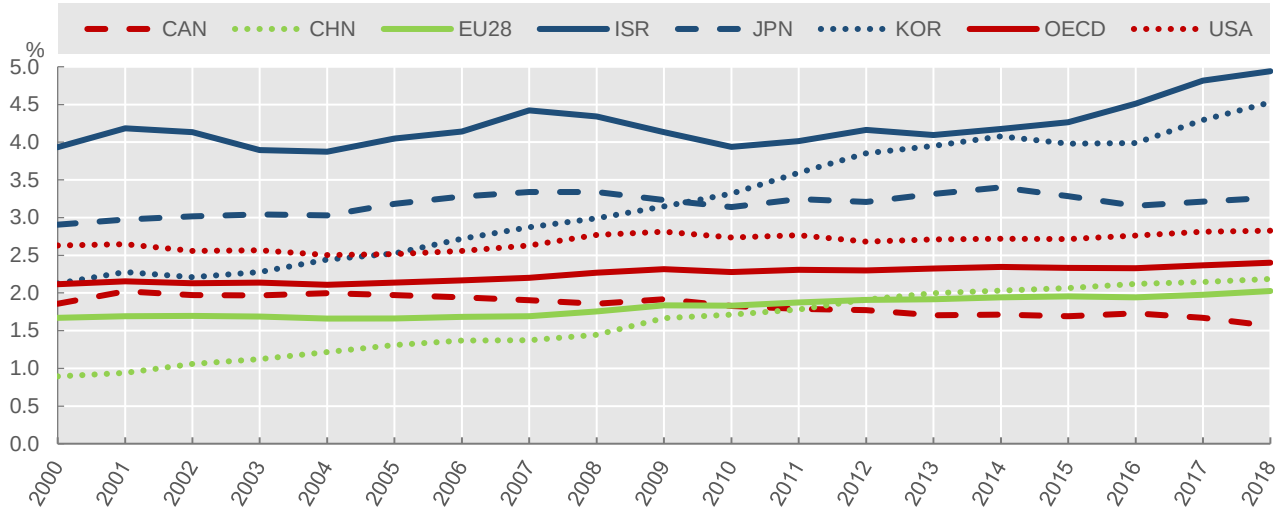
OECD Main Science and Technology Indicators
R&D Highlights in the February 2020 Publication

OECD countries see sustained increase in R&D investments

Research and development (R&D) intensity in the OECD area rose from 2.37% in 2017 to 2.40% in 2018, according to new data on R&D expenditure published in the ***OECD Main Science and Technology Indicators* (MSTI)** database. This increase, which follows a similar rise between 2016 and 2017, was driven by faster real growth in R&D expenditure (+3.8%) compared to GDP (+2.3%). The OECD area has not seen comparable growth in R&D expenditure over a two-year period since before the 2008 global financial crisis.

R&D intensity: Gross Domestic Expenditure on R&D as a percentage of GDP, 2000-18



Source: OECD Main Science and Technology Indicators Database, 28 February 2020. http://oe.cd/msti

R&D intensity – gross expenditure on R&D (GERD) as a percentage of gross domestic product (GDP) – is one of several indicators used as targets to measure progress toward achieving the UN Sustainable Development Goal (SDG) 9 on innovation. Growth in R&D intensity was widespread across the majority of OECD countries in 2018, with the United States, Japan, Germany and Korea accounting for much of the increase. In some countries, such as Canada and Sweden, R&D expenditure remained stagnant. R&D intensity in the EU28 area surpassed the 2% threshold for the first time, rising from 1.98% to 2.03%, due in large part to trends in Germany, the United Kingdom and Poland. R&D intensity in Germany reached 3.1% in 2018, up from 2.5% in 2006, while R&D intensity in the United Kingdom rose from 1.6% to 1.7% over the same period. Israel and Korea displayed the highest levels of R&D intensity among OECD countries in 2018, at 4.9% and 4.5% of GDP, respectively.

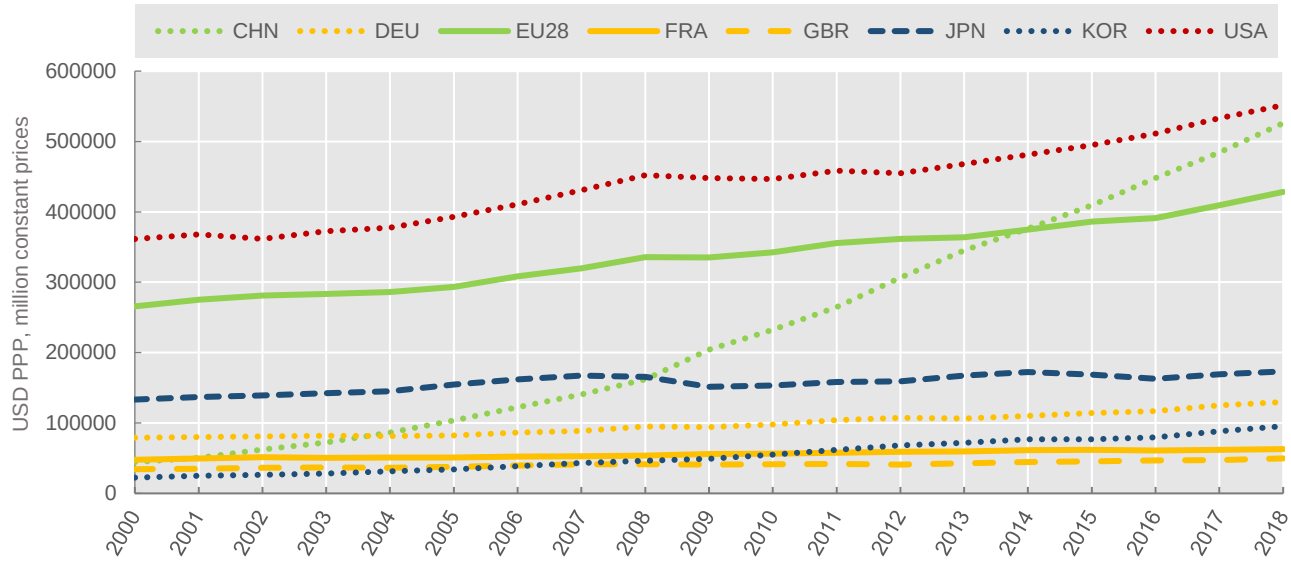
The global context: how fast is China catching up?

In 2017, the OECD area accounted for 62% of the world's total R&D expenditure (calculated in terms of purchase power parity (PPP) units and based on comparisons with the most recent available UNESCO estimates[1]), down from 63% the previous year. In 2017, China[2] accounted for 23% of the world's GERD, with other economies comprising the remaining 15%. China's R&D expenditure grew by 8.6% in 2018, well above the 8.1% rate observed the year before. R&D intensity in China increased from 2.15 to 2.19 between 2017 and 2018, on par with increases seen across the OECD area.

[1] Given the larger country coverage, the world aggregate published by the UNESCO Institute of Statistics, which includes the data published by OECD for its member countries, is not yet available for 2018. Given differences in national reporting practices, particularly in many developing countries, the figures may not be entirely comparable.

[2] People's Republic of China.

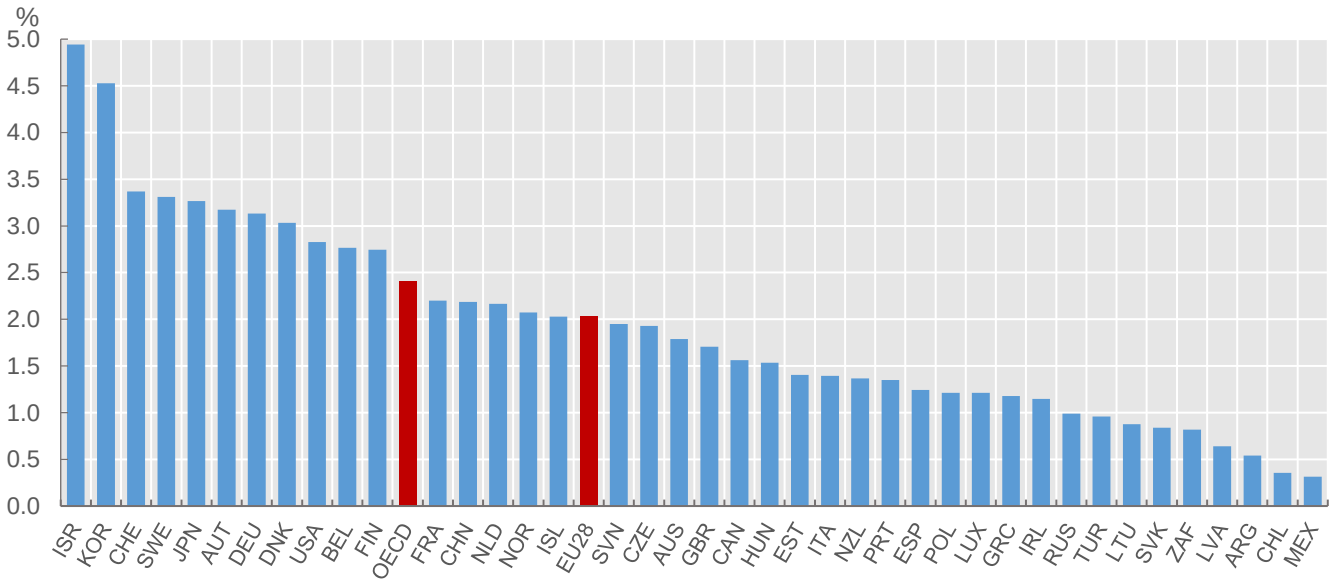
Gross Domestic Expenditure on R&D, 2000-18



Source: OECD Main Science and Technology Indicators Database, 28 February 2020. http://oe.cd/msti

Based on PPP measures and recent trends, China may already account for the largest volume of R&D expenditure among national economies. Yet when comparing economies based on exchange rate conversions to a common currency, there is still a very significant gap between China and the United States, with R&D expenditure in the former equalling only 50% of GERD in the latter.[3] Other OECD indicators complement this comparison. In 2018, the United States had 23% more top-cited publications (top 10% of cited publications within a given field) than China, despite having a lower number of indexed publications. Selected *OECD Patent Statistics* reported within MSTI indicate that China overtook Japan in 2017 for second-most PCT patent applications, behind the United States. Based on recent trends, China's PCT patent applications may have surpassed the United States in 2019, or even as early as 2018.

R&D intensity in OECD countries and selected economies, 2018



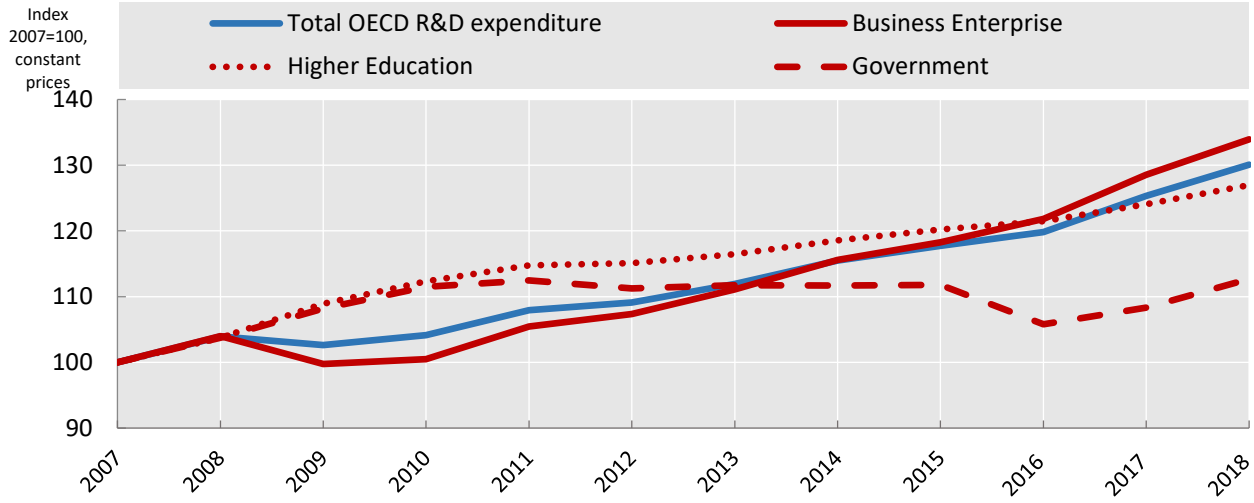
Source: OECD Main Science and Technology Indicators Database, 28 February 2020. http://oe.cd/msti

[3] International comparisons are typically best accomplished on the basis of PPP units. In the absence of specific PPPs for R&D, only GDP PPPs are available as proxies for differences in the costs of R&D activity. This is the basis for OECD international comparisons of R&D expenditures. Exchange rates might however be in some cases more appropriate comparators for the R&D costs associated with internationally traded goods and services. In the case of R&D, the largest share of costs is accounted for by employment costs.

Business R&D continues to be the main global driver of R&D growth

Real expenditure on R&D in the OECD area grew by 3.8% in 2018, mostly driven by the R&D performance behaviour of businesses, which accounted for more than 75% of this growth. The Business Enterprise sector, which accounts for 71% of all R&D performance in the OECD area, saw its R&D expenditure increase by 4.2% in 2018. R&D in the Higher Education (HE) sector grew by 2.3%, while R&D expenditures in the Government sector rose by 4.0% -- the highest rate since 2009. Yet R&D performance among government institutions remains only 13% higher than it was before the onset of the global financial crisis – on par with 2010 levels – and it accounts for less than 10% of OECD R&D expenditure. By contrast, Higher Education and Business Enterprise R&D have increased by 27% and 34%, respectively, compared to 2007 levels.

R&D expenditure trends in OECD countries, 2007-18

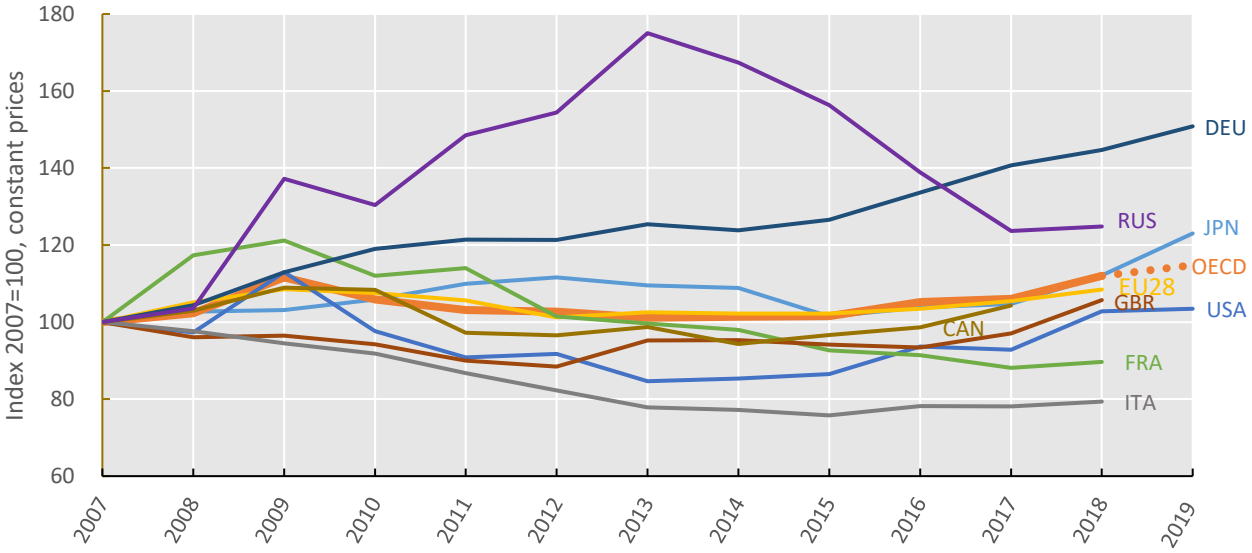


Source: OECD Main Science and Technology Indicators (MSTI) Database, 28 February 2020. http://oe.cd/msti

Growth in government R&D budgets in 2018 and 2019

Government R&D budget indicators for the OECD area provide insights into the funds that governments allocate for R&D, rather than actual expenditure reported by R&D performers. The latest indicators show that R&D budgets rose by 5.6%, in real terms, in 2018, marking the highest increase since 2009 and pushing budget allocations for R&D above their 2009 peak. This is primarily due to growth in budgeted R&D support in Germany, Japan, the United Kingdom and the United States. Preliminary estimates also suggest a significant but more moderate increase in R&D budgets for 2019 (+2.47%). Growth in US R&D budgets came to a halt in 2019, while R&D budgets in France, Italy and Spain were still below 2007 pre-crisis levels. (The United Kingdom and the United States only crossed the 2007 threshold in 2018.) At this point, comparable R&D budget data are not available for China.

Government R&D budget trends, selected economies, 2007-19



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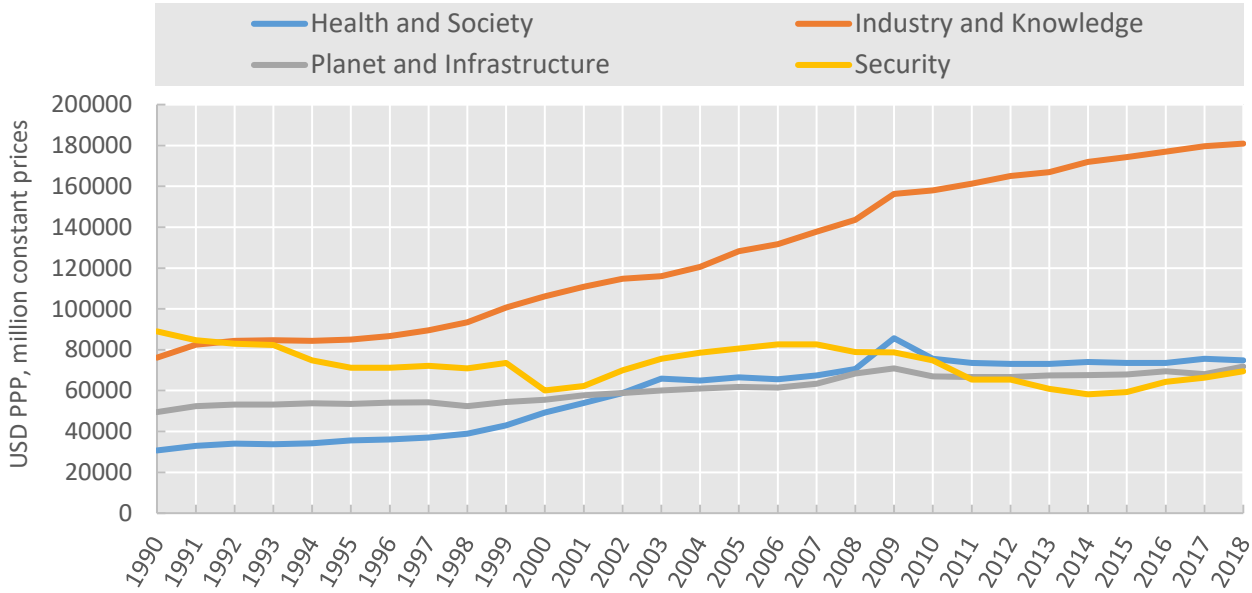
Directionality of government R&D funding in the OECD area and the UN SDGs

OECD statistics for government R&D budgets also provide insights into the socioeconomic objectives that governments pursue, thereby helping to assess the directionality of public R&D policies. While R&D intensity and other R&D indicators are used to monitor progress toward SDG 9, a broader perspective is needed to assess the full contribution of R&D and innovation to the SDGs. Public funding of R&D is often needed to support the development of radically new solutions that help attain more than one objective at once. R&D budget data do not have the granularity of some SDGs and do not neatly fall under defined categories; yet the main challenge in interpreting them stems from the fact that governments, for a variety of reasons, often fund R&D without targeting a specific application. Instead, they often delegate R&D planning and spending decisions to public agencies and, in many cases, private actors. Such R&D can ultimately affect several SDGs at once – especially in the case of basic research – but the channels by which this happens can take several years to materialise into concrete solutions, and will likely require additional investments.

The figure below presents results of a tentative, experimental mapping of government R&D support onto 4 SDG clusters. This clustering treats government support for the general advancement of knowledge and R&D tax incentives[4] as related to the SDG on innovation. Support for industry and knowledge has been the fastest growing category since consistent records are available. More recently, growth in R&D funding has focused on defence spending, which is identified here with the SDG on security. Funding directed toward health and society reached a peak in 2009, while there has been limited growth in support for R&D on planet and infrastructure SDGs.

Estimates of total government support for R&D by SDG-related cluster categories, 1990-2018



Note: This is an experimental indicator. GBARD statistics available by Socio-Economic Objectives (SEOs) are presented in clusters that are thematically related to groups of Sustainable Development Goals (SDGs): "Health and Society" includes "Education", "Culture, recreation, religion and mass media", "Political and social systems, structures and processes", "Health" and "General advancement of knowledge: R&D related to Medical and health sciences" (Socio-Economic Objectives (SEOs) 09 to 11, 07, 123 and 133); "Industry and Knowledge" includes "Industrial production and technology", "General advancement of knowledge: R&D related to Natural sciences, Engineering and technology, Social sciences, and Humanities and the arts" (SEO 06, 121, 122, 125, 126, 131, 132, 135, 136) as well as indirect government support through R&D tax incentives; "Planet and Infrastructure" includes "Exploration and exploitation of the Earth", "Exploration and exploitation of space", "Transport, telecommunication and other infrastructures", "Environment", "Energy", "Agriculture", and "General advancement of knowledge: R&D related to Agricultural and veterinary sciences" (SEO 01, 02, 03, 04, 05, 08, 124 and 134); and "Security" includes Defence (SEO 14). For Australia, Belgium, Canada, Denmark, Hungary, Israel, Japan, Korea, Lithuania, Luxembourg, Mexico, New Zealand, Norway, Poland, Portugal, Switzerland, Turkey, the United Kingdom and the United States, all "General advancement of knowledge" sub-categories are included in "Industry and Knowledge".

Source: OECD calculations based on OECD, Main Science and Technology Indicators, Research and Development Statistics Database, http://oe.cd/rds, and OECD R&D Tax Expenditures (RDTAXEXP) dataset, http://oe.cd/rdtax. February 2020.

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[4] Indirect tax-based support measures, which are not part of R&D budget estimates, have been increasing in importance in recent years, often crowding out direct government support (see http://oe.cd/rdtax).