24 May 2023

Information note for users of OECD R&D statistics:

Anomalies in R&D data reported by China requiring comprehensive explanation and potential correction

In the March 2023 edition of the Main Science and Technology Indicators (MSTI), the OECD decided to put under review data for several R&D indicators for the People's Republic of China (hereafter "China") for the period 2019-2021, suppressing the publication of several headline indicators until questions on the coherence of R&D expenditure and personnel data have been effectively addressed. This note provides further details for the benefit of users of OECD R&D statistics.

The OECD Directorate for Science, Technology and Innovation implements the periodic collection, review and publication of R&D statistics of OECD member countries and several partner economies, on behalf of and under the oversight of the OECD Working Party of National Experts of Science and Technology Indicators (NESTI), in line with the guidance of the OECD Frascati Manual[1] and the OECD Quality Framework for OECD Statistical Activities.[2]

Examination of data reported by China in February 2023 as part of the "2022/2 OECD data collection on resources devoted to R&D" revealed several anomalies in the data from China corresponding to 2021. More in depth examination by OECD staff identified additional anomalies over the entire 2019-21 period, including:

- Lack of coherence between estimates of several totals and their component parts.
- Lack of coherence between expenditure and personnel statistics within sectors.
- Insufficient explanations for reported data patterns.
- Missing data for important subcomponents, e.g. service sector industries.

These are explained in some detail below. The questions were referred to the relevant national authorities in China in March 2023. Pending a satisfactory conclusion of such enquiries, and following consultation with the NESTI Bureau, the publication of data for 2021 has been put on hold while previously published indicators for 2019 and 2020 have been supressed from the OECD databases.

There are several precedents in which OECD has withheld publication of data provided by national authorities from member countries and partner economies. Enquiries may result in a range of possible outcomes, ranging from confirmation of provided data, explicit identification of methodological breaks in series that are incorporated in the R&D metadata and flags, or the identification of data production errors or gaps requiring correction.

[1] https://www.oecd.org/innovation/frascati-manual-2015-9789264239012-en.htm
[2] https://www.oecd.org/sdd/qualityframeworkforoecdstatisticalactivities.htm

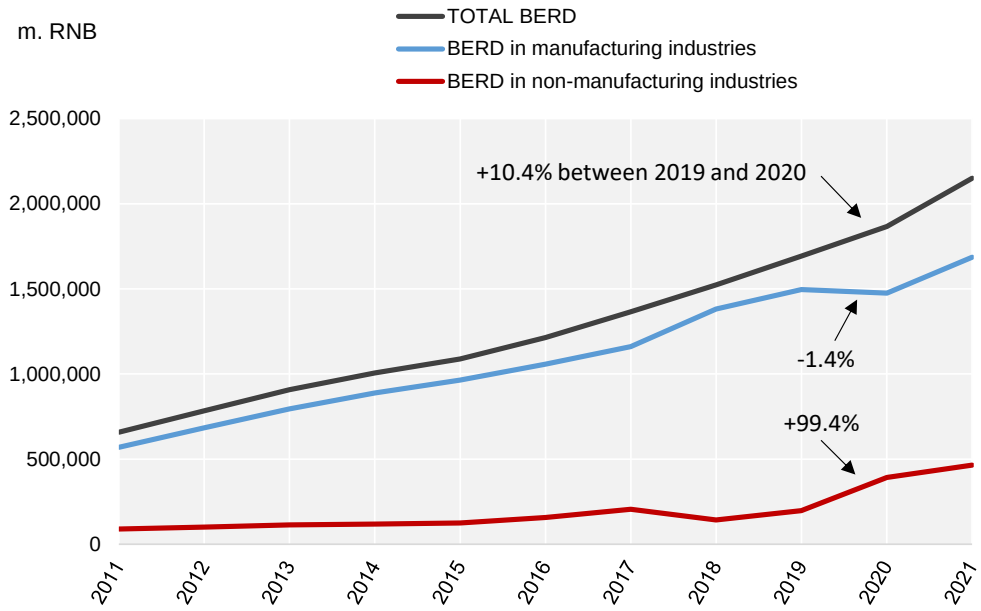
Detailed analysis

Business enterprise (BE) sector:

Business R&D data reported by China have been suppressed from 2020 onwards in OECD R&D statistics until the following questions are resolved:

- In the business sector, total BERD reported by China increased by 10% between 2019 and 2020 in nominal terms (went from RMB 1,692,179 million to RMB 1,867,375 million). During the same period, BERD in manufacturing industries decreased by 1% (from RMB 1,495,183 million to RMB 1,474,540 million). This would imply an unprecedented annual growth of 99% for the residual non-manufacturing category (from RMB 196,996 million to RMB 392,834 million) for which China did not provide any detailed data, unlike other countries reporting R&D data to OECD.

Figure 1. Business R&D expenditure reported by China, 2011-21



Source: Data reported by China to the OECD data collection on resources devoted to R&D, February 2023.

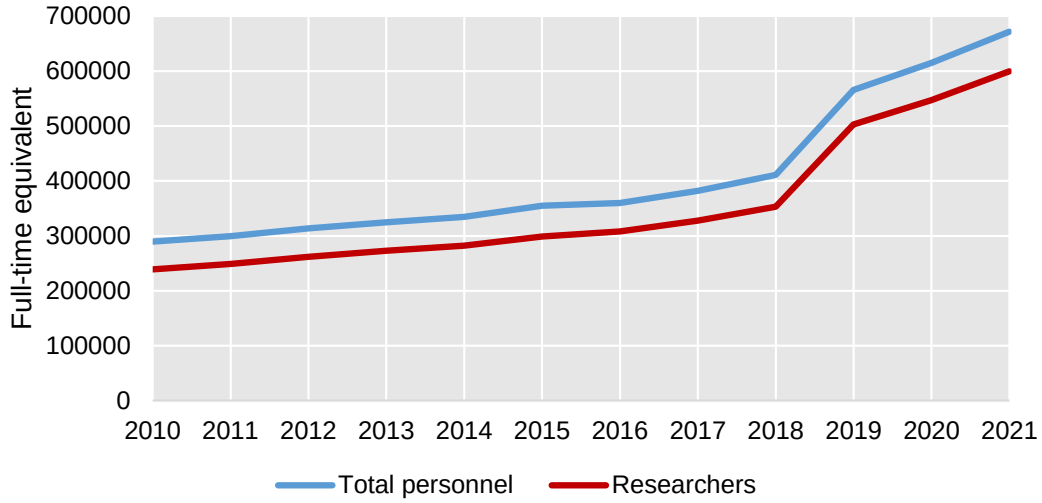
- Another major anomaly stems from the fact that BERD manufacturing decreased by 1% between 2019 and 2020 while total internal R&D personnel working in the manufacturing sector increased by 10%.
- For reference year 2020, the estimate of BE researchers (1,334,285 FTE) exceeds the estimate of BE researchers accounted for in the manufacturing sector only (1,376,809 FTE) which increased by 48% compared to the value provided for reference year 2019 (930,864 FTE). For reference year 2021, the estimate for total BE R&D personnel (4,463,870 FTE) fall short of the estimate for BE R&D personnel accounted for in the manufacturing sector only (4,681,399 FTE) which increased by 40% compared to the value provided for reference year 2020 (3,349,924 FTE).

Higher education (HE) sector:

HE data have been suppressed from 2019 onwards.

- The number of internal R&D personnel reported in FTEs increased by 38% in the higher education sector in 2019, mostly driven by a higher number of researchers (42% increase, corresponding to 150,000 new researchers in a single year). No adequate explanation for this change has been provided.
- In contrast, total HERD for the same year increased by 23% (in nominal terms).

Figure 2. R&D personnel in the Higher education sector



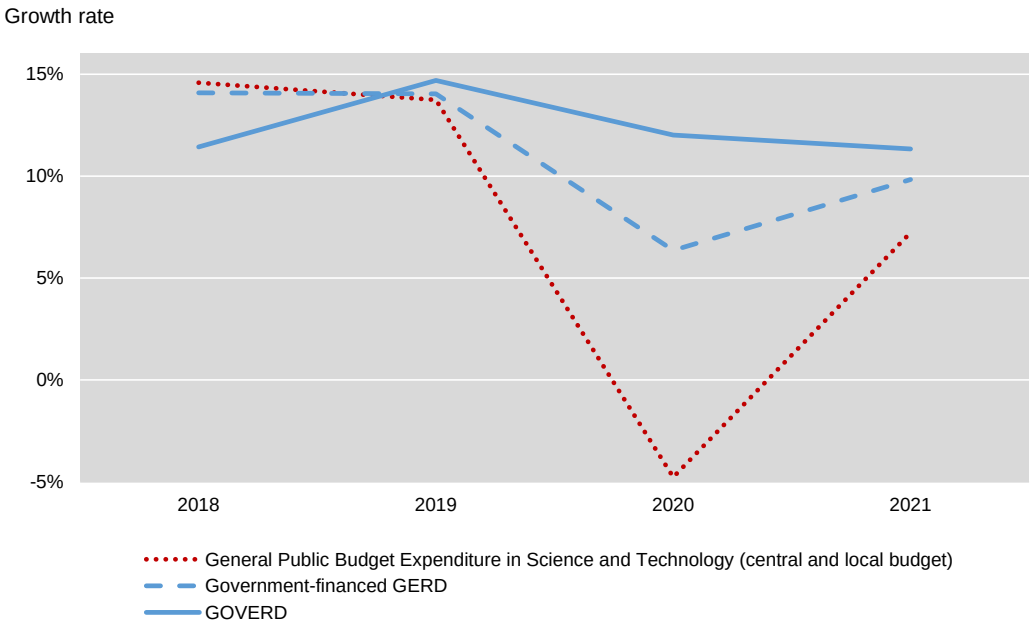
Source: Data reported by China to the OECD data collection on resources devoted to R&D, February 2023.

Government (GOV) sector:

GOVERD data have been suppressed from 2020 onwards in OECD R&D statistics.

- For reference year 2020, a 12% nominal increase in Government expenditure on R&D (GOVERD) was reported while R&D personnel in the government sector decreased by 1% in FTEs (a decline of 6% in terms of headcounts).
- In addition, the growth of GOVERD (and the government-financed GERD) reported to the OECD between 2019 and 2020 is significantly different from the growth of the General Public Budget Expenditure in Science and Technology (See figure below).

Figure 3. General Public Budget in S&T *versus* reported R&D executed and R&D financed by the Government sector in China

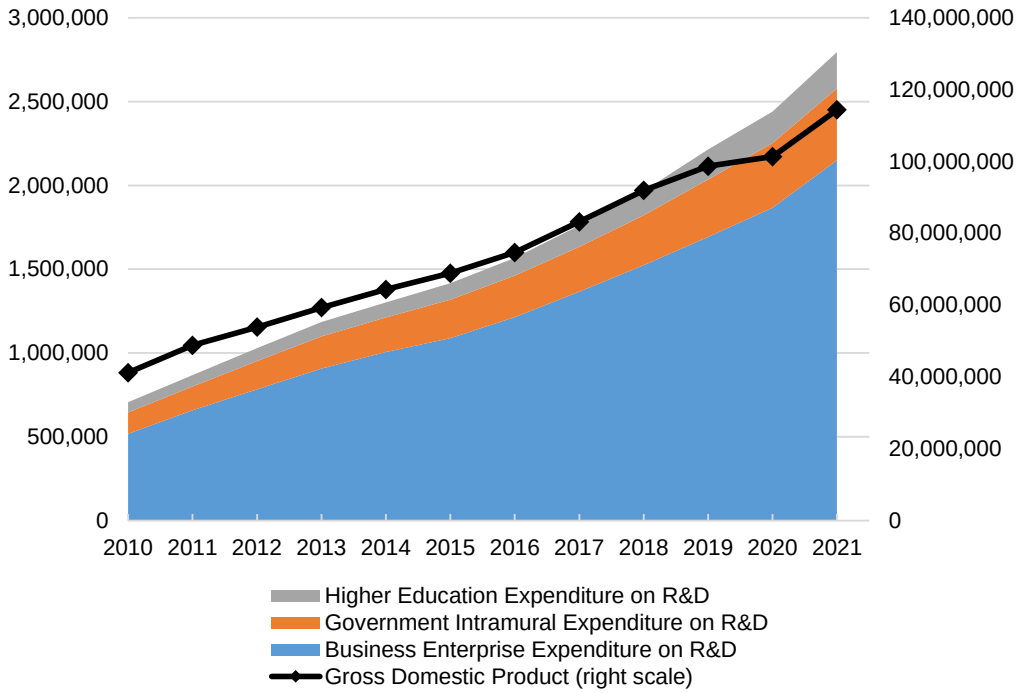


Source: OECD analysis based on data reported by China to the OECD for GOVERD and government-financed GERD, February 2023, and National Bureau of Statistics of China for public budget in S&T, China Statistical yearbooks, table 7-3, http://www.stats.gov.cn/sj/ndsj/2022/indexeh.htm.

Gross (domestic) intramural expenditure on R&D (GERD)

GERD data have been suppressed from 2019 onwards in OECD R&D statistics owing to the anomalies identified in relation to its component parts (see above). The significant breakdown in the structural relationship between nominal GERD and GDP in 2020 also needs to be accounted for.

Figure 4. Gross expenditure on R&D by sector in China, 2010-21
Million RNB, current prices



Source: Data reported by China to the OECD data collection on resources devoted to R&D, February 2023, and OECD Annual National Accounts Database, www.oecd.org/std/na.