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A deep dive into the global chip shortage

A roundtable discussion

Roundtable participants:

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The global microchip shortage has become headline news, as repercussions have spread from core technology products to other chip-heavy consumer goods — from autos to appliances and beyond. But while the unique circumstances of the pandemic brought the supply/demand dynamics of the chip industry to the brink, it can be argued that the path to the crisis started decades ago. And as the pandemic hit, an unlikely but powerful set of factors combined to create an unprecedented shortage of one of the basic building blocks of our increasingly digital society.

Columbia Threadneedle analysts and investment leaders with a long history of researching and investing in technology came together to discuss the story behind the semiconductor shortage, how it happened and what we can expect next.

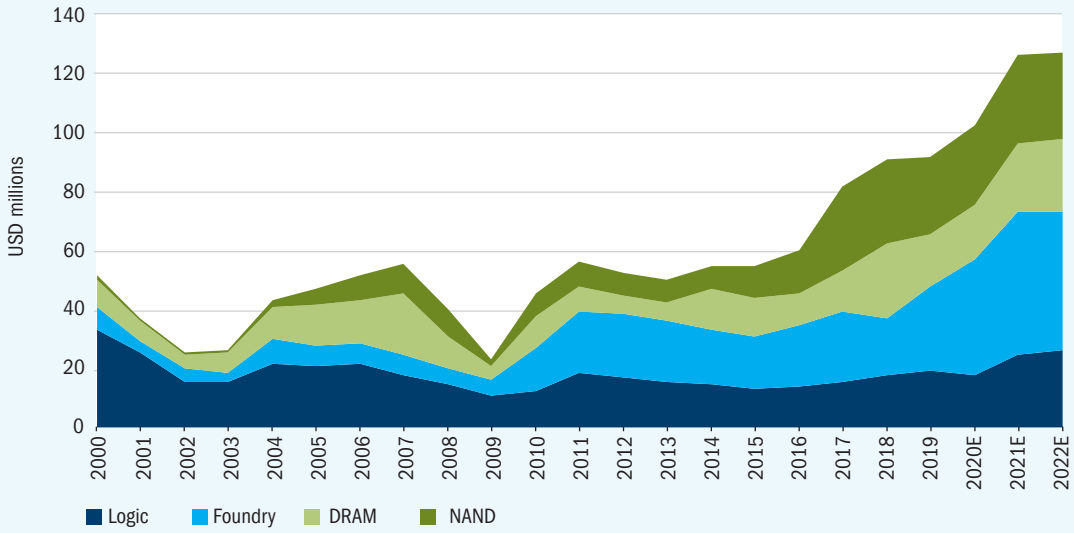
Question: It's been said that the chip shortage was a long time coming. What were some of the trends in supply and demand leading up to the current situation?

Paul Wick: The dynamics we're seeing play out today have been building for a while. Digital semiconductor companies used to have their own production facilities. In the 1990s that started to change as the industry increasingly moved to outsourcing manufacturing to fabricators in Asia, mostly in Taiwan. So, instead of 40 large chip companies with their own facilities running at 70% or 80% utilization, you have a handful of dedicated fabricators that tend to run their factories at 90% plus utilization, which is much more efficient. As a consequence, there's a lot less slack in semiconductor capacity.

Sanjay Devgan: The way semiconductor companies hold inventory has also changed. Before the tech bubble in 2000, most original equipment manufacturers (OEMs) carried chip inventory on their balance sheets. One of the most infamous inventory write-downs in history was a $2.7 billion write-down by one of the big OEMs when the bubble burst. They no longer wanted to take that risk. So, over the last 20 years inventory on the balance sheets — and in the warehouses — of the OEMs has come down and the inventory on the balance sheets of semi suppliers has gone up.

David Egan: Concurrently, we've been witnessing a dramatic growth in tech intensity. Personal computers in the 1990s. Phones and then smartphones in the 2000s. And the soon-to-be gigantic companies that were building businesses around mobile internet — the Amazons and the Googles. At the same time, businesses in many industries were undergoing digital transformations. All of this added up to a steady increase in demand for semiconductors.

A chip shortage persists even as capex for semiconductors have more than doubled industry wide



Source: Gartner, company data and J.P. Morgan estimates. As of April 30, 2021.

Question: How did the COVID-19 pandemic impact the current shortage?

Sanjay Devgan: Let's step back a few years. While 2019 was a great year for chip stocks, it was actually a poor year from a supply/demand perspective, because we were in the midst of a massive purge. Companies were drawing down inventories across the supply chain. When we came into 2020, inventories were already lean. Against this, COVID hits, and it causes a massive disruption.

Rahul Narang: There was a basic miscalculation of how COVID-19 was going to impact the world economies. Most assumed companies would cut back production as times were getting difficult, but demand proved to be quite resilient — even growing for some categories. People were stuck at home and buying and using more technology, whether it was new or additional PCs, bigger displays, 4K TVs, game consoles, remote meetings, etc. A sort of perfect storm formed that combined the demand miscalculation with lean inventories and a surprising consumer appetite for products full of microchips.

Charles Mann: Automakers in particular were hard hit, as they were unable to reinstate canceled chip orders when they realized consumers looking for safe transportation in the pandemic wanted more cars, not fewer. As cars have gotten more complex, data-driven and automated, the auto industry has become one of the major consumers of microchips. Chips have begun to take on and evolve into a new role in the automotive supply chain, becoming central to it – not only because of the "smart" content, but also the data sharing capabilities. In some cases, they've become so central that the lack of one specific, unremarkable chip can bring production to a virtual standstill.

David Egan: On the supply side, COVID restrictions on factory workers and international trade slowed production and delivery. On top of the pandemic disruptions, there was a fire in a major substrate facility (a key part of the chip packaging) in Asia. This affects things like gaming processors and networking equipment. We've seen reports that this has pushed product back from some companies for more than a year. And in February, the polar vortex in Texas shut down a number of big facilities, creating even more chinks in the semiconductor supply chain.

Question: How will this situation be resolved? What is the path forward for the industry in the next couple of years?

Rahul Narang: It's important to remember that some powerful longer term trends were also a factor in the resilience of demand during this crisis. The move to 5G, digital payments, digital enterprise transformation, cloud computing, cybersecurity, AI, autonomous driving, electric vehicles, battery technology and more. These are all things we're watching closely, and when we step back and look at these themes, we feel that this pandemic has kind of hit what I'd call a giant fast forward button to the future for many of them.

Paul Wick: Combined with intense near-term demand, these longer term trends bode well for the semiconductor industry. There's a lot of demand and it's pushing on a supply that's harder to add to. But we are going to see more spending on new manufacturing capacity. The largest foundry in the world announced that they are going to spend $30 billion this year on new facilities. That's around a 77% increase over last year, which is exceptional. And they've also said they're going to spend up to $100 billion over the next three years after this to expand capacity even further. This spending, combined with national security mandates from the U.S. and other countries to build new onshore fabrication capacity, could create a more diverse and resilient global supply of chips.

Sanjay Devgan: From an investment standpoint, visibility for the semiconductor industry is probably at an all time high. Historically with semis, when you place an order, the order is only good for that quarter. And then you have to build the backlog for the next quarter. One major firm is leading a change in that paradigm, offering what they call a "preferred supplier program." If you give them one year's worth of non-cancelable orders, then they will move you to the front of the supply queue. Basically, this gives the company revenue visibility out for a year. And we're seeing this type of thing happening across the entire industry. We're also seeing that pricing from the foundries is going up, as well as materials prices, and the semi companies are able to pass that onto their customers on a cost-plus basis.

The bottom line is that from the current vantage point, industry analysts and semiconductor companies are predicting chip shortages until the end of the year, and in some situations, into 2022. Despite this setback, we see the key demand drivers for technology continuing relatively unabated — some even accelerated by the realities and lessons of the pandemic.

As the pandemic economy fades, we expect to see a slow, and hopefully orderly, shakeout of the chip shortage over the next 9-to-12 months. Over that time, our team sees strong fundamentals, and opportunities for value in the semiconductor sector, including equipment suppliers, OEMS and manufacturers, against continued broad and strong demand. Compelling growth trends in advancing and emerging technologies also have the potential to provide support for expanded capacity and chip supply over the longer term.

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