM	Academic Program from Academic Analytics	Duplicated	Count from Academic Analytics	Academic Analytics (Per Capita) Books (05-14)	Journal Articles (11-14)	Citations (10-14)	Grants (10-14)	Grant Dollars (10-14)	Honors and Awards (Lifetime)	Academic Analytics (Weighted) Books	Journal Articles	Citations	Grants	Grant Dollars	Honors and Awards
Biological Engineering and Small-scale Technologies	UC Merced		26	0.3	11.7	277.5	1.2	147,839	0.4	7.8	303.9	7,214	30.9	3,843,801	9.1
	Academic Analytics			0.2	13.5	290.6		356,000	1.2	5.2	351.0	7,556	34.0	9,256,000	31.2
										150%	87%	95%	91%	42%	29%
Computer Science	UC Merced	*	16	0.1	12.1	124.5	1.4	173,475	0.6	1.6	193.0	1,992	22.1	2,775,595	10.1
	Academic Analytics Computer Science			0.2	6.2	55.0		250,000	0.8	3.2	99.2	880	28.6	4,000,000	12.8
										50%	195%	226%	77%	69%	79%
Electrical Engineering and Computer Science	UC Merced	*	16	0.4	12.1	124.5	1.4	173,475	0.6	6.4	193.0	1,992	22.1	2,775,595	10.1
	Academic Analytics Electrical Engineering			0.3	9.1	92.6	1.5	225,000	0.7	4.8	145.6	1,482	23.3	3,600,000	11.2
										133%	133%	134%	95%	77%	90%
Mechanical Engineering	UC Merced		17	0.2	19.0	253.0	1.4	137,033	0.4	3.1	323.0	4,301	24.0	2,329,563	7.0
	Academic Analytics			0.1	10.8	128.3	1.6	200,000	0.6	2.5	183.6	2,181	27.2	3,400,000	10.2
										124%	176%	197%	88%	69%	68%
	SCHOOL OF ENGINEERING		59							14.9	819.9	13,507	77.0	8,948,959	26.2
										11.7	657.0	10,918	87.2	16,456,000	53.4
										127%	125%	124%	88%	54%	49%
Applied Mathematics - Applied Mathematics	UC Merced	*	11	0.3	7.4	55.6	1.1	78,497	0.3	3.3	81.0	611	12.0	863,464	3.0
	Academic Analytics Applied Mathematics			0.2	9.2	101.6	1.5	180,000	0.9	2.2	101.2	1,118	16.5	1,980,000	9.9
										150%	80%	55%	73%	44%	30%
Quantitative and Systems Biology	UC Merced		40	0.1	10.2	153.1	1.0	181,365	0.3	4.0	406.0	6,123	41.2	7,254,594	10.0
	Academic Analytics			0.2	12.5	180.4	1.3	340,000	0.4	8.0	500.0	7,216	52.0	13,600,000	16.0
										50%	81%	85%	79%	53%	63%
Chemistry and Chemical Biology	UC Merced		16	0.3	10.8	288.3	1.1	206,538	0.3	4.8	172.0	4,612	18.1	3,304,601	5.0
	Academic Analytics			0.2	15.5	330.2	1.8	330,000	1.1	3.2	248.0	5,283	28.8	5,280,000	17.6
										150%	69%	87%	63%	63%	28%
Environmental Systems	UC Merced		27	0.1	12.2	152.6	1.5	235,405	0.4	2.7	328.1	4,120	40.0	6,355,939	11.1
	Academic Analytics			0.2	10.9	142.5	1.4	190,000	0.5	5.4	294.3	3,848	37.8	5,130,000	13.5
										50%	111%	107%	106%	124%	82%
Applied Mathematics - Mathematics	UC Merced	*	11	0.4	7.7	55.6	1.1	78,497	0.3	4.4	84.7	611	12.0	863,464	3.0
	Academic Analytics Mathematics			0.3	5.3	33.5	1.2	90,000	0.7	3.3	58.3	369	13.2	990,000	7.3
										133%	145%	166%	91%	87%	41%
Physics	UC Merced		18	0.2	11.6	125.1	0.9	110,077	0.6	3.2	208.8	2,252	16.9	1,981,379	10.1
	Academic Analytics			0.3	16.8	200.0	1.2	150,000	0.7	5.4	302.4	3,600	21.6	2,700,000	12.6
										60%	69%	63%	78%	73%	80%
	SCHOOL OF NATURAL SCIENCES		112							18.6	1197.7	17,718	128.2	19,759,977	39.1
										24.8	1424.5	20,690	155.1	28,195,000	68.3
										75%	84%	86%	83%	70%	57%
Cognitive and Information Sciences - Cognitive	UC Merced	*	26	0.3	11.4	111.2	0.9	65,079	0.5	7.8	295.9	2,892	22.1	1,692,057	13.0
	Academic Analytics Cognitive Sciences			0.2	11.6	129.0	1.3	260,000	0.6	5.2	301.6	3,354	33.8	6,760,000	15.6
										150%	98%	86%	65%	25%	83%
Cognitive and Information Sciences - Information Sci.	UC Merced	*	26	0.3	11.4	111.2	0.9	65,079	0.5	7.8	295.9	2,892	22.1	1,692,057	13.0
	Academic Analytics Information Sciences			0.2	5.5	49.6	1.2	130,000	0.6	5.2	143.0	1,290	31.2	3,380,000	15.6
										150%	207%	224%	71%	50%	83%

Figure 2: Relative Performance -- Books

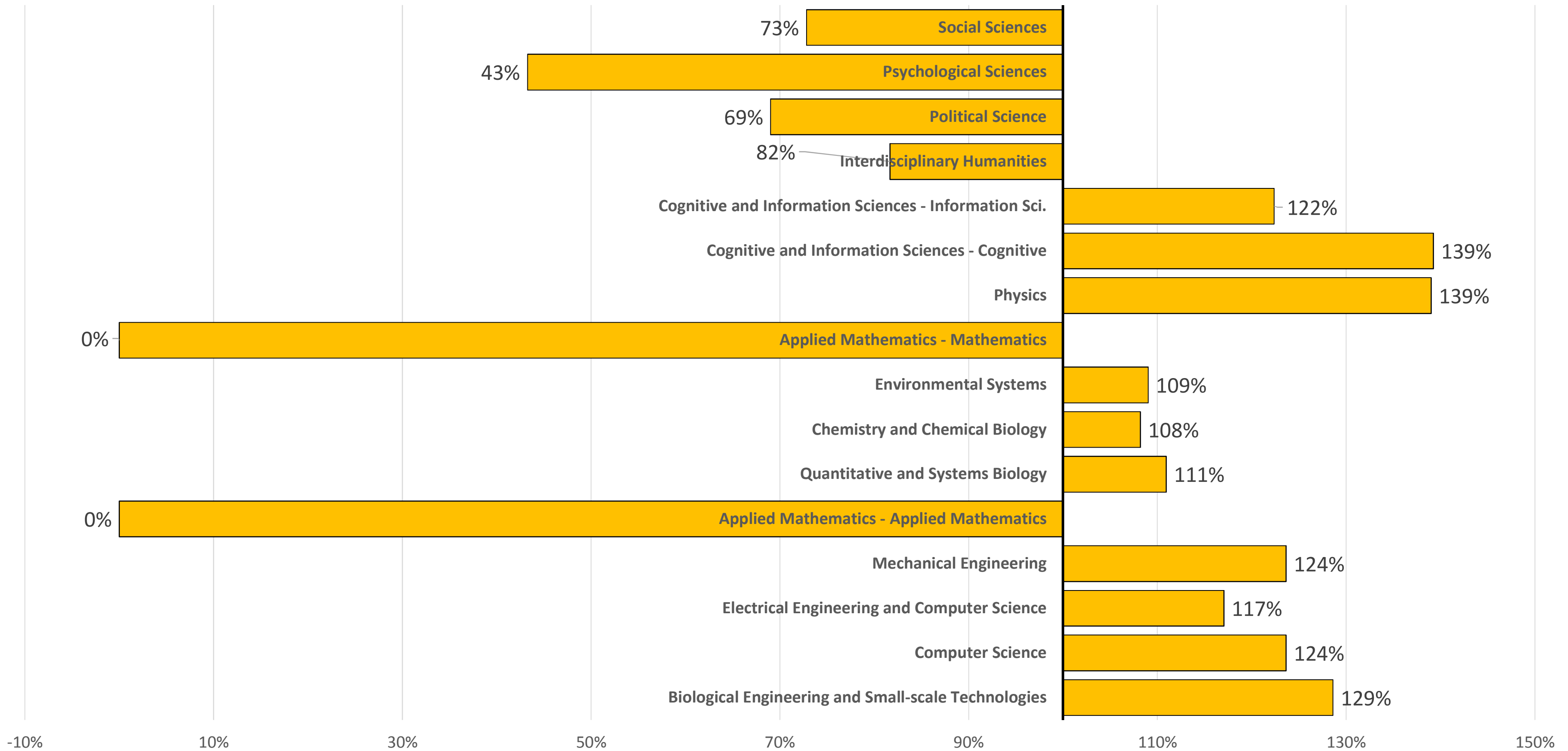
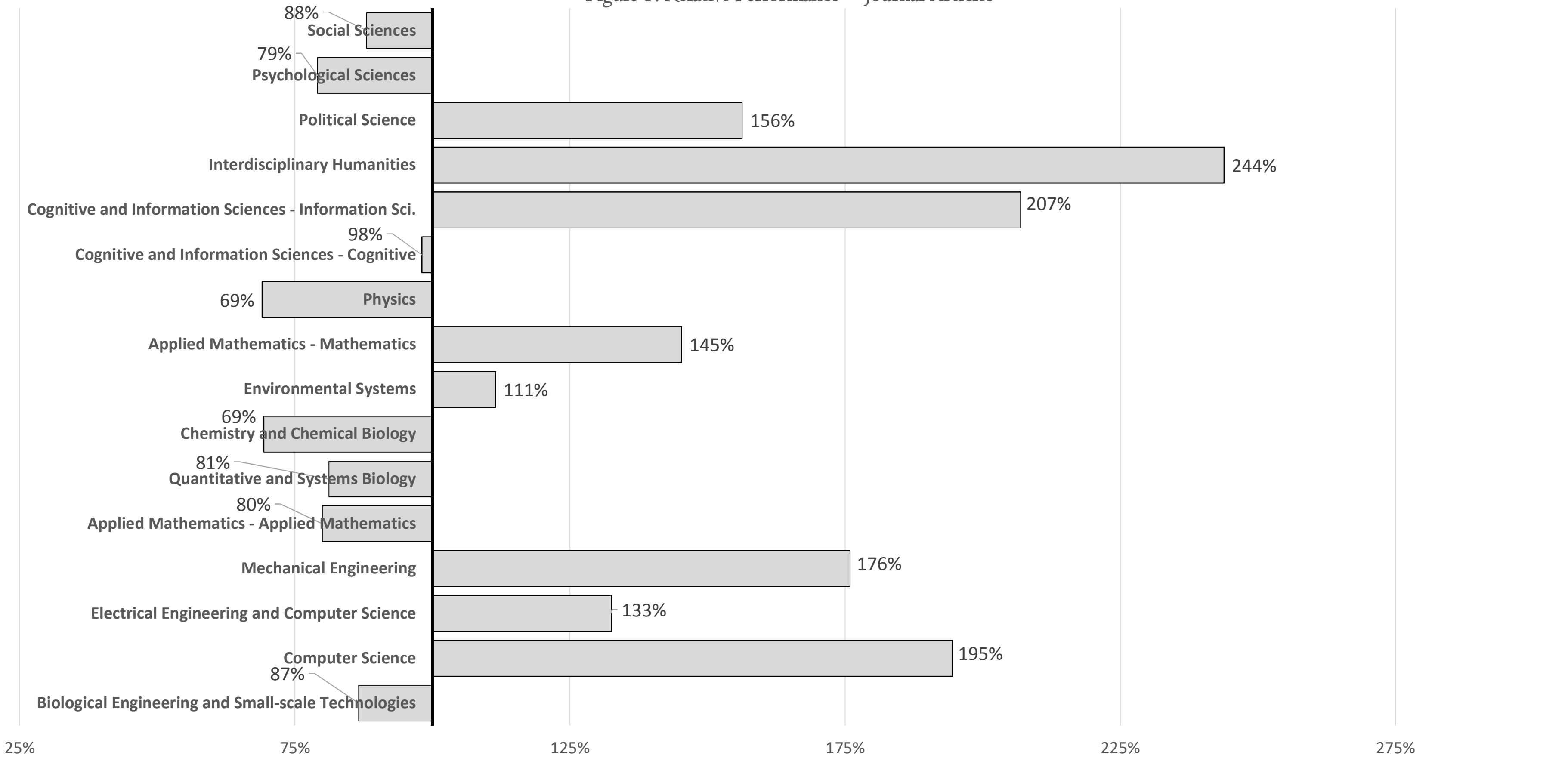


Figure 3: Relative Performance -- Journal Articles



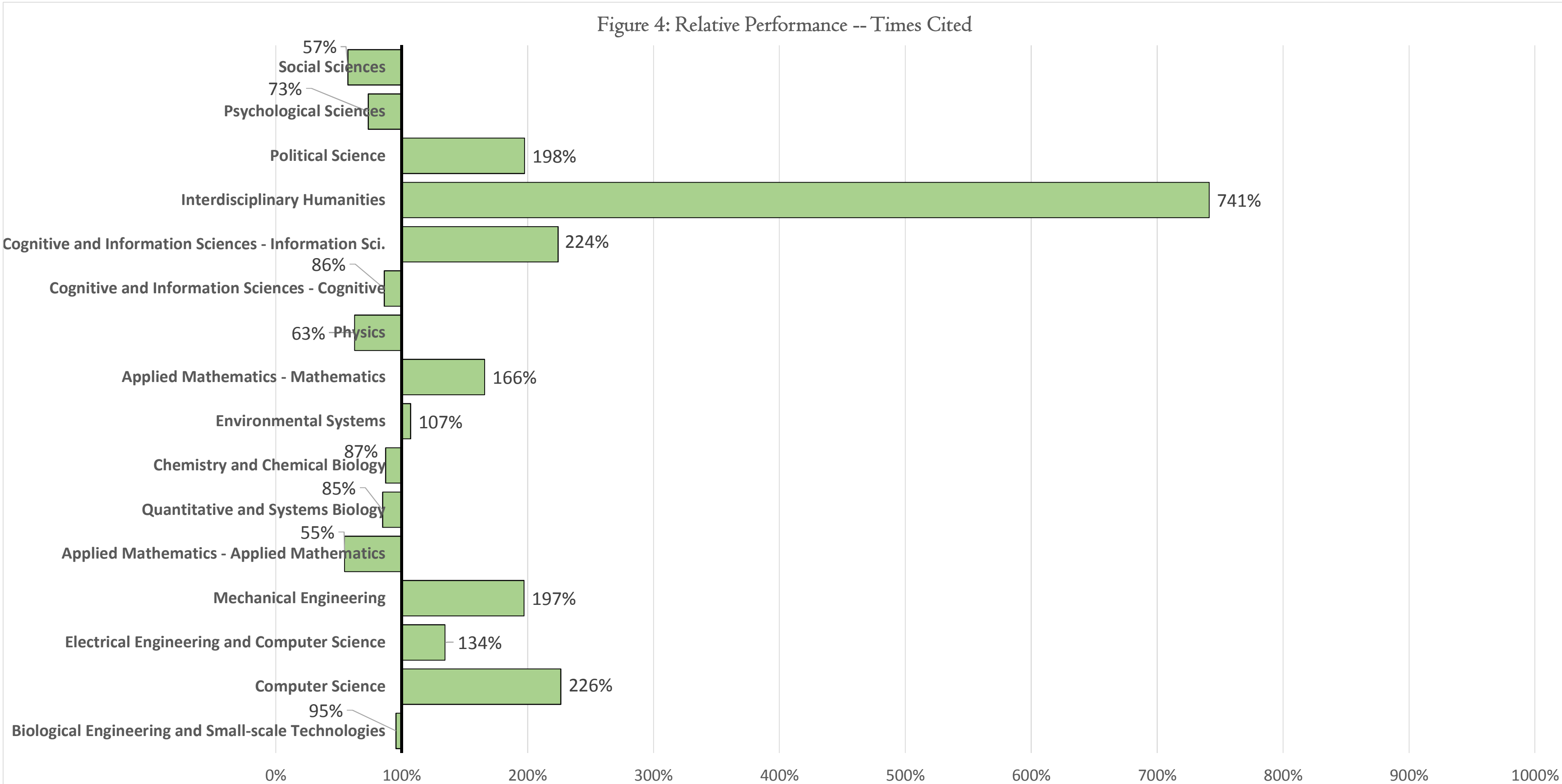


Figure 4: Relative Performance -- Times Cited
Social Sciences
57%
Psychological Sciences
73%
Political Science
198%
Interdisciplinary Humanities
741%
Cognitive and Information Sciences - Information Sci.
224%
Cognitive and Information Sciences - Cognitive
86%
Physics
63%
Applied Mathematics - Mathematics
166%
Environmental Systems
107%
Chemistry and Chemical Biology
87%
Quantitative and Systems Biology
85%
Applied Mathematics - Applied Mathematics
55%
Mechanical Engineering
197%
Electrical Engineering and Computer Science
134%
Computer Science
226%
Biological Engineering and Small-scale Technologies
95%
0%
100%
200%
300%
400%
500%
600%
700%
800%
900%
1000%

Figure 5: Relative Performance -- Number of Grants

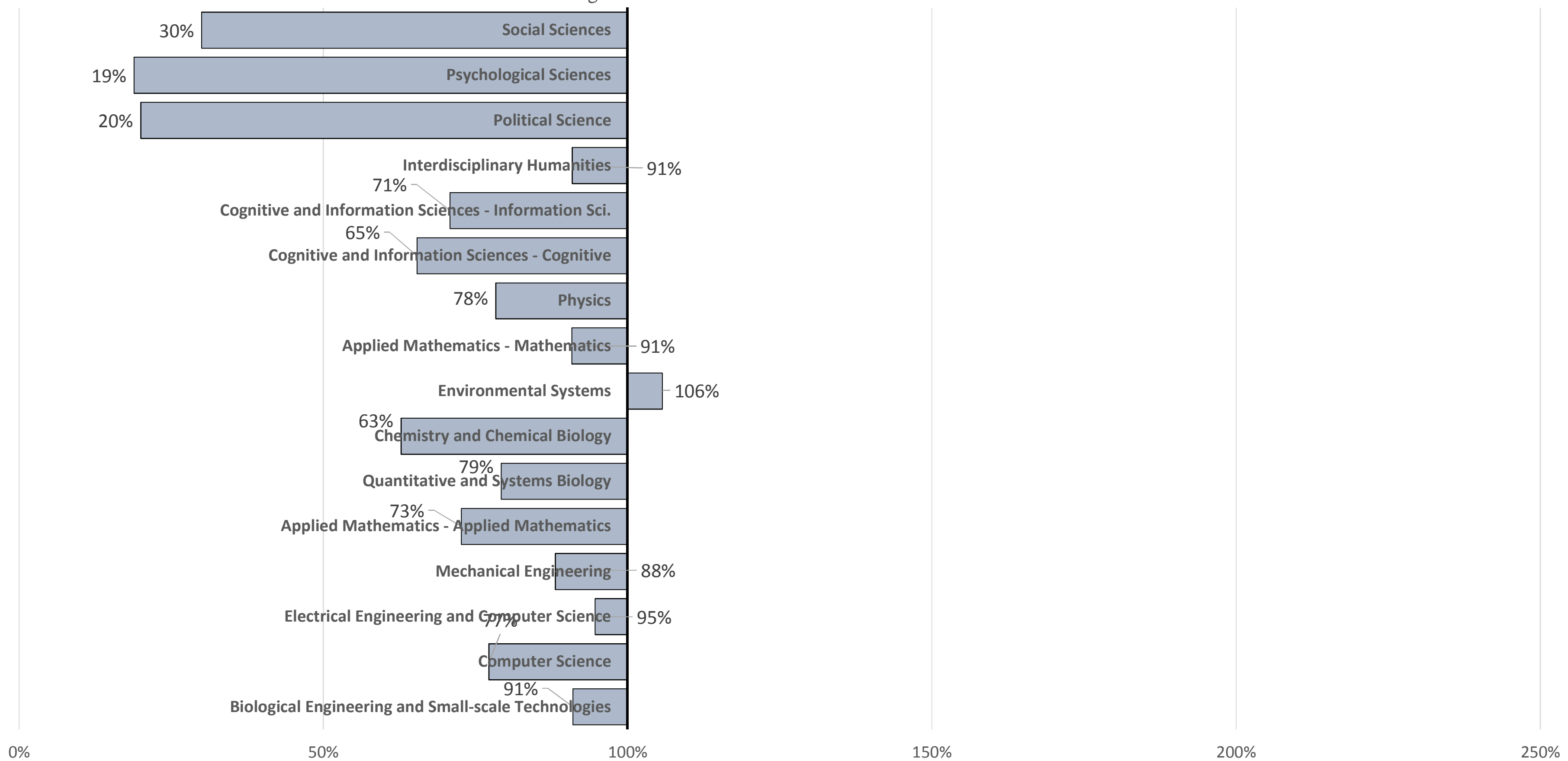


Figure 6: Relative Performance -- Grant Dollars