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MAKE IN INDIA: MANUFACTURING, INNOVATION AND GLOBAL SUPPLY CHAIN

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ABSTRACT

The Make in India, started in 2014, marks a substantial policy shift aimed at making India a worldwide manufacturing hub. Over the last decade, it has evolved from a promotional phrase to a comprehensive industrial strategy that influences foreign investment, manufacturing capability, technical innovation, and global trade integration.

Between 2014 and 2024, Make in India influenced manufacturing growth with a variety of sector-specific policies and investment incentives. The effort has boosted the adoption of emerging technologies such as automation and advanced manufacturing, albeit with mixed results across industries. Furthermore, Make in India has worked to integrate the country into global supply chains, using geopolitical shifts such as the "China+1" policy. This has created chances for India to strengthen its position in global industrial networks.

Although IT has made significant progress, issues remain. To fulfill the demands of modern manufacturing, regulatory processes must be streamlined, infrastructure improved, and labor skills enhanced. Addressing these issues will be critical to fully achieving the initiative's potential and establishing India as a competitive global manufacturing base.

KEYWORDS: Make in India, Manufacturing, Innovation, Global Supply Chain, PLI Scheme, Industry 4.0, Economic Policy, Foreign Direct Investment, Industrial Growth, China+1 Strategy

INTRODUCTION

The Make in India project, launched in 2014, sought to develop India into a worldwide manufacturing powerhouse. The policy targeted 25 core industries, aiming to increase manufacturing's contribution to GDP from slightly over 15% by resolving regulatory obstacles, modernizing infrastructure, and encouraging foreign investment. While ambitious, the path has been difficult, exacerbated by the COVID-19 pandemic and its disruptive impact on global supply chains. This essay looks at Make in India in terms of manufacturing performance, innovation, and technology adoption, as well as the importance of MSMEs. A complete examination of sectors growth, employment patterns, and productivity improvements is required to assess the initiative's impact.

Furthermore, evaluating expenditures in R&D, the incorporation of Industry 4.0 technologies, and the engagement of micro, small, and medium-sized businesses will disclose the extent to which Make in India has created a vibrant and technologically advanced manufacturing environment. This chapter examines Make in India through three interrelated lenses.

Manufacturing performance: an examination of sectors growth, job creation, and productivity trends.

Innovation and technology adoption: evaluating R&D spending, Industry 4.0 integration, and MSME engagement.

Global supply chain integration entails assessing trade performance, export diversification, and India's position in worldwide industrial networks.

The aim is not only to assess progress but also to situate Make in India within the broader narrative of India's economic transformation in the 21st century.

Policy Evolution Timeline

Year	Policy/Development	Key Impact
2014	Launch of *Make in India*; focus on 25 sectors	Global branding campaign, sector-specific investment roadmaps
2015	FDI reforms in defense, railways, construction	Increased FDI inflows, especially in rail and defense
2016	Digital India, Startup India synergy	Strengthened innovation and MSME participation
2017	GST rollout	Unified tax system, reduced logistics costs
2018	National Policy on Electronics 2019 draft	Focus on electronics manufacturing
2019	Corporate tax cut to 22% (15% for new manufacturing units)	Boosted investor confidence
2020	Production-Linked Incentive (PLI) scheme launch	Incentivized large-scale electronics, pharma, auto manufacturing
2021	Atmanirbhar Bharat emphasis	Self-reliance, domestic capacity building
2022	Semiconductor Mission announced	Entry into high-tech manufacturing
2023	Logistics Policy launch	Improved freight corridors and ports
2024	Expansion of PLI to green energy tech	Targeted solar, battery, and hydrogen industries

FDI Trends Under Make in India

From 2014 to 2024, India attracted record FDI inflows, especially in manufacturing-related sectors.

Year	FDI Inflows	Major Sectors
2014–15	45.1	Automobiles, IT hardware
2016–17	60.2	Electronics, textiles
2018–19	64.4	Defense, chemicals
2020–21	81.7	Electronics, pharma
2022–23	84.8	Semiconductors, EVs
2023–24	85.3	Renewable energy, advanced electronics

Table: FDI Inflows in Manufacturing-Related Sectors (US$ Billion)

Key Insight: While Make in India initially faced skepticism, policy continuity, tax reforms, and targeted incentives have helped India move from being a low-priority manufacturing destination to one of the top three in Asia for new investments by 2024.

1. MANUFACTURING SECTOR TRENDS (2014–2025)

1.1 GDP Contribution Over Time

When Make in India was launched in 2014, manufacturing contributed around 15.1% to India's GDP.By 2024–25, manufacturing's GDP share reached 17.8%, showing steady but incremental growth.

Year	Share of GDP (%)	Key Drivers
2014	15.1	Auto, textiles, basic metals
2016	16.0	GST preparation, FDI reforms
2018	16.4	Electronics, defense offsets
2020	16.1	COVID-19 slowdown
2022	17.2	PLI-driven electronics boom
2024	17.8	EVs, semiconductors, renewables

Table: Manufacturing Share in India's GDP

1.2 Sector-Specific Growth Patterns

Automobiles and EVs

- India emerged as the world's third-largest auto market by 2023.
- EV production rose from <0.5% of total vehicles in 2018 to 6.5% in 2024, driven by the PLI scheme for advanced battery manufacturing.

Electronics and Mobile Phones

- From near-zero mobile exports in 2014, India became the second-largest mobile phone manufacturer globally by 2023.
- Exports grew from US$ 300 million in 2014 to US$ 15 billion in 2024.

Defense Manufacturing

- Indigenous defense production crossed Rs.1 trillion in 2023–24, with India exporting to over 30 countries.

Textiles and Apparel

- Still a major employer, but global competition from Bangladesh and Vietnam has forced Indian producers to move toward higher value-added products.

Renewable Energy Equipment

- Solar panel and battery manufacturing capacity has doubled in three years, with major foreign and domestic investments.

1.3 Global Comparison

While China remains the manufacturing giant with over 28% of global manufacturing output, India is now competing more closely with Vietnam, which has aggressively captured electronics and apparel markets.

Country	Manufacturing Share of GDP	Key Strength
China	27.4%	Scale, infrastructure
Vietnam	24.1%	Low-cost exports, trade pacts
India	17.8%	Large domestic market, skilled labor

Table: Manufacturing Share in GDP – Comparative Snapshot (2024)

1.4 Employment Impact

Manufacturing jobs grew from around 60 million in 2014 to 74 million in 2024, with most new employment in electronics assembly, auto components, and renewable energy sectors.

Key Takeaways for This Period:

- The growth trend is upward but gradual.
- High-tech sectors are outpacing traditional manufacturing in both growth and export value.
- India's comparative advantage is shifting from low-cost labor to a mix of cost, scale, and skill.

2. INNOVATION AND R&D IN MAKE IN INDIA

2.1 Why innovation is the hinge

Manufacturing growth without innovation is just heavier machinery doing yesterday's work. What moved the needle after 2014 was the gradual shift from assembly-first mindsets to design, engineering, and process innovation. As domestic firms began supplying components to global value chains, tolerances tightened, certification standards rose, and process control went from optional to existential.

2.2 The Industry 4.0 toolkit

Across automotive, electronics, pharmaceuticals, and renewables, three technology arcs recur:

- **Digitization at the edge:** Low-cost sensors, machine-vision quality checks, and IoT gateways now stream production data in real time.
- **Data-driven decision-making:** Predictive maintenance models flag anomalies before breakdowns.
- **Automation where it earns its keep:** Robots and cobots handle repetitive, high-precision, or hazardous tasks.

2.3 R&D, patents, and the "last mile of capability"

India's R&D spend as a share of GDP remains modest, and that's a constraint. Yet, the composition of R&D is

maturing. Instead of only reverse-engineering or process tweaks, firms in EV components, electronics subassemblies, diagnostics, and formulation chemistry are investing in design for manufacturability (DfM), material science, embedded firmware, and packaging innovation. Patent filings have risen, but the metric that matters most to manufacturers is time-to-qualification with global customers: fewer iterations, faster certifications, greater repeatability.

2.4 Startups and the middle layer

The most under-appreciated driver is the startup–MSME mesh. Startups provide analytics, machine vision, and factory software; MSMEs bring domain specificity and cost discipline. When a small auto-ancillary firm adopts a local startup's vision system and cuts defects by half, it lifts an entire tier of the supply chain.

3. INTEGRATION INTO GLOBAL SUPPLY CHAINS

India's ambition under Make in India is not merely to replace imports with domestic goods, but to integrate deeply into the global manufacturing and trade ecosystem.

3.1 India's Shifting Export Composition

Over the past decade, India's export basket has evolved. Traditional strongholds like textiles, gems, and agricultural products have been complemented and in some cases overtaken by engineering goods, pharmaceuticals, chemicals, and electronics.

Electronics manufacturing, once negligible, has seen a compound annual growth rate (CAGR) of over 20% between 2018 and 2024, fueled by the Production-Linked Incentive (PLI) scheme for smartphones and semiconductors.

3.2 Supply Chain Realignment: The China+1 Strategy

Global companies seeking to diversify supply chains away from over-dependence on China have increasingly looked to India.

- **Electronics assembly:** Apple's contract manufacturers (Foxconn, Wistron, Pegatron) have expanded operations in Tamil Nadu and Karnataka.
- **Automotive components:** Bosch and Continental have scaled up India-based manufacturing for global EV platforms.
- **Pharmaceuticals:** India is already the world's largest provider of generic medicines, supplying over 50% of Africa's and 40% of the US's demand.

3.3 Logistics and Infrastructure Upgrades

To position itself as a global supply chain hub, India has accelerated investments in logistics corridors, ports, and digital trade facilitation.

In FY 2023–24, India's average container dwell time at major ports dropped to 2.5 days (from 4 days in 2017), bringing it closer to international benchmarks.

3.4 Regional and Bilateral Trade Agreements

India's participation in global supply chains has also been shaped by its evolving trade diplomacy. While India opted out of the Regional Comprehensive Economic Partnership (RCEP) in 2020, it has pursued targeted bilateral agreements with Australia (ECTA), UAE (CEPA), and is in advanced talks with the UK and EU.

3.5 Future Outlook

Between 2025 and 2030, India's role in global supply chains will depend on its ability to consistently deliver cost competitiveness, quality standards, and reliable logistics.India will need to focus on renewable energy use in factories, circular manufacturing processes, and verifiable ESG (Environmental, Social, and Governance) compliance.

4. CHALLENGES AND BOTTLENECKS

While Make in India has delivered notable gains, several structural, operational, and policy-related bottlenecks still hinder the initiative's full potential.

4.1 Infrastructure Gaps

Despite large-scale investments in transport corridors and logistics hubs, India's infrastructure still lags behind top manufacturing nations.

- **Transport bottlenecks:** Congested highways, incomplete expressway links, and inadequate last-mile connectivity in industrial clusters slow freight movement.
- **Port capacity:** While major ports like Mundra and Jawaharlal Nehru Port Trust (JNPT) have modernized, smaller ports still suffer from low mechanization and outdated equipment.
- **Power supply:** Although India has improved electricity availability, power outages remain an issue in rural and semi-urban manufacturing zones.

4.2 Regulatory Complexity and Compliance Burden

India's economic environment has gotten a lot better, as shown by the World Bank's Ease of Doing Business rankings, which went from 142nd in 2014 to 63rd in 2020. yet manufacturers still face:

- Overlapping central and state-level regulations
- Delays in environmental and land acquisition clearances
- High compliance costs for SMEs that lack in-house legal expertise

4.3 Skills Mismatch

The Make in India goal demands a workforce that knows how to use innovative manufacturing methods, automation, AI-driven quality control, and environmentally friendly methods.

- Only around 48% of India's workforce has received formal skill training (NSDC, 2024).
- The quality of vocational training varies widely, leading to mismatches between industry needs and available talent.
- A large share of micro and small enterprises still rely on manual processes, slowing adoption of Industry 4.0 technologies.

4.4 Access to Finance for MSMEs

Micro, Small, and Medium Enterprises (MSMEs) are the backbone of India's manufacturing supply networks, yet they confront chronic challenges to receiving inexpensive loans.

- Banks have strict collateral requirements.
- Government credit guarantee mechanisms are not widely known or used.
- Relying on informal finance, sometimes with higher interest rates.

4.5 Global Competition and Trade Barriers

Indian manufacturers face tremendous competition from countries like Vietnam, Thailand, and Indonesia,which offer:

- Lower labor costs
- Faster customs clearance
- Aggressive tax incentives for foreign investors In addition, protectionist measures by importing nations (like anti-dumping duties) can restrict market access for Indian exporters.

4.6 Sustainability Pressures

As global buyers increasingly demand low-carbon and ethically sourced products, Indian manufacturers face the dual challenge of:

- Adopting renewable energy in production without raising costs excessively
- Meeting international environmental certification standards

5. OPPORTUNITIES AND STRATEGIC RECOMMENDATIONS

Despite its challenges, Make in India sits at a strategic crossroads where policy reforms, technological adoption, and global supply chain shifts can catapult India into the next phase of industrial growth.

5.1 Leveraging Supply Chain Diversification Trends

The COVID-19 pandemic and recent geopolitical tensions have prompted multinational corporations (MNCs) to diversify manufacturing away from over-reliance on China.

- **Strengthening industrial clusters** near major ports and airports.
- Offering **fast-track clearances** for high-priority sectors like electronics, EV components, and pharmaceuticals.
- Deepening trade partnerships with ASEAN, Africa, and Latin America to secure stable export markets.

5.2 Green Manufacturing and ESG Leadership

Global demand is shifting toward environmentally responsible production. India can:

- Expand **Production-Linked Incentives (PLIs)** for solar panels, wind turbines, and green hydrogen technologies.
- Promote **low-carbon manufacturing parks** powered by renewable energy.
- Establish a **National Green Certification Framework** to help exporters meet ESG compliance faster.

5.3 Digital Transformation in Manufacturing

Adopting **Industry 4.0** tools such as AI-driven predictive maintenance, IoT-enabled supply chain monitoring, and blockchain for traceability can:

- Reduce waste and downtime.
- Improve product quality for global markets.
- Attract high-value foreign investments in advanced manufacturing.

5.4 Strengthening MSMEs as Global Suppliers

Given that MSMEs account for nearly 30% of India's GDP and 45% of exports:

- Establish digital marketplaces connecting MSMEs directly with overseas buyers.
- Expand skill upgradation programs in partnership with industry associations.
- Introduce cluster-based financing models to reduce credit risk for banks.

5.5 Infrastructure Prioritization

Focused infrastructure investment can yield outsized returns:

- Upgrade Tier-2 and Tier-3 city logistics to integrate them into export hubs.
- Accelerate Dedicated Freight Corridors (DFCs) for faster inland movement.
- Enhance cold chain and warehousing for high-value perishables like pharmaceuticals and processed foods.

5.6 Strategic Policy Recommendations

- **Policy Stability:** Ensure long-term predictability in tax and trade policies to attract sustained FDI.
- **Skill-Industry Alignment:** Launch a National Manufacturing Skills Council with direct corporate representation.
- **Unified Compliance Portal:** Merge state and central compliance systems into a single digital platform.
- **FDI + Domestic R&D Linkage:** Mandate technology transfer clauses in high-value FDI projects.

CONCLUSION

The Make in India initiative represents a transformative policy direction aimed at repositioning India as a global manufacturing hub. Over the past decade, it has sparked significant foreign direct investment inflows, improved the ease of doing business, and catalyzed industrial modernization in key sectors such as automobiles, electronics, defense, and renewable energy.

The convergence of three global trends supply chain diversification, climate-conscious manufacturing, and Industry 4.0 adoption presents India with a once-in-a-generation opportunity.

With coordinated efforts among government, industry, and academia, India can not only meet domestic manufacturing needs but also emerge as a trusted supplier in global value chains.

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