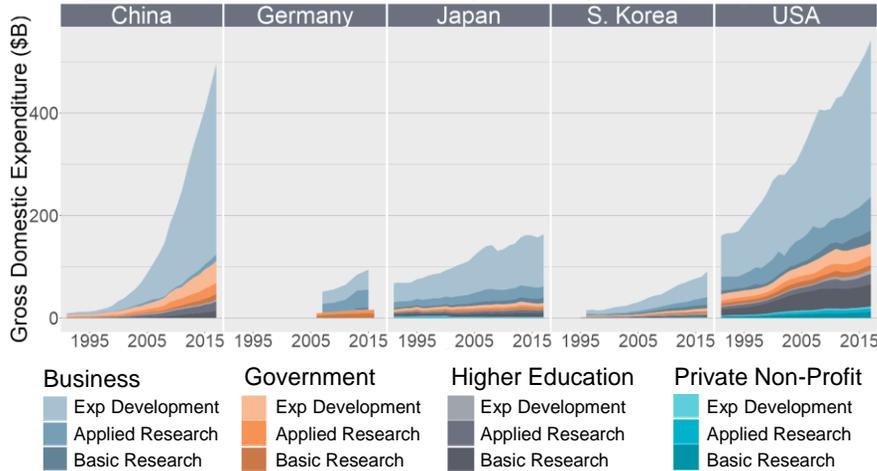


Look for our next issue:  
What's the payoff? Can R&D investment be mapped to innovation?

We saw in the last issue that the U.S. and China spent the most internationally on Research and Development in 2016. The below chart shows how

Source: *OECD*; Data in 2010 constant USD; purchasing power parity (PPP); \*Reporting years vary



R&D expenditures among the current top five countries have changed over the last few decades, by type of R&D and economic sector.

## Resources

- 2019 Missile Defense Review
- 2018 Science & Engineering Indicators
- 2019 World Wide Threat Assessment

R&D expenditures in all five countries are increasing, mainly due to growth in experimental development performed by the business sector. However, China's growth rate puts it on a pace to overtake the U.S. in 2018.

This transformation is due to many factors including a growing economy, and clear strategic vision with initiatives such as *Made in China 2025*. Note that China's government expenditures of Basic Research nearly match the U.S., but fall well below in the industry and higher education sectors.

Industrial investment in R&D is trending upward in both China and the U.S. In fact, NSF surveys showed that between flattening of federal funds for Basic Research, and increasing industry investment since 2012, the government share of Basic Research funding in the U.S. (not expenditures as depicted above) has fallen below 50% for the first time since WWII.

Source: *Strategy & Global Innovation 1000* / Huawei Annual Reports

Company	Country	Industry	R&D Investment 2017 \$B	R&D Investment 2011-2017
Amazon.com, Inc.	United States	Internet and Direct Marketing Retail	22.62	
Alphabet Inc.	United States	Internet Software and Services	16.23	
Volkswagen Aktiengesellschaft	Germany	Automobiles	15.77	
Samsung Electronics Co., Ltd.	South Korea	Technology Hardware, Storage and Peripherals	15.31	
Huawei	China	Communications	13.79	
Intel Corporation	United States	Semiconductors and Semiconductor Equipment	13.1	
Microsoft Corporation	United States	Software	12.29	
Apple Inc.	United States	Technology Hardware, Storage and Peripherals	11.58	
Roche Holding AG	Switzerland	Pharmaceuticals	10.8	
Merck & Co., Inc.	United States	Pharmaceuticals	10.21	

## Who are these companies & in what areas are they investing?

(A quick look is shown right)

And what are the national security implications for the U.S.?

**Podcast Recommendation**  
Tune into *The Security Studies Podcast, Episode 31* for an interview with Sean McFate about his new book, *The New Rules of War*. This former U.S. Army Officer, now G'town professor of strategy, thinks that conventional war is dead!