

Behind the Markets Podcast: The Chip War

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We were excited to have the opportunity to have Chris Miller, Associate Professor of International History at the Fletcher School at Tufts, as a guest on the show. He has just written the book, *Chip War: The Fight for the World's Most Critical Technology*, which is really a tour de force, taking the reader through the history of semiconductor developments and why the current supply chain looks the way that it does.

Of course, it culminates where we are today, with everyone feeling the geopolitical tension between China and the U.S. and wondering what might happen with respect to Taiwan.

To summarize some of the points in our discussion:

- Professor Miller talked briefly about his experience looking at Russian history and how he started thinking about chips as a result of considering the miniaturization of electronics. Human history sees a lot of progress come from developing weapons; in this case, the focus was on miniaturizing circuits in missile guidance systems. We see the difference between U.S. technology and Russian technology even today on the battlefield in Ukraine—it's clear that the U.S. technological approach won out on this matter.
- We talked about a big transformation that Intel undertook in the 1980s. One takeaway that people should have when thinking about chips is that there are many different types, and a primary demarcation is between memory chips and logic chips. In the 1980s, the world was beefing up its production capacity of memory chips—to the extent that they were almost becoming a commodity. At that time, production capacity was growing much faster in Asia and it was part of what we thought of then as 'Japan, Inc.' Intel had started its journey as a company making memory chips, but in one of the boldest steps ever taken by a silicon valley CEO, Andy Grove abandoned the memory chip focus and shifted to logic chips—the types of central processing units that you find in laptops and desktops today. This decision led to us hearing things like the 'Intel Inside' marketing campaign in the years to follow, but it was an incredibly difficult decision at the time.

- We were able to briefly discuss extreme ultraviolet lithography (EUV). Lithography is the process through which light can be used to etch the different designs in silicon wafers. In the early days of chips, different types of camera lenses were used and certain parts of the process could be done by hand. Today, we are dealing with etching structures on silicon that are smaller than COVID-19 virus particles. Bombarding molten tin with high-powered lasers to create plasma that emits light of 13.5 nanometers in wavelength—when you read about it, it seems almost like magic, and yet this is the process behind the 4 and 5-nanometer technology in Apple's newest chips, for example. ASML is the only company that produces the machines that can run this process, and no semiconductor fabrication company is able to use them as well as Taiwan Semiconductor Manufacturing Co. (TSMC).
- Finally, you cannot talk about a book titled *Chip War* without talking about Taiwan. Professor Miller noted that roughly one-third of the world's computing power, per year, comes out of Taiwan. The world as we know it today, at least in technology, could not function in the same fashion if access to Taiwan disappeared quickly. Professor Miller also noted that even if these companies, like TSMC or Samsung, are building factories all over the world, it remains to be seen how much of the most advanced capabilities are taken outside of Taiwan or South Korea. These countries want to maintain importance and relevance, even if the world also now understands the benefit of more robust supply chains.

The full discussion is available below, or on any of the normal podcast distribution outlets. We'd also note that many different megatrends or just the fact that the world is creating more data every year—all of this depends on a strong foundation of semiconductor technology. Even if these companies have not seen strong share price performance recently, the need for these building blocks is always there.

The [WisdomTree Artificial Intelligence and Innovation Fund \(WTAI\)](#) has a specific semiconductor exposure focused on those firms that see their chips heavily used within artificial intelligence.

Christopher Gannatti is an employee of WisdomTree UK Limited, a European subsidiary of WisdomTree Asset Management, Inc.'s parent company, WisdomTree Investments, Inc.

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