



Supporting Online Material for  
**The Increasing Dominance of Teams in Production of Knowledge**  
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Published 12 April 2006 on *Science* Express  
DOI: 10.1126/science.1136099

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

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## Overview

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

### Further Notes: Data

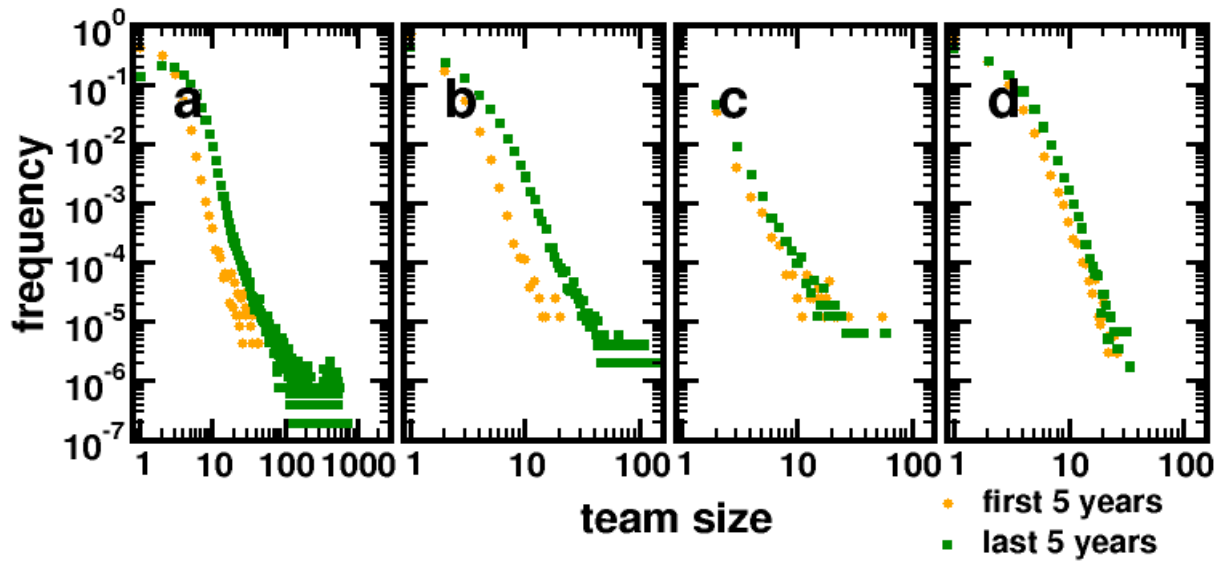
Data from the ISI database Web of Science (<http://www.isiknowledge.com>) were downloaded using software from Thomson Scientific. The data includes all full length research articles and shorter research pieces (letters) as classified by the ISI. This excludes books, book reviews, editorial material, 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 (SI).

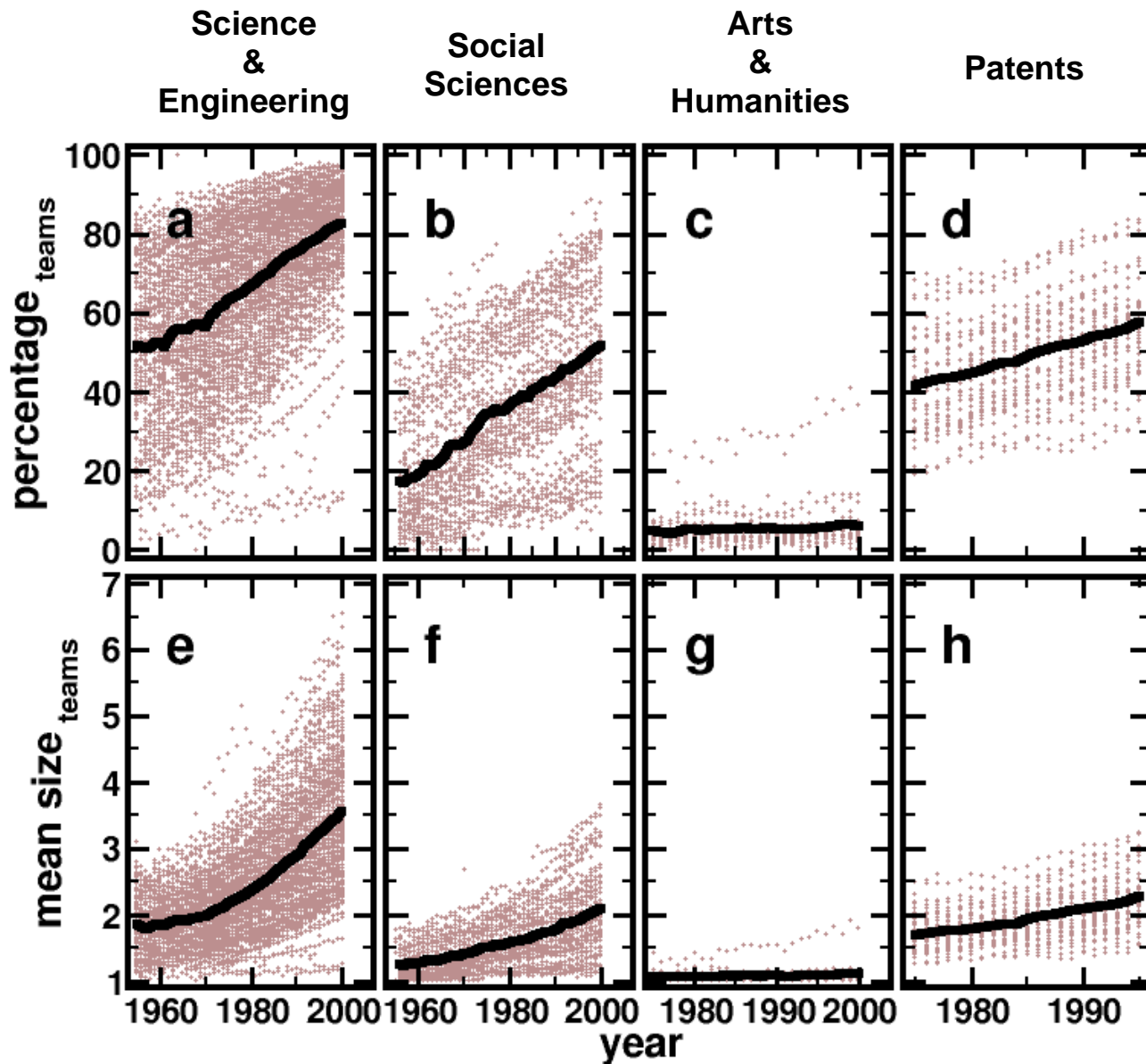
The ISI subfield classifications include 171 subfields in the sciences and engineering, 54 subfields in the social sciences, and 27 subfields in the arts and humanities. The US Patent and Trademark data is divided into 36 subfields following (SI). These subfields are listed in Supplementary Table S2.

### Further Notes: Analysis

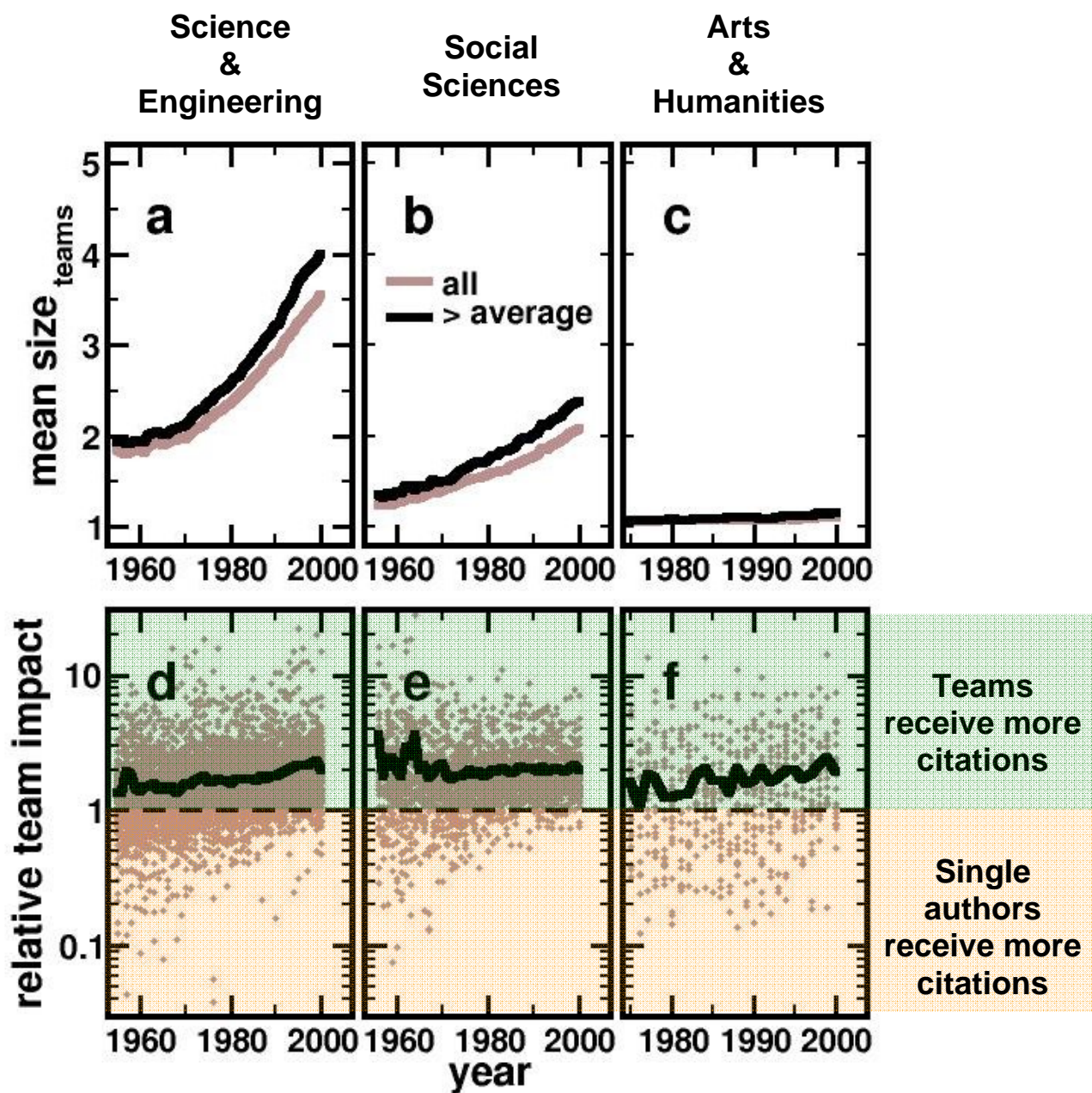
One may test whether the rise in the number of researchers in a field predicts the rise in average team size by running the following regression:  $\log(\text{team size})_{it} = a + b \cdot \log(\text{field size})_{it} + v_i + m_t + u_{it}$ , where  $i$  indexes the subfield,  $t$  indexes the year,  $v_i$  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  $.02 \times 2.6 / 0.6 = 9\%$  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.



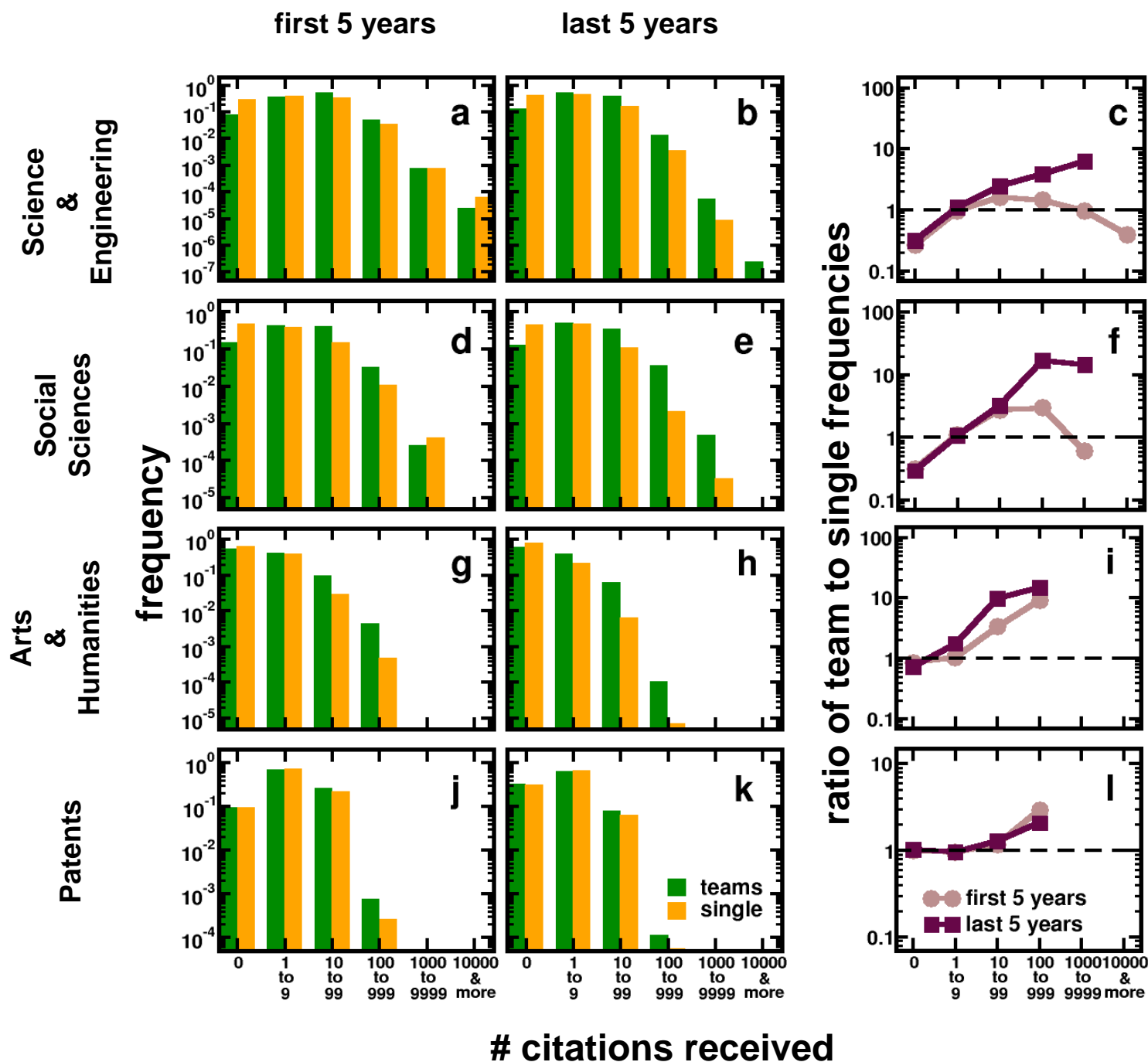
**Supplementary Figure S1:** Frequency distributions of team sizes in (a) Science & Engineering, (b) Social Sciences, (c) Arts & Humanities and (d) Patents. In particular, we obtain these curves in the first and last 5 years that are covered by our data (Science & Engineering, from 1955-1959 to 1996-2000;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



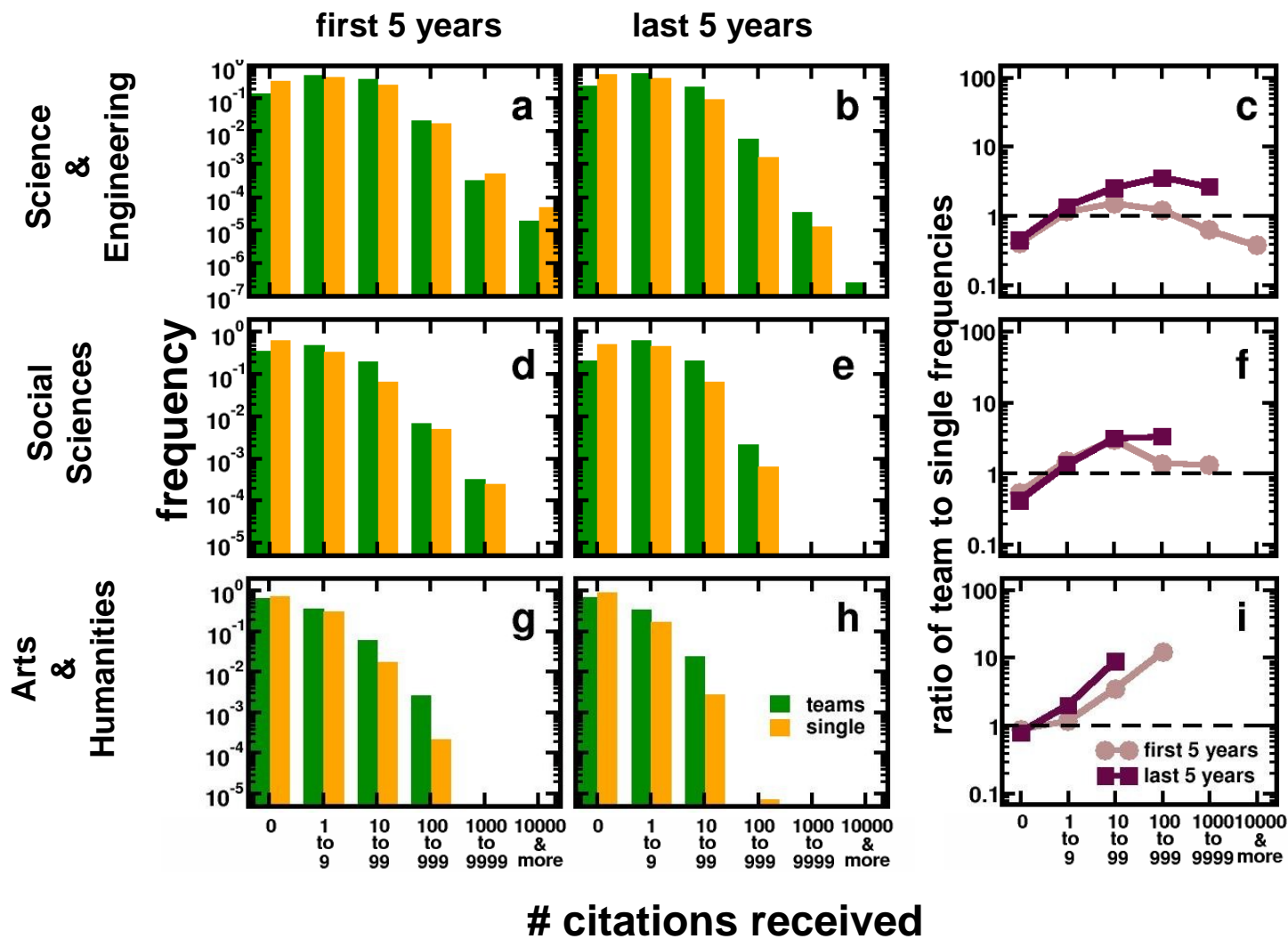
**Supplementary Figure S3:** In analogy to Figure 2 in the main paper, we show the same results *without* self-citations.



**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 <sub>papers</sub>	mean size <sub>team</sub>		%	fraction <sub>teams</sub>		%	RTI w self citations		%	RTI w/o self citations		%
		1955-59	1996-00	change	1955-59	1996-00	change	1955-59	1996-00	change	1955-59	1996-00	change
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 <sub>papers</sub>	mean size <sub>team</sub>		%	fraction <sub>teams</sub>		%	RTI w self citations		%	RTI w/o self citations		%
		1956-60	1996-00	change	1956-60	1996-00	change	1956-60	1996-00	change	1956-60	1996-00	change
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 <sub>papers</sub>	mean size <sub>team</sub>		%	fraction <sub>teams</sub>		%	RTI w self citations		%	RTI w/o self citations		%
		1975-79	1996-00	change	1975-79	1996-00	change	1975-79	1996-00	change	1975-79	1996-00	change
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 <sub>patents</sub>	mean size <sub>team</sub>		%	fraction <sub>teams</sub>		%	RTI w self citations		%			
		1975-79	1991-95	change	1975-79	1991-95	change	1975-79	1991-95	change			
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 <sub>papers</sub>	years <sub>covered</sub>		mean team size			fraction <sub>teams</sub>			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
Veterinary 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
Obstetrics	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 Disease	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
Ophthalmology	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
Toxicology	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
Crystallography	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
Meteorology	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
Acoustics	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
Thermodynamics	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 <sub>papers</sub>	years <sub>covered</sub>		mean team size			fraction <sub>teams</sub>			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 <sub>papers</sub>	years <sub>covered</sub>		mean team size			fraction <sub>teams</sub>			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
Multidisciplinary 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 <sub>patents</sub>	years <sub>covered</sub>		mean team size			fraction <sub>teams</sub>			relat. team impact		
				first 5 y.	last 5 y.	%change	first 5 y.	last 5 y.	%change	first 5 y.	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 & PHILOSOPHY 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
<b>Science &amp; Engineering</b>	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
<b>Social Sciences</b>	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
<b>Arts &amp; Humanities</b>	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
<b>Patents</b>	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).