



Electronics: Powering India's Participation in Global Value Chains

For Prelims: [NITI Aayog](#), [Electronics sector](#), [Economic growth](#), [Industrialization](#), [Production-Linked Incentive \(PLI\) scheme](#), [India Semiconductor Mission](#), [Global Value Chains \(GVCs\)](#), [R&D investment](#), [IoT devices](#), [Electric vehicles](#), [Industrial clusters](#), [Make in India](#)

For Mains: [India's Participation in Global Value Chains](#), [Investment Under PLI Schemes](#)

Why in News?

The [NITI Aayog](#) has released a comprehensive report titled "[Powering India's Participation in Global Value Chains \(GVCs\)](#)," with a focus on the [electronics sector](#).

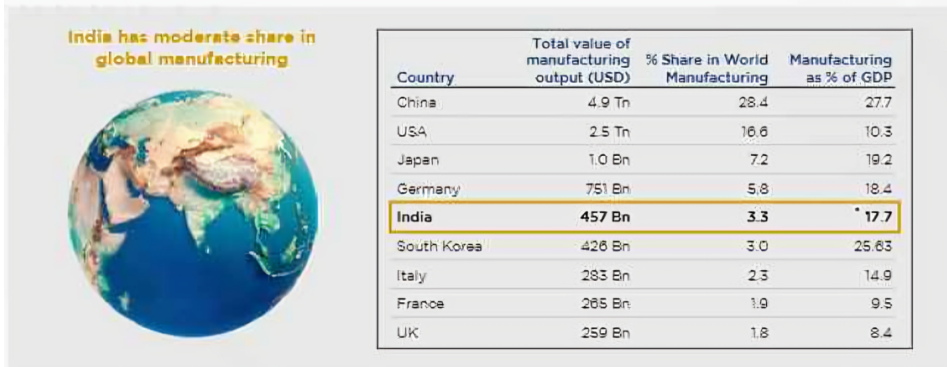
- This initiative comes at a crucial time as India seeks to bolster its share in the **global manufacturing landscape**, which currently stands at a modest **3.3% of global output**.

What are the Key Observations of the Report?

- **About:**
 - GVCs are international **production sharing**, where the full range of activities (i.e., design, production, marketing, distribution, and support to the final consumer, etc.) are **divided among multiple firms** and workers across geographic spaces, to bring a **product from conception to end-use** and beyond.
- **Role of GVCs:**
 - GVCs enable firms to integrate into global markets by **specializing in specific production tasks**.
 - Countries can participate in **parts of the production process**, not entire value chains, maximizing efficiency and specialization.
 - GVC participation **accelerates industrialization, economic growth**, and exports.
 - It fosters **job creation**, income generation, **knowledge transfer**, and ecosystem development.
 - **Example - iPhone:**
 - Components come from multiple countries (e.g., USA for design, China for rare earth minerals, Japan/Korea for LCD panels, Europe for gyroscopes).
 - Final assembly occurs in countries like India, China, and Vietnam.
- **Theoretical Evolution:** The concept of global value chains has evolved significantly over time, mirroring the changing landscape of international trade theory.
 - **David Ricardo's theory:** Specialization based on cost advantage benefits to trade.
 - **Heckscher-Ohlin theory:** Trade patterns depend on factor endowments like labor or capital.
 - **Paul Krugman's new trade theory:** Trade benefits arise from specialization, economies of scale, and industrial clusters.
- **Global Manufacturing Landscape:**
 - Globally, manufacturing grew 2.5 times in 24 years, reaching USD 1619 trillion in 2022.

- **China leads with 28.4% of global output**, followed by the USA (16.6%) and Japan (7.2%). India contributes USD 457 billion, **holding 3.3% of the global share**, trailing behind major players.

// Table 1: Global Manufacturing Landscape



▪ Significance of the Electronics Sector:

- **Economic Contribution:** The electronics sector significantly boosts India's **Gross Domestic Product (GDP)**, contributing between 13-17.7%.
- **Post-Covid Opportunities:** Supply chain shifts and **geopolitical factors** favor India as a manufacturing hub.
- **Rising Export Potential:** Growth in mobile phone exports strengthens India's global positioning.
- **Demographic Advantage:** A young, aspirational population increases demand for advanced electronics.
- **Innovation Driver:** The sector leads in **cutting-edge technology** influencing multiple industries.
- **Global Integration:** Strengthening ties in global value chains offers further growth potential.

▪ Global Value Chains (GVCs) in Electronics Sector:

- **Global Electronics Market:** Valued at USD 4.3 trillion, it spans diverse segments, from **smartphones** to electric vehicles.
- **Major Players:** Countries like China, Taiwan, the USA, South Korea, Vietnam, Japan, Mexico, and Malaysia dominate, controlling over **90% of global electronics production**.
 - **China leads** with 60% of global production.
 - **Emerging centers** include Vietnam, Malaysia, and **India**.
- **Trade Dynamics:** Global electronics trade is worth USD 3 trillion.
 - China accounts for 30% of exports, followed by Taiwan (9%) and the USA (7%).
 - India's share remains under 1%, with USD 25 billion in annual exports.
- **Finished Goods:** Valued at USD 2.4 trillion, it is expected to grow to USD 3.5 trillion by 2030, **driven by mobiles, auto electronics, and telecom electronics**.
- **Components Market:** Valued at USD 1.8 trillion, dominated by electronic components and modules.

India's participation in GVC is low, at <1% share share in ~\$3T electronics trade flow globally. Vietnam exports ~6X of India



India's could target to 5-6% of \$4T Electronics GVC (\$200-250Bn exports) by 2030

▪ **Outlook:**

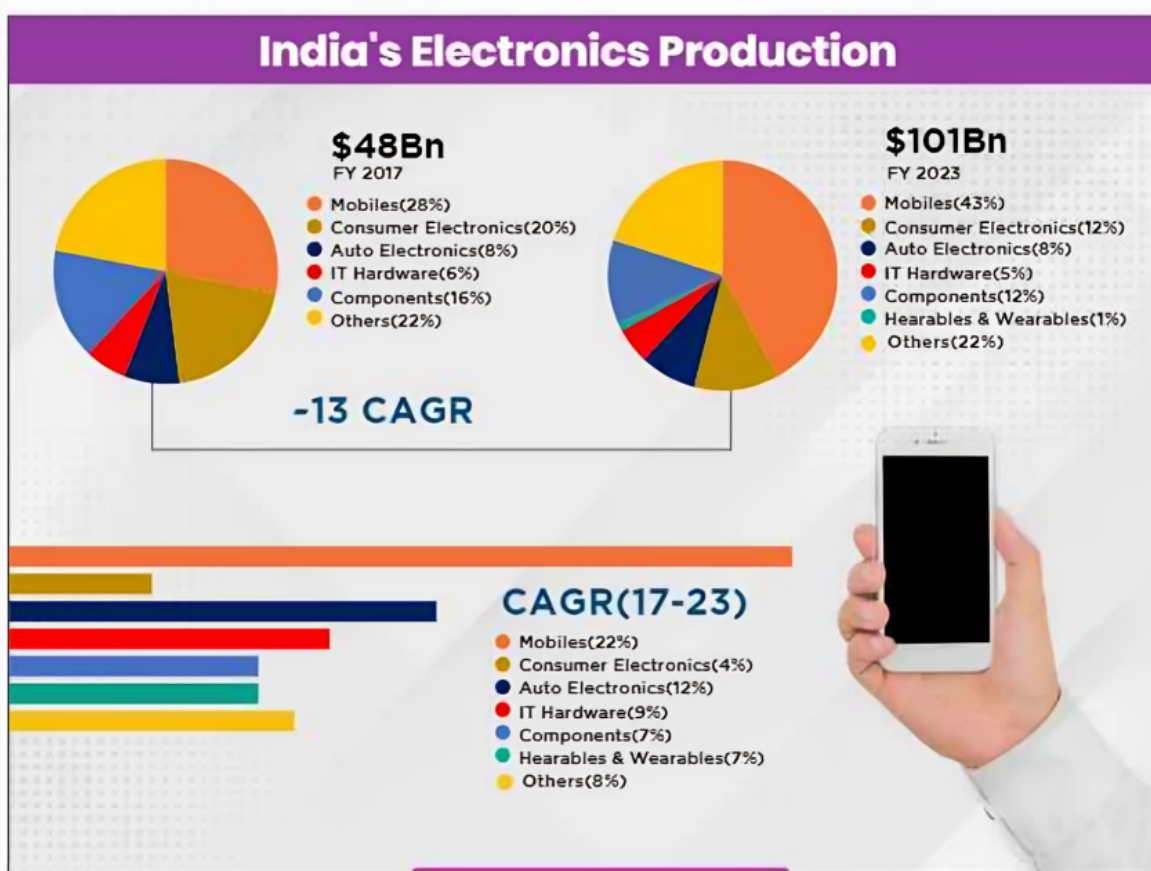
- **Market Growth:** The global electronics finished goods market is projected to grow at a 5% **Compound annual growth rate (CAGR)**, reaching USD 3.5 trillion by the Fiscal Year 2030, driven by **rising consumption, premiumization**, and new product categories.
- **Supply Chain Shift:** Geopolitical tensions, **Covid-19 disruptions**, and diminishing labor cost advantages in China are pushing producers to diversify supply chains to countries like Vietnam, Mexico, and Malaysia.
- **India's Potential:** Favorable **demographics**, government schemes, and growing domestic capabilities position India to benefit from this shift.
 - Strong competition from Vietnam, Mexico, and Malaysia makes it critical for India to act urgently to secure a **4-5% share in global electronics** exports by 2030.

What is the State of India's Electronics Manufacturing?

▪ **Growth of the Electronics Sector in India:**

- **Rapid Growth:** India's electronics sector grew at a **13% Compound annual growth rate (CAGR)**, with production doubling from USD 48 billion in FY17 to USD 101 billion in FY23, driven mainly by mobile phones (43% of production).
- **Mobile Manufacturing Milestone:** India transitioned from importing 80% of smartphones to producing 99% domestically.
- **Government Initiatives:** Policies, like [Make in India](#), [Production Linked Incentive Scheme \(PLI\)](#), and the [India Semiconductor Mission](#), have boosted domestic manufacturing and foreign investments, particularly in mobile and auto electronics.
- **Mixed Success:** While PLI for large-scale electronics has attracted significant investments, schemes for IT hardware and telecom are yet to achieve a similar impact.
- **Domestic Demand and Exports:** Electronics demand is growing at 15% CAGR, reaching USD 155 billion in FY23, but **India contributes only 4% of the global electronics market** and less than 1% to global value chains.
 - India's electronics production **focuses mainly on final assembly**, with limited progress in design and component manufacturing. To scale globally, India must pivot towards export-driven growth and strengthen its ecosystem.

Exhibit 6: India's Electronics Production



▪ **Manufacturing Landscape of India:**

- India's manufacturing spans diverse industries, with the [electronics sector](#) emerging as a standout.
- Valued at USD 155 billion, domestic electronics production doubled between 2017 and 2022, growing at a 13% CAGR due to rising demand, technological advances, and supportive policies.
- Electronics exports rose from the **9th to 6th position among India's top export sectors**, contributing USD 235 billion in FY23.
 - This growth highlights **India's global competitiveness**, boosting [foreign exchange](#) and solidifying its position in the international electronics market.

▪ **India's Presence across the Electronics Value Chain:**

- **Electronics Value Chain Overview:**

- **Design Players/ Original Design Manufacturers (ODMs):** Specialize in product design and prototypes.
- **Component Makers:** Includes Build-to-Print (Original Equipment Manufacturer (OEM) specs) and Build-to-Specification (co-create designs with ODMs).
- **Assemblers/ Electronics Manufacturing Services (EMS):** Contract manufacturers handling assembly, testing, and packaging.
- **Brand Owners (OEMs):** Focus on product innovation, marketing, and IP ownership.
- **India's Presence:**
 - Strong in assembling and OEMs (e.g., Foxconn, Dixon, Samsung).
 - Limited in component manufacturing, with most high-tech parts imported.
 - Minimal design capabilities across sectors.
- **Segment Insights:**
 - **Mobile Phones:** Strong in assembly and sub-assembly (batteries, chargers), but **high dependency on imports** for camera modules and displays. Minimal design presence.
 - **Consumer Electronics:** TVs, ACs, and refrigerators show moderate assembly localization but rely heavily on imported components like open cells.
 - **IT Hardware:** Over 80% import dependency for laptops and servers. Weak assembly and design capabilities.
 - **Telecom Products:** 40% imports from China for equipment; minimal local manufacturing and growing design initiatives.
 - **Automotive Electronics:** 65% import-dependent for sub-assemblies; low-tech components like wire harnesses produced locally. Limited electronic design capabilities.
 - **Wearables & Hearables:** Focused on assembly with **negligible design** and component manufacturing.

What are the Policy Initiatives in Electronics Sector?

- To achieve USD 500 billion in electronics production and USD 200-225 billion in exports, India must focus on USD 350 billion from finished goods and USD 150 billion from components, supported by incentives, [trade policies](#), [tax reforms](#), [infrastructure development](#), and a **strong R&D and technology ecosystem**.
- The policy initiatives and reforms have been broadly categorized into **two major heads:**
 - **Fiscal interventions** for components manufacturing, R&D, and industrial infrastructure; and
 - **Non-fiscal interventions** for overall electronics manufacturing.

Category	Intervention	Description
Fiscal Interventions	Fiscal Incentives	<ul style="list-style-type: none"> ▪ Opex support for low-complexity components ▪ Capex support for high-complexity components ▪ Hybrid support for high-complexity components
	Product/System Design Ecosystem	<ul style="list-style-type: none"> ▪ Innovation scheme for SMEs/R&D centers ▪ Scale-up scheme for 'designed in India' electronics
	Scale Up Industrial Infrastructure	<ul style="list-style-type: none"> ▪ Develop large-scale clusters ▪ Localized regulations and cluster governance ▪ Common facilities (waste treatment, utilities, connectivity) ▪ Duty-free imports

		(FTZs)
Non-Fiscal Interventions	Tariffs Simplification and Tax Rationalization	<ul style="list-style-type: none"> ▪ Worker's housing ▪ Rationalize tariffs/duties on inputs ▪ GST and income tax rationalization
	Soft Infrastructure/Skilling	<ul style="list-style-type: none"> ▪ Attract overseas talent ▪ Expedited visa approvals for training ▪ Foster academia-industry collaboration ▪ Industry-led skilling and training hubs
	Tech Transfer and EoDB	<ul style="list-style-type: none"> ▪ Simplify tech transfer and approvals ▪ Rationalize permits for on-ground operations ▪ Lower compliance costs and streamline regulations

What are the Challenges in Building India's Electronics Manufacturing Ecosystem?

- **Relatively high import tariffs:** India's **high and complex tariff structure**, with an average **Most Favored Nation (MFN)** tariff of 7.5% (compared to China's 4%, Malaysia's 3.5%, and Mexico's 2.7%), coupled with heavy reliance on imported components, **inflates costs** and undermines global competitiveness, especially in sub-assemblies and components.
- **Lack of Robust Electronics Component Ecosystem:** India's electronics component production grew at a slower CAGR of 7% (reaching USD 15 billion in FY23), dominated by **low-complexity components**, while high-complexity manufacturing remains undeveloped due to **high capex requirements**, unattractive incentives, and limited access to advanced technologies.
- **High cost of capital:** India's electronics manufacturing faces challenges due to **high financing costs (9-13%)** compared to 2-7% in countries like China and Vietnam, with **existing support schemes falling short** of industry needs.
- **Tech-Transfer Challenges:** Indian manufacturers face **critical technology** and skill gaps in **advanced electronics manufacturing**, compounded by delays in **joint ventures** and technology transfer due to **restrictive investment policies** and visa approvals, limiting access to expertise and innovations.
- **Inadequate Talent and Skilling:** India's electronics manufacturing sector faces **significant skill gaps at all levels**, driven by **outdated training programs**, insufficient practical exposure, and a lack of specialized institutes, resulting in **higher training costs**, low workforce readiness, and limited innovation capacity, which hinders industry growth and global competitiveness.

Way Forward

- **Production Scenarios @ 2030:** The **NITI Aayog report** highlights the three possible scenarios, out of which **Scenario 2 is the preferred Vision for 2030**.

Exhibit 12: Summary of production scenarios @ 2030

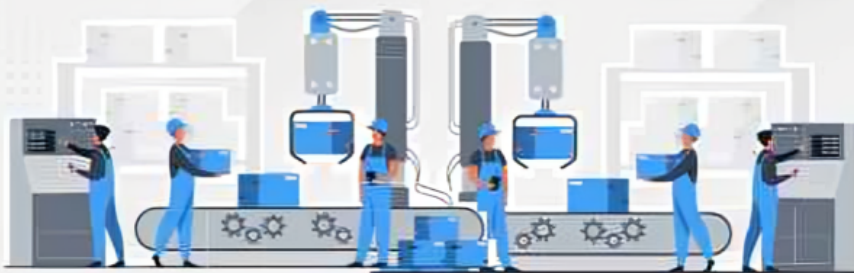
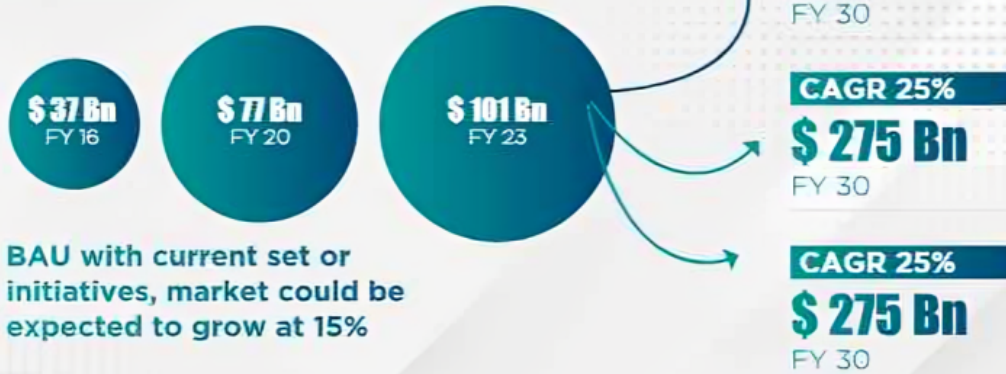


▪ **Vision @ 2030:**

- **Scenario 2** emphasizes **focused scaling of select segments** and components to **efficiently allocate resources**, optimize growth, and achieve targeted outcomes effectively.
- India's USD 500 billion electronics production target by 2030, with USD 350 billion from finished goods and USD 150 billion from components, aims to **boost Domestic Value Addition** to over 35%, secure 4-5% of global electronics exports, and **create 5.5-6 million jobs**, driving economic growth and stability.

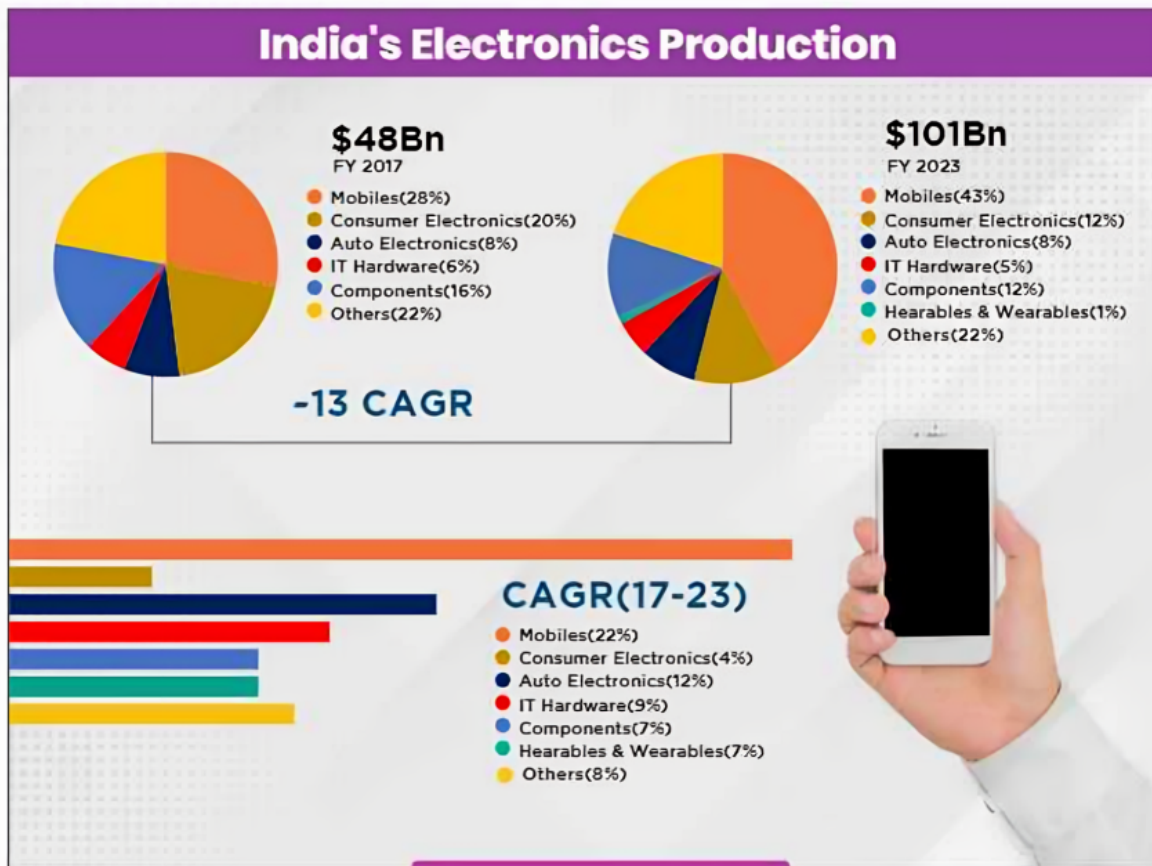
PRODUCTION AMBITION 2030

India's electronics production grew at -15.4% p.a. outpacing global production growth(-6.1%) by -9.4%



▪ Achieving USD 350 Billion Production in Finished Goods:

- **USD 500 Billion Electronics Production Target:** India aims for USD 350 billion from finished goods by focusing on **established segments**, diversifying into new products, and **moving up the value chain** with sub-assemblies like camera modules and displays.
- **Established Segments:** Scale up assembly operations in high-demand areas like **mobile devices and consumer electronics** for both domestic and global markets.
- **Emerging Products:** Venture into dynamic categories such as laptops, telecom hardware, wearables, and IoT devices to broaden the electronics portfolio.
- **Priority Segments:** Focus on mobiles, IT hardware, and **consumer electronics as mass-market drivers** with significant growth potential, leveraging existing infrastructure and favorable policies.
- **Auto Electronics Growth:** Capitalize on the rapid growth in auto electronics driven by Electronic Vehicles adoption and global demand for sustainable transportation.
- **5G and Advanced Electronics:** Leverage indigenous **5G capabilities** to scale production and exports, tapping into global demand for telecom and strategic electronics.



▪ Achieving the USD 150 billion in Component Production:

- **Value Chain Localization:** India must shift focus from **assembly to strengthening component manufacturing** to enhance global competitiveness and increase domestic value addition.
- **Targeted Component Growth:** Electronic component production is targeted to grow **from USD 15 billion to USD 150 billion by FY30**, contributing to exports, job creation, and domestic value addition.
- **Category A (High Capex, IP-Owned Components):** Semiconductors like **microprocessors** and power electronics, supported by the USD 10 billion **India Semiconductor Mission**, aim to contribute USD 20 billion by 2030.
- **Category B (Tech-Transfer Components):** Components like SMT-grade passives, battery cells, and sensors require technology access and moderate capex, targeting USD 55-60 billion in production by 2030.
- **Category C (Low Complexity, Scalable Components):** Easily scalable items like connectors, and wire harnesses are expected to contribute USD 70-75 billion, supported by domestic players scaling up.
- **Design Ecosystem Development:** Localized designs will enable the **sourcing of innovative components** and integrate India further into global value chains.