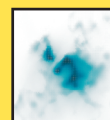


EUROPE BY THE NUMBERS

The region already hosts some of the world's leading scientific countries, and some of its smaller states are quickly catching up.

BY RICHARD VAN NOORDEN AND DECLAN BUTLER

Europe is a diverse patchwork of countries at different stages of scientific development — from the research-intensive Nordic region, through the science powerhouses of Germany, the United Kingdom and France, to former communist states trying to strengthen their research bases and countries that extend into Asia. All that diversity feeds a common goal. The European Union, a bloc of 28 member states and more than 500 million people, has put science and innovation at the heart of its societal and economic development. It funds large, pan-European research programmes that extend wider than the EU itself and support collaborative research and mobility across the bloc.



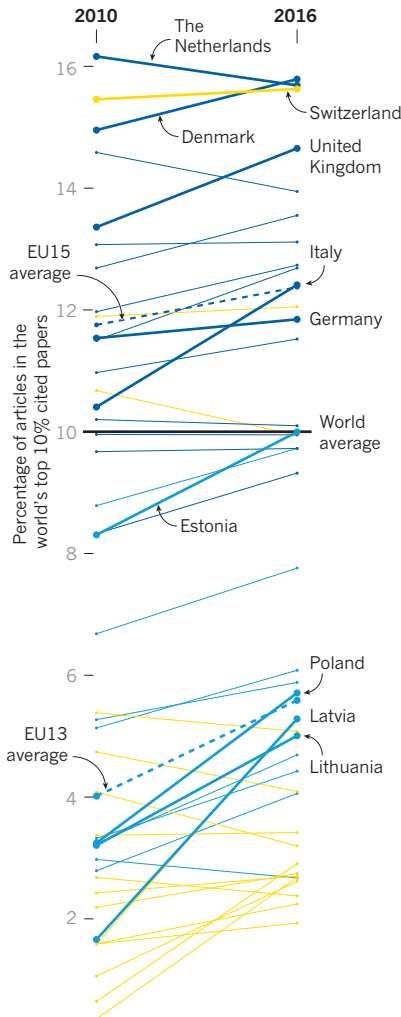
SCIENCE IN EUROPE
A *Nature* special issue
go.nature.com/europe

CITATIONS

Denmark, the Netherlands and Switzerland lead the world in citation impact; almost 16% of their respective papers are in the world's top 10%*. The EU13 countries are improving rapidly — particularly Estonia, Latvia, Poland and Lithuania.

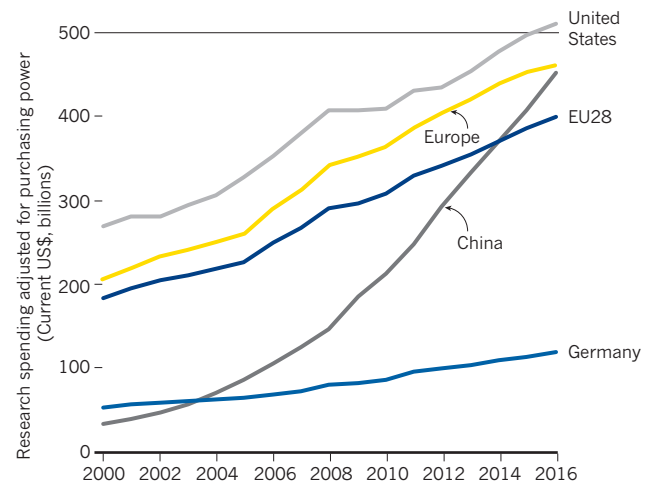
— EU15 — EU13 — Rest of Europe

SOURCES: CITATIONS: SCIENCE-METRIX/SCOPUS; SCIENCE SPENDING: UNESCO/OECD; RESEARCH ECONOMY: EUROSTAT/OECD



SCIENCE SPENDING

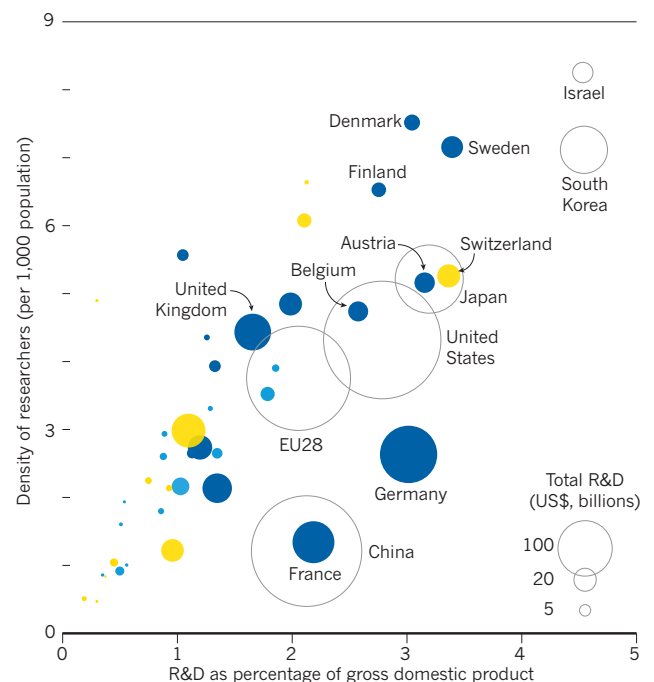
Europe's countries have increased their spending on research and development (R&D) by more than 5% per year in real terms since 2000. But China is quickly overtaking them. In absolute terms, China spends around two-thirds of what the EU does on R&D, but has passed the bloc in terms of purchasing power, which adjusts for differences in costs. Europe's share of world R&D spending has shrunk from around 28% in 2000 to 23% in 2016.



RESEARCH ECONOMY

The EU's 28 member states spent around €320 billion on R&D in 2017; public spending was around 40% of this, taking into account funds from the EU's central budget. Sweden, Austria, Denmark, Germany and Switzerland lead the world in terms of the share of their economies devoted to research (behind Israel and South Korea). But the EU13 countries invest smaller shares. The Nordic countries have the highest researcher density, relative to their R&D spending.

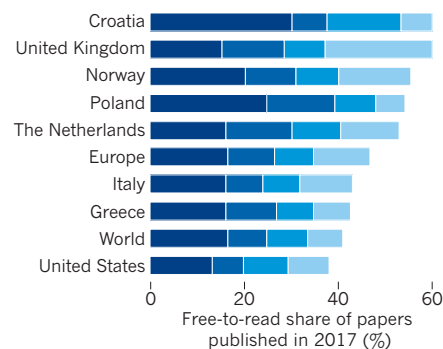
— EU15 — EU13 — Rest of Europe



OPEN ACCESS

A group of mainly European funders has said that, from 2020, their articles must be open access on publication — under 'Plan S'. In 2017, 47% of Europe's research articles were free to read — compared with the world's 41%.

■ Open-access journal
■ Hybrid journal
■ Free at publisher's site
■ Free only in a repository

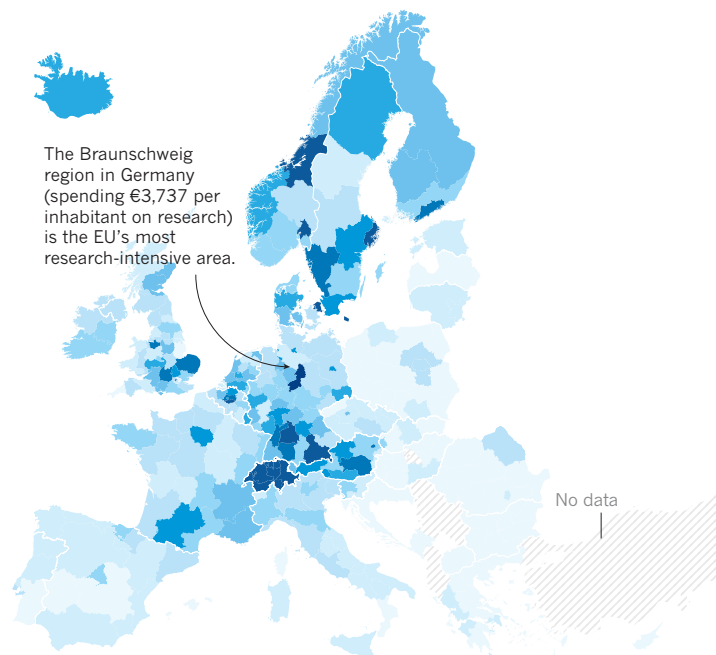


REGIONAL DIFFERENCES

R&D spending differs greatly not only by country, but also within each. This map shows how spending per inhabitant is much higher in particular regions, including prosperous Scandinavia, parts of southern England, the Benelux countries, southern Germany, Austria and Switzerland. There is a poorer and less research-intensive periphery to the east and south.

R&D spending per inhabitant

Low High



SOURCES: OPEN ACCESS: H. PIOWAR/IMPACTORY/UNPAYWALL/CROSSREF; REGIONAL DIFFERENCES: EUROSTAT/GSCO (ADMINISTRATIVE BOUNDARIES: © EUROGEOGRAPHICS)