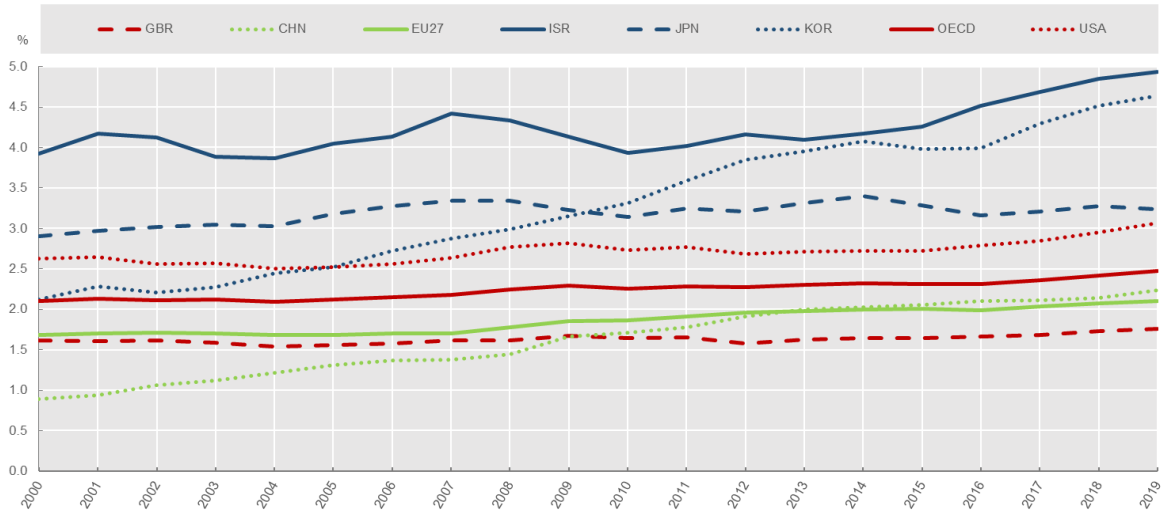
OECD Main Science and Technology Indicators
Highlights on R&D expenditure, March 2021 release

Before the COVID-19 crisis , OECD countries stepped up R&D investments

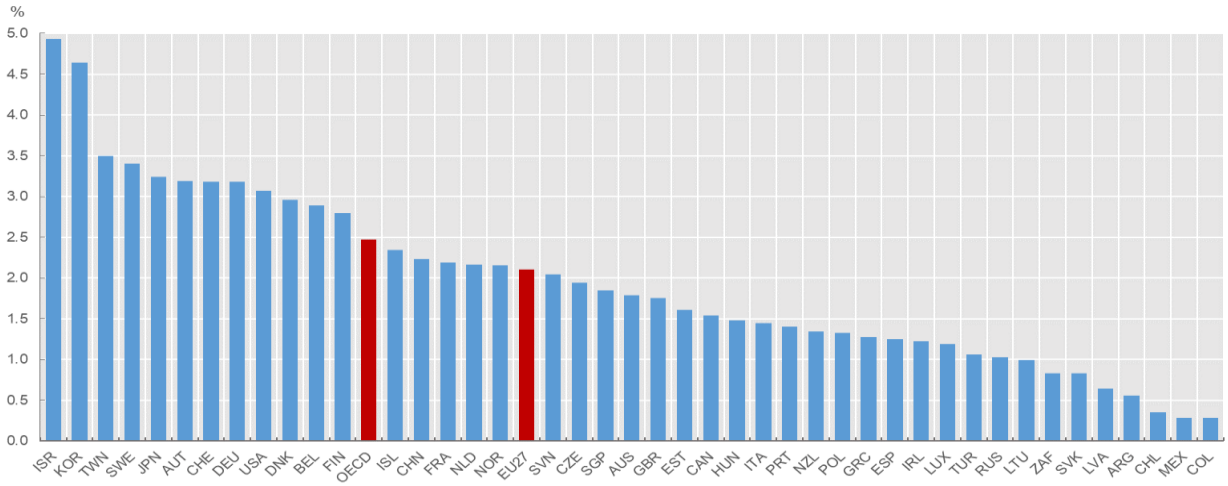
The latest official statistics for research and development (R&D) indicate that, prior to the onset of the COVID-19 pandemic, R&D expenditure in the OECD area grew in real terms by 4% in 2019. According to the latest data published on 18 March in the ***OECD Main Science and Technology Indicators* (MSTI)** database, OECD R&D intensity (domestic expenditure on R&D expressed as a percentage of gross domestic product (GDP)) rose from 2.4% in 2018 to nearly 2.5% in 2019. As observed in 2018 and 2017, this increase was driven by faster real growth of R&D expenditure (+4%) compared to GDP (+1.6%). After stagnating between 2013 and 2016, R&D intensity in the OECD area has been steadily rising. In fact, the OECD area has not seen comparable growth over a three-year period since the mid-1980s. Growth in R&D intensity was widespread across most OECD countries in 2019, with the United States, Germany and Korea accounting for much of the increase. Israel and Korea continued to display the highest levels of R&D intensity among OECD countries, at 4.9% and 4.6% of GDP, respectively. In the United States, R&D intensity surpassed the 3% milestone for the first time, while the R&D intensity of China grew from 2.1% to 2.2%. In contrast, the EU27 area experienced a more modest increase to 2.1%.

R&D intensity: Gross domestic expenditure on R&D as a percentage of GDP, 2000-19



Source: OECD Main Science and Technology Indicators Database, March 2021. http://oe.cd/msti

R&D intensity in OECD countries and selected economies, 2019

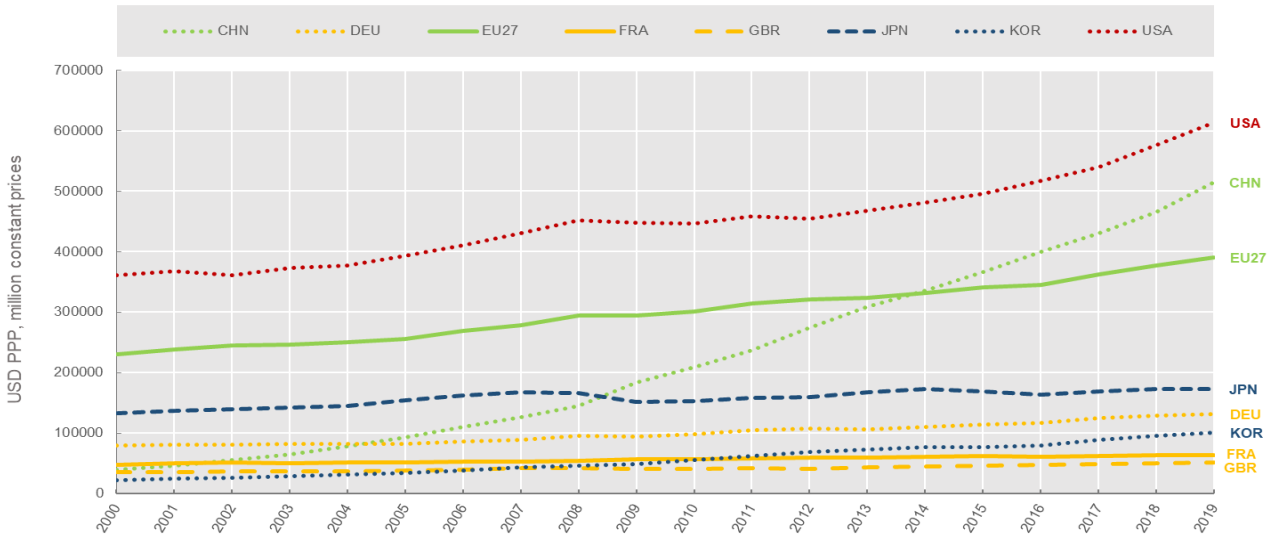


Source: OECD Main Science and Technology Indicators Database, March 2021. http://oe.cd/msti
Note: For Chile and Singapore, data refer to 2018. For Argentina, Australia, New Zealand, South Africa and Switzerland, data refer to 2017.

The United States and China account for a greater share of total R&D investment

In 2019, the United States, Japan, Germany, Korea and France were the largest R&D performers in the OECD area. In comparative purchasing power terms, China is the world's second-largest R&D player, with total R&D expenditure reaching 80% of that of the United States in 2019, up from 26% in 2005. Growth in R&D investments in the EU27 area has been on a faster trajectory since 2016, mostly driven by Germany, though it remains lower than growth in China and the United States over the same period. However, the performance of the EU27 exceeds that of Japan, which has gone from spending the equivalent of two-thirds of the EU27 total in 2000 to less than half in 2019. Korea and the United Kingdom offer another striking comparison. Although the countries had identical levels of R&D expenditure in 2008, Korea reported twice as much R&D as the United Kingdom just one decade later.

Gross domestic expenditure on R&D, 2000-19

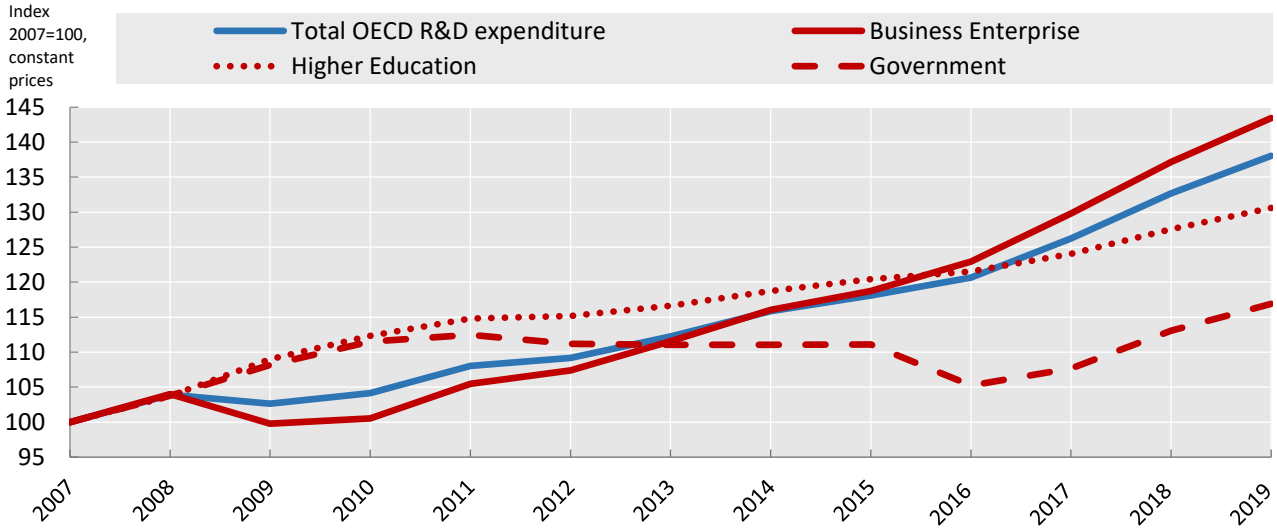


Source: OECD Main Science and Technology Indicators Database, March 2021. http://oe.cd/msti

Business R&D continues to be the main driver of R&D growth, but R&D in government institutes has seen a revival

In 2019, total growth in real expenditure on R&D in the OECD area was primarily driven by growth in R&D performed by businesses. The Business Enterprise sector, which accounts for 71% of all R&D performance in the OECD area, saw its R&D expenditure increase by 4.6% in 2019. R&D in the Higher Education sector grew by 2.4%, while R&D expenditures in the Government sector rose by 3.4%, confirming a partial reversal of previous trends that saw government institutions decline in relative importance as R&D performers.

R&D expenditure trends in OECD countries, 2007-19



Source: OECD Main Science and Technology Indicators (MSTI) Database, March 2021. http://oe.cd/msti

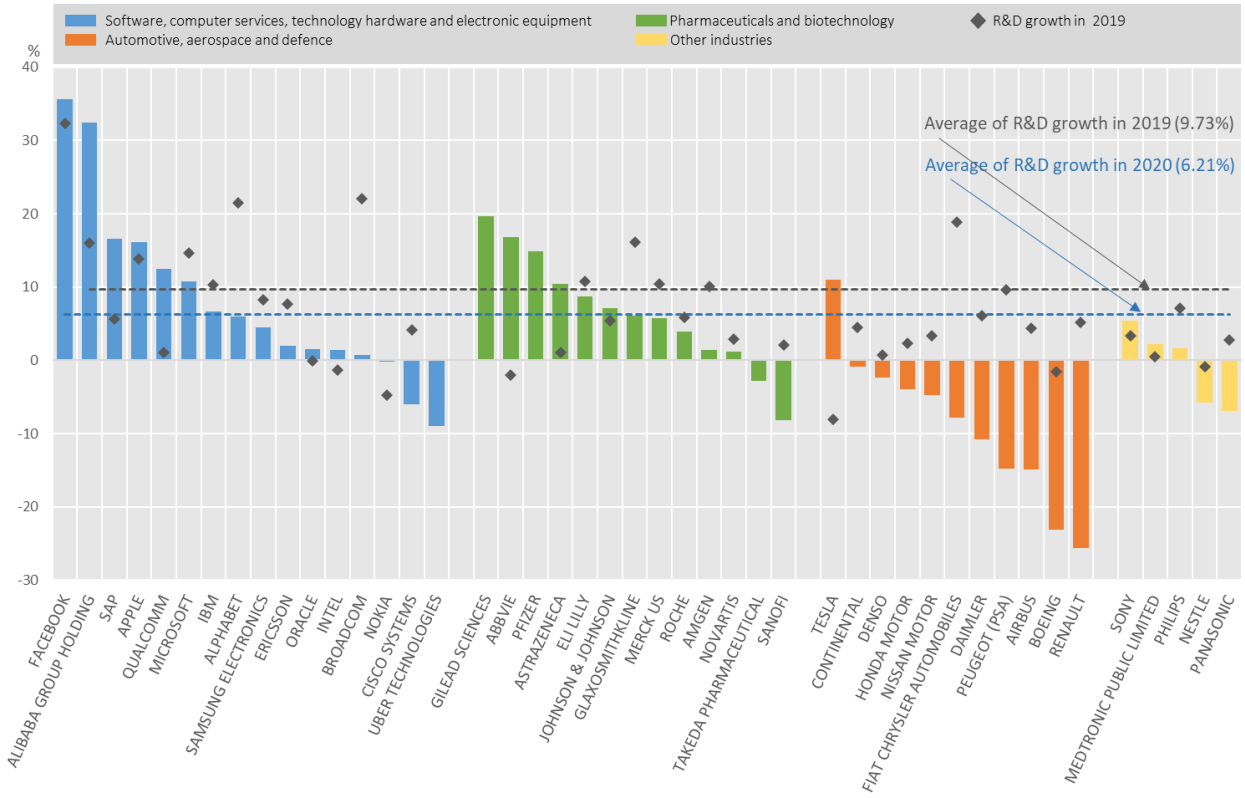
A glimpse into R&D investment in 2020 by businesses and governments

As R&D funders and performers across most economies began closing their accounts for 2020 in the initial months of 2021, official surveys on R&D performance in 2020 will have to wait for this process to finish before going in the field to collect data. This implies that statistical results from most countries will only be available from the third quarter of 2021 onwards. While these data collection efforts are ongoing, the OECD has developed and examined different leading indicators to provide a more timely snapshot of the state of R&D investments, with the aim to assist governments and data users in general.

Most large R&D investors sustained R&D during the crisis, but several sectors cut drastically

In April 2020, the OECD began monitoring the published **quarterly reports and accounts** for a panel of large R&D business investors, including their publicly declared R&D expenditures. This monitoring exercise, which is external and complementary to the publication of official statistics in MSTI, entails the manual inspection of quarterly reports published by selected companies identified as large R&D investors. This panel compilation by the OECD is based on R&D investors featured in the 2020 EU Industrial R&D Investment Scoreboard across different sectors (Industry Classification Benchmark sector aggregates) for which quarterly reports are available. Whenever possible, the OECD analysis makes a series of adjustments for greater comparability, for example removing R&D expenses attributed to the acquisition of other companies and the write-off of R&D assets, which would distort results.

Reported nominal R&D expense growth in selected top R&D companies, 2020

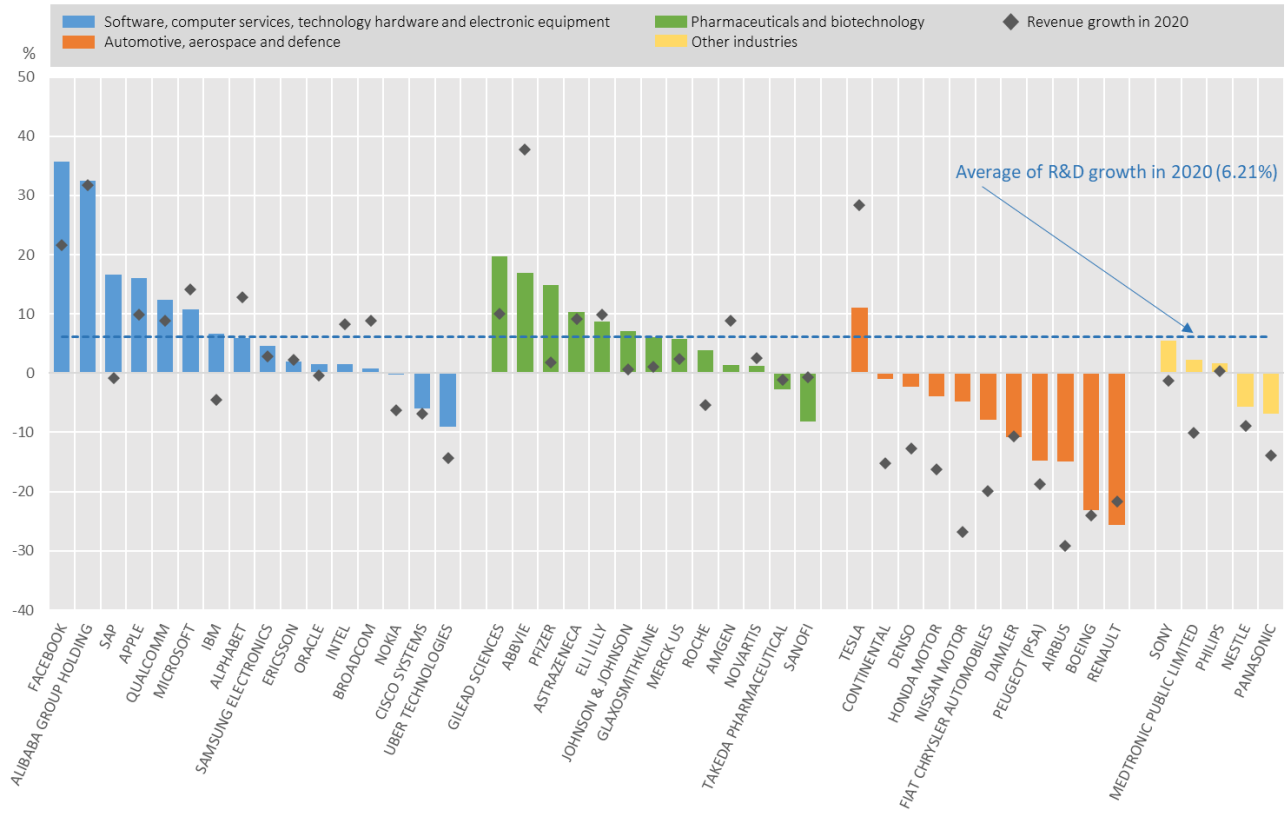


Note: Growth rates are based on reported R&D expenses expressed in nominal terms. Growth rates, measured between 2019 and 2020, refer to the January-December calendar period, except for Broadcom, Cisco, Medtronic Public Limited (February to January T+1) and Oracle (December T-1 to November). For companies whose fiscal year-end is December, figures are based on R&D reported in annual accounts. For those whose fiscal year differ from the calendar year, figures are derived from quarterly or semester reports. Averages of R&D growth in 2019 and 2020 (dotted lines) are weighted means of companies' R&D growth, using companies' 2020 R&D in USD as weights (using 2020 average exchange rates for currency conversion). Company reports of R&D expense need not coincide with R&D expenditures as covered in official R&D statistics compiled according to the Frascati Manual. For companies presenting their financial results in compliance with the International Financial Reporting Standards (IFRS), capitalised development costs are added to reported R&D expenses, while amortisation of capitalised development expenditures are conversely excluded when the information is available. For companies following the US Generally Accepted Accounting Principles (US GAAP), development costs are expensed as incurred (except for software development expenses under specific conditions). When possible, expenses and impairment of purchased in-process R&D (as well as restructuring R&D costs) are excluded. Data presented here are based on public companies' interim reports that include explicit R&D figures. For Alibaba, R&D figures refer to the income statement entry “product development expenses”. For Uber Technologies, R&D figures presented here exclude exceptional share-based compensation.
Source: OECD calculations, based on published annual and interim business financial reports, March 2021.

The analysis of changes in R&D investment over time suggests that business R&D investment continued to grow in 2020, although at a significantly lower rate than in 2019 and with striking differences across industries. Most of the major R&D investors in the information and communications technology (ICT) and the life sciences industries exhibited robust growth, while firms in other industries, especially in transport equipment, tended to see R&D investment fall. Overall, if subsequently confirmed by official data, this would have been the first global economic crisis in OECD history during which business R&D expenditures did not decline in aggregate terms.

Although this panel of firms is not representative of the ensemble of business R&D performers across countries, the high degree of R&D concentration implies that trends might be similar. Moreover, the sectoral profile of recent R&D expenditures reported by firms can have profound implications for countries with companies specialising in sectors more negatively impacted by the crisis.

Reported R&D expense and revenue growth in selected top R&D companies, 2020



Note: See notes on previous graph "Reported nominal R&D expense growth in selected top R&D companies, 2020". Revenue growth (diamonds) corresponds to the growth of total revenues (or total net sales) between 2019 and 2020.

Source: OECD calculations, based on published annual and interim business financial reports, March 2021.

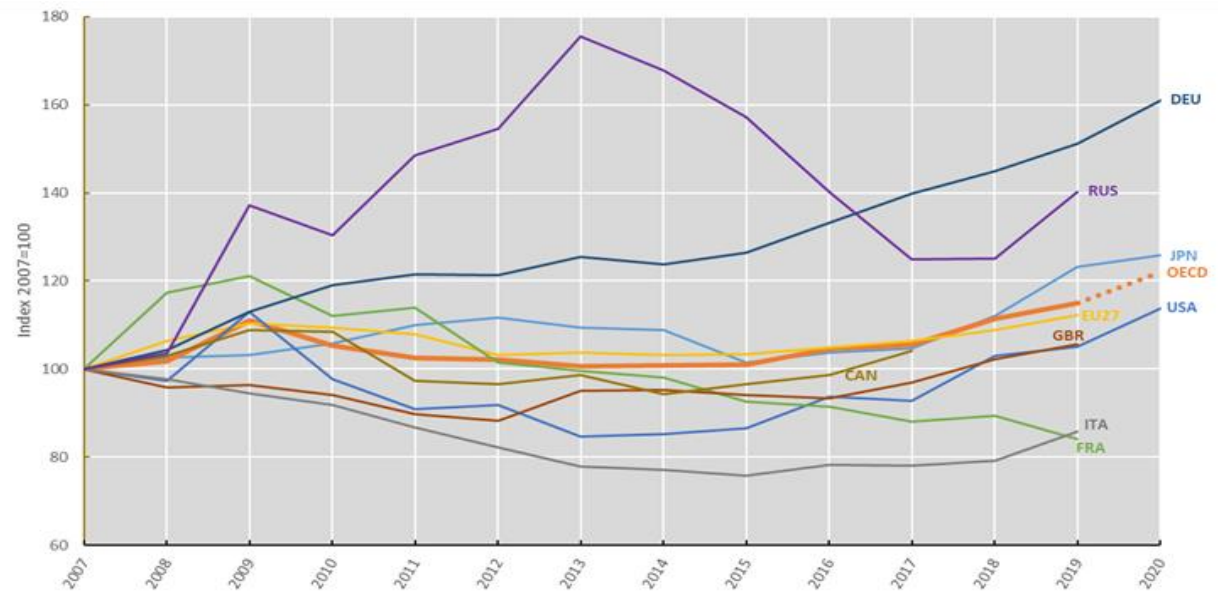
These firm-level R&D indicators, based on financial statement data disclosed for regulatory and investor information purposes, can be effectively compared to other financial indicators. Comparing them with company revenue allows to assess the evolution of an almost equivalent measure of R&D intensity at the level of firms rather than countries. One should bear in mind, however, that unlike official business R&D expenditure estimates, accounting measures of R&D investment include R&D subcontracted to third parties and exclude R&D carried out on behalf of, or sponsored by, governments or other actors.

For the vast majority of firms in the panel, R&D investment grew faster (or fell less) in 2020 than revenue. This is indicative of an increase in R&D intensity across all industries. Even among firms in industries that saw R&D fall, the drop in R&D investment was less than their revenue evolution might have implied. The OECD will continue monitoring the combined evolution of R&D and other financial indicators over the coming months, while encouraging national statistical offices to monitor the specific dynamics of domestic companies on a timely basis in light of major policy interest.

Government budgets for R&D broadly rose in 2020, but the picture is very incomplete

Government R&D budget indicators for the OECD area present the amounts that governments agree to allocate for R&D as part of their budgetary processes, rather than actual expenditure reported by R&D performers. In addition to shedding light on governmental intentions, these figures provide early insights into R&D performance in sectors that are highly reliant on government support, such as higher education and government research institutions. As of March 2021, R&D budgets in the OECD are estimated to have increased in real terms by 6.2% in 2020, based on data for the countries that have already disclosed their R&D budgets to the OECD. This estimate represents a marked increase over 2019, when R&D budgets increased by 3.2% on the previous year. Such an increase may reflect a combination of enhanced R&D funding authorised before the pandemic and additional emergency support in the course of the year, especially for health-related R&D to develop vaccines and treatments in response to COVID-19. Unfortunately, too many countries still lack detailed information about their government's budgetary support to R&D and, as a result, lack the means to inform the resource prioritisation and budgetary processes for 2021 at such a critical junction.

Government R&D budget trends, selected economies, 2007-20



Source: OECD Main Science and Technology Indicators (MSTI) Database, March 2021. http://oe.cd/msti

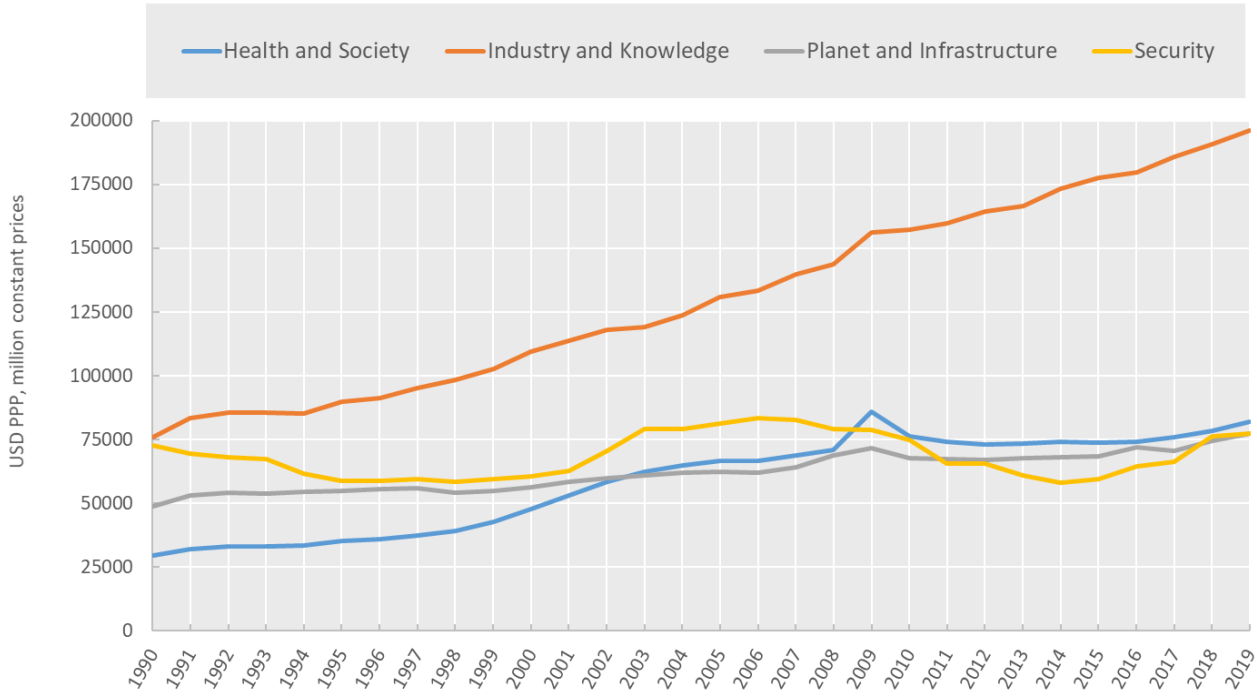
Limited directionality of government R&D support towards specific SDGs

R&D intensity is one of several indicators used to measure progress toward achieving the UN Sustainable Development Goal (SDG) 9 on innovation. 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 ensemble of SDGs**. Data on R&D budgets do not have the granularity of some SDGs and do not neatly fall under defined categories. However, the main SDG association and interpretation challenge stems from the fact that governments, for a variety of reasons, often delegate R&D planning and spending decisions to public agencies and, in many cases, private actors. Such non-directed funding approaches to R&D can include, for instance, general institutional funding for universities and most types of R&D tax incentives for firms. This type of sponsored 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 updates an experimental mapping of government R&D support onto four SDG "clusters". This clustering treats government support for the general advancement of knowledge and R&D tax incentives[1] as related to the SDG on innovation. Support for "industry and knowledge" has been the fastest growing category since consistent records are available, reflecting greater emphasis on non-directed forms of R&D support. While the COVID-19 pandemic likely led to a major realignment of R&D funding priorities, funding explicitly directed in budgets toward health and society edged up in 2019 closer to its 2009 peak, becoming the second largest funding "cluster".

[1] 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).

Estimates of total government support for R&D by SDG-related cluster categories, 1990-2019



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, 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. March 2021.

Accessing and visualising the indicators on the new STI.Scoreboard indicators platform

The latest MSTI database can be accessed through different routes presented in the dedicated MSTI webpage (http://oe.cd/msti). The new **STI.Scoreboard platform** (http://www.oecd.org/sti/scoreboard.htm) provides a convenient mechanism for visualising and downloading the MSTI data alongside other statistical indicators of science, technology and innovation (STI) systems across OECD countries and several other economies. The OECD STI Scoreboard provides:

- Well over 1000 indicators on research and development, science, business innovation, patents, education and the economy, drawing on the very latest, quality assured statistics from OECD and partner international organisations.
- An aid to data interpretation, with upfront information about what the indicators capture, key definitions, and specificities for each country, connecting to the actual sources.
- The possibility to navigate and search across the entire platform, connect and visualise together different families of indicators.
- A tool for users to generate their own charts, save and share them, and download data and charts.

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