House FY 2022 R&D Appropriations

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With all twelve bills heading to floor votes, here's a review of R&D estimates for defense and nondefense programs, with sectoral highlights and international comparisons.

Estimated Totals

Our current updated estimate[1] for aggregate R&D in House appropriations, before floor amendment, is $169.3 billion, an increase of $11.1 billion or 7.0% above FY 2021 estimated levels (Table 1). This is somewhat less than the overall discretionary rise allowed under the House deeming resolution.

Should this be adopted into law as-is, it would represent one of the larger increases of the past decade in both dollars and percent, though not unprecedented. Historical R&D budget authority data indicates similar or larger increases in FY 2016 and FY 2018. Federal R&D also saw larger growth in FY 2020, though much of that increase was driven by emergency COVID-19 R&D.

The House figure is also approximately $3 billion below the White House FY 2022 request,[2] with the shortfall mostly split between basic and applied research. The development and R&D facilities spending levels are similar.

Table 1: Estimated R&D in FY 2022 Appropriations
(budget authority in billions of dollars)

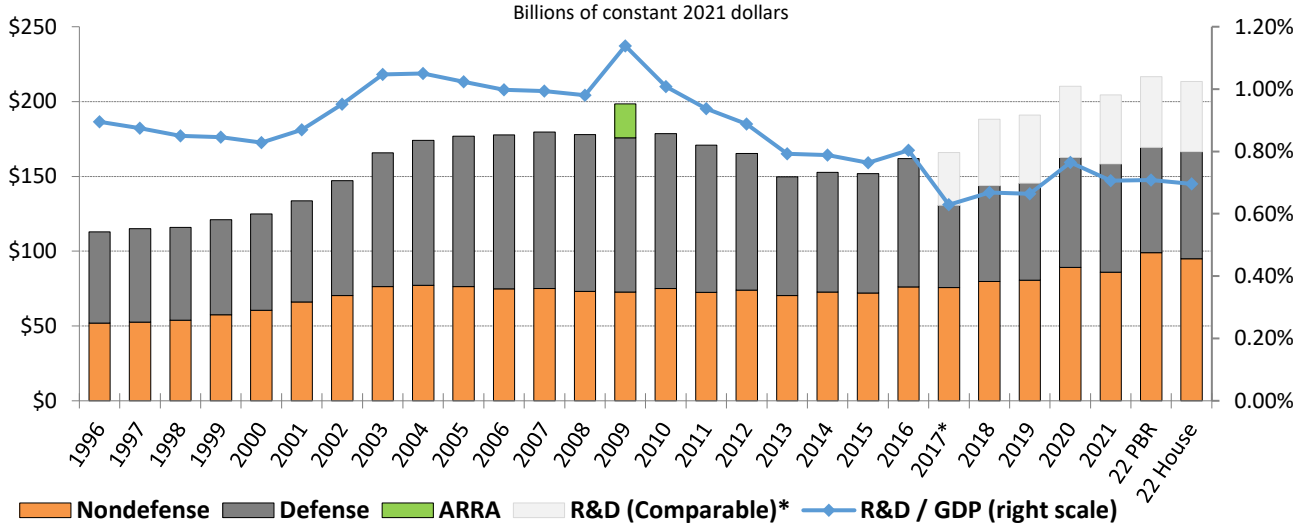
	FY 2021 Est.	FY 2022 Request	**FY 2022 House**	FY21 Change Amount	FY21 Change %
Basic Research	42.5	47.4	45.9	3.4	8.0%
Applied Res.	45.8	52.2	50.8	5.0	10.9%
Development	65.7	68.1	68.0	2.3	3.5%
R&D Facilities	4.1	4.6	4.5	0.4	9.7%
Total R&D	158.2	172.3	169.3	11.1	7.0%
Defense*	72.2	71.5	72.7	0.4	0.6%
Nondefense	86.0	100.8	96.6	10.7	12.4%

*Includes Defense Dept., NNSA, FBI, and DHS CISA
All figures rounded to the nearest million. Changes calculated from unrounded figures.

In spite of this growth, we estimate federal R&D would decline slightly as a share of the U.S. economy to 0.70% (Graph 1 below), due to the strong GDP growth predicted by CBO next year.[3]

A table with R&D funding for major agencies is on the following page.

Graph 1: Federal R&D Budget Authority
Billions of constant 2021 dollars



*Beginning in FY 2017 late-stage RDT&E and support funding, mostly in Defense, is no longer counted as R&D. The "comparable" series adds this funding back in for illustrative purposes. Based on OMB, agency, CBO, and appropriations data. | AAAS July 2021

Table 2: Estimated R&D in FY 2022 by Agency
(budget authority in billions of dollars)

	FY 2021 Est.	FY 2022 Request	**FY 2022 House**	FY21 Change Amount	FY21 Change Percent
Defense	64.29	63.80	64.69	0.40	0.6%
HHS	43.49	51.23	49.12	5.62	12.9%
Energy*	19.29	21.44	20.43	1.15	5.9%
NASA	13.23	14.57	14.66	1.44	10.9%
NSF	6.88	8.17	7.77	0.89	12.9%
USDA	2.96	3.61	3.27	0.30	10.3%
Commerce	2.12	2.78	2.57	0.45	21.2%
Interior	1.02	1.34	1.38	0.35	34.5%
Veterans	1.42	1.50	1.53	0.11	7.9%
All Others	3.48	3.87	3.88	0.40	11.6%
Total R&D	158.19	172.32	169.30	11.11	7.0%

*Includes NNSA.
All figures rounded to the nearest million.
Changes calculated from unrounded figures.

R&D Breakdowns

As seen in Table 1, research funding (including basic and, especially, applied) would receive larger increases than development: a combined $8.4 billion or 9.5% increase for research, versus a $2.3 billion or 3.5% increase for development. For research funding, this would represent the largest increase in inflation-adjusted dollars and as a percentage since the NIH doubling period, excluding the FY 2009 Recovery Act.

Relatedly, the nondefense R&D growth seen in Table 1 is also historically large – likely the largest growth for nondefense R&D since the Space Race, again excluding years with emergency R&D funding in FY 2009 and FY 2020.

Table 3: R&D by Budget Function
(budget authority in billions of dollars)

	FY 2021 Estimate	FY 2022 Request	**FY 2022 House**	Change from FY21 Amount	Change from FY21 Percent
Defense (050)*	72.2	71.5	72.7	0.4	0.6%
Nondefense	86.0	100.8	96.6	10.7	12.4%
Space (252)	12.6	13.8	13.9	1.3	10.6%
Health (550)	43.5	51.2	49.1	5.6	12.9%
Energy (270)	4.5	6.5	5.4	0.9	19.1%
General Sci (251)	13.8	15.4	14.9	1.1	8.2%
Environment (300)	2.9	3.8	3.8	0.8	28.6%
Agriculture (350)	2.7	3.2	2.9	0.2	7.5%
All Other	6.0	6.7	6.7	0.7	11.5%
Total R&D	158.2	172.3	169.3	11.1	7.0%

* Includes DOD, National Nuclear Security Administration, FBI, and DHS CISA.
Numbers in parentheses are the federal government budget function codes.
All figures rounded to the nearest million. Changes calculated from unrounded figures.

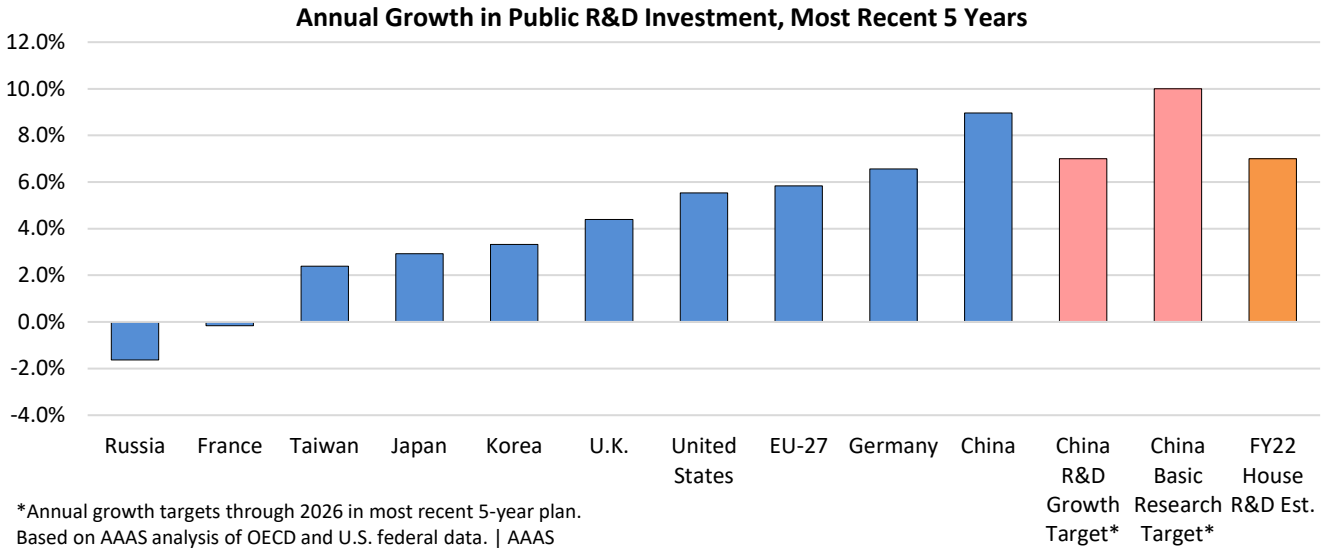
Table 3 displays our estimates of R&D by budget function, the definitions of which generally match those used by OMB and the budget committees. In raw dollars, health R&D would receive the largest increase, driven by a nearly $7 billion discretionary boost for NIH. Energy and environment also emerge as major priorities as measured by relative increase. These are partly driven by large plus-ups for the Office of Energy Efficiency and Renewable Energy, the U.S. Geological Survey, and the National Oceanic and Atmospheric Administration's research office, among other offices.[4]

On the other hand, even with these increases, it's notable that appropriations are also significantly below House-passed authorizations for the two agencies in the general science function: NSF and the Office of Science (DOE). The Office of Science discretionary appropriation is $1.5 billion below the FY 2022 authorization in the DOE Science for the Future Act (HR 3593), while NSF is $2.9 billion below the NSF for the Future Act (HR 2225).

AAAS has also been tracking earmarks for science, technology, engineering, and math (STEM). We currently estimate $260 million in approved community project requests with a STEM focus. Among individual bills, Labor-H received the largest earmark tally with $110 million in projects we classified as STEM-focused, followed by Agriculture with $53 million. In terms of AAAS-generated project categories, the "agricultural science," "higher STEM education," and "life science" categories were the largest, with each provided aggregate funding of over $40 million.[5]

International Comparisons

A major motivator underlying the recent push for elevated R&D investment is competition with foreign economies to sustain U.S. preeminence in science and technology. While China gets the most attention, it is not alone in seeking increased R&D investment.[6] This is out of global recognition that such investments can both drive technological innovation to lay the groundwork for economic growth,



*Annual growth targets through 2026 in most recent 5-year plan.
Based on AAAS analysis of OECD and U.S. federal data. | AAAS

and to help address broader societal challenges like human health, security, or climate change.

Graph 2 benchmarks our House R&D estimate against investments by the nine economies with the largest total R&D expenditures (including the United States, which is #1 in total R&D dollars). This comparison mostly relies on R&D expenditure data provided by OECD.[7]

Average annual growth in public (i.e. government) R&D expenditure from 2014 to 2019, covering the most recent five years preceding the COVID-19 pandemic, is displayed in blue. For additional context, China has specified five-year annual growth targets for economy-wide R&D and for basic science through 2026, both of which are displayed in red.[8] Lastly, our House R&D appropriations estimate is displayed in orange on the right.

As can be seen, the United States has ranked close to the leaders in pre-COVID-19 public R&D growth. Over that time, China achieved 9% average growth in public R&D, Germany achieved 6.6 % growth, and the EU achieved 5.8% growth, just ahead of 5.5% growth for the U.S.[9] Under our estimate, House R&D appropriations would put the U.S. ahead of the German pace, but still behind the recent Chinese pace.

Coincidentally, our 7% estimate for R&D matches the economy-wide R&D growth target established by the Chinese government over the next five years. However, comparing growth in basic science, our House estimate of 8% (Table 1) is somewhat below the Chinese growth target for basic science of 10%.

[1] AAAS estimates are based on OMB, agency, and appropriations data and language. We'll update these based on amendments or additional data reporting from the agencies. For the latest, visit www.aaas.org/rd

[2] For additional information about the Biden R&D budget, see: https://www.aaas.org/news/some-facts-about-biden-rd-budget

[3] Based on the July update to the economic outlook, https://www.cbo.gov/publication/57218

[4] For additional funding figures, visit the AAAS FY 2022 appropriations dashboard, https://www.aaas.org/news/fy-2022-rd-appropriations-dashboard

[5] AAAS' Gwendolyn Bogard calculated these estimates. For an interactive map and list of STEM-focused community project requests, visit https://www.aaas.org/news/tracking-stem-earmarks

[6] For additional information see https://www.aaas.org/news/snapshot-us-rd-competitiveness-2020-update

[7] *Main S&T Indicators*. (2021, March). OECD. https://www.oecd.org/sti/msti.htm

[8] Normile, D. (2021, March 5). China announces major boost for R&D, but plan lacks ambitious climate. *Science* | AAAS. https://www.sciencemag.org/news/2021/03/china-announces-major-boost-rd-plan-lacks-ambitious-climate-targets

[9] This reflects adjustments for comparability, to account for recent changes to how the federal government counts R&D. For more, see https://www.aaas.org/news/federal-government-tweaking-what-counts-rd-qa