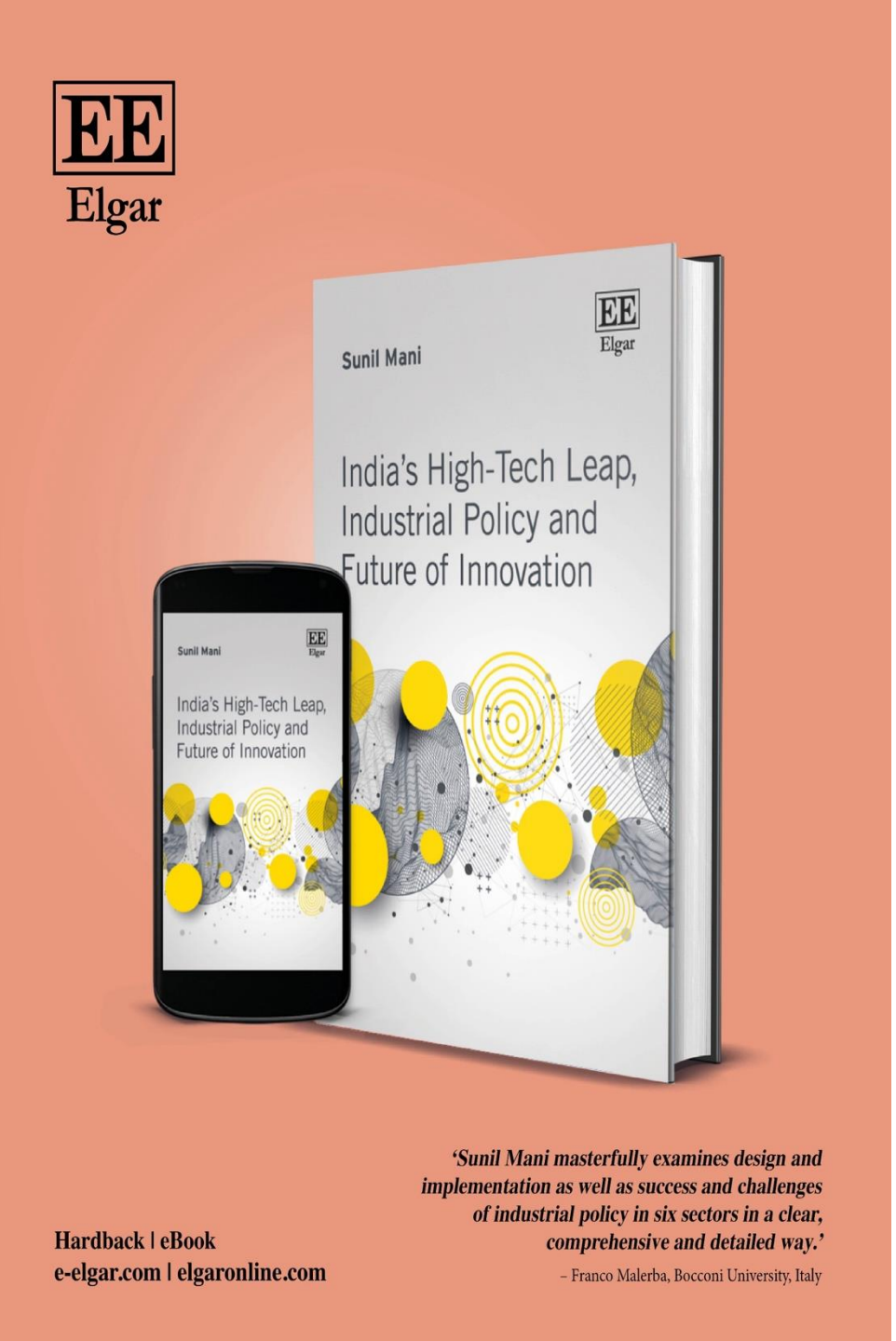

India's High Tech Leap, Industrial Policy and the Future of Innovation

Dr Sunil Mani

Visting Professor, Centre for Development Studies, Trivandrum and Ahmedabad University, International Economics and Development Laboratory, Department of Economics, University of Athens

Outline

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2. **The Renewed Debate on Industrial Policy:** Why This Book Matters Now
3. **India's High-Tech Landscape:** An Overview
4. **Case Study Snapshots:** Learning from Six Industries
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    2. COVID-19 Vaccines (A Tale of Two Policies)
    3. Wind Turbines & Solar PV (The Green Energy Transition)
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5. **Key Findings & Lessons Learned**
    1. For India
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Introduction: The Book's Core Argument

- **Central Question:** What role does **public policy** play in the growth (or lack thereof) of high-tech industries in a major emerging economy like India?
- **Core Thesis:** A "one-size-fits-all" approach to industrial policy is ineffective.
- **The Argument:** Sustained growth requires **tailored, sector-specific strategies** (vertical policies) that address the unique technological, institutional, and market conditions of each industry, supported by a strong enabling environment (horizontal policies).
- **Methodology:** In-depth empirical case studies of six key sectors.

Book Structure at a Glance

The book is organised into seven chapters, moving from the general to the specific:

- **Chapter 1:** Introduction: Sets the theoretical stage and introduces India's policy landscape.
- **Chapter 2:** Pharmaceutical Manufacturing & Computer Software Services.
- **Chapter 3:** R&D and Manufacturing of Vaccines for COVID-19.
- **Chapter 4:** Wind Turbine Manufacturing Industry.
- **Chapter 5:** Solar Photovoltaic Manufacturing Industry.
- **Chapter 6:** Electric Vehicle Manufacturing Industry.
- **Chapter 7:** Conclusion: Synthesizes findings and offers policy pathways.

Contribution to the Renewed Debate on Industrial Policy

- **Context:** The book enters the debate at a critical time, post-2008 financial crisis and post-COVID-19 pandemic.
- **Challenging Old Dogma:** It counters the "market efficiency" belief of the 1990s, arguing that **decisive state intervention is not just helpful, but necessary**.
    - *Market Failures:* Private firms under-invest in high-risk, high-reward R&D (Arrow, 1962).
    - *Historical Precedent:* Even "free-market" champions like the US (DARPA, CHIPS Act), Japan (MITI), South Korea, and China used strong industrial policies to build their high-tech sectors.
- **Key Insight:** The book provides empirical evidence from India, a leading democracy and emerging economy, showing **how** a modern state can strategically intervene.

Why Promote High-Tech Industries in India? (Chapter 1)

Reason	Impact
1. Leapfrogging	Skip resource-intensive stages and move directly to advanced, high-value sectors.
2. Global Competitiveness	Attract FDI, build cutting-edge capabilities (IT, Pharma, Semiconductors).
3. Job Creation	Create high-skilled jobs, leveraging India's demographic dividend.
4. Strategic Self-Reliance	Reduce import dependence in critical areas (defence, energy, health).
5. Sustainability	Promote green technologies (renewables, EVs) to meet climate goals.
6. National Security	Strengthen autonomy in aerospace, defence, and cybersecurity.

India's High-Tech Landscape: Two Worlds (Chapter 1)

High-Tech Manufacturing (HTM): Dominated by **Pharmaceuticals (75% of HTM value-added)** . Other sectors like electronics and aerospace have small but growing shares.

High-Tech Services (HTS): Dominated by **Computer Software Services**. India is the world leader in exports.

Key Finding: These two sectors alone account for ~98% of Indian patents granted in the US, highlighting a **narrow innovation base**

Case Study 1: The Established Leaders (Chapter 2)

Pharmaceuticals & Computer Software Services

Pharma: The "pharmacy of the world." Success built on pre-TRIPS process patent regime, strong R&D incentives, and a focus on generic drugs. High R&D intensity (~5.5%) and trade surplus.

Software: A global outsourcing powerhouse. Growth driven by a highly skilled, cost-effective workforce, industry clusters (Bangalore), and a proactive industry association (NASSCOM).

Innovation Paradox:

- **Pharma:** Patents dominated by **domestic firms**. Success measured by Abbreviated New Drug Applications (ANDAs).
- **Software:** Patents dominated by **MNC affiliates** in India. A few domestic giants (TCS, Infosys) are catching up.

Lesson: Different IP and innovation pathways can lead to global leadership.

COVID-19 Vaccines - A Tale of Two Countries (Chapter 3)

Instrument of Support	United States	India
Basic R&D	Strong, long-term federal funding (NIH).	Weak, almost non-existent for coronaviruses.
Institutional Support	Operation Warp Speed: Public-private partnership, DPA invoked.	NEGVAC & Suraksha Mission: Reactive, focused more on distribution than production.
Financial Support	Massive: $2.3B R&D + $24B in Advance Market Commitments.	Meagre: Limited R&D funding; more about loans and procurement.
IP Strategy	Patent pledges, use of Bayh-Dole Act.	Lobbied for WTO waiver, relied on voluntary licenses.
Lesson: Proactive, well-funded state intervention is critical in a crisis, even in a market economy.		

Case Study 4: Solar Photovoltaic Manufacturing (Chapter 5)

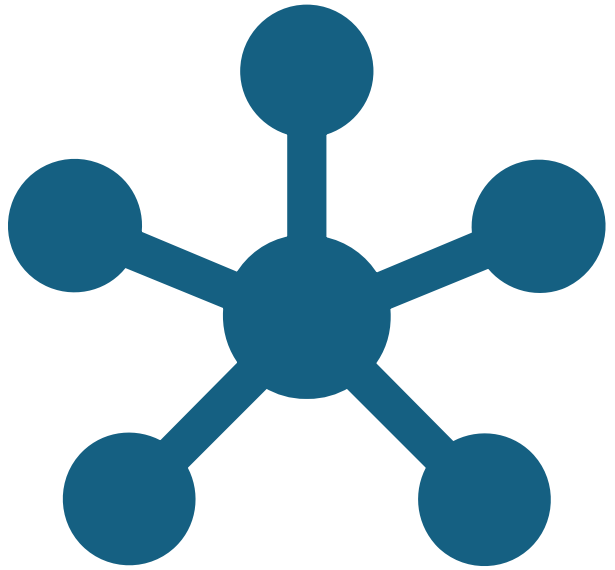
- **The Ambition:** Become a global leader in solar manufacturing. Now the 3rd largest module manufacturer globally.
- **The Dilemma:** Massive import dependence, especially on China.
  - 94% of solar cells imported from China.
  - Heavy reliance on Chinese polysilicon and wafers.
- **Policy Response (A Push for Self-Reliance):**
  - **PLI Scheme:** Financial incentives for high-efficiency manufacturing.
  - **BCD:** Basic Customs Duty on imports.
  - **ALMM:** Approved List of Models and Manufacturers to ensure quality.
- **Lesson:** Protecting domestic industry is a start, but breaking upstream technological dependence requires a long-term, integrated strategy. FDI by Chinese firms (like LONGi) presents both an opportunity and a risk.

Case Study 5: Electric Vehicle Manufacturing (Chapter 6)

- **A Unique Structure:** Unlike the West, India's EV revolution is led by **two-wheelers and three-wheelers**.
- **Policy Support:** FAME scheme (demand subsidies), PLI for batteries and auto components, state-level incentives, GST reduction.
- **Current State:**
  - **Passenger Cars:** Dominated by domestic players (Tata Motors ~73% share). Highly concentrated market.
  - **Two-Wheelers:** Competitive market (Ola, Ather, TVS).
  - **Supply Chain:** Heavily import-dependent for batteries, cells, and electronics (mostly from China).
- **Technological Capability:** Strong in software, BMS, and vehicle integration, but lags in core cell technology and power electronics.
- **Lesson:** A vibrant domestic market can be created with subsidies, but true industrial strength lies in building the entire supply chain.

Key Lessons for India (Chapters 2-6)

1. **Sectoral Specificity Matters:** Pharma's IP-driven success differs from software's talent-driven model. Policies must be tailored.
2. **The Import Dependence Trap:** Success in assembly (solar, wind, EVs) hides a critical vulnerability in core components and materials (from China).
3. **The Need for "Coordinative" Governance:** India lacks the kind of powerful, coordinating agency (like Japan's MITI) that drove Northeast Asian miracles. Policy is often fragmented.
4. **R&D is Not Enough:** India's R&D spending is low, and even when done (e.g., in public labs), it is often disconnected from industry. Need stronger commercialisation pathways.
5. **Geopolitical Agility is Key:** The US-China rivalry opens doors for India, but it must proactively forge alliances (e.g., Quad on semiconductors, Minerals Security Partnership) to secure technology and supply chains.



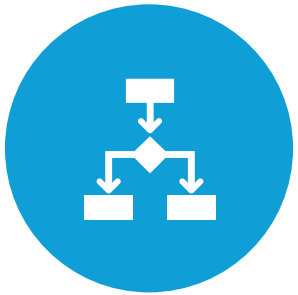
Key Lessons for Other Late-Industrialising Countries
(Chapter 7)

Lesson	Description
1. Adopt a Coordinative Model	A strong state must actively shape industrial priorities, direct credit, and enforce performance standards (like South Korea did).
2. Balance Supply & Demand	Don't just subsidize production. Stimulate domestic demand through public procurement (e.g., electric buses), consumer incentives, and wage growth.
3. Be Geopolitically Agile	Diversify supply chains, forge strategic alliances, and "hedge" technology partnerships to navigate US-China tensions and technology embargoes.
4. Link Support to Performance	State support (subsidies, loans) must be tied to measurable outcomes like export targets, patent filings, or local value addition, not just given as handouts.
5. Build the Whole Ecosystem	Focus not just on final assembly, but on the entire value chain—from raw materials and core components to R&D and a skilled workforce.

Conclusion & Final Reflections

Industrial policy is back. This book proves its continued relevance and necessity, even in market-friendly economies.

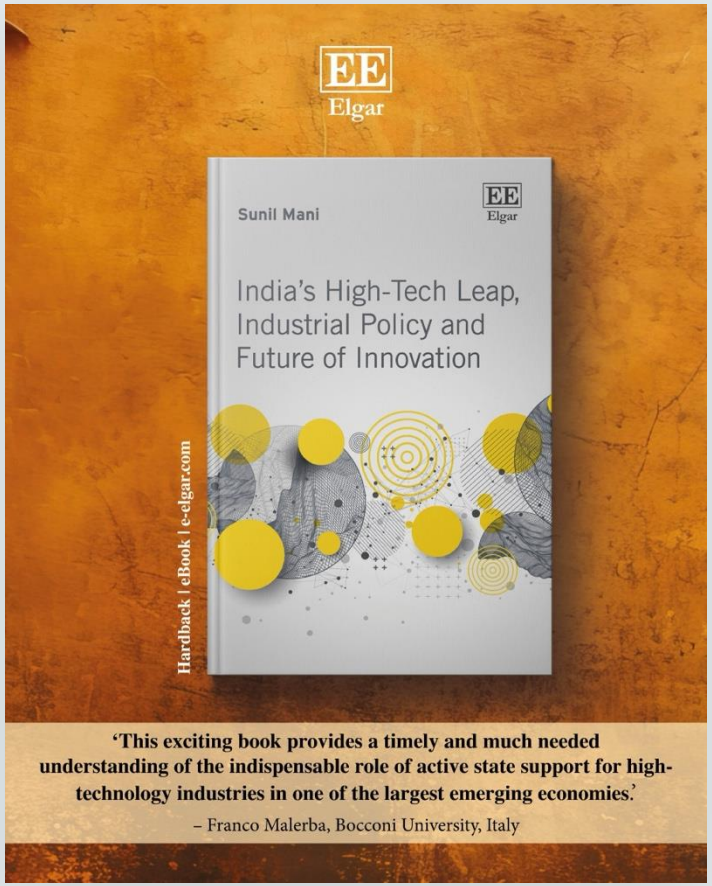
India's journey is a work in progress. It has achieved remarkable success in pockets (pharma, software) but struggles to build deep, self-reliant capabilities in strategic industries (electronics, clean energy).



The Path Forward: Requires a shift from a fragmented, incentive-based approach to a more *strategic, coordinative, and performance-oriented model*.

The Goal: To evolve from a high-tech ***assembler*** to a true global ***innovator and supplier***.

Thank you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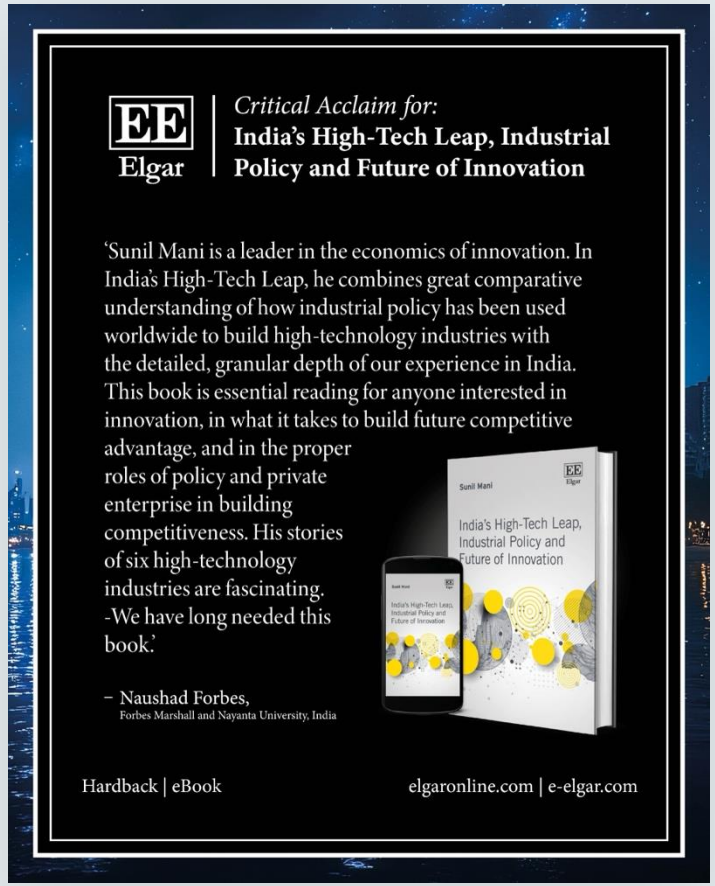
'This exciting book provides a timely and much needed understanding of the indispensable role of active state support for high-technology industries in one of the largest emerging economies.'
– Franco Malerba, Bocconi University, Italy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Critical Acclaim for:
India's High-Tech Leap, Industrial Policy and Future of Innovation
'Sunil Mani is a leader in the economics of innovation. In India's High-Tech Leap, he combines great comparative understanding of how industrial policy has been used worldwide to build high-technology industries with the detailed, granular depth of our experience in India. This book is essential reading for anyone interested in innovation, in what it takes to build future competitive advantage, and in the proper roles of policy and private enterprise in building competitiveness. His stories of six high-technology industries are fascinating. -We have long needed this book.'
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