

India's quest to take the lead in Global Semiconductor Manufacturing

The US-China tech war is heating up with Japan all set to join hands with the US to stop the supply of essential semiconductor technology and resources to China



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Some call it the 'brain' of modern electronics, while others call it the 'heart.' Regardless of the description, semiconductor chips play a critical

part in making life easier, stimulating digital disruption, and advancing economy. For something that the entire world relies on, the semiconductor manufacturing ecosystem is surprisingly constrained, with only a few countries capable of designing or manufacturing them across the world.

To achieve economic efficiency, companies across the semiconductor value chain use a variety of processes and technologies such as design, fabrication, and assembly. However, most companies have not been able to gain 100% autonomy in having an end-to-end setup in the same geography which has led to shortage concerns during the recent lockdowns due to the pandemic. Scarcity of chips can cause production to suffer in almost every industry, underlining the necessity to diversify chip supply. As the demand for chips grows, semiconductor manufacturers have decided to expand their production facilities. Furthermore, governments all around the world have been working on strategies to develop domestic chip production capability.

Asia Pacific is known as the world's biggest market for semiconductors, with China, Japan, South Korea and Taiwan spearheading the global market. However, each country has different strengths and still rely on each other since the semiconductor value chain is long and involves many specialized fields: IP Design, IC Design, SoC

development, system design, Equipment, Electronic Design Automation software (EDA), Intellectual Property core (IP), Integrated Device Manufacturer (IDM and fables), foundry and Outsourced Semiconductor Assembly & Test (OSAT).

Lessons that India could learn from other countries chipping in China

The biggest strength of China is that it can scale any technology at a speed that no other economy can match up to. China also has a large share of the global market in OSAT and is now expanding on integrated circuit (IC)



design. This is majorly due to the low labour and manufacturing costs and the progressive initiatives by the government. Indian government is very much on the same path and has recently launched similar initiatives to boost the semiconductor industry. Semiconductor devices with longer investment durations with ample time and money spent on R&D and design have a smaller market share in China and India could learn from this misstep to become an R&D-driven technology leader in years to come.

Taiwan

Taiwan has developed an atmosphere in which the semiconductor industry could thrive and earn an international reputation, thanks to public policies such as subsidies, tax breaks, and public infrastructures such as the creation of major research and industrial parks. Over the years, Taiwan has become very competitive in chip manufacturing and IC design and has the world's biggest foundry and most advanced semiconductor manufacturing process technology.

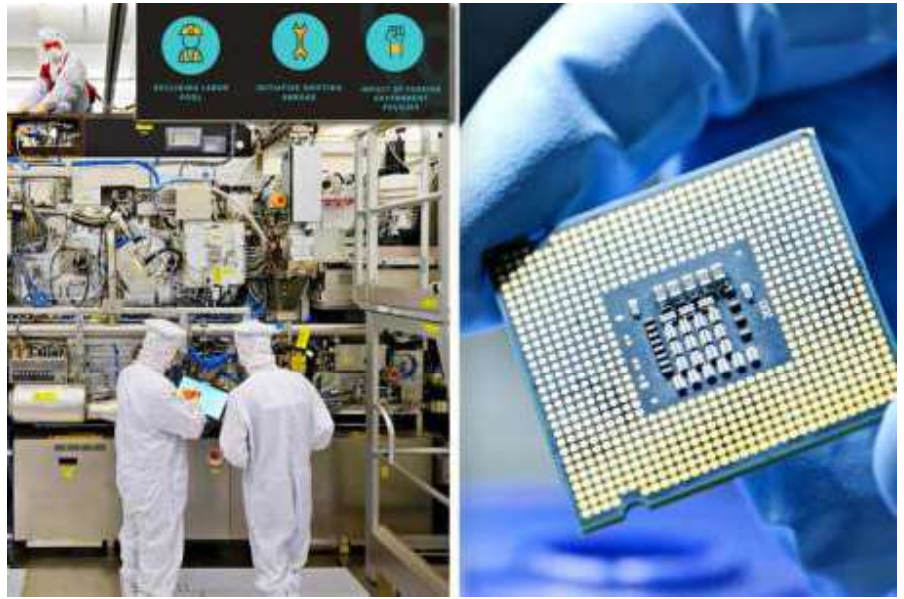
While the country's semiconductor industry can still suppress continue to grow, India can suppress Taiwan by creating a similar cluster of the right policies, subsidies, and infrastructure that they have created in a small geographical area for the growth of the semiconductor industry.

South Korea

South Korea has become the second largest semiconductor manufacturer in the world after US. The key competitive advantage of the South Korean semiconductor industry is in the production of memory semiconductors, which it achieves by utilizing its low-cost workforce in the labour-intensive process of semiconductor manufacturing. Just like South Korea, India too can create a massive industrial chain with every semiconductor factory being surrounded by a variety of supporting enterprises of layers of outsourcing and subcontracting.

Japan

Among most of the devices are produced in China, Taiwan, and South Korea, putting Japan in the fourth spot. Japan's strengths in semiconductors have always been in raw materials that have high requirements for purity, equipment, and small active-passive components. While Japan has been lagging, they have recently announced the



revival of the Japanese semiconductor sector as a national priority. Their existing semiconductor foundries will be upgraded to support the production of cutting-edge equipment such as processors and 5G networks. India too has similar favourable conditions for the raw materials required, and with the recent government push, the semiconductor industry in India can achieve similar heights.

How is India stepping up the ladder?

India, like other countries across the world, imports 100% of its chips from Taiwan, Singapore, Hong Kong, Thailand, and Vietnam. The Indian Government has started to make efforts to attract foreign companies to set up semiconductor manufacturing units in India. As part of the 'Make in India' initiative, India is also finalizing plans to mass-produce semiconductor chips. Recently the government unveiled a Rs 76,000-crore package for the development of India's semiconductor and display manufacturing ecosystem, including Rs 2.3 lakh crore in incentives to position India as a global hub for electronics manufacturing, with semiconductors serving as the foundational building block.

Developing domestic semiconductor manufacturing capabilities will have a multiplier effect across different sectors of the economy and will contribute significantly to achieving a USD 1 trillion digital economy and a USD 5

trillion GDP by 2025. The initiative will not only boost semiconductor manufacturing but will also help India achieve self-sufficiency, improve data security, and gain digital independence. The bottom line is that it is evident that India has the ability to design & manufacture its own semiconductors and establish an end-to-end supply chain within the country itself. India already has the right atmosphere, which followed by strategic implementation of resources and government support, might be a game changer for the country.

India could have a large role to play in the semiconductor industry, as the world's fifth-largest economy looks to boost its domestic chip sector.

Along with other countries like the U.S., India has been looking to forge strategic alliances around semiconductors, a critical technology that goes into many of the devices we use from smartphones to refrigerators.

“I think India has a crucial role to play, India can also set goal to have its' own Foundry to produce Single Crystal Silicon wafers as India has huge reserves available in mines.”

India tries to woo giants

The issue for many countries looking to boost their capacity to build ecosystem of Chip making is that the

companies and countries that dominate the industry are few and far between. For example, Taiwan and

South Korea make up about 80% of the global foundry market. Foundries are facilities that manufacture chips that other companies design. India has typically not been in the mix of the top countries for semiconductors. So, there aren't many giant Indian chip firms and certainly no leading-edge manufacturing companies.

While India might not have native semiconductor firms, it's plan under the government of Prime Minister Narendra Modi relies on trying to attract foreign giants.

Indian strengths

The large amount of capital required, the time it takes to set up factories and uncertainty over the business, tax and trade environment has often put companies off setting up in India.

“Previous attempts in India failed because of apprehensions on these counts,”

However, there are signs that things are changing.

“The track record has been not great but the new government has been heading in the right direction ...

[with] policies to drive impetus and attract leading semi and fab companies,”

That well-educated and cheap labour force could help India in a specific area of the semiconductor supply chain — chip design — an area that requires a large number of skilled workers, India can look forward to become the global leader in Semiconductor by next decade. ■

