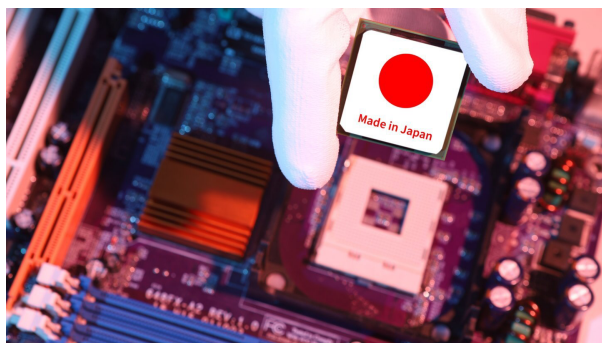




JAPAN TO RISE AS A STRONG ECONOMIC POWERHOUSE?: SEMICONDUCTORS

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Rapidus – Hokkaido's largest-ever development project – aims to revive the domestic semiconductor industry by mass-producing 2nm chips. Source: Shutterstock

Will Japan regain its status as an economic powerhouse? Japan has fallen to fourth place in the global GDP rankings, behind the US, China, and Germany. The country faces challenges such as an aging population, rising social spending, and a

shrinking workforce. As a result, Japan is seeking to balance its investment in research and development, which is the foundation for innovation and economic growth. Despite these challenges, which have led to Japan's declining technological and industrial competitiveness, the nation is making progress in the semiconductor industry and is making ambitious efforts using diplomatic and governmental initiatives.

Despite criticism of its national R&D policy and its declining global competitiveness, Japan remains committed to supporting science and technology. Public-private partnerships have become increasingly important as the government grapples with fiscal challenges. Japan's investment in science and technology has relied heavily on industry, rather than government and policy. In 2014 and 2018, businesses accounted for nearly 80% of Japan's gross domestic expenditure on research and development (GERD), while the government's share was only 1.3%. In comparison, in the United States, the federal government spends about 10% of the national GERD, while businesses show a similar trend to Japan, spending about [70% of the national GERD](#). Japan's government spending on R&D is relatively small. However, when considering the ratio of GERD to GDP, Japan's ratio (3.20%) is still [relatively higher](#) than other major economies such as the United States (3.13%), China (2.23%), and Germany (3.19%). According to UNESCO, Japan's GEDR places the greatest emphasis on "Non-Field Specific" (JPY 9,486,667 million), followed by "Life Sciences" (JPY 3,174,120 million). Semiconductors currently receive the most emphasis within Japan's "Non-Field Specific" category. The Japanese government is targeting a budget of [two trillion JPY](#) (\$13.2 billion) for semiconductors. Given the country's industry-led investment in R&D for science and technology, this new budget policy underscores the government's emphasis on this high technology. Japan still needs to make structural reforms to its social welfare costs due to its rapidly aging population to improve its tight fiscal situation, which will require fundamental fiscal and structural policy reforms in the long term. However, the nationwide focus on semiconductors is the best policy available at this time to revitalize its economy.

Rapidus, a Japanese chip startup, is a key player in Japan's semiconductor supply chain strategy. Founded in August 2022 with 70 billion yen in government investment along with financial and technical support from major Japanese companies, Rapidus aims to research, develop, and manufacture advanced logic semiconductors with process rules smaller than 2 nm. This nano-sized semiconductor is expected to be used in supercomputers and artificial intelligence. The microchip is likely to have a spillover effect on other semiconductor-dependent or related industries as well, such as the automotive industry. Concerns over Japan's declining semiconductor industry have grown alongside global market competition and increasing economic interdependence. Geopolitical tensions in the Taiwan Strait and China, two major semiconductor producers, have further emerged as critical issues amid the weaponization of economic ties. In response to these factors, Japan recognized the need to produce its semiconductors through strategic cooperation among the U.S., EU, and Japan, and strongly influenced the birth of the government-led chip startup. In 2022, Japan's Ministry of Economy, Trade and Industry (METI) and eight major companies, including Toyota, Softbank, and Mitsubishi UFJ Bank, launched the initiative of domestic semiconductor R&D through [Rapidus](#). To achieve its goal, Japan is implementing a close public-private-academic partnership between the Japanese government, Rapidus, and its top universities, such as the University of Tokyo. The goal is to strengthen the country's international position in semiconductor R&D and manufacturing. This partnership will enable Japan to mitigate critical risks in the high-tech supply chain arising from U.S.-China competition and geopolitical tensions surrounding Taiwan and Chinese reunification. If Japan is unable to secure its semiconductor supply chain due to any of these crises, its industries, including automotive and artificial intelligence, will suffer significant damage in the future. Japan's automotive industry is still one of the country's leading economic drivers, accounting for [17.1% of its total exports](#) to the global market. [Semiconductors](#) are essential in automotive manufacturing to improve engine performance, increase fuel efficiency, and provide a smoother and more comfortable ride for both gasoline and electric vehicles. A failure of the automotive industry, which

is highly dependent on semiconductor production and supply, would lead to an increased economic slowdown and a decline in Japan's global economic competitiveness. In addition, today's ongoing global race in artificial intelligence relies on semiconductors. Artificial intelligence requires hardware for complex computations such as intensive massive data processing, which is supported by [semiconductors](#). In 2022, Japan's AI market had a potential value of [JPY 1.145 trillion](#). Further scientific and technological progress in AI is crucial for Japan's diplomatic initiatives, demonstrated by the [Hiroshima AI Process Code of Conduct](#) adopted during its G7 presidency in 2023 and its promotion as a key agenda item for Italy's G7 presidency in 2024. Although there is some domestic opposition to the strong government initiative and large investment, METI's policy on semiconductors and Rapidus is compelling because of its strategic position, which offers both advantages and risk mitigation.

These technological, economic, and diplomatic factors point to a critical need for semiconductors in Japan. Without securing the semiconductor supply chain, Japan's world-renowned automobile production and ability to compete in the global artificial intelligence race will be severely impacted in both the short and long term. Japanese businesses would experience a recession, leading to declines in production, exports, and employment. Investment in the nation's science and technology would continue to decline. Japan has just begun the ambitious, nationwide challenge of self-manufacturing semiconductors through strategic partnerships, both domestically and internationally. With strong implications for Japan's technological capabilities, economy, and diplomacy, securing the semiconductor supply chain is critical to Japan's future in science and technology beyond semiconductors, automobiles, and artificial intelligence.

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