

Recent Developments in Global Semiconductor Industry

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This executive briefing summarizes recent developments in the global semiconductor (“chips”) industry. In 2022, global semiconductor sales reached an all-time high at \$574 billion. It is projected to surpass \$1 trillion by 2030, driven by demands from computing and data storage, wireless communication, and automotive electronics. China is the largest downstream user of semiconductors, as Chinese manufacturers incorporate semiconductors into a range of electronic products that are consumed domestically or exported globally. The United States still captures the largest share of value created in the semiconductor industry, though it is no longer the biggest producer. Global semiconductor manufacturing, instead, is concentrated in four Asian economies—South Korea (S. Korea), Taiwan, China, and Japan. Recognizing the importance of semiconductors for the economy and national security, major economies around the world have recently stepped up efforts to boost investment and expand domestic semiconductor production capacity.

Global semiconductor sales hit all-time high in 2022.

Global semiconductor sales reached \$574 billion in 2022, an all-time high. Logic chips (including micro processing units and microcontroller units), which process information, and memory chips, which store information, represented over half of global semiconductor sales (figure 1). Computers and communications were the biggest end users of semiconductors, together accounting for about 60 percent of the global semiconductor sales (figure 2). McKinsey projects the value of the global semiconductor market will nearly double, surpassing \$1 trillion by 2030. Computing and data storage, wireless communication, and automotive electronics are expected to lead the industry growth in the next decade.

Figure 1 Global semiconductor sales by product, 2018–22

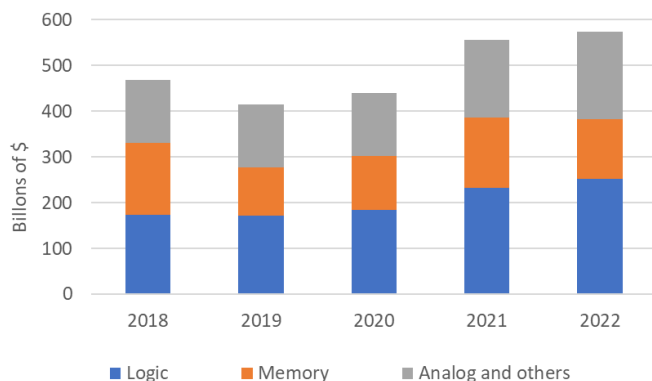
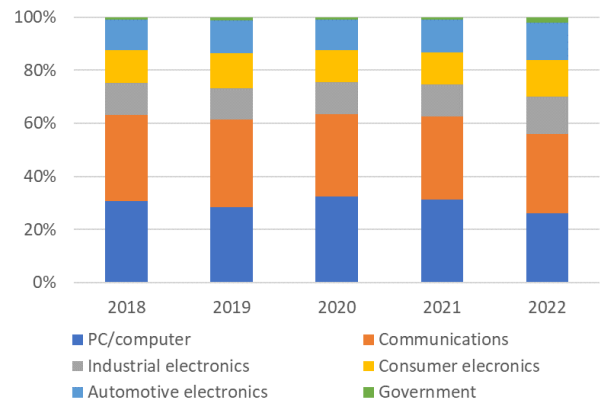


Figure 2 Global semiconductor sales by end user, 2018–22



Sources: SIA, [2019 Factbook](#), May 2019; [2020 Factbook](#), April 2020; [2021 Factbook](#), May 2021; [2022 Factbook](#), May 2022; and [2023 Factbook](#), May 2023. Note: Logic includes micro processing units and microcontroller units, while others are comprised of discrete, sensor, digital signal processors, and optoelectronic devices.

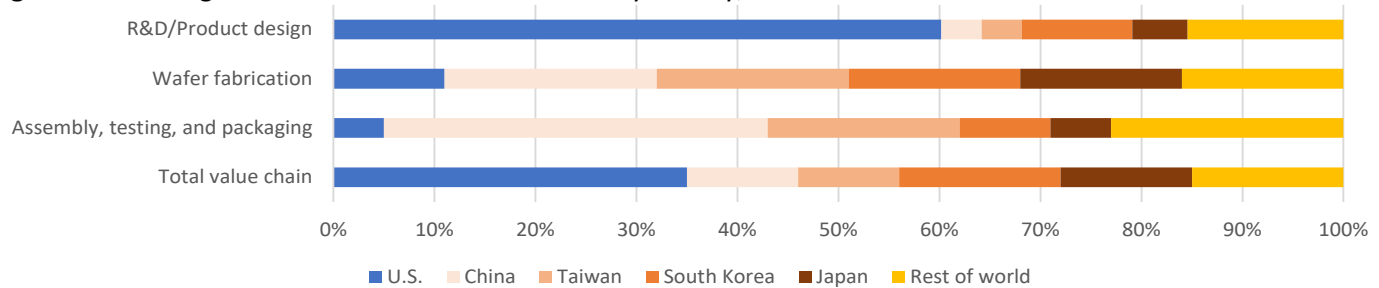
About two thirds of global semiconductor sales took place in Asia in 2022.

China—the world’s largest manufacturing nation in terms of output—is the largest downstream user of semiconductors, accounting for 32 percent of global semiconductor sales in 2022. Chinese manufacturers incorporate these semiconductors into a range of electronic products that are either consumed domestically or exported globally. The United States and China were the top final consumers of semiconductors contained in electronic goods, with a share of 25 percent and 24 percent, respectively, followed by the European Union (EU) at 20 percent.

Global semiconductor value chains have become more complex.

In the 1990s, semiconductor value chains were usually vertically integrated within a company and mainly concentrated in two countries—the United States and Japan. Since then, semiconductor value chains have become more fragmented across more than a dozen economies. Today, U.S. chip companies still capture the largest share of value created in the global semiconductor industry, though they largely focus on the upstream activities such as research and development (R&D) and product design. Four Asian economies—Taiwan, South Korea, China, and Japan—accounted for over 70 percent of value generated from semiconductor manufacturing activities (wafer fabrication, assembly, testing, and packaging) (figure 3).

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Figure 3 Share of global semiconductor value chains by activity, 2021

Source: Authors compiled based on SIA, "[2022 State of the U.S. Semiconductor Industry](#)," 2023.

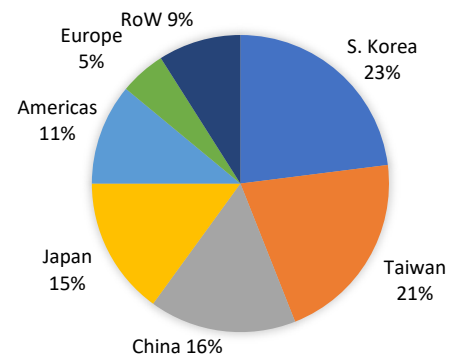
Global wafer fabrication capacity is concentrated in a few economies.

At the end of 2021, about 75 percent of global wafer fabrication capacity was in four Asian economies—Taiwan, South Korea, China, and Japan (figure 4). Five lead companies owned 57 percent of global wafer fabrication capacity: Samsung (South Korea, 19 percent), TSMC (Taiwan, 13 percent), Micro (U.S., 10 percent), SK Hynix (South Korea, 9 percent), and Kioxia/WD (Japan, 6 percent). U.S.-headquartered companies owned about 21 percent of global fabrication capacity, though over half was located overseas. Taiwan accounted for 92 percent of global wafer fabrication capacity for the most advanced logic chips, while South Korea had the largest share—44 percent—of wafer fabrication capacity for memory chips.

Economies are racing to expand domestic semiconductor production capacity.

Recognizing the importance of semiconductors for the economy and national security, the United States has stepped up efforts to expand domestic production capacity. In August 2022, President Biden signed into law the CHIPS and Science Act of 2022, committing \$39 billion over 5 years to incentivize domestic semiconductor manufacturing. Since the introduction of the CHIPS Act in spring 2020, over 50 new semiconductor-related projects and over \$210 billion of private investments have been announced across 20 states. These efforts cover a range of activities, including constructing new and expanding or upgrading existing manufacturing facilities for various chips, semiconductor equipment, and key material inputs.

Other economies around the world are also implementing their own policies to stimulate investment in domestic semiconductor production. In December 2022, China initiated a \$143 billion package primarily to support the purchase of semiconductor manufacturing equipment for domestic semiconductor production. In April 2023, the EU secured €43 billion (\$47 billion) of public and private investments in the semiconductor industry through the European Chips Act, aiming to double the EU's share of global semiconductor production. In March 2023, South Korea's parliament approved its own "K-Chips Act," which would provide increased tax credits for companies investing in domestic manufacturing facilities. In the same month, Samsung announced it is investing \$230 billion to help South Korea develop the world's largest high-tech semiconductor cluster. As a part of its effort to maintain technology leadership, Taiwan passed new rules that allow local chip firms to claim a tax credit on 25 percent of their annual R&D expenses.

Figure 4 Share of global installed wafer fabrication capacity, 2021

Source: Knometa Research, "[Global Wafer Capacity](#)," 2022.

Sources: SIA, [2019 Factbook](#), May 2019; [2020 Factbook](#), April 2020; [2021 Factbook](#), May 2021; [2022 Factbook](#), May 2022; and [2023 Factbook](#), May 2023; Kjeld van Wieringen, "[Global Semiconductor Trends](#)," October 2022; Jones et al. "[The Rising Role of Re-exporting Hubs](#)," *Journal of International Commerce and Economics*, April 2020; McKinsey & Company, "[Semiconductor Supply Shortage and Its Implication](#)," November 10, 2022; The White House, "[CHIPS and Science Act Will Lower Costs](#)," August 9, 2022; U.S. Senate Committee on Commerce, Science, & Transportation, "[The CHIPS Act of 2022: Section-by-Section Summary](#)," 1–3, accessed January 24, 2023; Casanova, "[The CHIPS Act Has Already Sparked \\$200 Billion](#)," December 14, 2022; Zhu, "[China Readying \\$143 Billion Package](#)," December 13, 2022; European Commission, "[European Chips Act](#)," accessed June 13, 2023; European Commission, "[Shaping Europe's Digital Future: European Chips Act](#)," accessed June 13, 2023; Lee, Kim, "[South Korea to Pass Own 'Chips Act'](#)," March 30, 2023; Liu et al., "[South Korean Government and Samsung to Build](#)," March 16, 2023; SEMI, "[Global Chip Industry Projected to Invest](#)," December 12, 2022; Knometa Research, "[Top Five Leaders Continue Expanding Share](#)," April 7, 2022; Knometa Research, "[More Than Half of American-Owned IC Fab Capacity](#)," January 31, 2023; Knometa Research, "[China's Share of Global Wafer Capacity](#)," February 10, 2022; Wu, "[Taiwan Passes Its Chips Act](#)," January 8, 2023.

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