SIDEBAR 📋

China's Progress in Supercomputers

The TOP500, an organization composed of computer scientists and industry specialists, has been tracking the world's most powerful and fastest-performing supercomputers since 1993. The TOP500 provides a semiannual update of the world's top 500 supercomputers, including information on the country of origin, performance, type of application, and technology.

According to the TOP500's November 2016 report, two supercomputers in China were ranked first and second in the world, giving China two slots in the top 10 list. The world's first-ranked computer is the 93-petaflop Sunway TaihuLight supercomputer at the National Supercomputing Center in Wuxi.* The second-ranked computer is the 34-petaflop Tianhe-2 (MilkyWay-2) in the National Supercomputer Center in Guangzhou. The United States continued to have the largest share of supercomputers in the TOP10, with five in the 2016 list. In addition, China reached parity with the United States in the total number of supercomputers (171) ranked in the top 500 list (Figure 6-C). China has made rapid progress over the last several years, with its share rising from 8% in 2010 to 34% in 2016. The U.S. share has fallen sharply from 55% in 2010 to 34% in 2016.

Although its achievements are impressive, China's supercomputing ability remains limited. Much of China's supercomputing capability is concentrated in its two supercomputers that are ranked first and second in the world (Feldman 2017). Together, they represent more than half of the aggregate performance of the country's supercomputers in the TOP500 list. The majority of China's supercomputers reside in the bottom half of the TOP500 list. Although China and the United States have the same number of supercomputers in the TOP500 list, China's median rank is 316, compared to 227 for the United States. China has made far more limited progress in the TOP100-ranked supercomputers. Between 2010 and 2016, China's share rose from 5% to 8% (Figure 6-C). The United States and the EU remain dominant in the TOP100, with shares of 40% and 34%, respectively, in 2016.

FIGURE 6-C

Top-ranked supercomputers, by location of region, country, or economy: 2010–16

Top 100
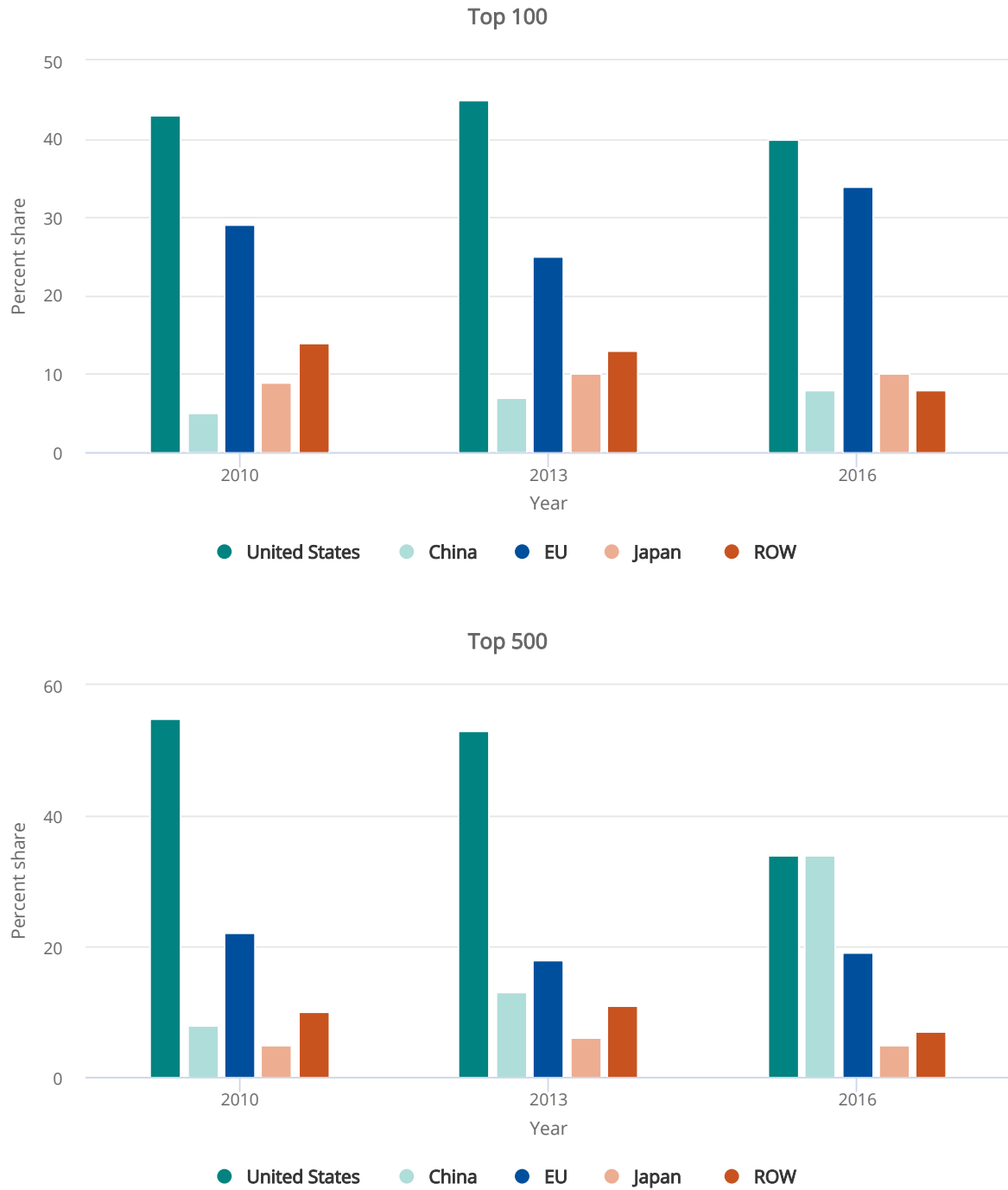
Top 500

EU = European Union; ROW = rest of world.

Source(s)

TOP500 November 2016, 2013, and 2010 reports, https://www.top500.org/lists/, accessed 15 February 2017.

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In addition, the majority of the Chinese supercomputers in the TOP500 list are probably not being used for applications that require the processing ability of supercomputers, including quantum mechanics, weather forecasting, climate research, oil and gas exploration, and molecular modeling and physical simulations. Of the 171 Chinese supercomputers in the TOP500 list, 114 are installed at Internet data center companies, cloud service providers, telecommunications firms, and electric companies (Feldman 2017). These supercomputers have less advanced technology and capability than leading-edge supercomputers and are likely being used for routine activities such as running Web-based or back-office applications. In contrast, most U.S.-based supercomputers are installed at federal national laboratories, universities, and research institutes (Feldman 2017).

* One petaflop is equivalent to one thousand million million (10^{15}) floating-point operations per second.