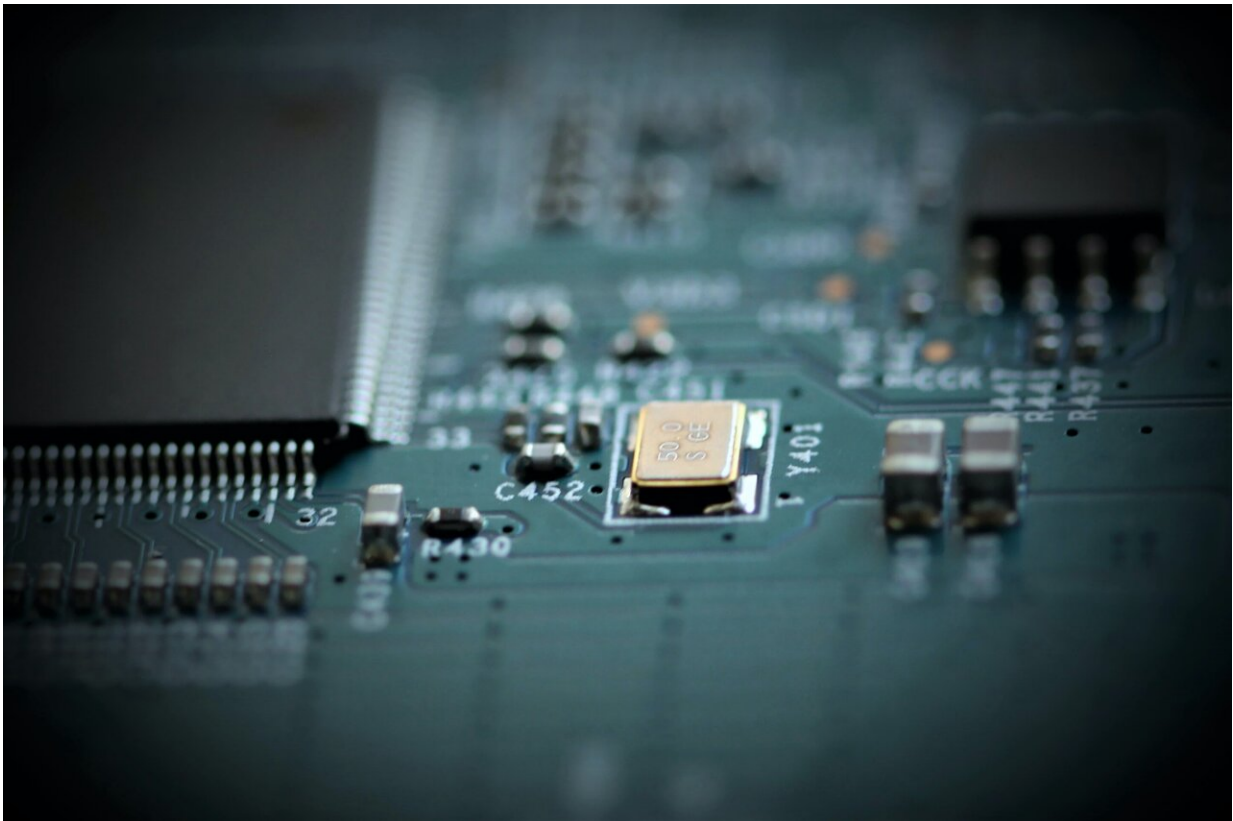


# Major players block China's access to advanced chip materials for developing AI

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The global semiconductor industry has been rocked by trade restrictions that threaten to upend longstanding supply chains and exacerbate geopolitical tensions between the United States and China.

As the U.S., Taiwan, Japan and the Netherlands move to block exports of certain chip-making materials to China, the world's most populous nation and a growing player in the high-tech industry, questions abound about the impact of these restrictions on innovation, security, and the future of the global tech landscape.

To better understand the implications of the new trade restrictions and the intricacies associated with manufacturing semiconductor materials, Penn Today spoke with Melissa Flagg, Perry World House visiting scholar and former deputy assistant secretary of defense for research.

## **What these trade restrictions are and why they are happening**

Flagg explains that this U.S.-led initiative to exert export controls on China's advanced chip-making industry, crucial for enhancing high-level computing operations such as those seen in [artificial intelligence](#) (AI), was implemented to hinder China's efforts toward developing a self-sufficient sector of its own.

"In recent months, with the popularization of ChatGPT and other learning models, computer-reliant tools in the AI space have displayed tremendous potential to disrupt many key sectors of industries that influence a nation's economy," Flagg says. "However, the production of semiconductors, which act as the building blocks for computational processing and memory storage, relies on an elaborate global supply chain with a few key players providing specialized components."

Flagg notes that export controls are not uncommon and are typically imposed in the aerospace and defense industries. Still, these latest measures may be particularly effective due to the uniquely specialized roles key players in the supply chain hold, saying, "As I understand it,

the machining tools needed to produce the most powerful processors are, for the most part, limited to the Netherlands, the U.S. and Japan. So, when you have this exquisite and highly specific bottleneck for technology further tightened, it will certainly have sweeping effects, and it wouldn't be surprising to expect some form of retaliation."

She adds that semiconductors are highly relevant to military capabilities, as many interconnected vehicles, artillery, and weapon systems heavily rely on processing and memory chips. "These restrictions aim to protect our national security interests and prevent China from developing its own cutting-edge semiconductor industry, which could someday threaten to rival that of the U.S.."

Flagg emphasizes that these controls are significant because they occur at a time when the full impact of this technology is yet unknown. "We're just beginning to understand what AI can do, so in 30 or so years, we can look back at this and determine whether it was crucial in the battlefield and if this decision was a wise move."

## **A potential cause for concern**

"When great powers with large militaries threaten each other, it's never a good situation, and it's dangerous because the circumstances have become more precarious," she says. "I think the biggest indicator that people are concerned about potential escalation is Gen. Mark Milley, chairman of the Joint Chiefs of Staff, publicly stating, "We need to tamp down the anti-China rhetoric.'"

Flagg emphasizes the importance of avoiding miscommunications, mistakes, and opportunities for misinformation from outside actors to exacerbate tensions.

Despite the potential for these trade restrictions to worsen this delicate

situation, Flagg believes that the mutual economic interests of the U.S. and China will likely prevent any threat of physical violence. "I don't think there's an incentive for either country to move beyond low-level clashes in the Pacific," she says.

## Moving forward

Flagg notes that, although the U.S. has secured this landmark deal, which involves vital partnerships at key bottlenecks throughout semiconductor manufacturing, the story doesn't end here. "How we interpret the moment differs greatly from how we look back at events historically," she says.

"We're not at the end of history here, so we need to remain cognizant of the fact that there will be something that supplants this type of large-scale physical processing relying on semiconductor materials."

Flagg adds that these restrictions may slow down China's race to domestic cutting-edge [chip production](#) while giving the U.S. and its partners an opportunity to advance. However, China still has economic resources to develop alternatives. "People often fall prey to believing that if they are in the lead, their way is the best way, and often, that theirs is the only way," Flagg says.

"So, what I tell scientists in the Department of Defense is, if someone is beating you, or you're losing the race, change the game. We need to be very conscious of the fact that we treat it like it's only one game, but it's just a matter of time before the situation changes."

Provided by University of Pennsylvania

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