IESE Business School
University of Navarra

OIT-78-E
July 2026

TSMC: Chip manufacturing in the era of AI

Mihalis G. Markakis

Abstract for promotional use only. Full version available at www.iesepublishing.com

Do Not Copy or Post

With a market capitalization of around $2.2 trillion in the summer of 2026, the Taiwan Semiconductor Manufacturing Company (TSMC) was the most valuable manufacturing company in the world and, overall, the sixth most valuable publicly traded firm.[1] However, these facts alone did not capture the technological, economic, and geopolitical significance of the somewhat obscure Taiwan-based company.

TSMC was the global leader in semiconductor manufacturing, particularly in terms of leading-edge process nodes such as 3 nm and 5 nm, which were essential for producing the latest high-performance computing chips used in data centers for artificial intelligence (AI) applications. In early 2026, the company had also began ramping up production of cutting-edge 2 nm chips. TSMC was the largest semiconductor foundry in the world, commanding over 70% of the global revenue from foundry services.[2] This dominant position gave the company significant influence over the semiconductor supply chain and turned TSMC into a critical supplier for many of the world's leading technology companies, including Nvidia, Apple, Broadcom, Qualcomm, and AMD. TSMC was also the default supplier of custom-made chips for Google, Amazon, and Meta.

By providing access to state-of-the-art technologies and manufacturing processes, TSMC enabled its customers to innovate and develop new products across various sectors, including AI, cloud services, consumer electronics, automotive, and national defense and security. It was no exaggeration to say that a nontrivial percentage of the global gross domestic product (GDP) growth could be attributed to products or services that used chips manufactured by TSMC.

[1] "Largest Companies by Market Cap," Marketcap, last modified June 12, 2026, https://companiesmarketcap.com/.

[2] "Global Pure Foundry Market Share: Quarterly," Statista, last modified June 12, 2026, https://www.statista.com/statistics/867223/worldwide-semiconductor-foundries-by-market-share/.

This case was prepared by Professor Mihalis G. Markakis. July 2026.
This case is based on the case with the same name, OIT-60-E, prepared by the same author.
IESE cases are designed to promote class discussion rather than to illustrate effective or ineffective management of a given situation.

Copyright © 2026 IESE. To order copies contact IESE Publishing via www.iesepublishing.com. Alternatively, write to publishing@iese.edu or call +34 932 536 558.
No part of this content may be reproduced, incorporated into public AI platforms or services, transmitted, distributed, disseminated, or made available to third parties without IESE's authorization.

Last edited: 2/7/26

TSMC's position as a leading player in a critically important industry also made it a factor in global geopolitics. Rising tensions between the United States and China, on the one hand, and the complicated history between China and Taiwan, on the other, put TSMC at the center of discussions concerning trade policies and technology security. In fact, TSMC was touted by some as Taiwan's "silicon shield" against geopolitical threats, given that, presumably, no one would risk disrupting access to leading-edge chips—for many of which TSMC was the sole supplier.

TSMC's dominance in the semiconductor industry was accompanied by excellent financial performance. Over the 30 years since its listing in 1994, the company had delivered a compound annual growth rate (CAGR) of 17.7% on revenues and 17.2% on earnings. It had built a "fortress balance sheet" that endowed it with the highest credit rating in the semiconductor industry. Its net income was around 40% of its revenue, which was extraordinary for a manufacturing company. Moreover, TSMC's cash flows were strong enough for it to rely on internally generated funds to finance organic growth.[3] For the company's 2023–2025 consolidated financial statements and its historical operating data, see Exhibits 1–4.

Yet the geopolitical tension between the United States and China, the global supply chain disruption caused by the COVID-19 pandemic, and the tariff-centric economic agenda of the Trump administration in 2025 had accelerated the re-shoring or near-shoring of manufacturing capacity in critical industry sectors, including semiconductors. Furthermore, the dawn of the AI era following the release of OpenAI's ChatGPT in November 2022 had triggered an "arms race" among big technology firms seeking to procure leading-edge, high-performance computing chips.[4] These factors forced TSMC, for the first time really, to invest in a massive capacity expansion outside of Taiwan, and the company faced operational, organizational, and cultural challenges along the way. However, even though the capital expenditure (CAPEX) associated with this expansion was significant relative to TSMC's historical standards, it remained much lower than the CAPEX growth of hyperscalers, whose data centers were powering the AI revolution. This rendered TSMC's leading-edge chips the bottleneck for the growth of the sector and, perhaps, offered a window of opportunity to TSMC's competitors.

Could TSMC maintain its technological dominance, robust growth, and excellent financial performance in this rapidly changing world?

The pervasiveness of advanced chips

Chips were critical to numerous vital technology applications across various industries. Leading-edge chips constituted the core piece of hardware underpinning data centers and cloud computing services, which represented the information technology (IT) backbone of modern society, where high-performance central processing units (CPUs) and graphics processing units (GPUs) were essential for handling large-scale data processing and storage. In particular, training and inference in relation to large language models, the core technology behind generative and agentic AI, required data centers based on Nvidia's Hopper and Blackwell custom GPUs or accelerator chips such as Google's tensor processing units (TPUs) and Amazon's Trainium.

[3] TSMC. "TSMC Shares Are an Attractive Investment for Semiconductor Innovations." TSMC. Last modified 2026. https://investor.tsmc.com/english.

[4] Meghan Bobrowsky. "Big Tech Is Spending More Than Ever on AI and It's Still Not Enough." Wall Street Journal. Last modified October 30, 2025. https://www.wsj.com/tech/ai/big-tech-is-spending-more-than-ever-on-ai-and-its-still-not-enough-f2398cfe.

Abstract for promotional use only. Full version available at www.iesepublishing.com

Do Not Copy or Post

Consumer electronics, especially mobile devices such as smartphones, tablets, and wearable devices, also used leading-edge chips in their CPUs and GPUs to enable high-performance computing, enhanced graphics, and efficient power consumption. Similarly, laptops and desktops required advanced CPUs and GPUs to provide adequate performance for tasks ranging from everyday use to gaming and professional applications.

The automotive industry employed advanced chips for real-time processing of data derived from sensors and cameras, enabling features such as self-driving and advanced driver assistance, as well as in infotainment systems, which were designed to provide a better user experience and greater connectivity.

Advanced chips were also essential for the development and deployment of fifth-generation (5G) cellular networks, providing faster data rates, lower latency, and enhanced connectivity to mobile devices such as smartphones and tablets.

"Physical AI" was another major consumer of advanced chips: high-performance processors and sensors were used in industrial robots and automation systems to enhance precision, efficiency, and reliability. They also formed part of smart sensors and Internet-of-Things devices employed in smart factories, agriculture, and smart cities.

Finally, a critical, albeit less frequently discussed, application of advanced chips was found in military technology, where leading-edge semiconductors were integrated into national security and defense, including fighter jets, missile and drone guidance, and electronic warfare systems. It was no coincidence that many of the breakthroughs in science and technology that paved the way for contemporary advanced chips were funded by the US government's Defense Advanced Research Projects Agency (DARPA).

The value chain of advanced chips

The value chain of advanced chips encompassed several key stages, the most important of which were as follows:

- Electronic design automation: Companies such as Cadence, Synopsys, and Mentor Graphics provided specialized software tools for designing, simulating, and verifying chips.
- Intellectual property (IP): ARM and Imagination Technologies, among others, provided predesigned IP cores and design services that downstream design companies could integrate into their chips.
- Integrated circuit design: Companies such as Apple, Nvidia, Broadcom, Qualcomm, AMD, Intel, Samsung, Google, Amazon, and Meta, using the aforementioned software tools and IP, designed the architecture and layout of the chips they needed for their products and services, specifying how millions or billions of transistors were arranged and interconnected. Design accounted for 53% of industry-wide research and development (R&D) expenses, 13% of CAPEX, and 50% of the total value added.[5]

[5] "Strengthening the Global Semiconductor Supply Chain in an Uncertain Era," SIA, last modified April 1, 2021, https://www.semiconductors.org/strengthening-the-global-semiconductor-supply-chain-in-an-uncertain-era.

Abstract for promotional use only. Full version available at www.iesepublishing.com

Do Not Copy or Post