Sciencexpress Report

The Increasing Dominance of Teams in Production of Knowledge

Stefan Wuchty,[1]* Benjamin F. Jones,[2]* and Brian Uzzi[3]*†

[1]Northwestern Institute on Complexity (NICO), Northwestern University, Evanston, IL 60208, USA. [2]Kellogg School of Management, Northwestern University, Evanston, IL 60208, USA. [3]Kellogg School of Management, Northwestern University and the Northwestern Institute on Complexity (NICO), Evanston, IL 60208, USA (Corresponding author).

*Authors contributed equally to this work.

†To whom correspondence should be addressed. E-mail: uzzi@northwestern.edu

We have used 19.9 million papers over 5 decades and 2.1 million patents to demonstrate that teams increasingly dominate solo authors in the production of knowledge. Research is increasingly done in teams across virtually all fields. Teams typically produce more highly cited research than individuals do, and this advantage is increasing over time. Teams now also produce the exceptionally high impact research, even where that distinction was once the domain of solo authors. These results are detailed for the sciences and engineering, social sciences, arts and humanities, and patents, suggesting that the process of knowledge creation has fundamentally changed.

An acclaimed tradition in the history and sociology of science emphasizes the role of the individual genius in scientific discovery (*1*, *2*). This tradition focuses on guiding contributions of solitary authors, such as Newton and Einstein, and can be seen broadly in the tendency to equate great ideas with particular names, such as the Heisenberg uncertainty principle, Euclidean geometry, Nash equilibrium, and Kantian ethics. The role of individual contributions is also celebrated through science's award-granting institutions, like the Nobel Prize Foundation (*3*).

Several studies, however, have explored an apparent shift in science from this individual-based model of scientific advance to a teamwork model. Building on classic work by Zuckerman and Merton, many authors have established a rising propensity for teamwork in samples of research fields, with some studies going back a century (*4*–*7*). For example, de Solla Price examined the change in team size in chemistry from 1910 to 1960, forecasting that in 1980 zero percent of the papers would be written by solo authors (*8*). Recently, Adams et al. established that teamwork had increased across broader sets of fields among elite U.S. research universities (*9*). Nevertheless, the breadth and depth of this projected shift in manpower remains indefinite particularly in fields where the size of experiments and capital investments remain small, raising the question as to whether the projected growth in teams is universal or cloistered in specialized fields.

A shift towards teams also raises new questions of whether teams produce better science. Teams may bring greater collective knowledge and effort, but they are known to experience social network and coordination losses that make them under-perform individuals even in highly complex tasks (*10*–*12*), as F. Scott Fitzgerald concisely observed when he stated that "no grand idea was ever born in a conference" (*13*). From this viewpoint, a shift to teamwork may be a costly phenomenon or one that promotes low-impact science, while the highest impact ideas remain the domain of great minds working alone.

We studied 19.9 million research articles in the Institute for Scientific Information (ISI) Web of Science database and an additional 2.1 million patent records. The Web of Science data covers research publications in science and engineering since 1955, the social sciences since 1956, and arts and the humanities since 1975. The patent data covers all U.S. registered patents since 1975 (*14*). A team was defined as having more than one listed author (publications) or inventor (patents). Following the ISI classification system, the universe of scientific publications is divided into three main branches and their constituent subfields: science and engineering (with 171 subfields), social sciences (with 54 subfields) and the arts and humanities (with 27 subfields). The universe of U.S. patents was treated as a separate category (with 36 subfields). See the Supplementary Material for details on these classifications.

For science and engineering, social sciences, and patents, there has been a substantial shift towards collective research. In the sciences, team size has grown steadily each year and nearly doubled from 1.9 to 3.5 authors per paper over 45 years.

Shifts toward teamwork in science and engineering have been suggested to follow from the increasing scale, complexity, and costs of big science. Surprisingly then, we find an equally strong trend towards teamwork in the social sciences, where these drivers are much less significant. Although social scientists in 1955 wrote 17.5% of their papers in teams, by 2000 they wrote 51.5% of their papers in teams, an increase similar to that in sciences and engineering. Mean team size has also grown each year. On average, today's social sciences papers are written in pairs with a continuing, positive trend towards larger teams. Unlike the other areas of research, single authors still produce over 90% of the papers in the arts and humanities. Nevertheless, there is a positive trend toward teams in the arts and humanities (p <.001). Finally, patents also show a rising dominance of teams. Although this data is on a shorter time scale (1975-2000), there was a similar annualized increase in the propensity for teamwork. Average team size has risen from 1.7 to 2.3 inventors per patent, with the positive trend towards larger teams continuing.

The generality of the shift to teamwork is captured in Table 1. In sciences and engineering, 99.4% of the 171 subfields have seen increased teamwork. Meanwhile, 100% of the 54 subfields in the social sciences, 85.2% of the 27 subfields in the humanities, and 100% of the 36 subfields in patenting have seen increased teamwork.

Supplementary table S1 presents trends for individual fields. In the sciences, areas like medicine, biology, and physics have seen at least a doubling in mean team size over the 45 year period. Surprisingly, even mathematics, long thought the domain of the loner scientist and least dependent of the hard sciences on lab scale and capital-intensive equipment, showed a marked increase in the fraction of work done in teams, from 19% to 57%, with mean team size rising from 1.22 to 1.84. In the social sciences, psychology, economics, and political science show enormous shifts toward teamwork, sometimes doubling or tripling the propensity for teamwork. With regard to average team size, psychology, the closest of the social sciences to a lab science, has the highest growth (75.1%) while political science has the lowest (16.6%). All areas of patents showed a positive change in both the fraction of papers done by teams and team size with only small variations across the areas of patenting, suggesting that the conditions favoring teamwork in patenting are largely similar across subfields. As reflected in Figure 1A, the humanities show lower growth rates in the fraction of publications done in teams, yet a tendency towards increased teamwork is still observed.

Our measure of impact was the number of citations each paper and patent receives, which has been shown to correlate with research quality (*15–17*) and is frequently used in promotion and funding reviews (*18*). Highly cited work was defined as receiving more than the mean number of citations for a given field and year (*19*). Teams produce more highly cited work in each broad area of research and at each point in time.

To explore the relationship between teamwork and impact in more detail, we define the *relative team impact* (RTI) for a given time period and field. RTI is the mean number of citations received by team-authored work divided by the mean number of citations received by solo-authored work. A RTI greater than 1 indicates that teams produce more highly cited papers than solo authors and vice versa for RTI less than 1. When the RTI is equal to 1, there is no difference in citation rates for team and solo authored papers. In our dataset the average RTI was greater than 1 at all points in time and in all broad research areas -- sciences and engineering, social sciences, humanities, and patents. In other words, there is a broad tendency for teams to produce more highly cited work than individual authors. Further, the RTI is rising with time. For example, in sciences and engineering, team-authored papers received 1.7 times as many citations as solo-authored papers in 1955, but 2.1 times the citations by 2000. Similar upward trends in relative team impact appear in sciences and engineering, social science, and arts and humanities, and more weakly in patents, although the trend is still upward there (*20*). Note especially that, during the early periods, solo authors received substantially more citations on average than teams in many subfields, especially within sciences and engineering (Fig. 2E) and social sciences (Fig. 2F). By the end of the period, however, there are virtually no subfields in sciences and engineering and social sciences where solo authors typically receive more citations than teams. Table S1 details the RTI for major individual research areas, indicating that teams currently have a nearly universal impact advantage. In a minority of cases the RTI declined with time (e.g. -34.4% in mathematics and -25.7% in education), although even here teams currently have a large advantage in citations received (e.g. 67% more average citations in mathematics and 105% in education).

The citation advantage of teams is also increasing with time when teams of fixed size are compared to solo authors. In Science and Engineering, for example, papers with two authors received 1.30 times more citations than solo authors in the 1950s but 1.74 times more citations in the 1990s. In general, this pattern prevails for comparisons between teams of any fixed size versus solo authors (table S4).

A possible challenge to the validity of these observations is the presence of self-citations given that teams have the opportunity to self-cite their work more frequently than a single author. To address this, we reran the analysis with all self-citations removed from the dataset (*21*). We found that removing self-citations can produce modest decreases in the RTI measure in some fields; for example, the RTI fell from 3.10 to 2.87 in Medicine and 2.30 to 2.13 in biology (table S1). Thus, removing self-citations can reduce the RTI by 5-10%, but the relative citation advantage of teams remains essentially intact.

Because the progress of knowledge may be driven by a small number of key insights (*22*), we further test whether the most extraordinary concepts, results, or technologies are the province of solitary scientists or teams. Pooling all papers and patents within the four research areas, we calculated the frequency distribution of citations to solo-authored and team-authored work, comparing the first five years and last five years of our data. If these distributions overlap in their right hand tails, then a solo-authored paper or patent is just as likely as a team-authored paper or patent to be extraordinarily highly cited.

Our results show that teams now dominate the top of the citation distribution in all four research domains (Fig 3, A-D). In the early years, a solo author in science and engineering or the social sciences was more likely than a team to receive no citations, but a solo author was also *more* likely to garner the highest number of citations – to be a paper that was singularly influential. However, by the most recent period, a *team-authored paper* has a higher probability of being extremely highly cited. For example, a team-authored paper in science and engineering is currently 6.3 times more likely than a solo-authored paper to receive at least 1,000 citations. Finally, in the arts and humanities and patents, individuals were never more likely than teams to produce the more influential work. These patterns also hold when self-citations are removed (fig. S5).

Taken together, these results suggest two important facts about preeminent work in our observational periods. One, it never appeared to be the domain of solo authors in the arts and humanities and patents. Second, solo authors did produce the papers of singular distinction in science and engineering and social science in the 1950s, but the mantel of extraordinarily cited work has passed to teams by 2000.

Over our 5 decade sample period, the increasing capital intensity of research may have been a key force in laboratory sciences where the growth in teamwork has been intensive (*8*), but it is unlikely to explain similar patterns in mathematics, economics, and sociology where we found that growth rates in team size have been nearly as large. Since the 1950's the number of researchers has grown as well, which could promote finer divisions of labor and more collaboration. Similarly, steady growth in knowledge may have driven scholars toward more specialization, prompting larger and more diverse teams (*7*, *10*). However, we found that teamwork is growing nearly as fast in fields where the number of researchers has grown relatively slowly (see Supplementary Material). Declines in communication costs could make teamwork less costly as well (*9*, *25*). Shifting authorship norms may have influenced coauthorship trends in fields with extremely large teams, such as biomedicine and high-energy physics (26, 27), and yet our results hold across diverse fields where norms for order of authorship, existence of post doctorates, and prevalence of grant-based research differ substantially.

References and Notes

1. R. K. Merton, *Science* **159**, 56 (1968).
2. P. J. Bowler, I. R. Morus, *Making Modern Science: A Historical Survey* (University of Chicago, Chicago, 2005).
3. J. F. English, *The Economy of Prestige: Prizes, Awards, and the Circulation of Cultural Value* (Harvard, Cambridge, MA, 2005).
4. R. Collins, *The Sociology of Philosophies: A Global Theory of Intellectual Change* (Harvard University Press, Cambridge, MA, 1998).
5. D. Cronin, D. Shaw, K. La Barre, *Journal of the American Society for Information Science and Technology,* **54**, 855 (2003).
6. H. Zuckerman, R. K. Merton in *The Sociology of Science*, R. K. Merton, N. Storer Eds. (Univ. of Chicago Press, Chicago, 1973), pp. 545-550.
7. B. F. Jones, *National Bureau of Economic Research Working Paper* #11360 (2005).
8. D. J. de Solla Price, *Little Science, Big Science* (Columbia, New York, 1963).
9. J.J. Adams, G. Black, R. Clemmons, P. E. Stephan, *Research Policy* **34**, 259 (2005).
10. R. Guimerà, B. Uzzi, J. Spiro, L. Amaral, *Science* **308**, 697 (2005).
11. N. Babchuk, K. Bruce, P. George, *The American Sociologist* **30**, 5 (1999).
12. K. Y. Williams, C. A. O'Reilly in *Research in Organizational Behavior*, B. Staw and Robert Sutton, Eds. (JAI Press, Greenwich, CT, 1998), vol. 20, pp. 77-140.
13. F. S. Fitzgerald, in *The Crack Up*, E. Wilson, Ed. (New Directions, New York, 1993) 122.
14. B.H. Hall, A.B. Jaffe, M. Trajtenberg, *National Bureau of Economic Research* Working Paper #8498 (2001).
15. M. Trajtenberg, *RAND Journal of Economics*, **21**, 172 (1990).
16. B.H. Hall, A.B. Jaffe, M. Trajtenberg, *RAND Journal of Economics*, **36**, 16 (2005).
17. D. W. Aksnes, *Journal of the American Society for Information Science and Technology* **57**, 169 (2006).
18. N. S. Ali, H. C. Young, N. M. Ali, *Library Review* **45**, 39 (1996).
19. Citations received were counted from publication year to 2006. Recent publications have smaller citation counts because they have had less time to be cited, but this effect is standardized when comparing team versus solo publications within a given year.
20. In patenting, we may observe weaker trends because citing earlier work can limit a patent's scope, so that applicants may avoid citations and (b) patent examiners typically add the majority of citations, which makes patent citations different from paper citations (*23*, *24*).

21. A self-citation is defined as any citation where a common name exists in the authorship of both the cited and citing papers. All citations were removed in which a citing and cited author's first initial and last name matched. Note that this method can also eliminate citations where the authors are different people but share the same name. However, performing Monte Carlo simulations on the data, we find that such errors occur in less than 1 of every 2,000 citations. Thus, any errors introduced by this method appear negligible. We did not remove self-citations from patents because citations to previous work in the patent literature are primarily assigned by the patent examiner (*24*), who independently assigns citations to earlier work based on the relevance of previous patents' content.
22. T. S. Kuhn, *The Structure of Scientific Revolutions* (University of Chicago, Chicago, 1970).
23. B. Sampat, "Determinants of Patent Quality: An Empirical Analysis", mimeo, Columbia University, 2005.
24. J. Alcacer, M. Gittelman, *Review of Economics and Statistics* **88**, 774 (2006).
25. G. Becker, K. Murphy, *Quarterly Journal of Economics* **107**, 1137 (1992).
26. J. Drenth, *Journal of the American Medical Association* **280**, 219 (1998).
27. B. Cronin, *Journal of the American Society for Information Science and Technology* **52**, 558 (2001).
28. We thank R. Guimera, S. Stern, K. Murnighan, and K. Williams Phillips, and two anonymous referees for their helpful comments. The Northwestern Institute on Complex Systems provided financial support.

Supporting Online Material
www.sciencemag.org/cgi/content/full/1136099/DC1
SOM Text
Figs S1 to S5
Tables S1 to S5
References

10 October 2006; accepted 3 April 2007
Published online 12 April 2007; 10.1126/science.1136099
Include this information when citing this paper.

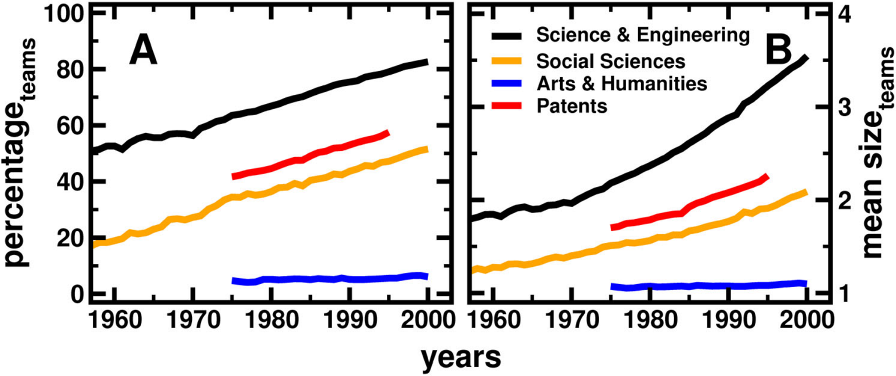
Fig. 1. The growth of teams. These plots present changes over time in the fraction of papers and patents written in teams (panel A) and in mean team size (panel B). Each line represents the arithmetic average taken over all subfields in each year.

Fig. 2. The relative impact of teams. Panels A-D present mean team size comparing all papers and patents with those that received more citations than average in the relevant subfield. Panels E-H plot the "relative team impact" (RTI), which is the mean number of citations received by team-authored work divided by the mean number of citations received by solo-authored work. A ratio of 1 indicates that team and solo-authored work have equivalent impact on average. Each point in the plots represents the RTI for a given subfield and year, while the black lines present the arithmetic average in a given year.

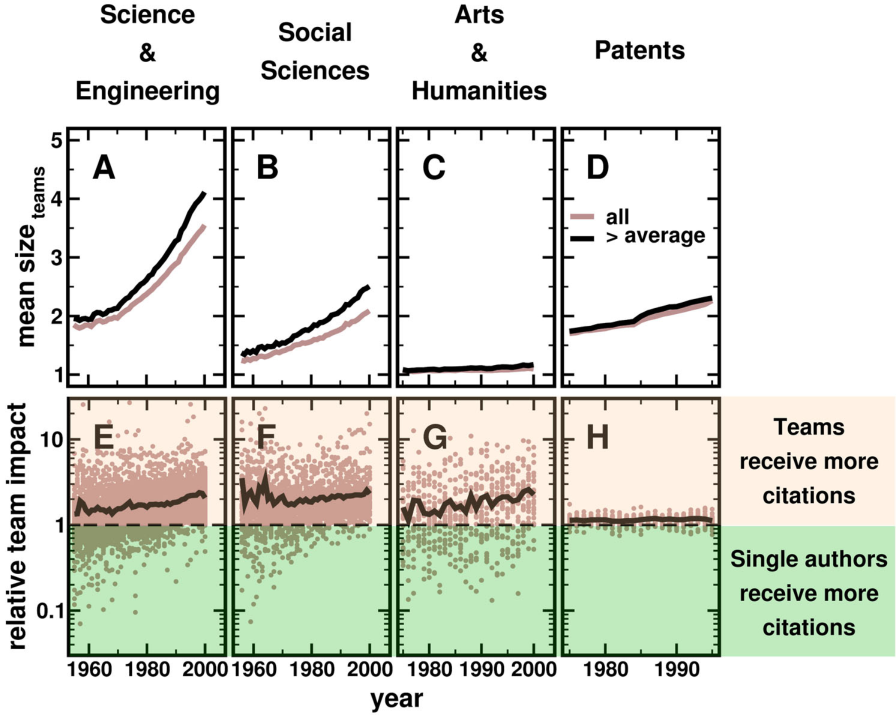
Fig. 3. Exceptional research. Pooling all publications and patents within the four research categories, we calculated frequency distributions of citations received. Separate distributions are calculated for single authors and teams, and the ratio is plotted. A ratio greater than 1 indicates that a team-authored paper had a higher probability of producing the given range of citations than a solo-authored paper. Ratios are compared for the early period (first 5 years of available data) and late period (last 5 years of available data) for each research category, sciences and engineering (A), social sciences (B), arts and humanities (C), and patents (D).

Table 1. Patterns by subfield. For the three broad ISI categories and for patents, we count the number (N) and percentage (%) of subfields that show (1) larger team sizes in the last five years compared to the first five years and (2) relative team impact measures (RTI) larger than 1 in the last five years. We show the RTI measures both with and without self-citations removed in calculating the citations received.

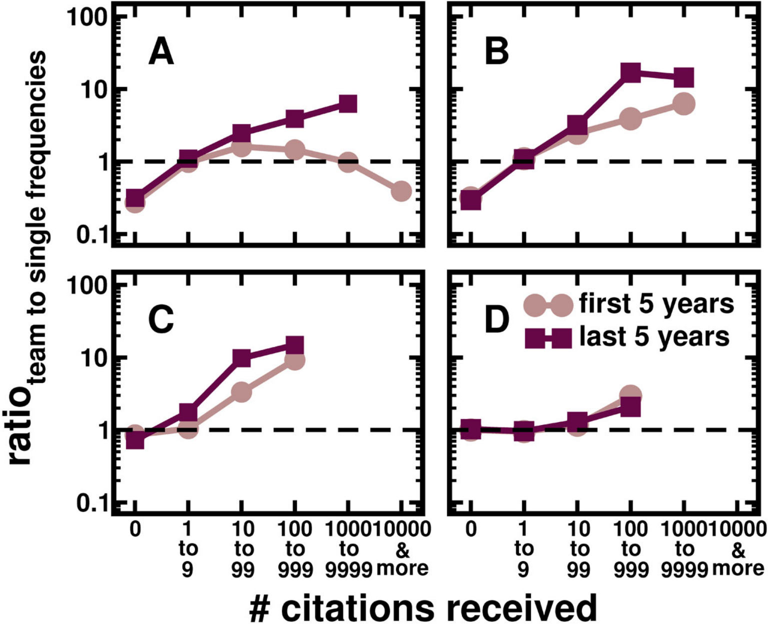
fields	N_{fields}	increasing team size		RTI > 1 (with self citations)		RTI > 1 (no self citations)	
		N_{fields}	%	N_{fields}	%	N_{fields}	%
Science & Engineering	171	170	99.4	167	97.7	159	92.4
Social Sciences	54	54	100.0	54	100.0	51	94.4
Arts & Humanities	27	24	88.9	23	85.2	18	66.7
Patents	36	36	100.0	32	88.9	--	--



A
B
Science & Engineering
Social Sciences
Arts & Humanities
Patents
percentage$_{teams}$
mean size$_{teams}$
years
0
20
40
60
80
100
1
2
3
4
1960
1970
1980
1990
2000



Science & Engineering
Social Sciences
Arts & Humanities
Patents
A
B
C
D
E
F
G
H
mean size teams
all
> average
relative team impact
Teams receive more citations
Single authors receive more citations
year
1960
1980
2000
1990
5
4
3
2
1
10
0.1



A
B
C
D
first 5 years
last 5 years
100
10
1
0.1
ratio$_{team\ to\ single\ frequencies}$
0
1 to 9
10 to 99
100 to 999
1000 to 9999
10000 & more
citations received

www.sciencemag.org/cgi/content/full/1136099/DC1

Supporting Online Material for

The Increasing Dominance of Teams in Production of Knowledge

Stefan Wuchty, Benjamin F. Jones, Brian Uzzi*

*To whom correspondence should be addressed. E-mail: uzzi@northwestern.edu

Published 12 April 2006 on *Science* Express
DOI: 10.1126/science.1136099

This PDF file includes:

SOM Text
Figs. S1 to S5
Tables S1 to S4
References

The Increasing Dominance of Teams in the Production of Knowledge – Supplementary Material

Stefan Wuchty[1], Benjamin F. Jones[2] and Brian Uzzi[3]

1 Northwestern Institute on Complexity (NICO), Northwestern University, Evanston, IL 60208, USA
2 Kellogg School of Management, Northwestern University, Evanston, IL 60208, USA
3 Kellogg School of Management, Northwestern University and the Northwestern Institute on Complexity (NICO), Evanston, IL 60208, USA (Corresponding author).

Overview

These supplementary materials provide detailed assessment of individual subfields and other analyses as cited in the paper.

Further Notes: Data

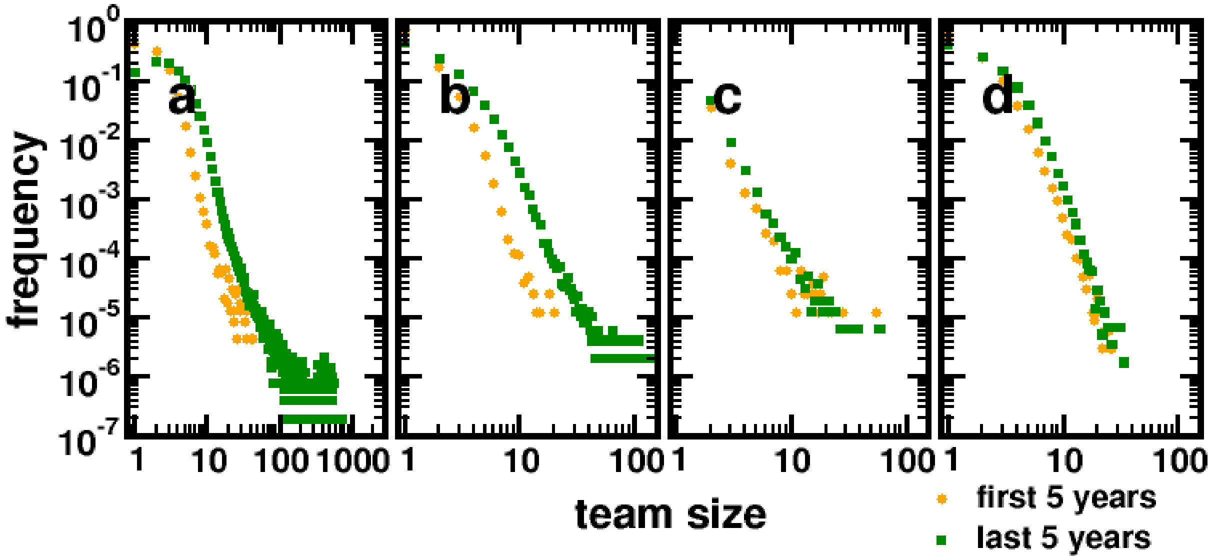
Data from the ISI database Web of Science (http://wwwisiknowledge.com) were downloaded using software from Thomson Scientific. The data includes all full length research articles and shorter research pieces (letters) as classified by the ISI. This excludes books, book reviews, editorial material, meeting abstracts, and several other types of media. See the ISI website for further information on types of documents.

Data for patents were drawn from the United States Patent and Trademark Office, covering all utility patents issued from 1975-1999, as compiled by (*S1*).

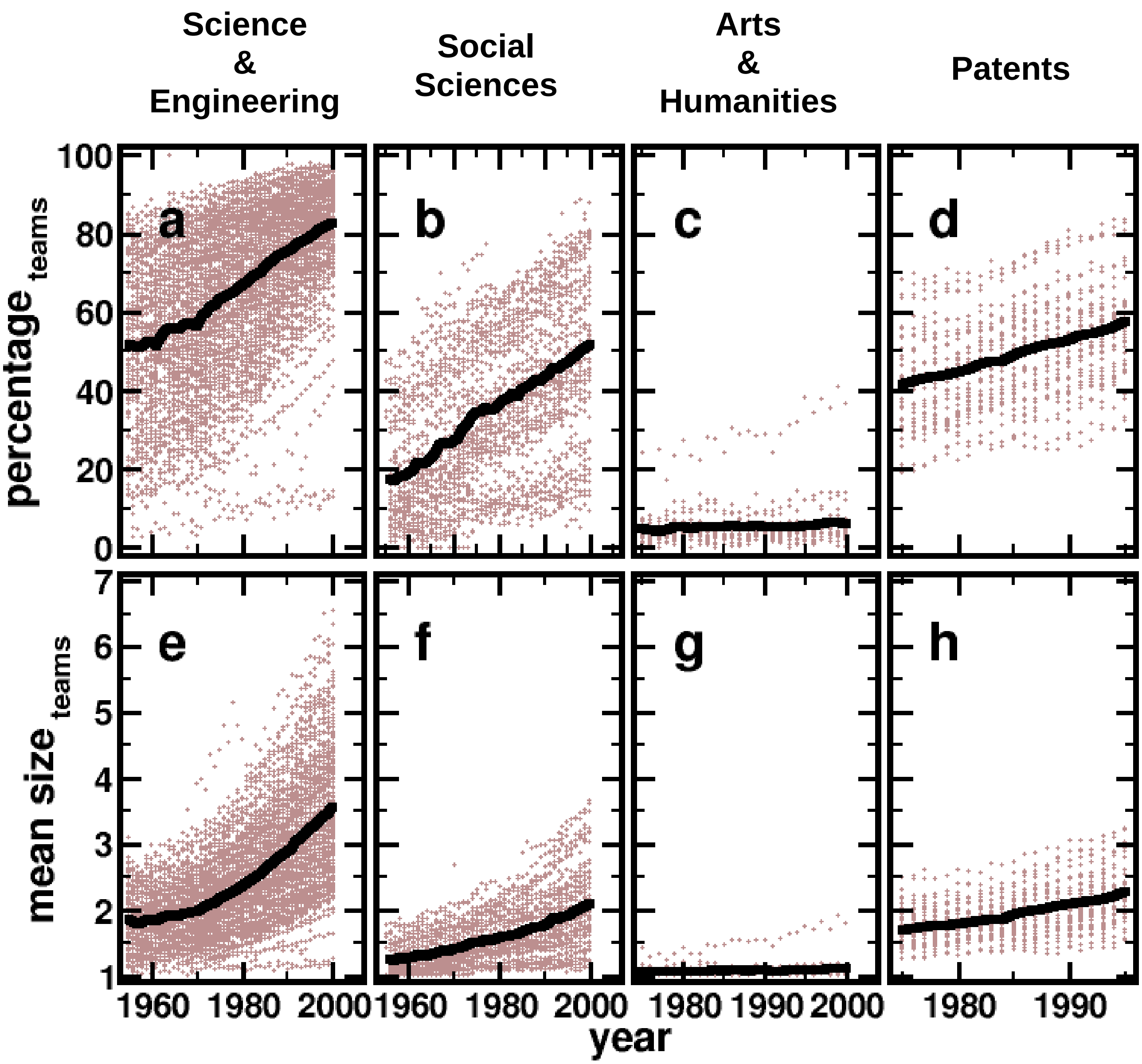
The ISI subfield classifications include 171 subfields in the sciences and engineering, 54 subfields in the social sciences, and 27 subfields in the arts and humanities. The US Patent and Trademark data is divided into 36 subfields following (*S1*). These subfields are listed in Supplementary Table S2.

Further Notes: Analysis

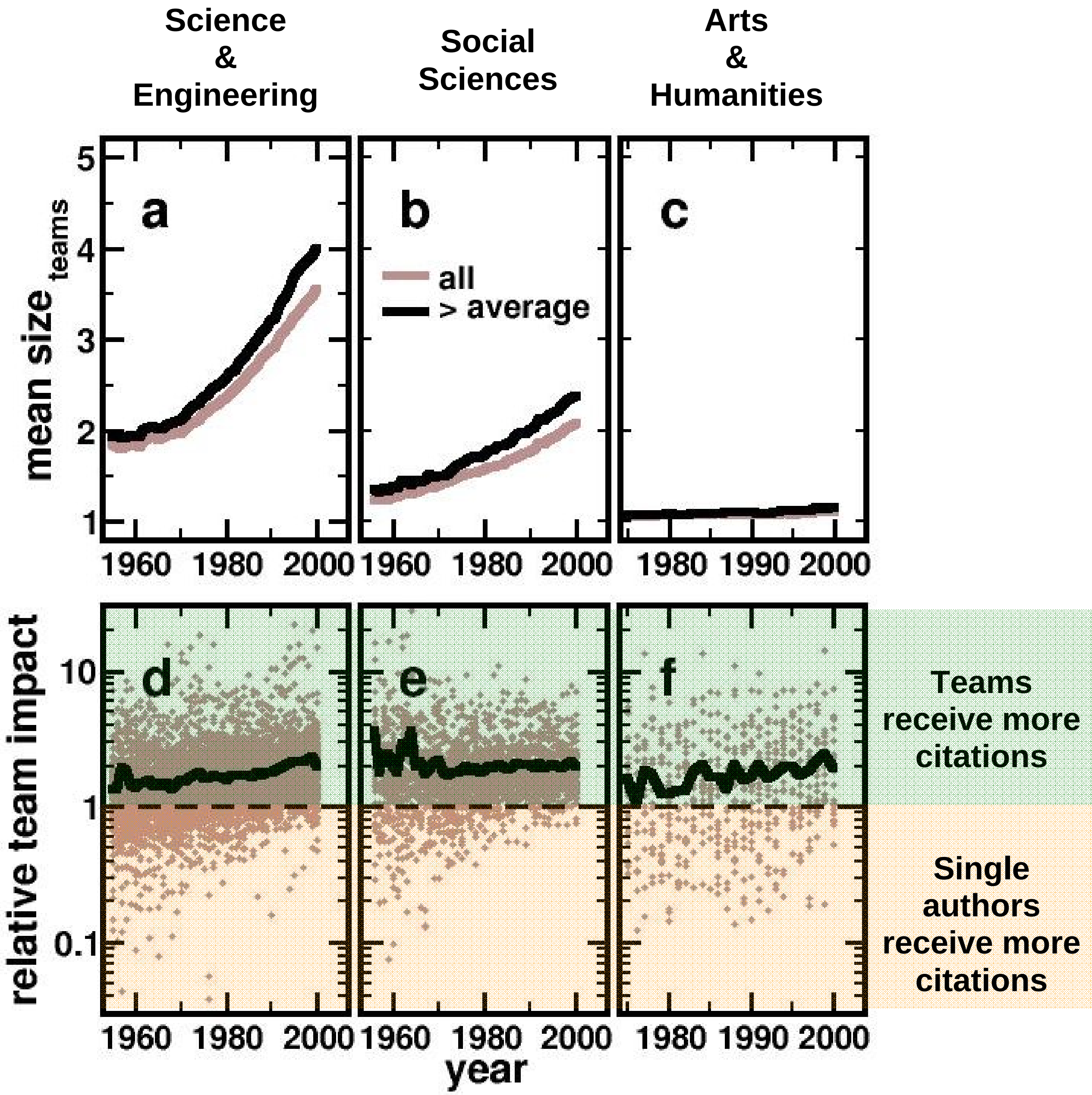
One may test whether the rise in the number of researchers in a field predicts the rise in average team size by running the following regression: $\log(\text{team size})_{it} = a + b*\log(\text{field size})_{it} + v_i + m_t + u_{it},$ where i indexes the subfield, t indexes the year, v_i and m_t are fixed effects for subfield and year respectively, and u_{it} is an error term. The results show a statistically significant but small association between the number of researchers and average team size in Science and Engineering and Social Sciences, but no effect in Arts and Humanities. In Sciences and Engineering, for example, the effect implied that a 100% increase in the subfield size is associated with only a 2% increase in average team size. Given that average field size has increased by 2.6 log points over the time span of the data, while team size has increased by 0.6 log points, expansions of field size can explain only .02 x 2.6 / 0.6 = 9% of the increase in team size. This suggests that rises in manpower may be important to the rise in team size yet, at most, a limited part of a richer, multivariate set of explanations.



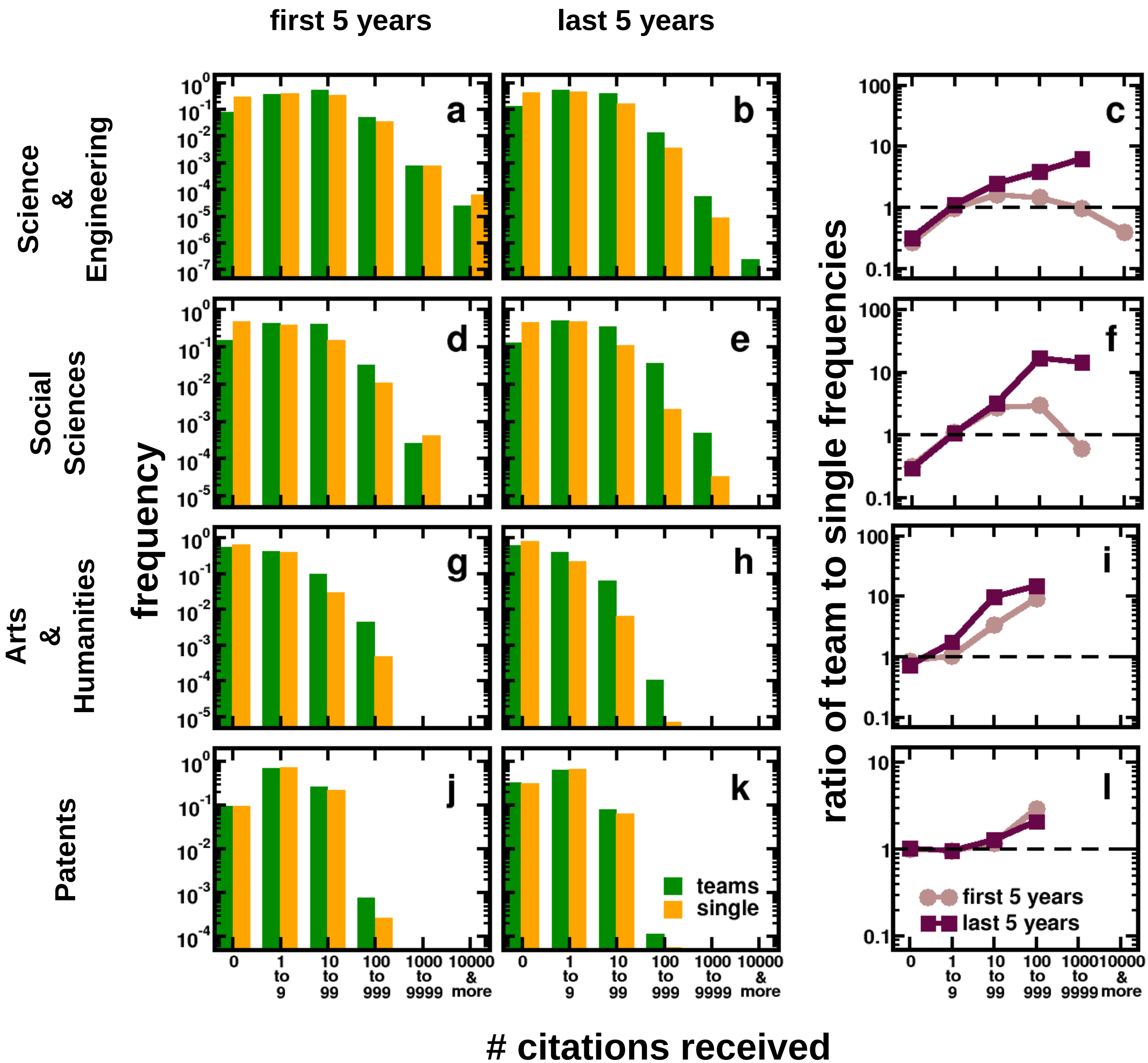
Supplementary Figure S1: Frequency distributions of team sizes in **(a)** Science & Engineering, **(b)** Social Sciences, (**c**) Arts & Humanities and **(d)** Patents. In particular, we obtain these curves in the first and last 5 years that are covered by our data (Science & Engineering, from 1955-1959 to 1996-2000; Social Sciences from 1956-1960 to 1996-2000; Arts & Humanities 1975-1979 to 1996-2000 and Patents, from 1975-1979 to 1991-1995).



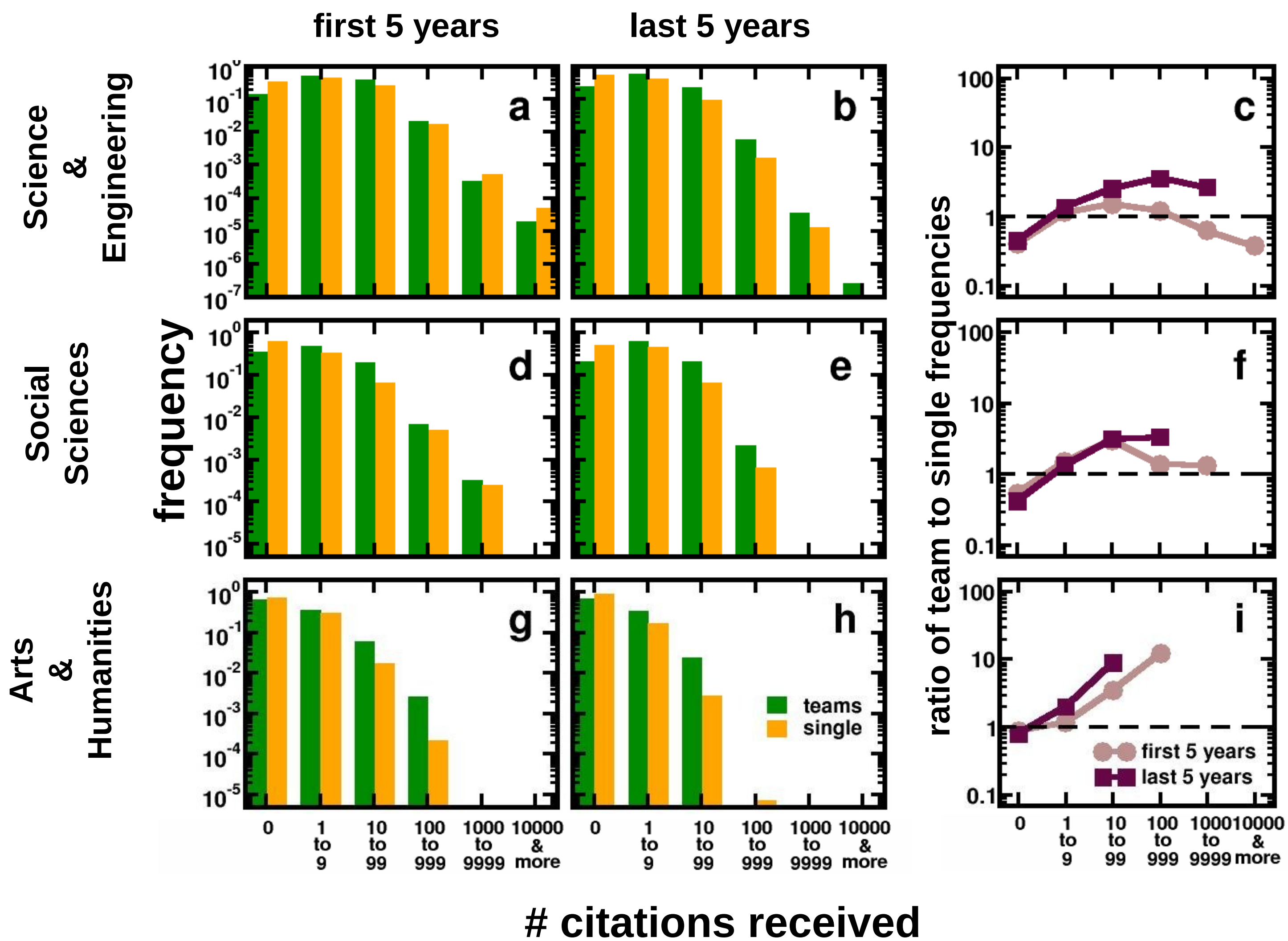
Supplementary Figure S2: The growth of teams as an extended version of Figure 1 in the main paper. These plots present changes over time in the fraction of papers and patents written in teams (panels a-d) and in mean team size (panels e-h). Each point represents a specific subfield in a specific year. Black lines present the arithmetic mean over all subfields in each year. Subfields for publications are defined by the ISI classification system, with 171 different subfields in Science and Engineering, 54 subfields in Social Sciences, and 27 subfields in Arts & Humanities. Patents are categorized in 36 subfields as suggested by (*S1*).



Supplementary Figure S3: In analogy to Figure 2 in the main paper, we show the same results *without* self-citations.



Supplementary Figure S4: The decline of the exceptional gifted solo scientist (as an extended version of Figure 3 in the main paper). Pooling all publications and patents within the four research categories, we calculated frequency distributions of citations received in the early period (first 5 years of available data, leftmost column) and late period (last 5 years of available data, center column). We distinguished between publications and patents that have been written by single authors (orange bars) and teams (green bars) and calculated separate frequency distributions for each group. The ratio of team and solo frequencies (rightmost panels) is also plotted. A ratio greater than 1 indicates that a team-authored paper had a higher probability of producing the given range of citations than a solo-authored paper. In the early period, solo-authors had a substantial advantage in producing the most highly cited work in both sciences and engineering (c) and social sciences (f). In the contemporary period, this advantage reversed; the percentage of team-authored papers that are highly ranked is now substantially greater than the percentage of solo-authored papers that are highly ranked. For example, in science and engineering in the recent period, the fraction of team-authored papers that receive *1,000+* citations is *6.3* times higher than the fraction of solo-authored papers that achieve such success (see c). The patterns in arts and humanities and patents (panels i and l) are more consistent over time, with teams consistently more likely to produce the highest impact work. Panels: Sciences and Engineering (a 1955-1959, b 1996-2000, c ratio); Social Sciences (d 1956-1960, e 1996-2000, f ratio); Arts and Humanities (g 1975-1979, h 1996-2000, i ratio); Patents (j 1975-1979, k 1991-1995, l ratio).



Supplementary Figure S5: In analogy to Figure 3 in the main paper and Supplementary Figure S4, we show the same results *without* self-citations.

Supplementary Table S1: Major subfields. Description of number of papers, mean team size, fraction of teams, and relative team impact score (RTI) with and without self-citations for the beginning and end periods of our analysis.

Science & Engineering	N_{papers}	mean size $_{team}$		% change	fraction $_{teams}$		% change	*RTI* w self citations		% change	*RTI* w/o self citations		% change
		1955-59	1996-00		1955-59	1996-00		1955-59	1996-00		1955-59	1996-00	
Medicine	4,203,383	2.02	4.39	117.9	0.57	0.87	52.2	2.05	3.10	50.9	2.00	2.87	43.4
Biology	1,877,587	1.84	4.00	117.3	0.55	0.90	63.2	0.83	2.30	175.9	0.70	2.13	203.2
Physics	1,804,970	1.72	4.05	135.1	0.49	0.85	72.7	1.05	1.67	59.7	0.97	1.57	62.3
Chemistry	1,691,801	2.20	3.69	67.6	0.76	0.92	21.1	1.33	1.86	39.9	1.30	1.67	28.4
Engineering	1,388,696	1.80	2.94	63.6	0.55	0.78	41.3	1.03	2.43	136.4	0.93	2.25	141.6
Mathematics	474,203	1.22	1.84	50.4	0.19	0.57	197.4	2.54	1.67	-34.3	2.79	1.58	-43.2
Environmental	442,310	1.32	2.98	124.9	0.25	0.82	226.7	1.05	1.51	44.8	1.04	1.40	34.7
Material Science	434,651	1.88	3.46	84.1	0.62	0.88	42.3	0.84	1.91	126.4	0.81	1.73	113.4
Geo Sciences	312,241	1.54	2.99	95.0	0.39	0.82	111.1	1.09	1.59	45.6	1.03	1.44	39.1
Agriculture	278,162	2.58	3.29	27.2	0.80	0.89	11.4	1.60	1.50	-6.4	1.57	1.36	-13.9
Computer Science	249,603	1.32	2.39	81.2	0.23	0.74	216.5	0.96	1.48	54.3	0.93	1.40	51.4

Social Sciences	N_{papers}	mean size $_{team}$		% change	fraction $_{teams}$		% change	*RTI* w self citations		% change	*RTI* w/o self citations		% change
		1956-60	1996-00		1956-60	1996-00		1956-60	1996-00		1956-60	1996-00	
Psychology	384,176	1.47	2.57	75.1	0.33	0.72	115.2	0.99	1.99	102.3	0.95	1.89	99.7
Economics	130,236	1.10	1.71	54.6	0.09	0.52	455.5	1.37	1.62	17.9	1.35	1.60	18.2
Political Science	124,276	1.06	1.23	16.6	0.05	0.17	267.9	4.34	3.54	-18.5	4.23	3.55	-16.1
Education	100,008	1.20	1.97	65.1	0.15	0.51	234.7	2.76	2.05	-25.7	2.86	1.89	-33.9
Law	82,742	1.11	1.35	22.2	0.09	0.20	123.0	0.97	1.90	96.1	0.89	2.18	144.6
Sociology	61,645	1.21	1.50	24.2	0.18	0.34	91.3	1.95	2.13	9.4	1.92	2.10	9.5
Anthropology	36,204	1.27	1.93	52.2	0.18	0.40	121.8	1.88	1.93	2.6	1.87	1.69	-9.8

Arts & Humanities	N_{papers}	mean size $_{team}$		% change	fraction $_{teams}$		% change	*RTI* w self citations		% change	*RTI* w/o self citations		% change
		1975-79	1996-00		1975-79	1996-00		1975-79	1996-00		1975-79	1996-00	
Literature	184,512	1.05	1.07	2.2	0.03	0.05	43.9	4.61	5.04	9.2	5.16	4.62	-10.5
History	95,263	1.06	1.08	1.8	0.05	0.07	24.2	2.04	2.28	11.8	1.98	2.19	10.6
Art & Architecture	71,773	1.06	1.09	2.7	0.05	0.06	31.0	1.02	3.87	279.9	0.89	3.52	293.3
Philosophy	52,053	1.05	1.06	0.3	0.05	0.05	-4.8	0.88	2.31	161.8	0.82	2.17	165.9
Dance & Music	39,914	1.07	1.10	2.5	0.04	0.06	52.5	2.90	6.76	132.9	3.13	5.87	87.5
Religion	36,306	1.06	1.09	3.0	0.04	0.06	35.5	4.38	4.99	13.9	4.35	4.75	9.2
Theater, Film, TV & Radio	22,800	1.07	1.07	-0.4	0.04	0.04	1.1	0.38	2.16	472.8	0.19	1.81	826.4
Archaeology	13,750	1.32	1.79	35.9	0.22	0.37	70.2	2.01	2.72	35.5	1.93	2.60	34.7

Patents	$N_{patents}$	mean size $_{team}$		% change	fraction $_{teams}$		% change	*RTI* w self citations		% change
		1975-79	1991-95		1975-79	1991-95		1975-79	1991-95	
Mechanical	373,671	1.58	1.96	24.2	0.36	0.49	36.5	1.15	1.23	6.9
Chemical	352,194	1.46	1.74	19.0	0.30	0.40	34.4	1.16	1.19	2.3
Electrical & Electronics	345,561	2.02	2.53	25.3	0.57	0.70	23.0	1.02	1.04	2.3
Computers & Comm.	273,941	1.64	2.09	27.5	0.41	0.55	33.8	1.10	1.19	8.4
Drugs & Medical	151,438	1.71	2.23	30.5	0.44	0.58	31.1	1.20	1.25	4.0

Supplementary Table S2: For each subfield in Science & Engineering, Social Sciences, Arts & Humanities and Patents we present the total number of papers/patents, years covered by the data, as well as mean team sizes, mean fraction of work done in teams and relative impact factors (RTI) in the first and last five years of available data. In addition we provide changing rates of these measures.

Science & Engineering fields	N_{papers}	$years_{covered}$		mean team size			$fraction_{teams}$			RTI		
				first 5 y.	last 5 y.	$\%_{change}$	first 5 y.	last 5 y.	$\%_{change}$	first 5 y.	last 5 y.	$\%_{change}$
Biochemistry	**669,227**	**1955**	**2000**	**1.95**	**4.46**	**129**	**0.63**	**0.96**	**52**	**0.63**	**1.72**	**172**
General Medicine	**529,398**	**1955**	**2000**	**1.80**	**3.33**	**85**	**0.43**	**0.68**	**59**	**4.40**	**6.66**	**51**
Surgery	**391,028**	**1955**	**2000**	**2.06**	**4.38**	**113**	**0.62**	**0.87**	**41**	**1.35**	**3.18**	**136**
Pharmacology	**386,311**	**1955**	**2000**	**2.30**	**4.31**	**87**	**0.70**	**0.91**	**30**	**1.41**	**1.79**	**27**
Chemistry, Multidisciplinary	**385,191**	**1955**	**2000**	**2.26**	**3.53**	**56**	**0.79**	**0.87**	**10**	**1.13**	**3.00**	**165**
Engineering, Electrical	**356,453**	**1960**	**2000**	**1.57**	**3.12**	**98**	**0.41**	**0.82**	**100**	**1.19**	**1.88**	**58**
Physics, Applied	**353,213**	**1955**	**2000**	**1.82**	**4.08**	**124**	**0.55**	**0.92**	**67**	**1.01**	**1.74**	**72**
Multidisciplinary Sciences	**328,914**	**1955**	**2000**	**1.73**	**3.48**	**101**	**0.47**	**0.67**	**41**	**1.59**	**13.74**	**765**
Neurosciences	**322,472**	**1955**	**2000**	**1.95**	**4.05**	**108**	**0.62**	**0.92**	**48**	**1.03**	**1.89**	**83**
Physics Condensed Matter	**316,711**	**1955**	**2000**	**1.75**	**3.92**	**125**	**0.52**	**0.91**	**75**	**0.78**	**1.28**	**64**
Physics, Multidisciplinary	**308,681**	**1955**	**2000**	**1.73**	**5.56**	**221**	**0.43**	**0.77**	**78**	**0.99**	**2.10**	**112**
Chemistry, Physical	**293,108**	**1955**	**2000**	**1.82**	**3.55**	**95**	**0.62**	**0.92**	**49**	**1.20**	**1.36**	**13**
Material Science, Multidisciplinary	**286,226**	**1955**	**2000**	**1.78**	**3.60**	**102**	**0.53**	**0.90**	**69**	**0.83**	**1.45**	**75**
Immunology	**275,875**	**1955**	**2000**	**2.40**	**5.38**	**124**	**0.75**	**0.94**	**26**	**1.28**	**2.42**	**89**
Chemistry, Organic	**269,096**	**1955**	**2000**	**2.34**	**3.85**	**65**	**0.85**	**0.97**	**14**	**1.06**	**1.24**	**16**
Cell biology	**267,217**	**1955**	**2000**	**1.68**	**4.55**	**171**	**0.47**	**0.95**	**101**	**1.91**	**1.71**	**-11**
Oncology	**258,726**	**1955**	**2000**	**2.19**	**5.80**	**165**	**0.68**	**0.94**	**37**	**1.34**	**2.70**	**102**
Plant Sciences	**257,592**	**1955**	**2000**	**1.62**	**3.41**	**110**	**0.46**	**0.90**	**95**	**1.36**	**1.74**	**28**
Mathematics	**256,161**	**1955**	**2000**	**1.16**	**1.61**	**39**	**0.15**	**0.45**	**203**	**1.68**	**1.51**	**-10**
Physics, Atomic	**237,499**	**1955**	**2000**	**1.83**	**3.47**	**89**	**0.61**	**0.90**	**47**	**0.97**	**1.29**	**34**
Clinical Neurology	**203,258**	**1955**	**2000**	**1.89**	**4.37**	**131**	**0.56**	**0.86**	**53**	**1.48**	**2.85**	**93**
Engineering, Chemical	**197,532**	**1955**	**2000**	**1.92**	**2.74**	**42**	**0.66**	**0.77**	**16**	**1.25**	**3.65**	**193**
Cardiac	**192,860**	**1955**	**2000**	**2.54**	**5.18**	**104**	**0.76**	**0.90**	**18**	**1.50**	**3.75**	**151**
Radiology	**188,236**	**1955**	**2000**	**1.98**	**4.46**	**125**	**0.60**	**0.89**	**50**	**1.21**	**2.94**	**144**
Environmental Sciences	**185,899**	**1960**	**2000**	**1.88**	**3.23**	**72**	**0.46**	**0.86**	**86**	**2.75**	**1.71**	**-38**
Chemistry, Analytical	**184,614**	**1955**	**2000**	**2.00**	**3.52**	**76**	**0.71**	**0.92**	**29**	**1.48**	**1.73**	**17**
Biophysics	**183,981**	**1955**	**2000**	**2.27**	**4.23**	**87**	**0.77**	**0.95**	**24**	**0.57**	**1.16**	**105**
Endocrinology	**178,031**	**1955**	**2000**	**2.46**	**4.95**	**102**	**0.76**	**0.93**	**23**	**1.19**	**2.05**	**72**
Veterinery Sciences	**169,855**	**1955**	**2000**	**2.47**	**3.39**	**38**	**0.78**	**0.77**	**0**	**1.11**	**3.20**	**187**
Research Medicine	**168,628**	**1955**	**2000**	**2.48**	**4.85**	**95**	**0.77**	**0.90**	**16**	**1.33**	**3.74**	**181**
Microbiology	**165,910**	**1955**	**2000**	**2.31**	**4.28**	**86**	**0.76**	**0.93**	**23**	**1.20**	**1.86**	**55**
Astronomy	**162,302**	**1955**	**2000**	**1.41**	**3.71**	**163**	**0.31**	**0.80**	**161**	**1.12**	**2.07**	**85**
Physiology	**153,489**	**1955**	**2000**	**2.04**	**3.90**	**91**	**0.65**	**0.93**	**43**	**1.30**	**1.58**	**22**
Genetics and Heredity	**152,534**	**1955**	**2000**	**1.54**	**4.90**	**217**	**0.38**	**0.92**	**143**	**0.99**	**1.83**	**84**
Pediatrics	**151,866**	**1955**	**2000**	**2.03**	**4.15**	**104**	**0.59**	**0.86**	**46**	**1.82**	**2.60**	**43**
Psychiatry	**149,911**	**1955**	**2000**	**1.71**	**3.86**	**125**	**0.42**	**0.82**	**94**	**2.04**	**2.46**	**20**

Mathematics, Applied	**146,518**	**1955**	**2000**	**1.15**	**1.90**	**65**	**0.14**	**0.61**	**338**	**2.29**	**1.44**	**-37**
Chemistry, Inorganic	**145,316**	**1955**	**2000**	**1.98**	**3.96**	**100**	**0.78**	**0.96**	**23**	**1.21**	**1.63**	**35**
Food Science	**141,988**	**1955**	**2000**	**2.43**	**3.35**	**38**	**0.75**	**0.88**	**17**	**1.87**	**2.07**	**11**
Instruments	**140,518**	**1955**	**2000**	**1.98**	**4.27**	**116**	**0.62**	**0.81**	**30**	**1.40**	**2.06**	**47**
Geosciences, Multidisciplinary	**138,673**	**1955**	**2000**	**1.50**	**3.13**	**108**	**0.34**	**0.81**	**134**	**1.29**	**1.59**	**23**
Biotechnology	**138,443**	**1955**	**2000**	**2.53**	**4.07**	**61**	**0.71**	**0.90**	**27**	**1.16**	**3.08**	**165**
Public Health	**137,784**	**1955**	**2000**	**1.84**	**3.98**	**116**	**0.46**	**0.83**	**79**	**3.68**	**2.53**	**-31**
Optics	**137,755**	**1962**	**2000**	**1.71**	**3.37**	**97**	**0.48**	**0.85**	**76**	**1.53**	**1.90**	**25**
Mechanics	**135,914**	**1955**	**2000**	**1.64**	**2.34**	**42**	**0.45**	**0.79**	**76**	**0.86**	**1.47**	**71**
Nuclear Science	**135,627**	**1956**	**2000**	**1.92**	**4.84**	**153**	**0.57**	**0.85**	**50**	**0.92**	**1.61**	**75**
Polymer Science	**135,522**	**1960**	**2000**	**2.09**	**3.41**	**63**	**0.64**	**0.92**	**44**	**0.91**	**2.02**	**123**
Hematology	**133,935**	**1955**	**2000**	**2.59**	**5.85**	**126**	**0.81**	**0.93**	**16**	**1.21**	**3.05**	**152**
Pathology	**133,910**	**1955**	**2000**	**1.88**	**4.48**	**139**	**0.57**	**0.89**	**57**	**1.61**	**2.87**	**78**
Zoology	**130,050**	**1955**	**2000**	**1.53**	**2.80**	**83**	**0.39**	**0.81**	**104**	**1.20**	**1.38**	**15**
Ecology	**119,271**	**1955**	**2000**	**1.33**	**2.62**	**97**	**0.25**	**0.77**	**206**	**1.03**	**1.37**	**33**
Obstretics	**115,727**	**1955**	**2000**	**1.91**	**4.10**	**115**	**0.56**	**0.86**	**53**	**1.40**	**2.53**	**80**
Gastroenterology	**112,025**	**1955**	**2000**	**2.40**	**5.14**	**114**	**0.72**	**0.90**	**25**	**1.66**	**2.44**	**47**
Vascular Diseaese	**108,906**	**1955**	**2000**	**2.65**	**5.23**	**97**	**0.82**	**0.92**	**13**	**1.15**	**3.19**	**178**
Engineering, Mechanical	**104,557**	**1964**	**2000**	**1.57**	**2.34**	**49**	**0.40**	**0.73**	**82**	**1.97**	**2.42**	**22**
Ophtalmology	**103,907**	**1955**	**2000**	**1.78**	**3.82**	**115**	**0.51**	**0.88**	**72**	**1.51**	**2.41**	**60**
Dentistry	**97,298**	**1959**	**2000**	**1.63**	**3.22**	**97**	**0.40**	**0.80**	**97**	**1.95**	**3.10**	**58**
Toxiocology	**96,234**	**1959**	**2000**	**2.74**	**3.93**	**43**	**0.82**	**0.91**	**11**	**0.95**	**1.38**	**44**
Biology	**95,543**	**1955**	**2000**	**1.65**	**3.11**	**88**	**0.41**	**0.78**	**90**	**0.62**	**1.45**	**132**
Metallurgy	**95,161**	**1955**	**2000**	**1.76**	**3.04**	**73**	**0.55**	**0.82**	**49**	**1.02**	**2.65**	**158**
Urology	**93,746**	**1955**	**2000**	**1.95**	**4.52**	**132**	**0.59**	**0.88**	**48**	**1.27**	**2.44**	**92**
Marine	**93,589**	**1955**	**2000**	**1.34**	**2.89**	**115**	**0.28**	**0.84**	**203**	**1.46**	**1.42**	**-2**
Physics, Nuclear	**92,642**	**1960**	**2000**	**2.52**	**5.36**	**113**	**0.64**	**0.81**	**25**	**0.97**	**1.57**	**62**
Chemistry, Applied	**90,638**	**1955**	**2000**	**1.95**	**3.58**	**83**	**0.53**	**0.90**	**70**	**2.80**	**1.76**	**-37**
Entomology	**90,251**	**1955**	**2000**	**1.91**	**2.71**	**42**	**0.61**	**0.78**	**28**	**1.00**	**2.14**	**115**
Infectious Diseases	**88,794**	**1955**	**2000**	**2.34**	**5.09**	**118**	**0.77**	**0.90**	**17**	**0.49**	**2.07**	**320**
Geochemistry	**88,099**	**1955**	**2000**	**1.67**	**3.06**	**83**	**0.49**	**0.85**	**73**	**0.87**	**1.48**	**70**
Engineering, Multidisciplinary	**88,011**	**1955**	**2000**	**1.99**	**2.41**	**21**	**0.65**	**0.71**	**10**	**1.01**	**2.31**	**129**
Dermatology	**87,469**	**1955**	**2000**	**1.94**	**3.82**	**97**	**0.59**	**0.86**	**45**	**1.48**	**2.30**	**56**
Physics, Mathematical	**85,883**	**1960**	**2000**	**1.39**	**2.33**	**68**	**0.32**	**0.72**	**123**	**1.09**	**1.57**	**44**
Spectroscopy	**85,780**	**1957**	**2000**	**1.81**	**4.70**	**160**	**0.59**	**0.89**	**49**	**0.85**	**1.47**	**74**
Chemistry Medicinal	**84,825**	**1955**	**2000**	**1.88**	**5.28**	**181**	**0.59**	**0.97**	**63**	**1.24**	**1.43**	**15**
Energy	**84,272**	**1955**	**2000**	**1.84**	**2.64**	**43**	**0.57**	**0.71**	**23**	**1.57**	**3.24**	**106**
Nutrition	**83,437**	**1955**	**2000**	**1.91**	**3.84**	**101**	**0.43**	**0.84**	**95**	**4.85**	**1.63**	**-66**
Agriculture, Dairy and Animal Science	**83,372**	**1955**	**2000**	**2.63**	**3.53**	**34**	**0.81**	**0.91**	**11**	**1.52**	**1.18**	**-22**
Respiratory System	**82,141**	**1959**	**2000**	**2.93**	**4.77**	**63**	**0.86**	**0.89**	**4**	**1.05**	**3.23**	**207**
Agronomy	**78,550**	**1960**	**2000**	**1.96**	**3.34**	**70**	**0.62**	**0.89**	**43**	**1.00**	**1.63**	**63**
Chrystallography	**78,471**	**1964**	**2000**	**1.86**	**3.98**	**114**	**0.62**	**0.94**	**52**	**0.48**	**0.72**	**51**
Biochemical Research Methods	**78,203**	**1955**	**2000**	**1.28**	**3.81**	**197**	**0.25**	**0.93**	**268**	**0.84**	**1.23**	**47**
Anesthesiology	**77,965**	**1955**	**2000**	**1.92**	**3.42**	**78**	**0.50**	**0.80**	**60**	**2.36**	**5.04**	**114**

Computer Science, Theory	76,246	1955	2000	1.42	2.38	67	0.32	0.73	132	0.97	1.29	34
Statistics	75,602	1955	2000	1.24	1.96	58	0.20	0.64	218	3.22	1.70	-47
Orthopedics	71,889	1955	2000	1.68	3.34	99	0.48	0.83	75	1.16	3.13	169
Coating	67,880	1955	2000	1.99	3.92	97	0.70	0.92	32	1.01	1.75	75
Water Resources	67,494	1965	2000	1.82	2.84	56	0.54	0.83	54	1.36	1.71	26
Mathematics, Interdisciplinary	67,216	1955	2000	1.31	2.27	73	0.26	0.73	187	0.64	1.40	120
Virology	65,893	1955	2000	1.87	5.24	180	0.62	0.97	57	0.85	1.94	129
Engineering, Civil	65,692	1966	2000	1.30	2.27	75	0.22	0.69	212	5.82	2.30	-60
Behavioral Sciences	65,542	1958	2000	1.68	3.01	79	0.48	0.86	78	1.01	1.16	15
Meterology	64,715	1955	2000	1.29	3.22	149	0.24	0.82	236	1.14	1.54	35
Physics, Particle	62,941	1967	2000	3.58	5.30	48	0.63	0.71	14	1.85	1.68	-9
Agricultural, Multidisciplinary	62,478	1955	2000	2.37	3.30	39	0.72	0.90	25	1.88	2.03	8
Physics, Fluid	60,984	1956	2000	1.42	3.34	135	0.31	0.83	166	1.00	1.32	32
Computer Science, Interdisciplinary Applications	59,844	1968	2000	1.61	2.52	56	0.41	0.78	91	1.57	1.48	-5
Transplantation	59,003	1963	2000	2.20	6.07	175	0.65	0.93	41	0.79	1.95	148
Otorhinolaryngology	58,848	1961	2000	1.83	3.62	98	0.53	0.88	67	1.77	1.81	2
Psychology	58,830	1955	2000	1.40	3.21	129	0.27	0.85	213	1.42	1.43	1
Telecommunications	58,611	1964	2000	1.55	2.33	50	0.41	0.67	61	0.62	2.83	355
Electrochemistry	57,846	1955	2000	1.99	3.52	77	0.70	0.93	33	1.01	1.68	67
Accoustics	57,279	1955	2000	1.53	2.80	83	0.39	0.81	104	1.32	1.78	35
Sports Sciences	56,315	1955	2000	2.53	3.35	33	0.80	0.81	2	1.75	2.82	61
Theromodynamics	54,885	1957	2000	1.82	2.64	45	0.60	0.83	38	0.83	1.56	89
Medical Technology	54,457	1955	2000	2.43	4.19	73	0.77	0.87	14	1.09	1.52	39
Management Science	54,448	1956	2000	1.37	2.14	57	0.26	0.74	179	2.22	1.22	-45
Engineering, Software	53,644	1955	2000	1.36	2.15	57	0.28	0.62	120	1.01	2.11	108
Automation	50,755	1961	2000	1.38	2.21	60	0.32	0.72	124	1.77	1.85	4
Agricultural, Soil	48,603	1965	2000	1.91	2.99	57	0.65	0.87	35	1.25	1.45	16
Reproductive Biology	46,639	1955	2000	1.81	4.20	132	0.54	0.91	69	1.26	1.85	47
Engineering, Aerospace	45,618	1963	2000	1.71	2.70	58	0.51	0.68	34	1.10	2.13	93
Engineering, Environmental	44,841	1967	2000	1.79	3.04	69	0.49	0.84	72	2.98	3.14	5
Oceanography	44,399	1955	2000	1.54	2.89	88	0.42	0.82	94	0.96	1.72	78
Engineering, Biomedical	44,283	1956	2000	1.74	4.04	132	0.50	0.90	79	0.30	1.83	517
Information Systems	43,075	1955	2000	1.25	2.49	100	0.21	0.77	275	1.57	1.31	-17
Ceramics	42,752	1955	2000	1.88	3.23	71	0.65	0.84	29	0.94	2.26	141
Hardware	42,582	1955	2000	1.40	2.48	78	0.29	0.76	162	0.73	1.54	110
Developmental Biology	42,187	1959	2000	1.81	4.09	126	0.54	0.96	77	0.91	2.20	142
Education	40,841	1956	2000	1.15	2.28	99	0.12	0.57	373	1.08	1.88	74
Fisheries	39,231	1965	2000	1.63	3.06	89	0.47	0.86	83	1.07	1.44	35
Parasitology	37,829	1955	2000	1.47	3.92	166	0.35	0.91	159	1.23	1.19	-4
Industrial Engineering	37,244	1956	2000	1.31	2.24	71	0.21	0.70	225	1.74	1.79	3
Critical Care	36,282	1972	2000	2.42	4.45	84	0.72	0.88	23	2.73	4.10	50
Artificial Intelligence	36,065	1968	2000	1.61	2.40	49	0.44	0.78	78	2.02	1.21	-40
Horticulture	35,899	1961	2000	1.38	3.42	148	0.29	0.91	212	0.54	1.90	254
Health Care	35,667	1956	2000	1.24	2.93	137	0.16	0.69	318	2.69	2.07	-23

Forestry	**34,245**	**1961**	**2000**	**1.48**	**2.65**	**79**	**0.41**	**0.77**	**90**	**1.18**	**1.67**	**42**
Nursing	**32,315**	**1956**	**2000**	**1.17**	**2.12**	**81**	**0.14**	**0.53**	**275**	**3.82**	**1.66**	**-56**
Engineering, Petroleum	**30,644**	**1966**	**2000**	**1.59**	**2.23**	**40**	**0.36**	**0.56**	**52**	**1.90**	**3.32**	**75**
Nanoscience	**30,103**	**1966**	**2000**	**1.70**	**3.80**	**124**	**0.43**	**0.92**	**111**	**1.00**	**1.11**	**11**
Geriatrics	**29,908**	**1956**	**2000**	**1.64**	**3.81**	**132**	**0.39**	**0.81**	**106**	**1.57**	**2.04**	**30**
Evolutionary Biology	**29,686**	**1955**	**2000**	**1.46**	**2.81**	**92**	**0.33**	**0.80**	**142**	**0.90**	**1.20**	**33**
Paper and Wood	**28,723**	**1965**	**2000**	**1.60**	**2.51**	**57**	**0.42**	**0.71**	**68**	**1.61**	**3.24**	**101**
Tropical Medicine	**28,529**	**1955**	**2000**	**2.33**	**4.49**	**92**	**0.68**	**0.87**	**28**	**2.20**	**2.68**	**21**
Rheumatology	**28,505**	**1955**	**2000**	**2.11**	**4.28**	**103**	**0.65**	**0.85**	**31**	**1.61**	**1.98**	**23**
Mining	**28,088**	**1959**	**2000**	**2.05**	**3.25**	**59**	**0.68**	**0.76**	**13**	**1.04**	**3.01**	**188**
Mineralogy	**26,727**	**1955**	**2000**	**1.65**	**3.01**	**83**	**0.49**	**0.86**	**77**	**1.00**	**1.12**	**12**
Biodiversity	**22,374**	**1955**	**2000**	**1.33**	**2.30**	**74**	**0.25**	**0.66**	**161**	**0.76**	**1.79**	**136**
Allergy	**22,359**	**1971**	**2000**	**2.97**	**4.26**	**44**	**0.81**	**0.84**	**4**	**2.67**	**2.36**	**-11**
Construction	**21,992**	**1966**	**2000**	**1.22**	**2.41**	**97**	**0.18**	**0.74**	**314**	**1.90**	**1.85**	**-3**
Geography, Physical	**21,566**	**1965**	**2000**	**1.45**	**2.61**	**80**	**0.35**	**0.72**	**107**	**1.63**	**1.44**	**-12**
Geology	**21,299**	**1955**	**2000**	**1.23**	**2.75**	**124**	**0.21**	**0.78**	**266**	**1.18**	**1.57**	**33**
Manufacturing	**21,086**	**1973**	**2000**	**1.34**	**2.53**	**89**	**0.27**	**0.81**	**204**	**7.18**	**1.86**	**-74**
Mycology	**19,601**	**1955**	**2000**	**1.44**	**3.24**	**126**	**0.34**	**0.86**	**153**	**1.22**	**1.90**	**56**
Limnology	**19,002**	**1956**	**2000**	**1.58**	**2.80**	**77**	**0.45**	**0.84**	**90**	**0.71**	**1.67**	**136**
Anatomy	**17,407**	**1955**	**2000**	**1.42**	**3.46**	**143**	**0.36**	**0.87**	**143**	**1.24**	**1.32**	**7**
Emergency Medicine	**17,363**	**1972**	**2000**	**1.71**	**3.31**	**94**	**0.45**	**0.82**	**82**	**1.74**	**2.93**	**68**
Paleontology	**17,197**	**1955**	**2000**	**1.29**	**2.41**	**87**	**0.26**	**0.69**	**172**	**1.06**	**1.43**	**35**
Remote Sensing	**15,863**	**1964**	**2000**	**1.59**	**2.80**	**76**	**0.46**	**0.81**	**77**	**0.97**	**1.48**	**53**
Material Science, Characterization and Testing	**15,675**	**1964**	**2000**	**1.37**	**2.38**	**73**	**0.32**	**0.66**	**108**	**0.85**	**3.82**	**349**
History and Philosophy of Science	**14,778**	**1956**	**2000**	**1.05**	**1.16**	**10**	**0.05**	**0.13**	**158**	**0.70**	**1.71**	**146**
Rehabilitation	**14,509**	**1972**	**2000**	**2.37**	**3.16**	**33**	**0.65**	**0.77**	**17**	**2.07**	**3.18**	**54**
Ornithology	**13,733**	**1965**	**2000**	**1.44**	**2.43**	**69**	**0.28**	**0.74**	**167**	**1.12**	**1.35**	**20**
Microscopy	**13,607**	**1955**	**2000**	**2.26**	**3.51**	**55**	**0.67**	**0.87**	**29**	**0.68**	**1.24**	**81**
Neuroimaging	**13,232**	**1971**	**2000**	**2.73**	**4.67**	**71**	**0.82**	**0.90**	**10**	**1.67**	**2.97**	**77**
Medical Informatics	**13,045**	**1964**	**2000**	**1.74**	**3.30**	**89**	**0.33**	**0.82**	**147**	**1.62**	**1.21**	**-26**
Engineering, Agricultural	**12,769**	**1971**	**2000**	**2.31**	**3.05**	**32**	**0.82**	**0.89**	**9**	**1.10**	**1.30**	**18**
Substance Abuse	**12,421**	**1975**	**2000**	**2.34**	**3.69**	**57**	**0.69**	**0.85**	**23**	**1.54**	**1.68**	**9**
Imaging Science	**12,309**	**1969**	**2000**	**2.13**	**2.86**	**34**	**0.67**	**0.81**	**21**	**1.61**	**1.67**	**4**
Legal, Medicine	**11,805**	**1966**	**2000**	**1.32**	**3.03**	**130**	**0.25**	**0.73**	**190**	**2.01**	**2.35**	**17**
Composites	**11,759**	**1968**	**2000**	**1.76**	**2.67**	**52**	**0.59**	**0.88**	**47**	**0.90**	**1.26**	**40**
Textiles	**11,446**	**1965**	**2000**	**2.12**	**2.68**	**26**	**0.70**	**0.75**	**8**	**1.53**	**3.37**	**120**
Transportation	**10,938**	**1967**	**2000**	**1.65**	**2.37**	**43**	**0.45**	**0.77**	**71**	**0.82**	**1.24**	**50**
Cybernetics	**9,541**	**1975**	**2000**	**1.67**	**2.20**	**31**	**0.46**	**0.69**	**50**	**1.56**	**1.96**	**26**
Engineering, Geological	**8,967**	**1965**	**2000**	**1.54**	**2.45**	**59**	**0.42**	**0.82**	**93**	**1.56**	**1.21**	**-23**
Engineering, Ocean	**8,936**	**1969**	**2000**	**1.47**	**2.50**	**69**	**0.33**	**0.72**	**120**	**4.01**	**2.33**	**-42**
Engineering, Marine	**8,154**	**1968**	**2000**	**1.25**	**1.22**	**-2**	**0.21**	**0.13**	**-39**	**2.01**	**24.72**	**1127**
Agricultural Economics and Policy	**7,550**	**1966**	**2000**	**1.32**	**2.09**	**58**	**0.29**	**0.68**	**136**	**2.16**	**1.33**	**-38**
Biomaterials	**7,327**	**1980**	**2000**	**3.01**	**4.07**	**35**	**0.81**	**0.96**	**19**	**1.06**	**0.95**	**-10**
Andrology	**6,025**	**1975**	**2000**	**2.93**	**4.17**	**43**	**0.83**	**0.90**	**8**	**1.18**	**2.41**	**105**

Robotics	5,061	1983	2000	1.68	2.38	42	0.45	0.75	67	2.52	1.66	-34
Integrative Medicine	4,766	1974	2000	1.79	3.32	86	0.46	0.74	62	1.27	3.59	183
Medical Ethics	4,192	1975	2000	1.17	2.06	76	0.12	0.37	213	1.55	1.57	1

Social Sciences fields	N_{papers}	$years_{covered}$		mean team size			$fraction_{teams}$			relat. team impact		
				first 5 y.	last 5 y.	$\%_{change}$	first 5 y.	last 5 y.	$\%_{change}$	first 5y.	last 5 y.	$\%_{change}$
Economics	130,248	1956	2000	1.10	1.71	55	0.09	0.52	456	1.37	1.62	18
Psychiatry	117,485	1956	2000	1.73	3.44	99	0.41	0.76	83	1.60	2.80	75
Political Science	100,290	1956	2000	1.06	1.22	15	0.05	0.16	226	4.55	4.24	-7
Multidisciplinary Psychology	93,363	1956	2000	1.52	2.27	50	0.36	0.61	73	0.87	2.22	154
Law	82,748	1956	2000	1.11	1.35	22	0.09	0.20	123	0.97	1.90	96
Education and Educational Research	78,956	1956	2000	1.16	1.86	61	0.13	0.47	262	2.14	2.00	-7
Experimental Psychology	67,729	1956	2000	1.35	2.56	90	0.26	0.78	198	2.02	1.66	-18
Psychology, Clinical	65,616	1956	2000	1.51	3.05	102	0.35	0.77	119	1.62	1.79	10
Business	63,226	1956	2000	1.17	1.66	43	0.13	0.44	238	1.46	3.36	130
Sociology	61,719	1956	2000	1.21	1.50	24	0.18	0.34	91	1.95	2.14	9
Public Health	49,099	1956	2000	1.56	3.14	101	0.33	0.77	131	3.30	1.96	-41
Management	46,744	1956	2000	1.25	1.91	53	0.18	0.61	228	2.38	1.62	-32
Psychology, Developmental	43,788	1956	2000	1.65	2.96	79	0.43	0.79	86	1.74	1.90	9
Psychology, Social	42,090	1956	2000	1.53	2.44	59	0.39	0.77	95	1.61	1.64	2
Social Sciences, Interdisciplinary	38,889	1956	2000	1.19	1.71	44	0.14	0.39	185	2.47	2.53	2
Information Science	37,069	1956	2000	1.07	1.69	58	0.06	0.35	483	1.99	3.10	55
Anthropology	36,204	1956	2000	1.27	1.93	52	0.18	0.40	122	1.88	1.93	3
Educational Psychology	35,985	1956	2000	1.46	2.28	56	0.34	0.67	100	0.80	1.86	132
Social Issues	35,714	1956	2000	1.06	1.34	26	0.04	0.20	363	6.58	3.37	-49
International Relations	34,278	1956	2000	1.04	1.24	20	0.03	0.19	563	2.59	2.49	-4
Psychology, Applied	33,590	1956	2000	1.50	2.37	58	0.37	0.74	98	1.02	1.52	49
Rehabilitation	33,021	1956	2000	1.29	2.48	92	0.21	0.69	227	2.76	1.90	-31
Business, Finance	31,148	1956	2000	1.13	1.39	23	0.09	0.27	208	2.68	6.48	142
Nursing	30,174	1956	2000	1.17	2.08	79	0.14	0.52	267	3.82	1.68	-56
Environmental Studies	28,605	1956	2000	1.17	1.76	51	0.16	0.49	218	3.24	1.35	-58
Psychology, Biological	27,182	1958	2000	1.71	3.06	78	0.51	0.85	67	0.92	1.51	64
Geography	26,612	1956	2000	1.10	1.63	48	0.09	0.41	354	2.15	1.12	-48
Planning	25,426	1956	2000	1.15	1.62	41	0.12	0.43	249	6.01	1.51	-75
Applied Linguistics	23,507	1956	2000	1.13	2.01	78	0.10	0.55	461	2.18	2.33	7
Area Studies	22,173	1956	2000	1.06	1.19	12	0.05	0.14	160	6.33	2.00	-68
Mathematical Social Sciences	21,374	1956	2000	1.20	1.85	54	0.17	0.57	243	1.53	1.61	5
Education, Special	21,067	1956	2000	1.31	2.54	95	0.22	0.73	230	2.72	1.66	-39
Gerontology	20,710	1956	2000	1.60	3.22	101	0.36	0.76	109	1.34	2.78	107
Health Policy	20,203	1956	2000	1.56	2.63	69	0.32	0.62	96	1.26	2.46	95
Social Work	19,578	1956	2000	1.11	2.08	87	0.09	0.56	506	2.76	1.92	-30
Industrial Relations	18,818	1956	2000	1.12	1.81	62	0.09	0.47	450	3.40	1.57	-54
Social Sciences, Biomedical	17,137	1967	2000	1.53	2.18	42	0.37	0.51	38	1.69	2.23	32

Family Studies	16,598	1956	2000	1.07	2.35	120	0.06	0.66	1033	3.04	1.72	-43
Public Administration	16,284	1956	2000	1.09	1.51	39	0.07	0.39	468	0.29	1.19	308
Criminology and Penology	16,245	1956	2000	1.13	1.77	57	0.10	0.45	369	3.09	2.27	-26
Communication	15,478	1956	2000	1.16	1.75	51	0.14	0.46	227	1.63	1.88	16
UrbanStudies	13,483	1964	2000	1.21	1.65	37	0.19	0.43	124	0.95	1.25	32
History and Philosophy of Science	13,321	1956	2000	1.05	1.15	9	0.05	0.12	149	0.70	1.90	172
Ethics	12,423	1956	2000	1.00	1.42	42	0.00	0.25	-	-	1.87	-
Psychology, Psychoanalysis	11,889	1956	2000	1.11	1.59	43	0.09	0.26	198	1.19	2.22	87
Ergonomics	11,740	1956	2000	1.37	2.65	94	0.26	0.79	204	1.59	1.31	-17
Demography	11,063	1956	2000	1.15	1.93	68	0.12	0.52	321	2.01	1.82	-9
Substance Abuse	10,964	1971	2000	1.78	3.09	73	0.45	0.79	77	2.94	1.92	-35
Psychology, Mathematical	10,320	1956	2000	1.41	2.03	44	0.31	0.67	112	0.54	1.08	100
History	9,707	1956	2000	1.01	1.10	8	0.01	0.08	477	0.87	1.20	38
Womens Studies	9,620	1975	2000	1.55	1.80	16	0.38	0.41	6	1.16	2.78	140
History of Social Sciences	7,887	1956	2000	1.05	1.20	14	0.05	0.17	255	1.24	1.50	21
Transportation	5,893	1967	2000	1.21	2.30	89	0.17	0.72	310	1.42	1.27	-11
Ethnic Studies	2,903	1969	2000	1.16	1.20	3	0.11	0.15	36	0.71	2.35	233

Arts & Humanities fields	N_{papers}	$years_{covered}$		mean team size			$fraction_{teams}$			relat. team impact		
				first 5 y.	last 5 y.	$\%_{change}$	first 5 y.	last 5 y.	$\%_{change}$	first 5y.	last 5 y.	$\%_{change}$
History	84,832	1975	2000	1.06	1.07	1	0.05	0.06	15	1.83	1.75	-4
Multidsciplinary Humanities	62,209	1975	2000	1.06	1.08	2	0.03	0.05	56	1.75	2.37	35
Literature	60,561	1975	2000	1.03	1.05	2	0.03	0.03	30	1.23	2.56	108
Philosophy	52,053	1975	2000	1.05	1.06	0	0.05	0.05	-5	0.88	2.31	162
Art	42,716	1975	2000	1.06	1.10	3	0.05	0.06	24	0.99	4.64	369
Literary Reviews	38,238	1975	2000	1.07	1.07	0	0.04	0.04	7	0.78	1.12	43
Religion	36,306	1975	2000	1.06	1.09	3	0.04	0.06	35	4.38	4.99	14
Music	34,788	1975	2000	1.07	1.10	3	0.04	0.06	59	2.75	6.12	122
Theory of Language and Linguistics	31,021	1975	2000	1.11	1.18	7	0.09	0.13	54	4.92	3.62	-27
Architecture	29,057	1975	2000	1.07	1.09	2	0.05	0.07	40	1.82	1.89	4
Literature, Romance	28,489	1975	2000	1.05	1.04	-1	0.03	0.03	11	1.07	1.78	67
Archaeology	13,750	1975	2000	1.32	1.79	36	0.22	0.37	70	2.01	2.72	35
Classics	12,997	1975	2000	1.02	1.05	3	0.02	0.03	14	0.95	1.20	26
Film, Radio and TV	12,768	1975	2000	1.10	1.06	-4	0.05	0.04	-21	0.73	2.72	272
Asian Studies	11,855	1975	2000	1.04	1.06	1	0.04	0.05	14	1.15	1.39	20
History and Philosophy of Science	10,431	1975	2000	1.10	1.16	6	0.08	0.13	66	1.97	1.84	-6
Theater	10,032	1975	2000	1.03	1.08	4	0.03	0.04	70	0.18	1.72	851
Literature, German	9,378	1975	2000	1.02	1.05	3	0.02	0.04	173	0.82	1.20	47
Medieval Studies	8,647	1975	2000	1.03	1.04	1	0.02	0.04	87	0.85	1.24	45
Literary Theory	7,841	1975	2000	1.02	1.04	2	0.02	0.03	19	0.55	0.41	-25
Literature, british	6,777	1975	2000	1.02	1.03	0	0.02	0.02	19	0.64	1.66	160
Dance	5,126	1975	2000	1.02	1.04	2	0.02	0.02	-3	1.61	0.00	-100
Poetry	4,945	1975	2000	1.02	1.02	0	0.02	0.02	-21	0.52	3.07	495

Literature, Slavic	4,843	1975	2000	1.05	1.06	0	0.04	0.04	10	1.85	0.64	-66
Literature, American	4,514	1975	2000	1.04	1.05	1	0.03	0.02	-43	0.78	0.56	-28
Folklore	4,392	1975	2000	1.09	1.10	1	0.06	0.08	23	1.72	1.03	-40
Literature, African, Australian and Canadian	3,429	1975	2000	1.02	1.04	3	0.02	0.04	117	0.91	1.24	36

Patents fields	$N_{patents}$	$years_{covered}$		mean team size			$fraction_{teams}$			relat. team impact		
				first 5 y.	last 5 y.	$\%_{change}$	first 5 y.	last 5 y.	$\%_{change}$	first 5y.	last 5 y.	$\%_{change}$
Miscellaneous, Chemical	214,854	1975	1995	1.93	2.49	29	0.52	0.67	27	1.07	1.10	3
Miscellaneous, Others	179,925	1975	1995	1.48	1.92	30	0.31	0.46	49	1.22	1.18	-3
Materials Processing & Handling	108,873	1975	1995	1.59	1.98	24	0.36	0.50	40	1.12	1.12	0
Miscellaneous, Mechanical	103,854	1975	1995	1.45	1.79	23	0.31	0.43	37	1.19	1.16	-2
Communications	98,046	1975	1995	1.65	2.17	32	0.42	0.57	36	1.16	1.17	1
Computer Hardware & Software	83,094	1975	1995	1.96	2.37	21	0.52	0.62	18	1.19	1.22	3
Motors, Engines & Parts	78,584	1975	1995	1.59	2.06	30	0.36	0.52	44	1.20	1.29	8
Organic Compounds	78,188	1975	1995	2.22	3.03	36	0.64	0.81	26	1.16	0.80	-31
Drugs	77,210	1975	1995	2.48	3.15	27	0.67	0.80	18	1.07	0.86	-20
Resins	74,993	1975	1995	2.19	2.84	30	0.65	0.80	25	1.04	0.98	-6
Power Systems	73,849	1975	1995	1.66	2.16	30	0.41	0.57	38	1.07	1.11	4
Electrical Devices	65,500	1975	1995	1.55	1.93	24	0.38	0.52	36	1.12	1.13	1
Metal Working	63,669	1975	1995	1.89	2.36	25	0.47	0.61	30	1.18	1.18	0
Surgery & Medical Instruments	62,192	1975	1995	1.49	2.03	36	0.33	0.52	60	1.19	1.17	-2
Measuring & Testing	62,021	1975	1995	1.68	2.13	27	0.42	0.58	37	1.10	1.18	8
Transportation	61,501	1975	1995	1.44	1.81	26	0.30	0.43	46	1.18	1.25	6
Miscellaneous, Electrical	52,206	1975	1995	1.73	2.11	22	0.43	0.54	25	1.13	1.25	10
Optics	51,102	1975	1995	1.84	2.35	27	0.46	0.58	27	1.19	1.14	-4
Semiconductor Devices	47,123	1975	1995	1.93	2.36	23	0.55	0.61	12	1.04	1.11	8
Agriculture, Husbandry, Food	44,718	1975	1995	1.65	1.86	13	0.37	0.44	18	1.22	1.16	-5
Furniture, House Fixtures	43,499	1975	1995	1.29	1.51	17	0.22	0.31	41	1.12	1.12	0
Receptacles	43,353	1975	1995	1.37	1.62	18	0.27	0.37	34	1.07	1.07	1
Information Storage	43,182	1975	1995	1.79	2.37	33	0.46	0.60	28	1.28	1.19	-6
Apparel & Textiles	35,001	1975	1995	1.52	1.64	8	0.32	0.38	21	1.06	1.02	-4
Electrical Lighting	33,769	1975	1995	1.72	2.10	22	0.44	0.54	22	1.04	1.14	10
Coating	32,820	1975	1995	1.92	2.46	28	0.52	0.67	28	1.12	1.22	9
Nuclear & X-ray	32,402	1975	1995	1.82	2.28	26	0.48	0.61	27	1.07	1.17	10
Earth Working & Wells	29,645	1975	1995	1.54	1.80	17	0.34	0.46	35	1.11	1.35	22
Biotechnology	29,638	1975	1995	2.48	2.90	17	0.69	0.80	17	1.02	0.92	-9
Heating	28,267	1975	1995	1.55	1.95	26	0.33	0.48	47	1.10	1.06	-4
Computer Peripherals	22,809	1975	1995	1.96	2.55	30	0.54	0.62	15	1.16	1.17	1
Amusement Devices	22,227	1975	1995	1.30	1.44	11	0.21	0.30	40	1.23	1.27	3
Pipes & Joints	18,444	1975	1995	1.43	1.74	21	0.29	0.42	44	1.09	1.01	-7
Agriculture, Food, Textiles	18,351	1975	1995	2.03	2.83	39	0.56	0.71	28	1.02	1.25	23
Miscellaneous, Drugs & Medical	14,356	1975	1995	1.46	1.77	22	0.32	0.44	37	1.38	1.09	-22
Gas	10,047	1975	1995	1.77	2.15	21	0.44	0.56	29	1.16	1.25	8

Supplementary Table S3: In the paper we merge subfields into larger branches of Science & Engineering, Social Sciences, Arts & Humanities, and Patents. Here, we show these fields with the subfields they contain.

Science & Engineering	
fields	**sub-fields (according to ISI)**
Medicine	ALLERGY
Medicine	ANATOMY & MORPHOLOGY
Medicine	ANDROLOGY
Medicine	ANESTHESIOLOGY
Medicine	BEHAVIORAL SCIENCES
Medicine	CARDIAC & CARDIOVASCULAR SYSTEMS
Medicine	CLINICAL NEUROLOGY
Medicine	CRITICAL CARE MEDICINE
Medicine	DENTISTRY, ORAL SURGERY & MEDICINE
Medicine	DERMATOLOGY
Medicine	EMERGENCY MEDICINE
Medicine	ENDOCRINOLOGY & METABOLISM
Medicine	GASTROENTEROLOGY & HEPATOLOGY
Medicine	GERIATRICS & GERONTOLOGY
Medicine	HEALTH CARE SCIENCES & SERVICES
Medicine	HEMATOLOGY
Medicine	IMMUNOLOGY
Medicine	INFECTIOUS DISEASES
Medicine	INTEGRATIVE & COMPLEMENTARY MEDICINE
Medicine	MEDICAL ETHICS
Medicine	MEDICAL INFORMATICS
Medicine	MEDICAL LABORATORY TECHNOLOGY
Medicine	MEDICINE, GENERAL & INTERNAL
Medicine	MEDICINE, LEGAL
Medicine	MEDICINE, RESEARCH & EXPERIMENTAL
Medicine	NEUROIMAGING
Medicine	NEUROSCIENCES
Medicine	OBSTETRICS & GYNECOLOGY
Medicine	ONCOLOGY
Medicine	OPHTHALMOLOGY
Medicine	ORTHOPEDICS
Medicine	OTORHINOLARYNGOLOGY
Medicine	PATHOLOGY
Medicine	PEDIATRICS
Medicine	PERIPHERAL VASCULAR DISEASE
Medicine	PHARMACOLOGY & PHARMACY
Medicine	PHYSIOLOGY
Medicine	RADIOLOGY, NUCLEAR MEDICINE & MEDICAL IMAGING
Medicine	RESPIRATORY SYSTEM
Medicine	RHEUMATOLOGY
Medicine	SURGERY
Medicine	TOXICOLOGY
Medicine	TRANSPLANTATION
Medicine	TROPICAL MEDICINE
Medicine	UROLOGY & NEPHROLOGY
Biology	BIOCHEMICAL RESEARCH METHODS
Biology	BIOCHEMISTRY & MOLECULAR BIOLOGY
Biology	BIODIVERSITY CONSERVATION
Biology	BIOLOGY
Biology	BIOPHYSICS
Biology	BIOTECHNOLOGY & APPLIED MICROBIOLOGY
Biology	CELL BIOLOGY
Biology	DEVELOPMENTAL BIOLOGY

Biology	ENTOMOLOGY
Biology	EVOLUTIONARY BIOLOGY
Biology	GENETICS & HEREDITY
Biology	MARINE & FRESHWATER BIOLOGY
Biology	MICROBIOLOGY
Biology	MICROSCOPY
Biology	MYCOLOGY
Biology	ORNITHOLOGY
Biology	PALEONTOLOGY
Biology	PARASITOLOGY
Biology	PLANT SCIENCES
Biology	REPRODUCTIVE BIOLOGY
Biology	VIROLOGY
Biology	ZOOLOGY
Chemistry	CHEMISTRY, ANALYTICAL
Chemistry	CHEMISTRY, APPLIED
Chemistry	CHEMISTRY, INORGANIC & NUCLEAR
Chemistry	CHEMISTRY, MEDICINAL
Chemistry	CHEMISTRY, MULTIDISCIPLINARY
Chemistry	CHEMISTRY, ORGANIC
Chemistry	CHEMISTRY, PHYSICAL
Chemistry	CRYSTALLOGRAPHY
Chemistry	ELECTROCHEMISTRY
Chemistry	FOOD SCIENCE & TECHNOLOGY
Chemistry	POLYMER SCIENCE
Chemistry	SPECTROSCOPY
Physics	ACOUSTICS
Physics	ASTRONOMY & ASTROPHYSICS
Physics	NUCLEAR SCIENCE & TECHNOLOGY
Physics	OPTICS
Physics	PHYSICS, APPLIED
Physics	PHYSICS, ATOMIC, MOLECULAR & CHEMICAL
Physics	PHYSICS, CONDENSED MATTER
Physics	PHYSICS, FLUIDS & PLASMAS
Physics	PHYSICS, MATHEMATICAL
Physics	PHYSICS, MULTIDISCIPLINARY
Physics	PHYSICS, NUCLEAR
Physics	PHYSICS, PARTICLES & FIELDS
Physics	THERMODYNAMICS
Engineering	AUTOMATION & CONTROL SYSTEMS
Engineering	CONSTRUCTION & BUILDING TECHNOLOGY
Engineering	ENERGY & FUELS
Engineering	ENGINEERING, AEROSPACE
Engineering	ENGINEERING, BIOMEDICAL
Engineering	ENGINEERING, CHEMICAL
Engineering	ENGINEERING, CIVIL
Engineering	ENGINEERING, ELECTRICAL & ELECTRONIC
Engineering	ENGINEERING, ENVIRONMENTAL
Engineering	ENGINEERING, GEOLOGICAL
Engineering	ENGINEERING, INDUSTRIAL
Engineering	ENGINEERING, MANUFACTURING
Engineering	ENGINEERING, MARINE
Engineering	ENGINEERING, MECHANICAL
Engineering	ENGINEERING, MULTIDISCIPLINARY
Engineering	ENGINEERING, OCEAN
Engineering	ENGINEERING, PETROLEUM
Engineering	HORTICULTURE
Engineering	IMAGING SCIENCE & PHOTOGRAPHIC TECHNOLOGY
Engineering	INSTRUMENTS & INSTRUMENTATION

Engineering	MECHANICS
Engineering	METALLURGY & METALLURGICAL ENGINEERING
Engineering	MINING & MINERAL PROCESSING
Engineering	NANOSCIENCE & NANOTECHNOLOGY
Engineering	REMOTE SENSING
Engineering	ROBOTICS
Engineering	TELECOMMUNICATIONS
Engineering	TRANSPORTATION SCIENCE & TECHNOLOGY
Environmental	ECOLOGY
Environmental	ENVIRONMENTAL SCIENCES
Environmental	FISHERIES
Environmental	FORESTRY
Environmental	METEOROLOGY & ATMOSPHERIC SCIENCES
Environmental	WATER RESOURCES
Mathematics	MATHEMATICS
Mathematics	MATHEMATICS, APPLIED
Mathematics	MATHEMATICS, INTERDISCIPLINARY APPLICATIONS
Mathematics	STATISTICS & PROBABILITY
Geosciences	GEOCHEMISTRY & GEOPHYSICS
Geosciences	GEOGRAPHY, PHYSICAL
Geosciences	GEOLOGY
Geosciences	GEOSCIENCES, MULTIDISCIPLINARY
Geosciences	LIMNOLOGY
Geosciences	MINERALOGY
Geosciences	OCEANOGRAPHY
Computer	COMPUTER SCIENCE, ARTIFICIAL INTELLIGENCE
Computer	COMPUTER SCIENCE, CYBERNETICS
Computer	COMPUTER SCIENCE, HARDWARE & ARCHITECTURE
Computer	COMPUTER SCIENCE, INFORMATION SYSTEMS
Computer	COMPUTER SCIENCE, INTERDISCIPLINARY APPLICATIONS
Computer	COMPUTER SCIENCE, SOFTWARE ENGINEERING
Computer	COMPUTER SCIENCE, THEORY & METHODS
Agriculture	AGRICULTURAL ECONOMICS & POLICY
Agriculture	AGRICULTURAL ENGINEERING
Agriculture	AGRICULTURE, DAIRY & ANIMAL SCIENCE
Agriculture	AGRICULTURE, MULTIDISCIPLINARY
Agriculture	AGRICULTURE, SOIL SCIENCE
Agriculture	AGRONOMY

Social Sciences	
fields	**sub-fields (according to ISI)**
Psychology	PSYCHOLOGY, APPLIED
Psychology	PSYCHOLOGY, BIOLOGICAL
Psychology	PSYCHOLOGY, CLINICAL
Psychology	PSYCHOLOGY, DEVELOPMENTAL
Psychology	PSYCHOLOGY, EDUCATIONAL
Psychology	PSYCHOLOGY, EXPERIMENTAL
Psychology	PSYCHOLOGY, MATHEMATICAL
Psychology	PSYCHOLOGY, MULTIDISCIPLINARY
Psychology	PSYCHOLOGY, PSYCHOANALYSIS
Psychology	PSYCHOLOGY, SOCIAL
Economics	ECONOMICS
Political	INTERNATIONAL RELATIONS
Political	POLITICAL SCIENCE
Education	EDUCATION & EDUCATIONAL RESEARCH
Education	EDUCATION, SPECIAL
Law	LAW
Sociology	SOCIOLOGY
Anthropology	ANTHROPOLOGY

Arts & Humanities	
fields	**sub-fields (according to ISI)**
Literature	LANGUAGE & LINGUISTICS THEORY
Literature	LITERARY REVIEWS
Literature	LITERARY THEORY
Literature	LITERATURE, african, australian & canadian
Literature	LITERATURE, american
Literature	LITERATURE, british
Literature	LITERATURE, german
Literature	LITERATURE
Literature	LITERATURE, romance
Literature	LITERATURE, slavic
Literature	POETRY
History	HISTORY
History	HISTOR & PHIOLOSOPGY OF SCIENCE
Art & Architecture	ART
Art & Architecture	ARCHITECTURE
Philosophy	PHILOSOPHY
Music & Dance	DANCE
Music & Dance	MUSIC
Religion	RELIGION
Theater, Film, TV & Radio	FILM, RADIO, TV
Theater, Film, TV & Radio	THEATER
Archaeology	ARCHAEOLOGY

Patents	
fields	**sub-fields**
Chemical	AGRICULTURE, FOOD, TEXTILES
Chemical	COATING
Chemical	GAS
Chemical	ORGANIC COMPOUNDS
Chemical	RESINS
Chemical	MISCELLANEOUS CHEMICAL
Computers & Communication	COMMUNICATIONS
Computers & Communication	COMPUTER HARDWARE & SOFTWARE
Computers & Communication	COMPUTER PERIPHERALS
Computers & Communication	INFORMATION STORAGE
Drugs & Medical	DRUGS
Drugs & Medical	SURGERY & MEDICAL INSTRUMENTS
Drugs & Medical	BIOTECHNOLOGY
Drugs & Medical	MISCELLANEOUS DRUGS & MEDICAL
Electrical & Electronics	ELECTRICAL DEVICES
Electrical & Electronics	ELECTRICAL LIGHTING
Electrical & Electronics	MEASURING & TESTING
Electrical & Electronics	NUCLEAR & X-RAY
Electrical & Electronics	POWER SYSTEMS
Electrical & Electronics	SEMICONDUCTOR DEVICES
Electrical & Electronics	MISCELLANEOUS ELECTRICAL
Mechanical	MATERIALS PROCESS & HANDLING
Mechanical	METAL WORKING
Mechanical	MOTORS, ENGINES & PARTS
Mechanical	OPTICS
Mechanical	TRANSPORTATION
Mechanical	MISCELLANEOUS MECHANICAL

Supplementary Table S4: The citation advantage of teams is increasing when we compare teams of any particular size versus solo authors. Each cell reports a ratio, where the numerator is the average number of citations received in that year by a team of size k, and the denominator is the average citations received by teams of size 1. The size of teams used in the numerator is indicated at the top of each column. For example, in Science and Engineering, papers with two authors received *1.30* times more citations than solo authors in 1960 but *1.74* times more citations in the 2000, indicating a large increase in the advantage of teamwork.

	ratios of mean number of received citations						
	year	solo	team size 2 / solo	team size 3 / solo	team size 4 / solo	team size 5 / solo	team size >5 / solo
Science & Engineering	1960	1.00	1.30	1.22	1.49	1.46	1.34
	1970	1.00	1.57	1.64	1.83	2.08	2.34
	1980	1.00	1.59	1.75	1.91	2.09	2.58
	1990	1.00	1.67	1.88	2.15	2.55	3.12
	2000	1.00	1.74	2.00	2.28	2.62	3.72
Social Sciences	1960	1.00	1.88	2.25	2.99	2.43	4.88
	1970	1.00	1.89	2.32	3.15	3.25	4.10
	1980	1.00	2.36	2.99	4.18	7.23	8.57
	1990	1.00	2.80	4.06	6.29	8.88	12.91
	2000	1.00	2.50	3.42	5.04	6.77	13.01
Arts & Humanities	1980	1.00	2.60	2.97	2.40	1.31	4.07
	1990	1.00	3.19	5.41	5.89	4.63	4.74
	2000	1.00	3.22	5.99	8.79	8.04	5.93
Patents	1975	1.00	1.09	1.12	1.11	1.03	1.05
	1985	1.00	1.11	1.20	1.25	1.28	1.30
	1995	1.00	1.04	1.07	1.06	1.13	1.13

References – Supplementary Material

S1. B.H. Hall, A.B. Jaffe, M. Trajtenberg, *National Bureau of Economic Research* Working Paper #8498 (2001).