

Digital Economy

The Divine Trinity in the Chip Industry

El Economista (Mexico)

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August 1st, 2024

The US-based company NVIDIA was originally known as a manufacturer of graphics chips or Graphics Processing Units (GPUs). GPUs are a particular type of chip that performs a limited set of instructions at high speed and in high volume, ideal for iterative and repetitive functions such as the graphical or visual part of a computer. For the average user, it can be said that more than 90% of the processing power of a computer, laptop or cell phone is consumed by the graphical user interface (videos, streaming, video games, etc.).

The boom in the cryptocurrency market brought broad benefits to NVIDIA. The great relative advantage of GPUs in performing iterative and repetitive calculations was ideal for mining Bitcoins and other crypto assets. With the increase in the prices of these virtual assets, the demand for GPUs grew rapidly.

But destiny still had the best in store for NVIDIA: an insatiable demand for GPUs to feed the growing Artificial Intelligence industry. In less than five years, its shares increased by more than 2,000%. Today, it has a market capitalization of nearly \$3 trillion, placing it as the third most valuable company in the world, behind only Apple and Microsoft. But NVIDIA is only the architect and does not produce the chips.

Taiwan Semiconductor Manufacturing Company (TSMC) is the company that makes NVIDIA's most powerful chips (and Apple's M3 chips) and is the world's leading manufacturer of all types of chips. From the beginning, it realized the importance of chips for modern life, but it could not compete with the big, established brands. Thus, it decided to opt for a business model consisting of subleasing its facilities to small and large chip companies. Over the decades, this maquiladora company has managed to accumulate installed capacity and technology far superior to other chip producers. Taiwan has a very important geopolitical position that strains relations between the United States and China, not only as a political counterweight in the region, but because of its importance in the world production of semiconductors. But TSMC does not manufacture the most advanced machines to print chips, it buys them.

Little known, Netherlands-based Advanced Semiconductor Materials Lithography (ASML) is one of the world's leading manufacturers of photolithography machines and is currently the only one with extreme ultraviolet (EUV) technology used to manufacture chips for the AI market, as it allows for smaller patterns to be made on silicon wafers. Each EUV machine costs between \$150 million and \$300 million and is the size of a trailer.

Today, NVIDIA, TSMC, and ASML are the divine trinity of the chip industry. In the trade war between the United States and China for global economic supremacy, the technological battle over chips is probably the most hotly contested front. Those who control the most powerful, smallest, and most value-added chips will have economic, political, and military hegemony in the 21st century. The United States has imposed regulations and exerted political pressure to prevent China from acquiring cutting-edge products from these three companies; however, it is probably only a matter of time before the Asian dragon matches or surpasses this technology. Who will win the chip battle?

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