

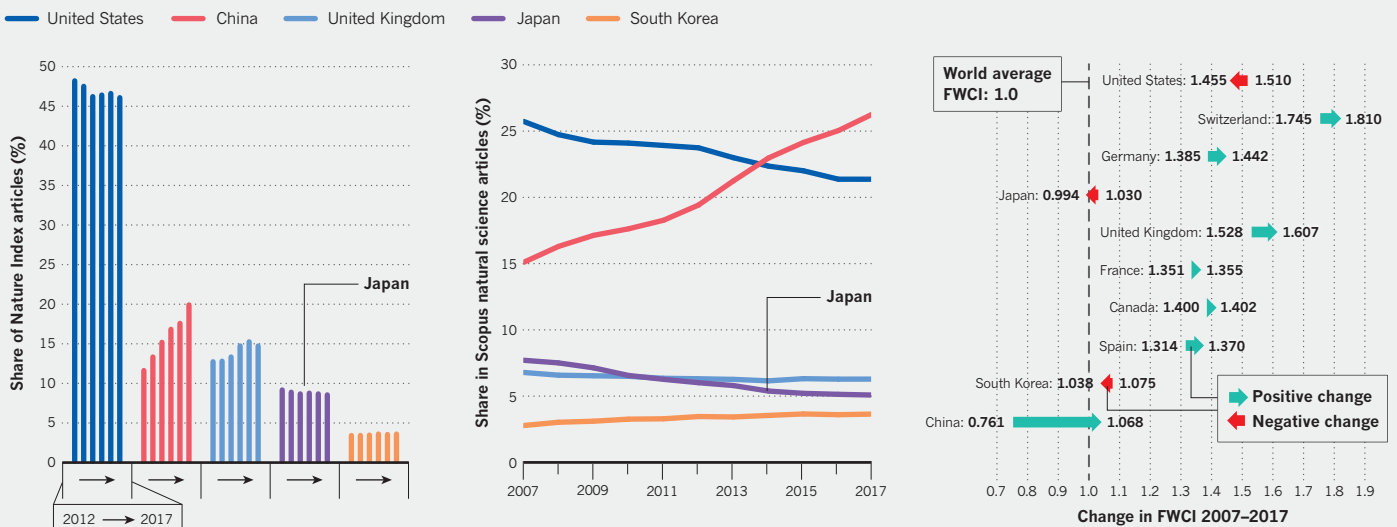
RELATIVE GAIN

While Japan's production of natural science papers continues to fall, a relatively high proportion of its output is of high quality. The country ranked 4th among the top countries in the Nature Index when assessed on its authorship of papers in the index relative to its contribution to the Scopus database, 2012–2017. Some of Japan's smaller institutions stand out for their efficiency in producing high-quality science.

DATA ANALYSIS BY AARON BALLAGH, BO WU, AND WILLEM SIJP OF THE NATURE INDEX; AND KANA TAKASAKA AND ANDERS KARLSSON AT ELSEVIER

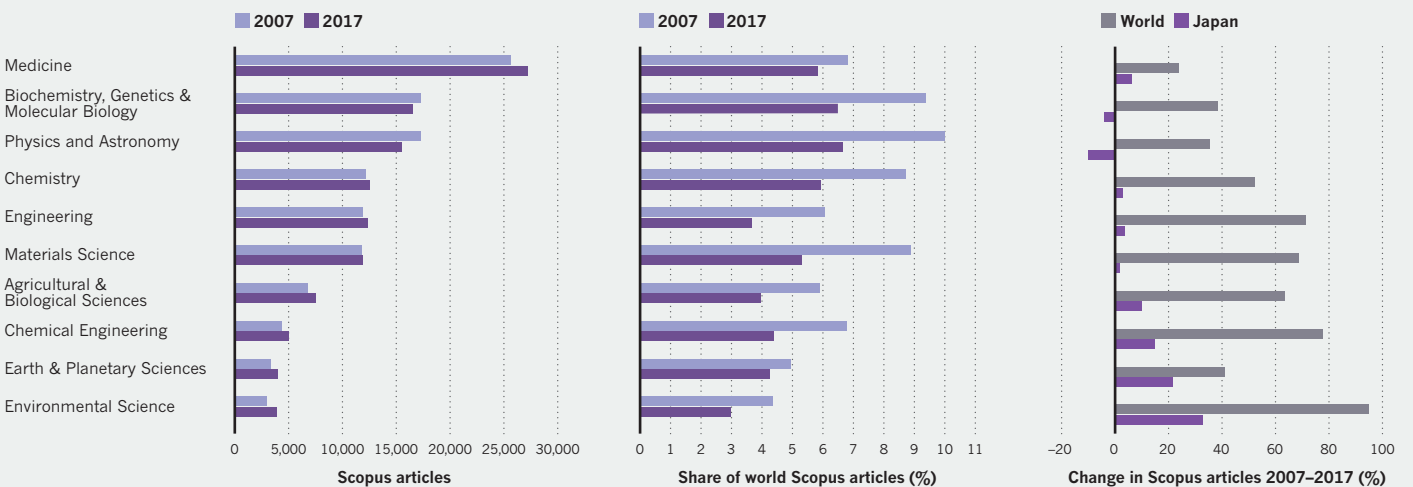
DECLINE IN GLOBAL SHARE

Japan's share of the world's high-quality research articles declined from 9.2% in 2012 to 8.6% in 2017 (left), and its share of natural science papers in Scopus also dropped over the past decade, from 7.7% in 2007 to 5.1% in 2017 (centre). The country's field-weighted citation impact (FWCI) in 2017 was lowest among the top ten countries in the Nature Index in 2017 (right).



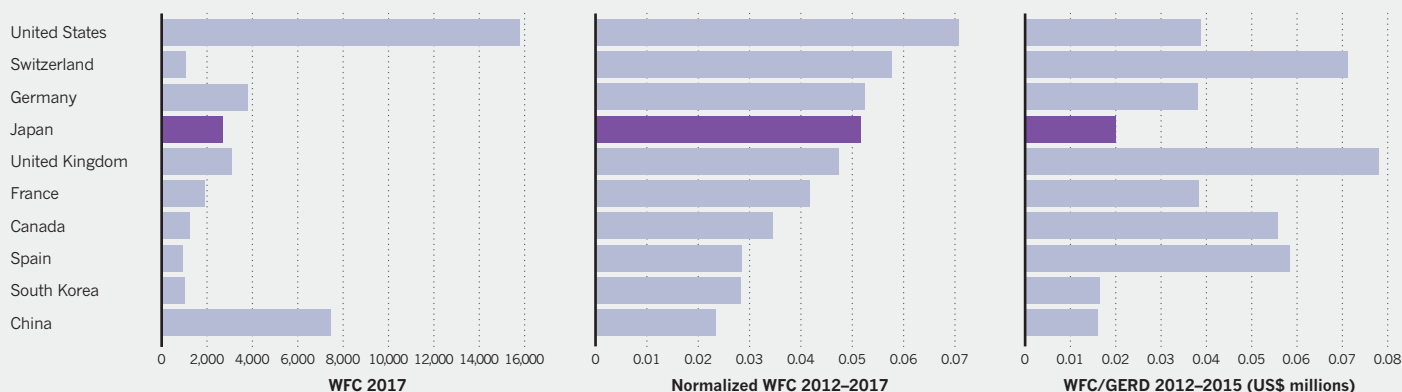
REDUCED STAKE IN EVERY SUBJECT

While Japan's article counts in the Scopus database of science articles have increased in absolute terms in the major science fields (left), its share of global output has declined in each one (centre). Shown here are Japan's top ten science subjects in the database in 2017, and their change in output since 2007 (right).



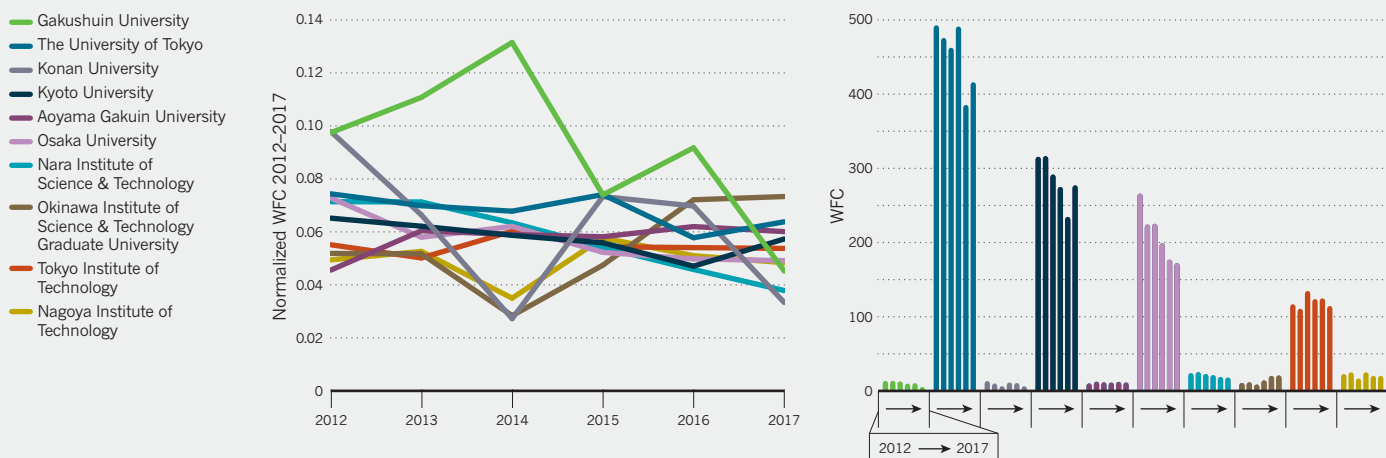
EFFICIENT PRODUCER OF QUALITY SCIENCE

Japan ranks 5th globally for its contribution to the authorship in the Nature Index, measured by weighted fractional count (WFC, left). But it jumps to 4th place among top countries in the Nature Index when assessed on the proportion of its total natural science output that is of high quality (normalized WFC 2012–2017, centre). For every individual contribution to an article in the index, Japan spent US\$50 million on research and development, double the amount spent by the United States (right).



SMALLER INSTITUTIONS SHINE

Tiny Gakushuin University cannot compete with the research behemoth The University of Tokyo for quantity of output (right). But when the playing field is levelled, to assess which Japanese institutions produced the most high-quality research relative to their total output in the natural sciences over the past six years, Gakushuin comes out on top.



A GLOBAL COMPETITOR

Top Japanese universities are on the whole more focussed on the natural sciences (NS) than some of their counterparts in the US, UK and South Korea. But article counts (AC) are declining in some. With the exception of The University of Tokyo, they produce fewer high-quality articles as a proportion of their total output in the natural sciences (NS) than top global rivals.

Institution	Normalized WFC 2012-2017	Nature Index WFC 2012-2017	Scopus NS articles 2012-2017	Nature Index AC 2012-2017	Change in AC 2012-2017	Scopus NS articles (%) 2012-2017
Massachusetts Institute of Technology, US	0.1089	2928.97	26899	9744	14.8%	77.6%
Harvard University, US	0.0767	4875.56	63562	15966	-3.4%	53.6%
Korea Advanced Institute of Science & Technology, South Korea	0.0708	763.64	10792	1685	1.4%	71.9%
The University of Tokyo, Japan	0.0680	2699.17	39721	7829	0.7%	78.1%
University of Oxford, UK	0.0659	2260.99	34294	7594	17.0%	65.0%
Kyoto University, Japan	0.0577	1686.08	29212	4334	-6.8%	79.3%
Osaka University, Japan	0.0574	1239.47	21579	3232	-24.0%	75.1%
Tokyo Institute of Technology, Japan	0.0547	701.44	12834	2031	5.5%	83.4%
Nagoya University, Japan	0.0478	741.82	15527	2480	-4.7%	74.9%
Peking University, China	0.0423	1698.13	40146	5725	105.2%	72.9%