



Key Figures *Science*



Science system

Science makes a significant contribution to our prosperity and well-being, and will also continue to facilitate, improve, astonish or challenge us and our lives.

The results of the inter-departmental policy research into scientific research, concluded in 2014, indicate that Dutch scientific research achieved excellent results with an average amount of public resources.

The Netherlands has a leading role internationally and records exceptional performances in the area of scientific quality and productivity. A European Commission study conducted in the context of the Europe 2020 strategy indicates that the Netherlands is among the leaders with respect to transparency, excellence and appeal of the science system. Several factors explain the international success of Dutch science, including its *outward-looking perspective and the non-hierarchical and open culture*, the decades-long history of *research reviews* and the *high degree of autonomy* of institutions and researchers.

The government wants Dutch science to maintain its leading role. The cabinet's plans for science policy are laid down in 'Wetenschapsvisie 2025: keuzes voor de toekomst'. These are the ambitions of the cabinet:

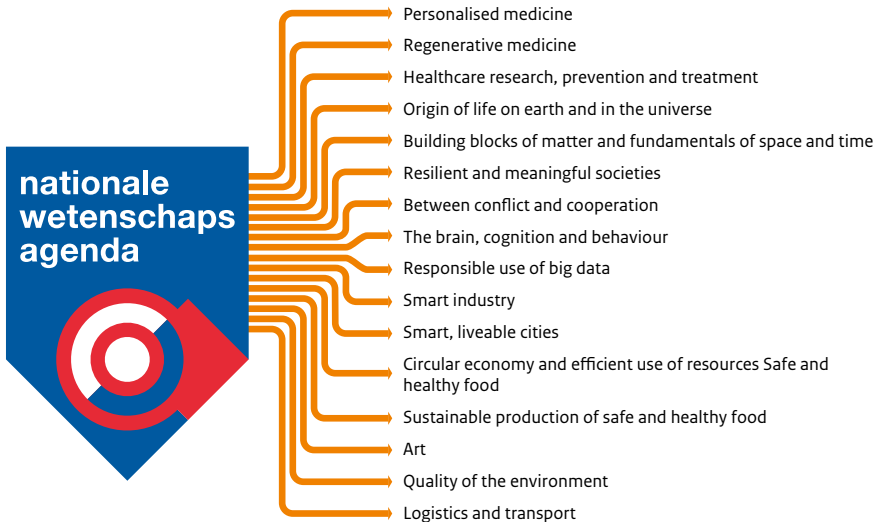
- to have world-class Dutch science;
- to strengthen the bond between science and society and the business sector to ensure science has maximum impact;
- to ensure that Dutch science will still be a breeding ground for talent in 2025.

In formulating its science policy, the government is supported by a network of advisory bodies, including the Advisory Council for Science, Technology and Innovation (AWTI), the Rathenau Institute, the Royal Netherlands Academy of Arts and Sciences (KNAW), the Netherlands Bureau for Economic Policy Analysis (CPB) and the Scientific Council for Government Policy (WRR).

Interconnecting Science

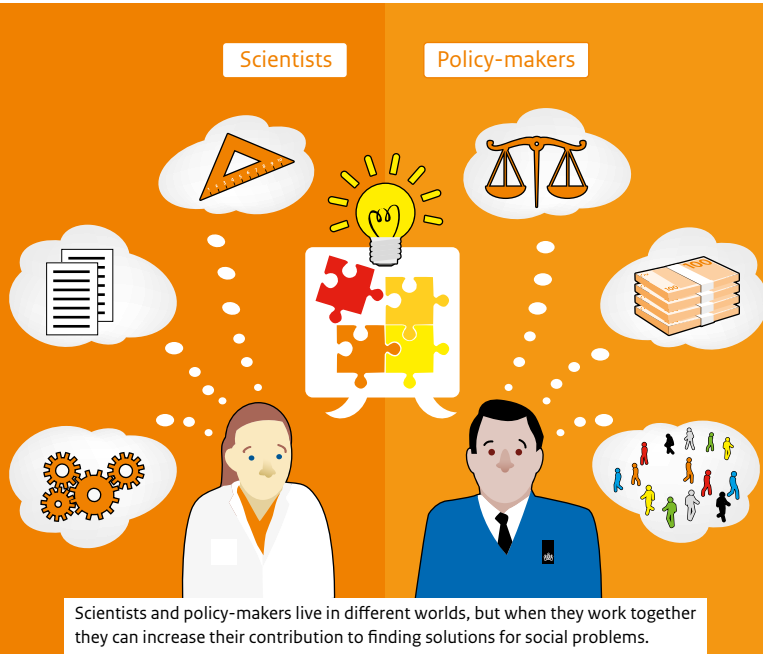
In order to maintain and strengthen the leading international position of the Dutch science sector, the cabinet announced in its 'Science Vision' the need for a National Science Agenda. The importance of such an agenda had previously been emphasised in the inter-departmental policy research into scientific research. To this end, the cabinet instructed the Knowledge Coalition ('Kenniscoalitie') to propose an agenda, building on existing agendas, to connect the various disciplines and which challenges scientists, resulting in scientific breakthroughs. Such an agenda must also be in line with current or desired strengths of Dutch science, economic opportunities and societal challenges.

The agenda should focus on the areas in which Dutch science is or should be strong. Societal challenges and economic opportunities are taken up. In late November 2015, the Netherlands established the innovative National Science Agenda, which consists of 140 major science-related questions. They form the basis for the 16 'routes' with which connections can be established across the entire research chain.



The National Science Agenda stimulates creativity and innovation as well as connects parties and themes. The agenda has brought science, the business sector and society closer together. The entire network of fundamental, strategic and applied research will draw inspiration from the Science Agenda to tackle important issues in concert. By collating the cluster questions and routes, the entire research community (liberal arts, science, social sciences) is involved in scientific, engineering and societal challenges.

The agenda reflects the quality and potential of Dutch research for society, the business sector and science alike. It also fits in with international agendas, such as Horizon 2020, and may serve as a basis for further international cooperation.



The science system in the Netherlands

The government bears responsibility of legislation and regulations. The government's science policy is laid down in the Higher Education and Research Act (WHW) and the *Netherlands Organisation for Scientific Research*, (NWO) Act. The WHW states how government funding for scientific research is determined, while the NWO Act sets out the duties of the NWO and the role of Science Budget.

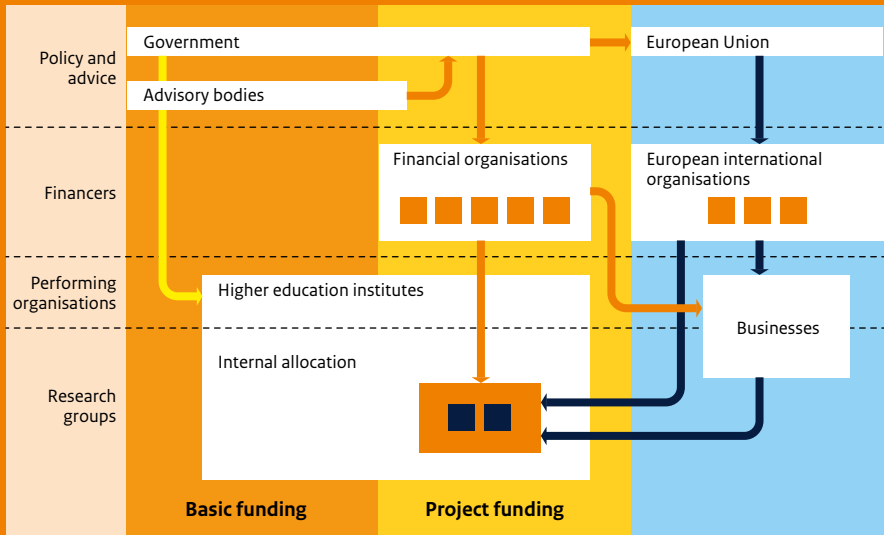
Direct government funding for science, which consists of funding for education and research, provides universities with an integral budget with which they can finance education and research activities. The government gives universities the discretion, within certain parameters, to spend funding as they see fit. Direct government funding for research is a fairly stable revenue source which enables them to commit to long-term obligations. For instance, it allows universities to finance the wage costs of permanent staff or invest in its basic infrastructure, such as laboratories and libraries.

The research part of *direct government funding* amounted to over EUR 1.8 billion in 2013, which was divided among the universities based on the parameters of a funding allocation model. The research part of government funding has the following parameters:

- 1 Degrees;
- 2 Doctorate degrees;
- 3 Financial facilities for research; and
- 4 Research facilities.

Indirect funding, which is also provided by the government, aims to support excellent and innovative research. These resources are mainly allocated by the NWO. NWO's primary task is to finance scientific research at Dutch public research institutes, particularly universities. It is also responsible for formulating and giving advice on science policy.

Contract funding concerns all other revenue generated by universities and research institutes. A part of contract funding is raised by Dutch government authorities and semi-public organisations. In this context, government authorities are the sponsors of the research. For instance, the government may commission a study into a policy issue. This means that contract funding gives Dutch government authorities the opportunity to direct scientific research. Health care and other funds as well as private organisations are also regular financiers and sponsors of research. Companies also directly contribute to fundamental research, which is stimulated by the government as it wants to involve the business sector more in public-private research. Contract funding further consists of substantial resources made available by the European Union. In 2014, the European Commission launched the research programme Horizon 2020, which has identified a number of *Grand Challenges*. The Horizon 2020 budget is over EUR 70 billion in current prizes for the period 2014-2020. Dutch universities and knowledge institutes are relatively successful in securing European funding. For instance, in the period 2008-2013 the Netherlands yielded a return of 6.7% of awarded funding, which is higher than the Dutch contribution of about 5% to the EU budget. The Netherlands therefore is a net recipient of European R&D subsidies.



Dutch science system and funding streams

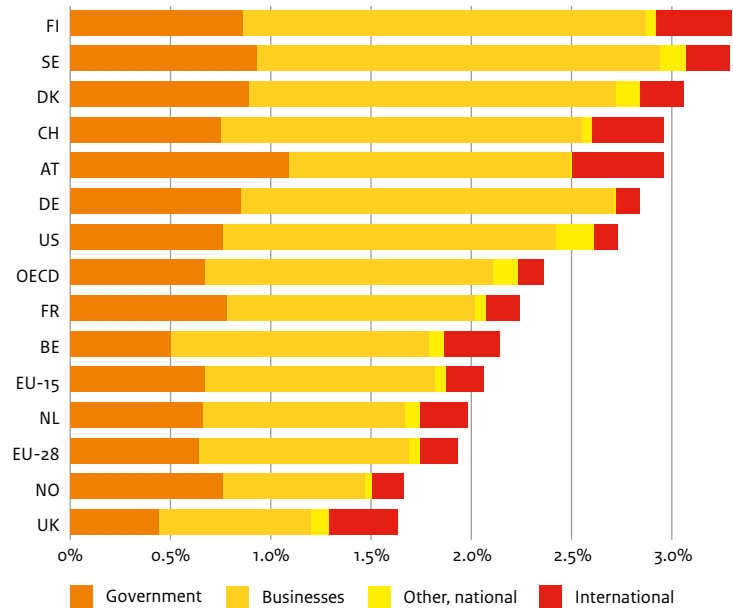
The Dutch science sector comprises a large number of organisations and institutes with different roles. Overall, *there are four different levels of organisations:*

- Organisations that are responsible for formulating and giving advice on *science policy*. The Royal Netherlands Academy of Arts and Sciences (KNAW), the Netherlands Organisation for Scientific Research and the Advisory Council for Science, Technology and Innovation (AWTI).
- *The financier* of research is the government, whose funding is provided through intermediary organisations such as the NWO and the Netherlands Enterprise Agency (RVO). But research is also funded by European organisations.
- *The organisations that perform research:* These include universities, university medical centres, universities of applied sciences, institutes of the KNAW, research institutes of the NWO and the Netherlands Organisation for Applied Scientific Research (TNO).

Companies biggest financers

Research and development (R&D) expenses are also covered by various other financing sources: companies (private), the government (public), the private non-profit sector (PNP) and foreign funders (the EU and foreign companies).

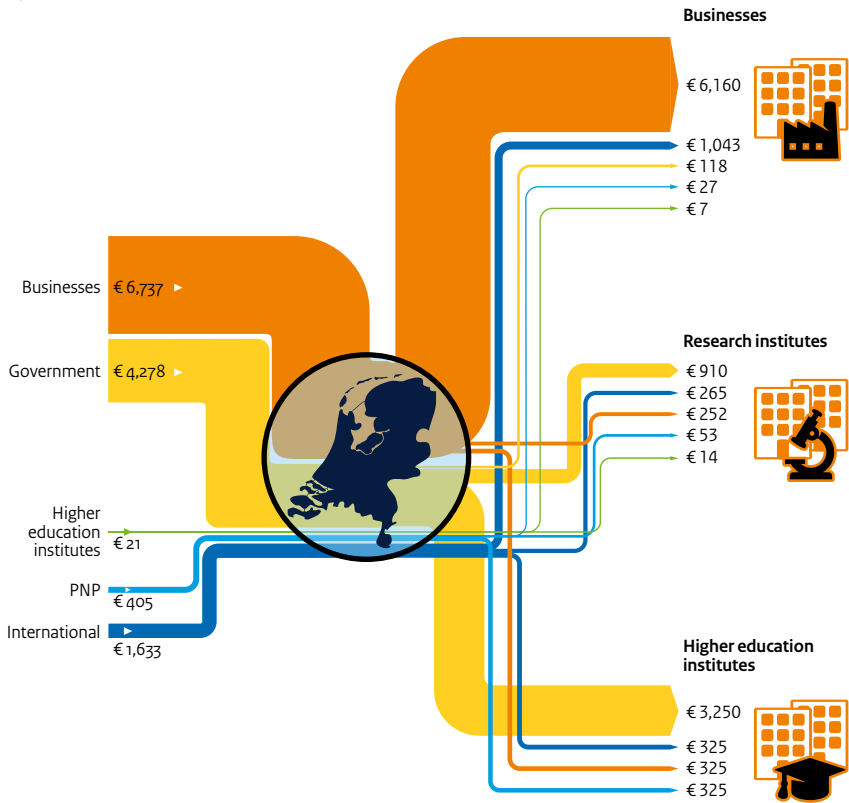
R&D expenditure GDP according to financing source, 2013 (or closest year)
(in %)



R&D is conducted in three sectors: the business sector, public research institutes (including PNP) and higher education institutes (universities, universities of applied sciences and university medical centres). R&D expenditure is expressed as % of the GDP to make an international comparison of the various financing sources (government, companies, other national parties and foreign funders).

Companies in the Netherlands finance less R&D activities, as a % of the GDP, than many other European countries. Similarly, government funding by the Dutch government is relatively lower than in other European countries, but still the Netherlands performs slightly above the EU average. In some countries, foreign funders finance more than 10% of research.

R&D expenditure in the Netherlands according to research sector and financing source, 2014 (in millions €)



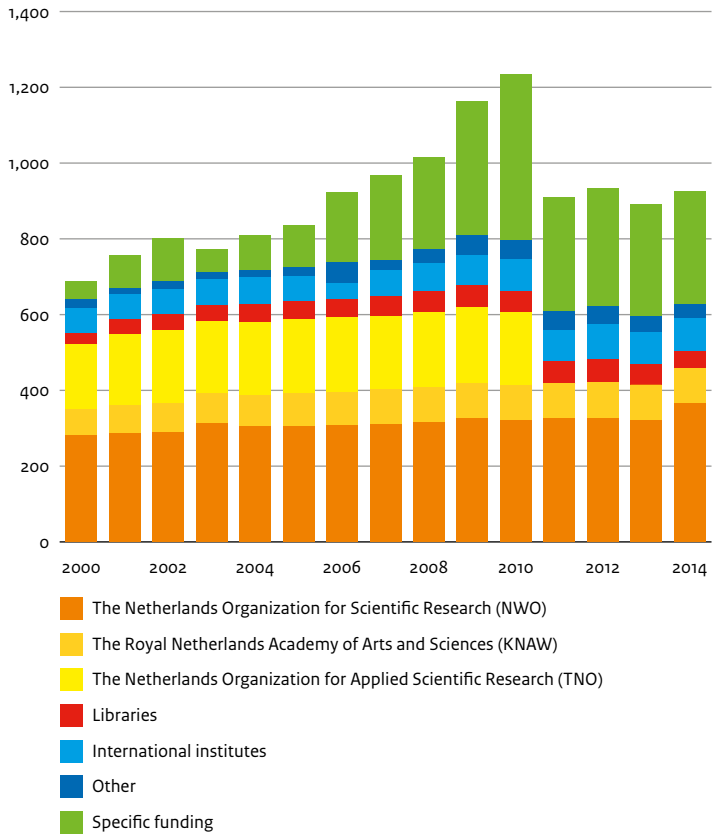
In the Netherlands, companies are the biggest financers of R&D, and fund 51% of the total R&D in the Netherlands, followed by the government (33%) and foreign funders (13%). The government mainly finances R&D at higher education institutes (universities, university medical centres and universities of applied sciences) and research institutes, while the business sector mostly finances R&D activities in its own sector.

The business industry is also the biggest performer of R&D activities (56%), followed by higher education institutes (32%) and public research institutes (11%).

OCW expenditure on science

Universities are allocated EUR 1.8 billion from the lump sum for research. The NWO is the biggest receiver of OCW resources for science. Other institutes that are financed include the KNAW, the statutory libraries (such as the Royal Library), international organisations (such as CERN and ESA) and several smaller institutes. In addition, a major part of OCW resources covers specific costs, such as budgets earmarked for the NWO and project subsidies. The portion of OCW funding to finance institutes has steadily decreased over the years, from a little over 90% to a little under 70%. The drop between 2010 and 2011 was caused by the transfer of the budget for TNO to the Ministry of Economic Affairs.

OCW expenditure on scientific institutes (in millions)



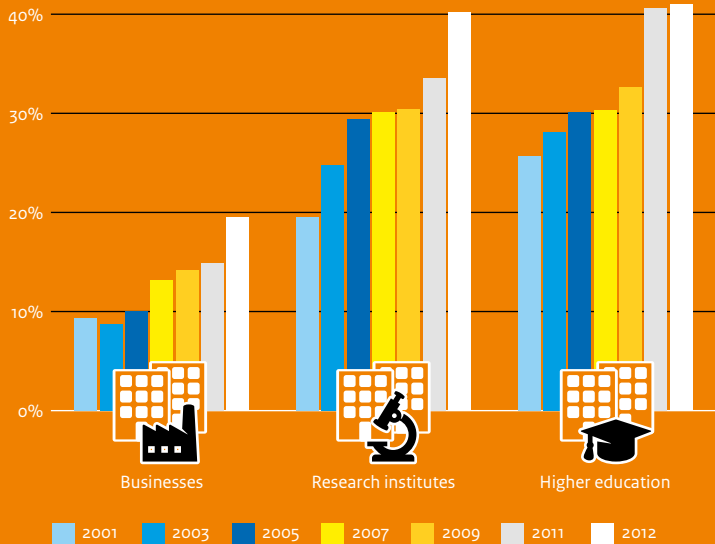
Source: OCW (annual reports)

The figure shows the allocation of the OCW budget earmarked for science (excluding the contribution to higher education institutes). The OCW budget consists of institutional subsidies and specific funding.

More female scientists

All research sectors show an upward trend in the number of female researchers. This number has increased to about 40% at higher education institutes and research institutes, while companies have been lagging behind (20%). However, the number of women at the top of Dutch scientific research is still too low: in 2014, of all professors in the Netherlands only 17% were female. In this sense, the Netherlands is bringing up the rear in Europe. The same development can be seen in the number of female assistant professors and associate professors. An unbalanced composition of the teaching staff is detrimental for science.

Female researchers of the total number of researchers per sector (in %)

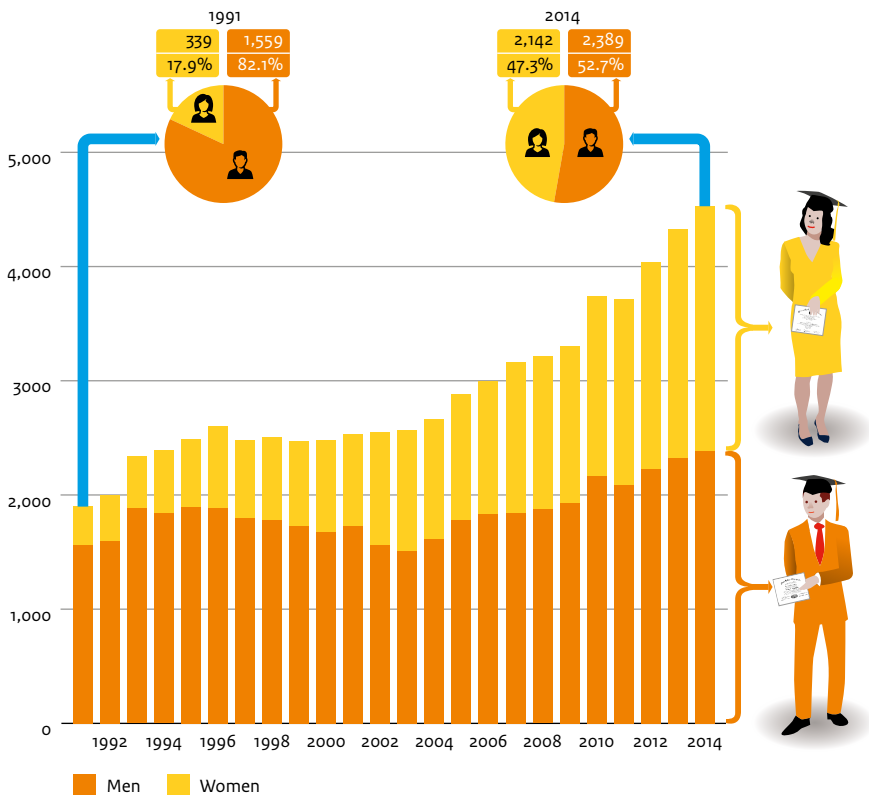


Source: Statistics Netherlands

Doctoral degrees in the Netherlands

A specific form of output are the theses, the result of a successful four or five year PhD trajectory. Most doctoral degrees are in the health care and welfare sector, followed by social sciences.

Number of doctoral degrees awarded in the Netherlands, according to gender



Barring few exceptions, there has been a yearly upward trend of 5% on average in the number of doctoral degrees for quite some time. While in 1990/91 only 1,900 doctoral degrees were awarded, this number had risen to about 4,500 by 2013/14.

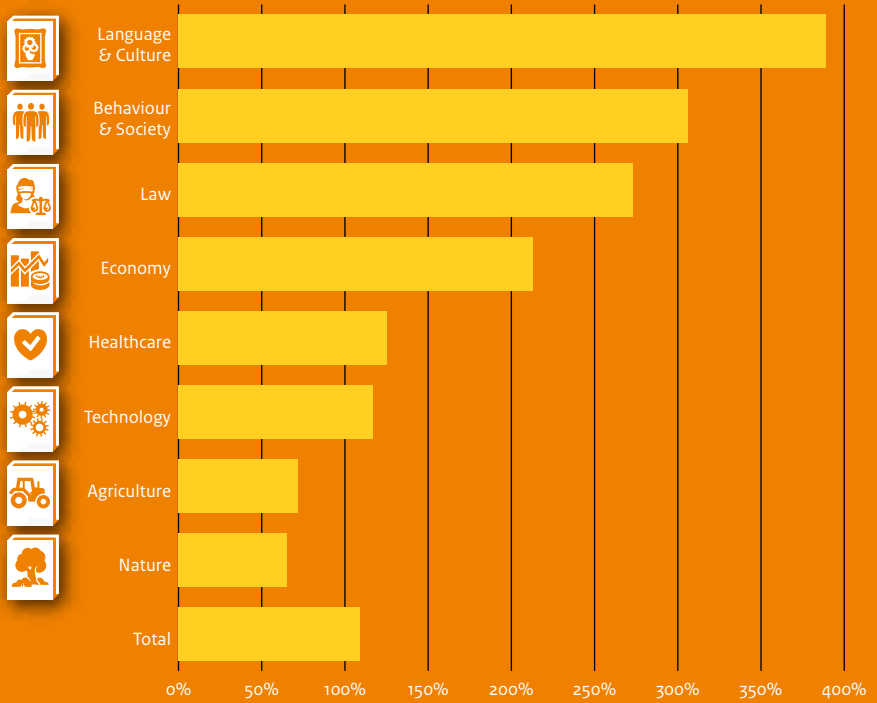
Scientific publications and citations

The results of scientific research can mainly be found in journals in which publications have been peer-reviewed for quality purposes. *A measure of quality of the results of scientific research is the number of citations of a scientific publication. The citations are standardised to the international average (value = 1) to compare countries.* Data on scientific publications and their citations are included in the 'Web of Science' of Thomson Reuters.

In 2014, Dutch researchers were involved in over 39,000 scientific publications, which represents about 2.5% of the world's total of scientific publications. The publications in which Dutch researchers were involved were often written with other researchers from the Netherlands or abroad. The main producers of scientific publications are the United States, with about 400,000 publications, and China with about 250,000 publications (not included in the figure due to high number). China was also responsible for the highest increase in the number of publications between 2005 and 2013, namely 255%. The Netherlands recorded a growth of 62% in the same period. The rise in output in all countries is partly the result of the growth of the Web of Science.

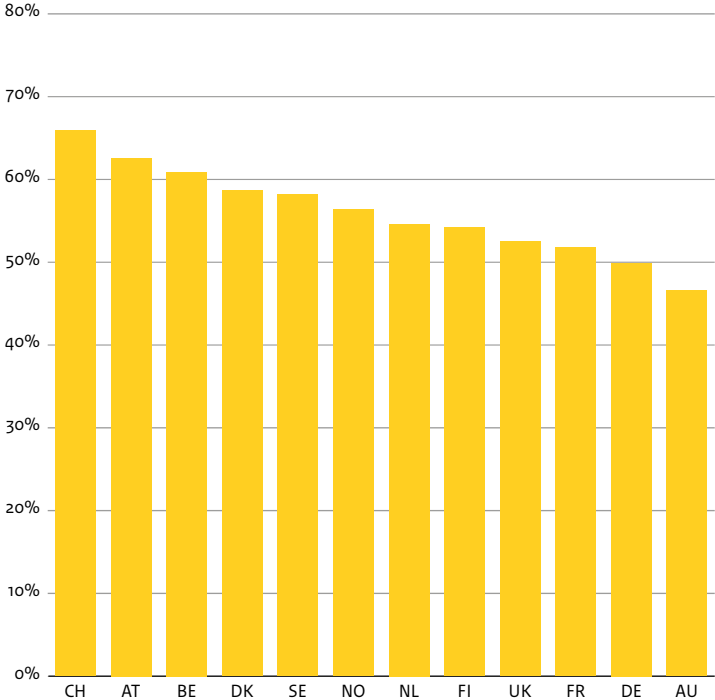
In the Netherlands, the universities and university medical centres are the major contributors to the output of scientific publications (about 90%), while Dutch researchers are involved in 55% of international co-publications. This percentage is higher than 50% for most countries, and is much lower for several others. This applies to countries such as the US, China, Japan and South Korea, with contributions of around 30%. Language is a major factor in this, but also the size of the country, where a large domestic market offers plenty of researchers with whom to cooperate. The number of international co-publications has seen an increase in the past few years.

International co-publications according to subject increase
(between 2005 and 2014)



The figure shows an increase in the number of international co-publications. Publications in the humanities and social sciences showed a strong increase in the period 2005-2013, which is partly because the science sector has traditionally had a high number of co-publications. The relative increase in language and culture is also caused by the lower number of publications in this sector.
Source: Rathenau Institute (Thomson Reuters / CWTS Web of Science)

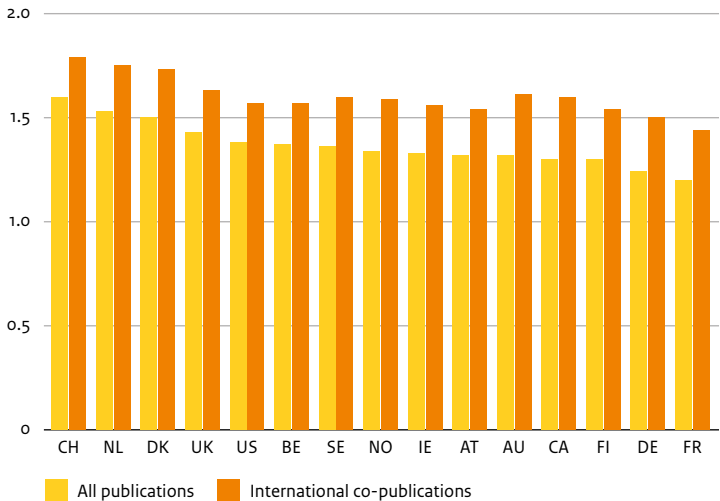
International co-publications as share of total number of scientific publications, 2010-2013



Netherlands ranks second in citation score list

Between 2010 and 2013, Dutch research scored 53% above the global average for citation scores. This landed the Netherlands the second place, after Switzerland. When distinguishing between all publications and international co-publications, it shows that for all countries the latter group scores higher for citation scores than all publications. The Netherlands even scores 75% above the global average. The relative number of citations of scientific publications in other scientific publications is an indicator of the quality of the scientific research concerned. Incidentally, citation scores are generally better applicable to scientific publications in science and some social sciences than in the humanities and some technical science disciplines.

Citation impact score 2010-2013





Colophon

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