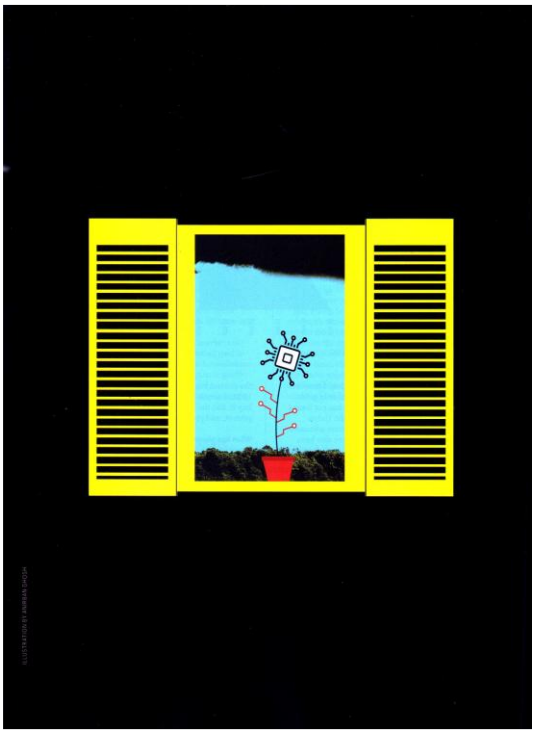
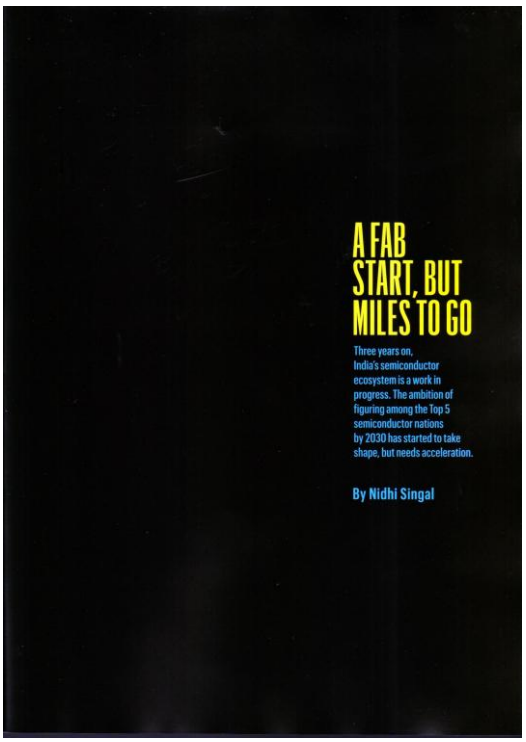
Quote By Devroop Dhar, India CEO & Co-founder, Primus Partners

Published in Fortune India
May 09, 2025

A Fab Start, But Miles To Go





IN

IN 1972, just four years after it was founded, U.S.-headquartered Intel made a defining move. The company selected Penang, Malaysia, to set up its first offshore manufacturing facility—a modest plant to package and assemble semiconductor components. By 1975, this plant was a key link in Intel's global manufacturing chain. Intel's Penang gambit was a response to Malaysia's Free Trade Zone Act of 1971, which sought to turn Penang into an export-oriented industrial zone by offering tax holidays, tariff exemptions, streamlined regulatory processes, and with sites well linked to highways, railway systems, seaports, and an airport.

Soon after Intel, giants such as AMD (which was born a year after Intel), Hitachi, and HP entered Malaysia. By the early 1980s, 14 semiconductor firms were operating in Malaysia. In just over five decades, Malaysia's early bet on electronics has made it a part of the global semiconductor value chain. Today, it hosts nine front-end fabrication units or fabs and 38 back-end facilities, including advanced packaging and testing units. It plays a vital role in global supply as companies diversify beyond China and Taiwan.

Contrast this with India, which launched its semiconductor push in December 2021 with the India Semiconductor Mission (ISM). While India had set up Semiconductor Complex Ltd in 1983, before Taiwan or China had any fabs, and Indian talent contributed to the chip design industry, SCL was destroyed in a fire in 1989. It was rebuilt in 1998, but India lost the plot.

Till the 2021 policy, India did not have a good road map for the industry. It aims to become one of the Top 5 global semiconductor ecosystems by 2030. "India will be among the Top 5 countries for semiconductor manufacturing within the next five years," Union Minister for Electronics & Information Technology (MeitY) Ashwini Vaishnaw had said.

India is trying to do in a decade what took Malaysia 55 years to create. Can it succeed? The 2021 semiconductor policy, Semicon1.0, offered ₹76,000 crore in incentives, support for setting up fabs, and chip-testing and packaging plants, together with a design ecosystem. The stakes are high, but so is the momentum. Micron Technology is building a back-end facility in Gujarat, Tata Electronics is pursuing a fab and a Semiconductor Assembly and Test unit, and other firms are getting into chip design and ATMs or assembly, testing, and marking units.

Danish Faruqui, CEO of Fab Economics, says India is now walking the talk. "The 2025 Budget allocation for subsidies for greenfield chip manufacturing and packaging projects, $1 billion, matches Germany's Budget allocation for semiconductor subsidies in 2025," says Faruqui. Fab Economics is a U.S.-based consultancy for fabs and OSAT facilities, and also offers advisory services for semiconductor investments. OSAT or Outsourced Semiconductor Assembly and Test companies provide specialised services for packaging, assembling, and testing semiconductor devices, primarily for manufacturers who design and fabricate chips but outsource the post-fabrication steps.

In the high-volume manufacturing phase, India's

PROCESSOR POWER

$627 BILLION
SIZE OF THE GLOBAL SEMICONDUCTOR MARKET IN 2024

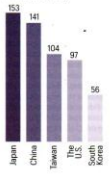
$1 TRILLION
EXPECTED MARKET SIZE BY 2030

$52 BILLION
SIZE OF THE SEMICONDUCTOR MARKET IN INDIA IN 2024

$103.4 BILLION
EXPECTED SIZE OF INDIA'S SEMICONDUCTOR MARKET BY 2030

THE WORLD OF SEMICONDUCTOR MANUFACTURING

COUNTRIES WITH MOST SEMICONDUCTOR FABRICATION FACILITIES (FAB)



NOTE: Fabs across 150mm, 200mm and 300mm wafer sizes and all technology generations are included.
Countries with the highest number of fabs does not co-relate to countries with highest share of semiconductor capacity.

COUNTRIES WITH THE MOST SEMICONDUCTOR ASSEMBLY AND PACKAGING FACILITIES

NOTE: IDM & OSAT counted
Existing, greenfield, brownfield and ground broken packing and assembly facilities and projects.

SOURCE: FAB ECONOMICS R&A DATABASE

five OSATs (including the four approved) will produce 100 million+ products a day. Their total cleanrooms, of 4.4 million+ sq. ft, will exceed the total OSAT cleanroom capacity of 3.4 million sq. ft that ASE, the No. 1 player in the segment, has across its five OSAT sites in Penang, Malaysia, according to Fab Economics.

While India has made an encouraging start in its semiconductor journey, it faces a hard climb if it wants to join the ranks of the world's Top 5 chip-producing nations within the next five years. But it can become a preferred hub—if it can plug the critical gaps, and learn from countries that have mastered semiconductor manufacturing over the past six decades.

Waiting for anchors

While Semicon 1.0 can be considered a promising start, the reality is that only one globally established chipmaker, U.S.-based Micron Technology, has applied under the scheme so far. The other projects cleared are mostly Indian conglomerates venturing into semiconductors for the first time.

Bharat Kapoor, partner and global lead of Kearney's PERLab or Product Excellence and Renewal Lab, says, "When India realised the importance of semiconductors, so did many other countries. The challenge was that some economies were already far ahead in this game—Taiwan, Korea, the U.S., China, Japan, Germany, and others. Firms built there because of market opportunities and a strong ecosystem. Also, the semiconductor ecosystem in India is not as well developed."

This underscores a broader challenge. To scale up, India needs an "anchor tenant"—a seasoned global player such as Intel, Samsung, Taiwan Semiconductor Manufacturing Company (TSMC), GlobalFoundries, or Infineon. Such anchors bring a network of supporting suppliers, equipment vendors, material providers, and talent pools, speeding up ecosystem development.

Jochen Hanebeck, CEO of Germany-based Infineon,

semiconductor fabs requires billions of dollars in investment, making it a substantial financial commitment. Investors must be assured of the long-term viability of projects so they can proceed confidently."

The broader trade environment has also become volatile. After the U.S. announced tariffs on all imports, China responded with tariffs on imports of all semiconductor products, if they have been fabricated in the U.S. The Trump administration is also preparing a new round of semiconductor-specific tariffs. This uncertainty adds pressure on global companies evaluating new geographies for expansion.

Devroop Dhar, co-founder and MD at Primus Partners, says the U.S. retaliatory tariffs (though put on hold as of now) on certain Indian exports under a WTO waiver mechanism have raised concerns over bilateral trade. "Though semiconductor products are not directly targeted (at the moment), companies are cautious about what lies ahead," says Dhar.

But the geopolitical friction also creates a potential opening for India. As the proposed U.S. tariffs on semiconductors from China are expected to be higher, India could emerge as a viable alternative to the U.S.

Talent remains a key factor that semiconductor CEOs consider before selecting a site. While India has nearly 20% of the global semiconductor design workforce, it lacks manufacturing and packaging talent. The Indian government has taken a strategic approach by studying the ecosystem and consulting key stakeholders before launching its programme.

The ISM set a goal to train 85,000 high-skilled engineers over the next five years. Yet, many global IDMs, foundries, ATPs, and OSAT players still see the lack of manufacturing talent as a major hurdle, says Faruqui. He emphasises that India should aggressively develop semiconductor manufacturing talent and announce the plans to the world.

"WE HAVE PROVIDED THE MOST IMPORTANT, COMPLEX, AND ADVANCED EDA TOOLS IN 240 UNIVERSITIES."

ASHWINI VAISHNAW
Union Minister for Electronics & IT

Vaishnaw says, "We have provided the most important, complex, and advanced EDA tools in 240 universities," referring to electronic design automation. The Centre is trying to get industry leaders such as Vinod Dham, the U.S.-based entrepreneur known as the father of the Pentium chip, to give back to the colleges where they have studied. In April, Vaishnaw shared the dais with Dham, now a venture capitalist, at the launch of a centre of excellence for semiconductors and microelectronics at the Delhi Technological University.

INDIA LEADS THE WAY AMONG EMERGING COUNTRIES IN FRONT-END MANUFACTURING

Country	Total score	Ease of doing business and government support	Country infrastructure and innovation focus	People skills and availability	Proximity to materials	Capex incentives	Labour incentives	Taxes and duties incentives	Semi-specific incentives	OPEX cost
India	4.7	2.2	0.8	6.4	4.8	7.9	0.0	3.3	1.8	9.1
Thailand	3.6	3.6	1.0	5.3	4.8	3.8	10.0	2.2	0.0	7.9
Vietnam	3.3	3.8	0.2	2.1	8.9	3.8	0.0	3.6	0.0	8.9
Philippines	3.1	2.6	0.2	2.6	8.9	3.8	10.0	0.8	0.0	8.0
Czech Republic	2.8	7.0	4.0	4.5	0.9	1.6	3.8	1.5	0.0	5.8
Spain	2.7	4.9	4.7	1.4	0.9	1.6	3.8	2.2	2.4	3.7

SEMICONDUCTOR MANUFACTURING ATTRACTIVENESS INDEX SCORE (FRONT-END): SOURCE: KEARNEY RESEARCH

INDIA AND THE WORLD OF SEMICONDUCTOR MANUFACTURING

2021 — THE LAUNCH

DEC 15: Semicon India Programme launched with ₹76,000 crore outlay.

VISION: To develop an end-to-end semiconductor ecosystem—from design to fabrication and packaging.

2022 — FOUNDATIONS LAID

FEB: First fab and OSAT proposals submitted. Vedanta-Foxconn, ISMC [Tower Semi], IGSS Ventures.

APR: First Semicon India Conference hosted in Bengaluru; global fabs and design firms invited to explore India as a semiconductor destination.

SEPT: Programme revamped; focus sharpened to mature nodes [28nm], SiC/GaN tech, and packaging.

2023 — FIRST BREAKTHROUGH

JUNE: Micron's testing packing plant worth $2.75 billion approved in Sanand, Gujarat

2024 — PROJECTS APPROVED AND ACCELERATED

FEB: Cabinet approves three major projects:

Tata Electronics (Dholera, Gujarat)—₹91,000 crore silicon fab with Taiwan's PSMC.

Tata TSAT (Morigaon, Assam)—₹27,000 crore mega ATMP/OSAT plant.

CG Power (Sanand, Gujarat)—₹7,600 crore ATMP plant with Renesas and Stars Microelectronics.

SEPT: Kaynes Technology's ₹3,307 crore OSAT project approved. Semicon 1.0 closed.

SOURCE: FORTUNE INDIA

who was in India recently, said the country is rapidly emerging as a hub for semiconductor innovation. "We are proud to be at the heart of this development." However, the company is in wait-and-watch mode when it comes to manufacturing in India.

India is yet to attract an anchor. But it is trying. Ashok Chandak, president of SEMI IESA, a semiconductor and electronics industry body, says, "The first step was to get global semiconductor leaders excited about India—not just reading about developments from afar, but experiencing the momentum firsthand." The Semicon India 2024 conference played a pivotal role in this. Leadership teams of major chipmakers engaged with government officials and industry stakeholders. "The highlight was when 15 top global CEOs were hosted at the Prime Minister's residence, underscoring India's commitment to building a world-class semiconductor ecosystem," says Chandak.

Geopolitics, the spoiler

The lockdowns during Covid-19 disrupted supply chains everywhere, and the semiconductor supply chains are being reworked. Countries, including the U.S., are trying to de-risk their semiconductor dependencies by bringing chip manufacturing back home.

Kanishka Chauhan, senior principal analyst at Gartner, says 120 fabs were announced between 2019 and 2025, promising significant capacity expansion.

"However, given the global political and economic climate, new companies are hesitant to expand into unfamiliar countries," says Chauhan. "Establishing

"INDIA IS RAPIDLY EMERGING AS A HUB FOR SEMICONDUCTOR INNOVATION."

JOCHEN HANEBECK
CEO, Infineon

INDIA IN TOP 3 LUCRATIVE MARKETS FOR BACK-END MANUFACTURING

● Opex score ○ Business environment score
○ Capex score ● Total cost score ● Total weighted score

SEMICONDUCTOR MANUFACTURING ATTRACTIVENESS INDEX SCORE (BACK-END); SOURCE: KEARNEY RESEARCH

Seeding the ecosystem

Semiconductor manufacturing is one of the most complex industrial processes, involving hundreds of precise steps and highly specialised materials, equipment, and skills. Success hinges on ideally having all critical players—fabs, materials suppliers, equipment makers, and testing facilities—co-located in clusters to enable seamless coordination, reduce logistics delays, and ensure quality control. Taiwan's Hsinchu Science Park exemplifies this model: it is home to TSMC, United Microelectronics, and its offspring MediaTek, to name a few.

India, too, is following this approach with the ATMP units of Micron Technology, CG Power, and Kaynes Technology coming up in Sanand, Gujarat.

These clusters also need good infrastructure managed by utilities that mean business, not bureaucracy.

Raja Manickam, founder & CEO, iVP Semi, and former CEO of Tata Electronics' OSAT unit, says, "Fabs require a sophisticated ecosystem, including power, water, and treatment facilities, which, in India are managed by public sector agencies."

Laying the second layer

The global political uncertainty could weaken India's play for semiconductor dominance. With companies in wait-and-watch mode, India must act swiftly, launch Semicon 2.0, and make decisions quickly.

The government has stopped taking applications under Semicon 1.0, but several companies are waiting for approvals. Surat-based Suchi Semicon, which has constructed its OSAT facility and shipped its first packaged chips to a U.S. client for validation, is one such. Co-founder Shetal Mehta says, "If we get a 50% subsidy, things will move much faster. If not, a bit slower. So, either we will reach the target in three to five years, or probably a bit later."

Experts suggest Semicon 2.0 should focus on advanced packaging to attract global investments. "Technology licensing to Indian business houses like legacy OSAT projects is not an option in leading-edge advanced packaging technologies due to exclusivity and competitive advantage of AP," says Faruqui.

India should urgently introduce targeted schemes encouraging global and domestic ecosystem players to set up bases alongside fabs. Chandak of IESA suggests that when the Union government is giving 50% incentive for a particular semiconductor plant setup as capital expenditure, the incentives for the other ancillary stuff could be a part of the allocation, as giving separate incentives for the ancillary ecosystem will only drain the government's cash flow.

Also, fabs are only viable when operating at over 95% capacity. While India's fabs will initially rely on global orders, long-term success demands building indigenous technologies to keep them full.

This momentum can serve as the flywheel propelling India towards its goal of becoming one of the Top 5 semiconductor manufacturing nations. As Chauhan of Gartner says, "India doesn't need a strong foothold immediately; it needs to establish a presence with the first few fabs to overcome initial barriers."

Once that first wafer is sliced and polished, the ecosystem will follow. If India stays focussed, this dream may transform from silicon aspirations into solid-state reality.