C 7 Scientific publications[410]

A large proportion of new technologies and services are based on developments and results from science. Bibliometric indicators and metrics are regularly used as yardsticks for evaluating scientific achievements to estimate the performance of a research and science system in both quantitative and qualitative terms.

The bibliometric database Web of Science (WoS) covers worldwide publications in scientific journals, as well as citations from these publications. The research affiliation of scientists referenced in the database makes it possible to assign individual publications to a specific country. Fractional counting is employed in cases where several co-authors from different countries contribute to a publication. Indicators on the quantity and quality of scientific publications can be used to assess the performance of a research and science system.

Looking only at the number of publications, individual countries' shares of all WoS publications changed considerably between 2006 and 2016 (C 7-1). China in particular more than doubled its share of publications from 7.4 to 17.0 percent. The shares of South Korea, Brazil and India also increased during this period. By contrast, lower shares were recorded in particular by the established science systems of the USA, Western Europe, Israel and Japan. Germany's share fell from 5.8 to 4.5 percent. Despite the massive increase in publications from China, some countries in Europe, such as Denmark or Poland, still succeeded in increasing their share slightly over time.

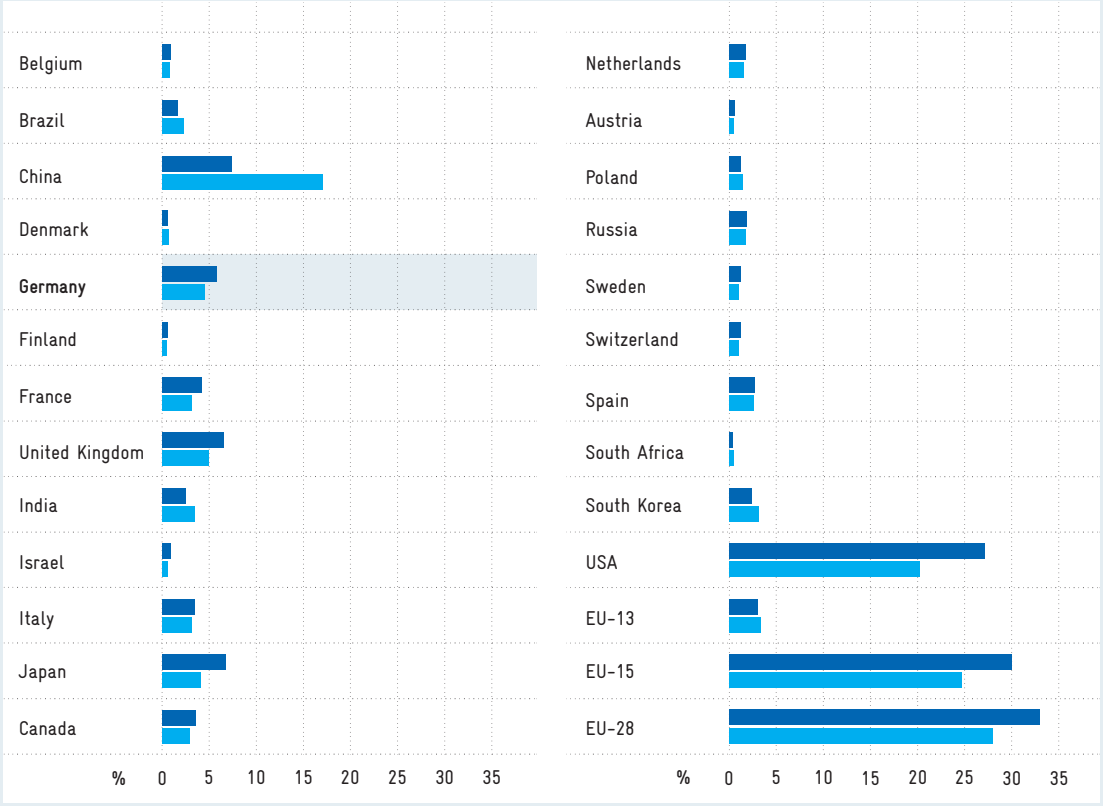
Publications in scientific journals with an international alignment (IA) are an indicator of the quality of scientific publications. In this field, particularly the USA, the Netherlands and Switzerland held a strong position in 2014 (C 7-2). According to this quality indicator, Germany has overtaken such countries as Israel, Canada and Sweden, and caught up with the United Kingdom since 2006, but has not yet quite reached the top group. By contrast, since 2006, scientists from the USA seem to have lost ground in terms of both the quantity (see above) and the quality of their published works in a relative comparison. Most of the BRICS countries – with the exception of Brazil – succeeded in improving their position in the index over time. However, they are still well below the average. The scientific regard (SR) of publications shows that in 2014 publications from Switzerland, the USA, Denmark, China and the UK were cited particularly frequently in scientific journals by international comparison (C 7-3). Germany falls short of this group, and its performance has worsened since 2006. The BRICS countries, by contrast, have improved or – in the case of Russia – stagnated.

Fig. C 7-1

Download data

Percentages of all publications in the Web of Science from selected countries and regions in 2006 and 2016

The analysis concentrates on countries' shares, rather than on absolute figures, to compensate for changes, especially the ongoing expansion of data collection.



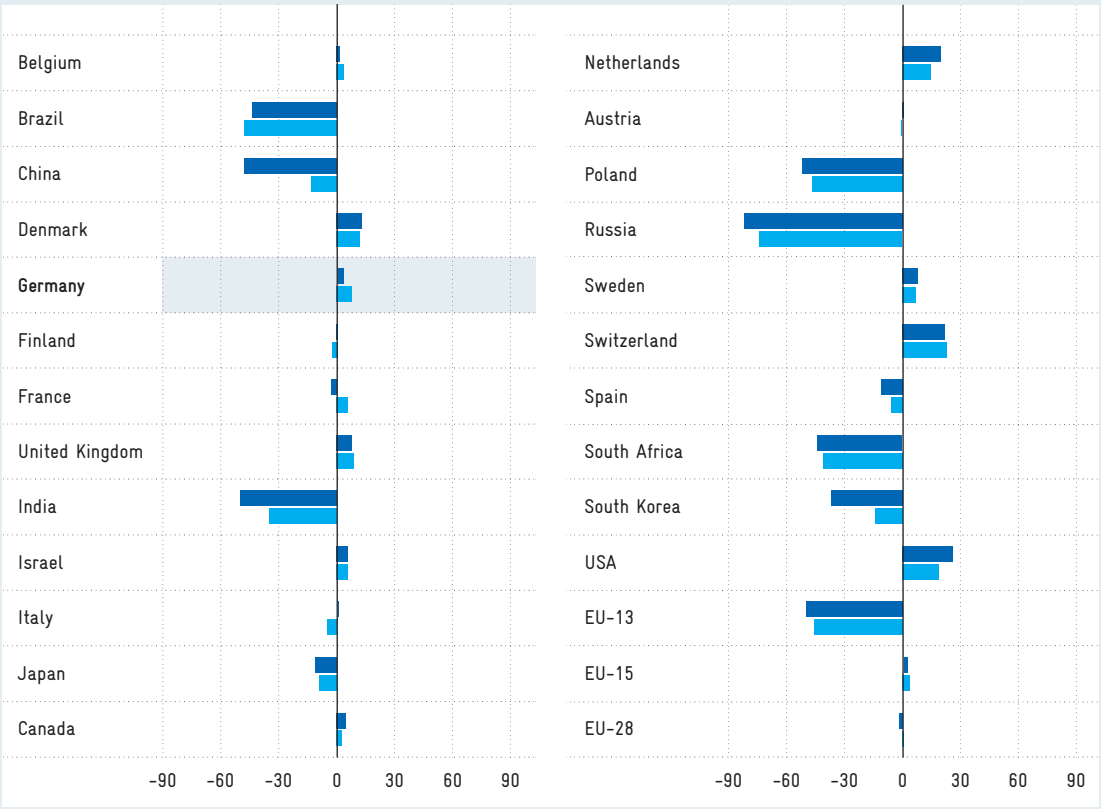
Fractional counting.
Source: Web of Science. Research and calculations by Fraunhofer ISI in Helmich et al. (2018).

Fig. C 7-2

Download data

International alignment (IA) of publications in the Web of Science from selected countries and regions in 2006 and 2014 (index values)

The IA index indicates whether a country's authors publish in internationally more highly recognized or less highly recognized journals relative to the world average. Positive or negative values indicate an above-average or below-average IA.



Fractional counting.
Source: Web of Science. Research and calculations by Fraunhofer ISI in Helmich et al. (2018).

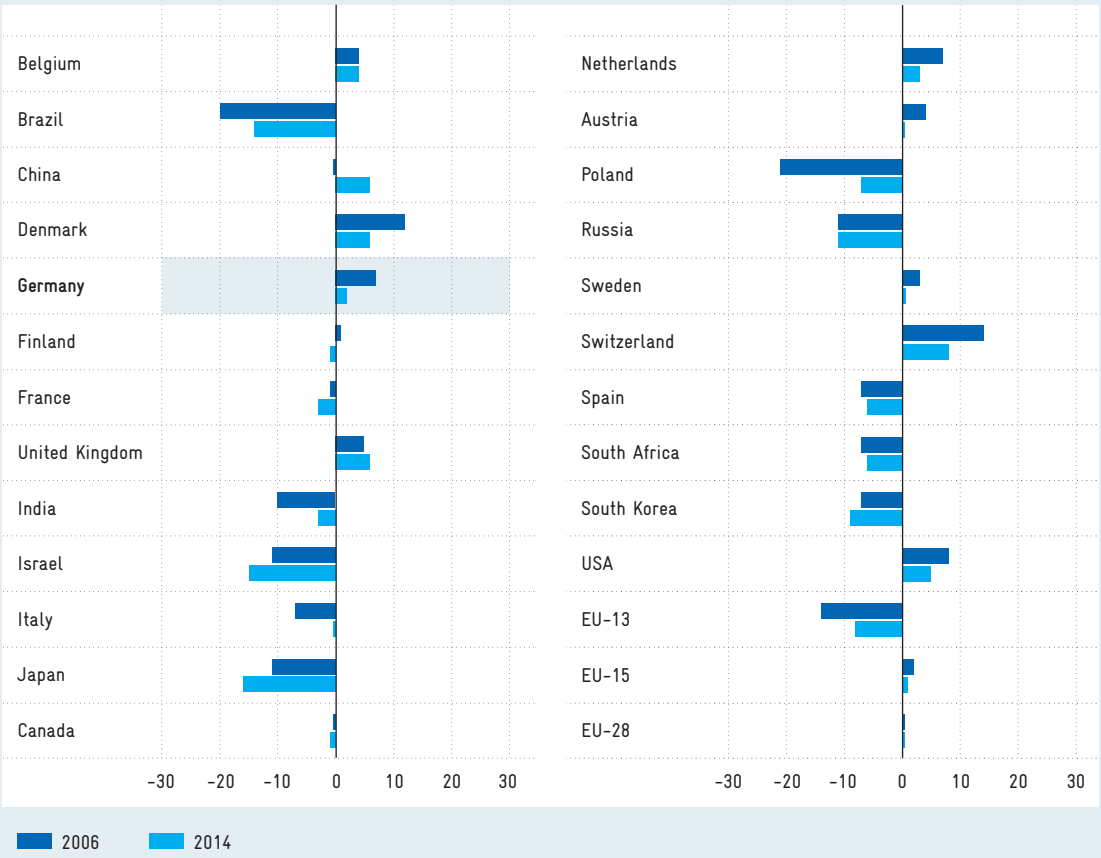
C

Fig. C 7-3

Download data

Scientific regard (SR) of publications in the Web of Science from selected countries and regions in 2006 and 2014 (index values)

The SR index indicates whether a country's articles are cited on average more frequently or more seldom than other articles in the journals in which they appear. Positive or negative values indicate an above-average or below-average scientific regard. The index is calculated without self-citations.



Fractional counting.
Source: Web of Science. Research and calculations by Fraunhofer ISI in Helmich et al. (2018).