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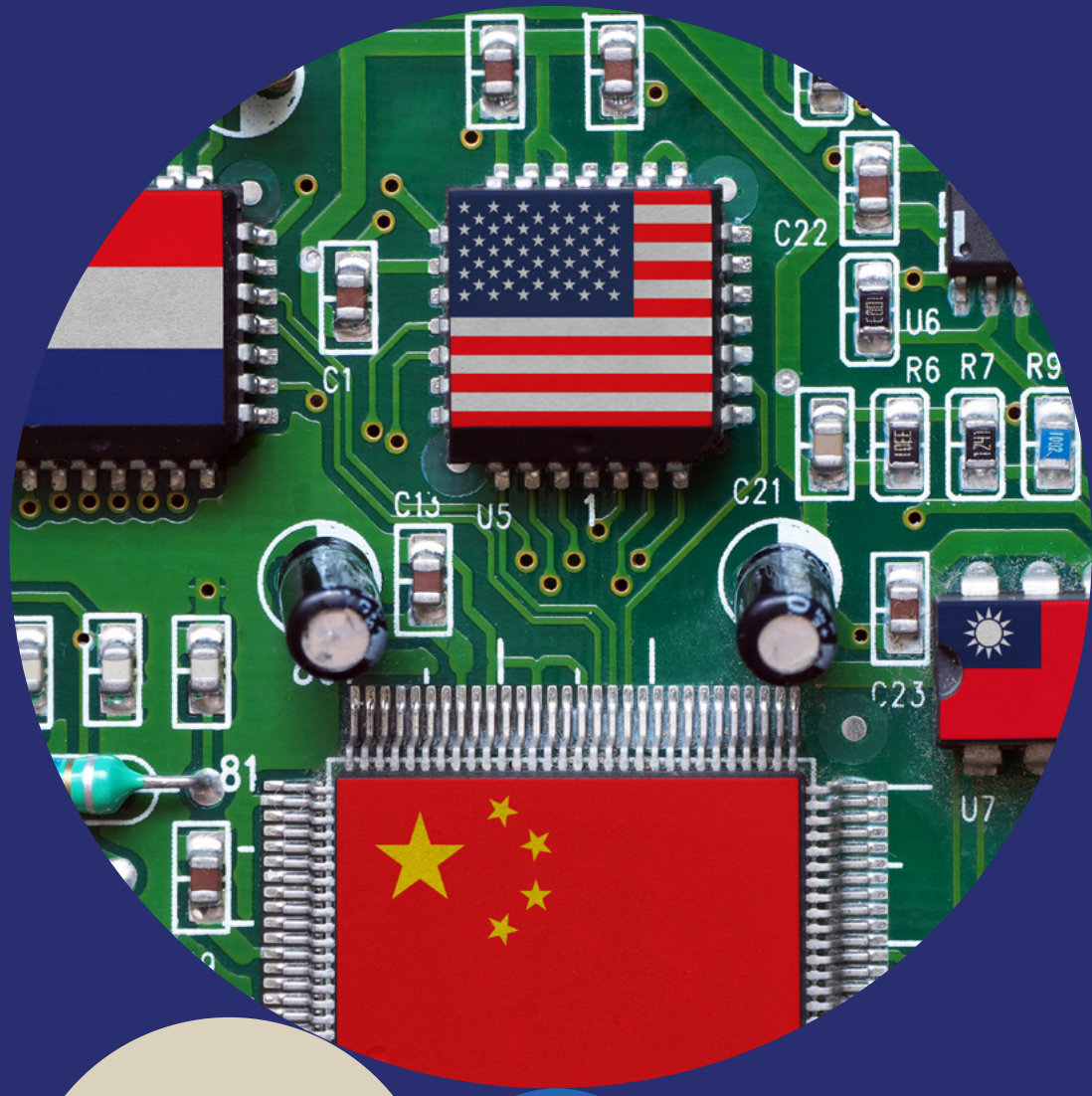
# What lies ahead for the geopolitics of semiconductors

Webinar summary



Manufacturers are taking semiconductor supply chains more seriously than ever before – and that is good news, according to **Chris Miller**, author of the 2022 book Chip War: The Fight for the World's Most Critical Technology.

However, Miller added: "The bad news is that semiconductor manufacturing is just as concentrated today as five years ago." Just one company in Taiwan, TSMC, produces 90% of the world's most advanced chips, and the semiconductor supply chain has a series of single points of failure.

Miller was speaking on a webinar with **Andrea Blair**, Director of Business Resilience and Continuity Management Services at Zurich North America. The webinar was moderated by **Matt Holmes**, Head of Political and Government Affairs at Zurich.

Before the pandemic, Miller said, leaders of many organizations had not appreciated the extent of their vulnerability: "The shocks made it clear to everyone in the manufacturing world – auto manufacturers, medical device manufacturers, industrial equipment manufacturers – the extent to which their equipment relies on semiconductors."

## Building resilience through diversification is a challenge

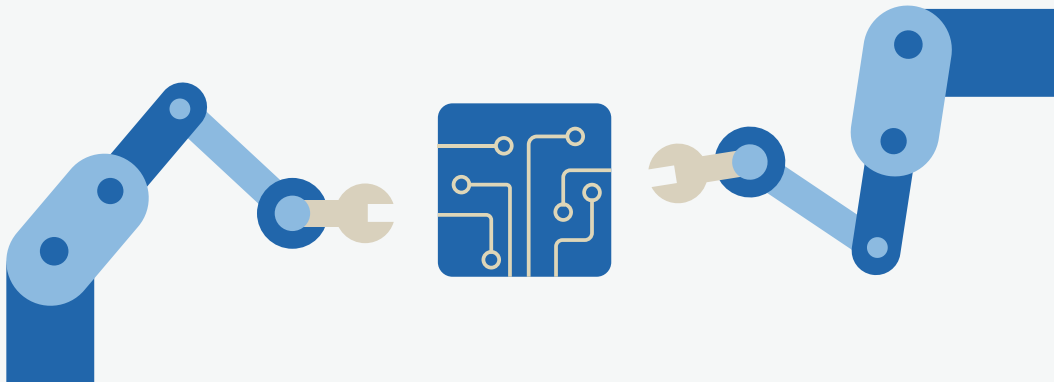
It may seem surprising that an essential component for so many industries is largely made in just one place. Miller explained that the concentration of the semiconductor industry is largely an accident of history. In the 1980s, when most companies designed and manufactured chips in-house, TSMC set itself apart with a business model of manufacturing for others. By serving multiple customers it developed scale, and this has become an increasingly important competitive advantage. TSMC's size allows it to constantly learn, improve processes, and lower costs.

After the pandemic made clear the extent to which this concentration creates vulnerabilities, other countries have embarked on an attempt to build resilience by diversifying supply chains. However, Miller emphasized, "the key challenge with building resilience is that it's very expensive and it takes a long time."

In 2022 the U.S., for example, introduced the Chips Act to incentivize the domestic manufacturing of chips, allocating $39 billion over around five years. To put that sum in context, TSMC invested almost the same amount in CapEx last year alone. Building just one cutting-edge manufacturing plant can cost around $20 billion.

TSMC has built plants outside Taiwan – currently, in Japan, the U.S. and Germany. However, most of its CapEx is still focused on Taiwan, and Taiwan's government mandates it to conduct cutting-edge work only in Taiwan.

The U.S. today produces slightly over 10% of the world's chips, which are not the same high-end chips as produced by TSMC. In a decade's time, industry experts expect that might have risen to perhaps 15%. "That is a change", Miller remarked, "but not a drastic change". As a consequence, the security of supply chains out of Taiwan will be a concern for the foreseeable future.



## Pinch points in the semiconductor supply chain

To explain why diversifying the supply chain is such a slow process, the webinar discussed the complexities at play.

The semiconductor supply chain starts with metals and minerals that are often available only in politically unstable countries. A typical chip uses 30 to 40 materials; alongside silicon, these could include gallium, germanium, or tantalum. China excels in the processing of these elements. As Miller said, “It’s hard to produce cutting-edge chips without sourcing materials that have at least been processed in China.”

Over the last two years, China has implemented new export control regimes on some of these key minerals. Miller argued that this is not as big a problem as it might appear: “The processing of these minerals isn’t very hard. It’s moderately expensive, but you could bring online other sources of supply relatively quickly if you needed to.”

Semiconductor manufacturing facilities add another layer of complexity to the supply chain of the chips. These facilities rely on highly sophisticated machines that often have monopoly suppliers. The Dutch multinational ASML, for example, is the world’s only producer of photolithography machines that are used to carve transistors onto chips. “These are machines that cost $300 million apiece,” said Miller, and “this is just one of the multiple tools you need to make an advanced chip. It illustrates the mind-boggling complexity of the supply chains that are necessary to build a cutting-edge chip-making plant.”

Once the chips are manufactured, they are assembled into servers in complex processes, often in third countries. With the rise of AI, this process is getting even more challenging. “A typical AI server has 35,000 components inside,” said Miller, “which gives you a sense of the scope for delays or disruption if just one of those types of components is not available in the quantities that are needed.”

Then AI data centers need to be powered. While the chip industry is delivering more energy-efficient computing every year, the amount of computing power being used is increasing much more rapidly. “We’re going to need to find ways to bring much more power online to make it possible to deliver these AI systems,” Miller said. “Doing it in a sustainable way is even more difficult, but it’s got to be an area of focus because I think it’s implausible as a society that we are going to just stop wanting to use more computing power.”

## Geopolitical risks to the supply chain in Taiwan

Today's power-hungry AI systems benefit from stability in semiconductor production, but this cannot be taken for granted. A number of factors could threaten supplies in the future.

"Right now, I think the supply chain is working well," said Miller. "But it's not hard to imagine an earthquake or a natural disaster, or a conflict in the Taiwan straits that could disrupt semiconductor production."

Tensions between China and Taiwan are not new, Miller outlined, with the dispute about the territory going all the way back to 1949. "What is changing is the dramatic rise in China's power and capabilities," said Miller. There is a higher level of concern about China-Taiwan tensions than ever before, and this dynamic is not going to change soon.

"If everyone is simply trying to maximize their GDP," Miller pointed out, "no one will take steps to disrupt Taiwan's chip exports. But we have seen in the past couple of years, as well as throughout history, that political leaders do not always try to maximize GDP. There is a risk that a leader – whether in Beijing, in Taipei, or in Washington – takes a step that disrupts the status quo and sparks a broader crisis."

## Semiconductors raise critical security questions

In Beijing and Washington alike, there is recognition that access to the most advanced chips is crucial for security and economic reasons. TSMC currently produces 99% of the AI accelerator chips used for training and deploying AI systems.

"If you talk to security policymakers," Miller said, "their argument is that they want to be able to control the infrastructure that will matter for AI, the data centers that will train AI systems and the data centers that will run AI systems. If it's your companies with your chips running most of the world's AI systems, that gives you a lot of influence. If it's your adversaries, that gives them influence."

This line of thinking underlies why the U.S. has made it illegal, since 2022, to transfer the most advanced AI accelerators to China. As more of the economy – consumer, industrial, and healthcare products – comes to depend on AI, it will be increasingly important from a data protection perspective for countries to have the AI infrastructure that processes data inside their borders, or in a jurisdiction they trust.

Beyond the most advanced chips, security questions are increasingly prominent in all kinds of semiconductor supply chains. The recent attack in which communication devices were supplied with a secret capacity to be remotely detonated was a dramatic demonstration that even seemingly innocuous hardware can pose a security risk, unless every component can be verified as trustworthy.

While there is a long history of concern about "critical" supply chains, Miller said, "What we've seen over the last five years is that the definition of what's critical has gotten bigger every single year."

The U.S., for example, recently announced a ban on components from adversary countries in autonomous driving systems. In another example, Chinese-made cranes used to unload containers in U.S. ports were found to include cellular modems that had not been part of the order specification. "You want your industrial equipment to be able to be accessed remotely," said Miller, "but you want to make sure you know who can access it remotely."

## The U.S. approach may not change dramatically under President Trump

Such tensions between the U.S. and China could be brought to the fore when President Trump returns to the White House in 2025.

However, Miller does not expect a major change in direction from the Biden administration: “I think there’s somewhat uniquely bipartisan agreement in the U.S. around the supply chain issues.” Both political parties are generally in favor of tariffs, controls on technology transfer, and subsidies to encourage manufacturing in the U.S.

As a candidate, President Trump discussed imposing tariffs as high as 60% for China and 20% for the rest of the world. “I would bet that we don’t reach those numbers,” Miller said, “but certainly we’re going to see more headlines about tariffs and more action on tariffs than we’ve seen over the past four years.”

## The private sector has a crucial role to play

However relationships evolve between leaders of governments, the private sector will have a key role to play in increasing the resilience and transparency of the semiconductor supply chain.

All business leaders will want to avoid a repeat of the kind of shock experienced during the pandemic, when hundreds of billions of dollars’ worth of cars went unsold due to chip shortages.

“It would be unfortunately wrong to rely on governments to foresee pinch points in advance and take proactive steps to address them,” argued Miller. “I’ve been repeatedly struck, in my engagement with governments across the world, by the extent to which they’re constantly asking the private sector for more visibility into supply chains. The private sector has the information, governments generally don’t. It’s got to be the private sector that is looking ahead and then taking steps to address the pinch points before they emerge.”

## Insurers can help businesses to plan ahead

If the private sector is to step up to the challenge of increasing transparency, the insurance sector can help. Speaking for Zurich, Andrea Blair emphasized the importance of businesses working with organizations that have the capabilities to help them organize and understand the information they have on their supply chains and vulnerabilities. “It can be hard for people who are immersed in a business to take a step back and look objectively,” said Blair. “Insurers like Zurich can help them to feel confident that they have thought everything through and they’re not missing anything.”

Since the pandemic, Blair outlined, companies have generally sought to guard against future interruptions by moving from a “just in time” supply chain model to a “just in case” model. The blockage of the Suez Canal, in 2021, added impetus to this shift.

“Companies are now thinking through how many days they could keep operating if supplies of key parts or processes were interrupted,” said Blair.

However, when it comes to semiconductors, this question is not an easy one to answer. “Semiconductor chips are not only in a finished product, like a car,” said Blair. “They’re also in the tools you use for design, manufacturing, logistics, and distribution. When asking how a shortage of chips could affect your business, directly or indirectly, you have to look at many different things beyond what is obvious.”

All companies have a limited amount of capital expenditure available for managing risks and building resilience, Blair added. The challenge is to identify priority areas: “My team is helping companies look at the entire process from cradle to grave, considering questions such as where raw materials are coming from, how they are processed, what interdependencies exist between facilities, and where the finished products end up.”

With the right expertise and support, companies can identify where they are most vulnerable and what steps they can take to improve their business continuity plans.

Such resilience will be key, as the semiconductor supply chain looks set to remain as complex as the technology itself is ubiquitous.



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